CITY OF HOBART

SUPPORTING INFORMATION

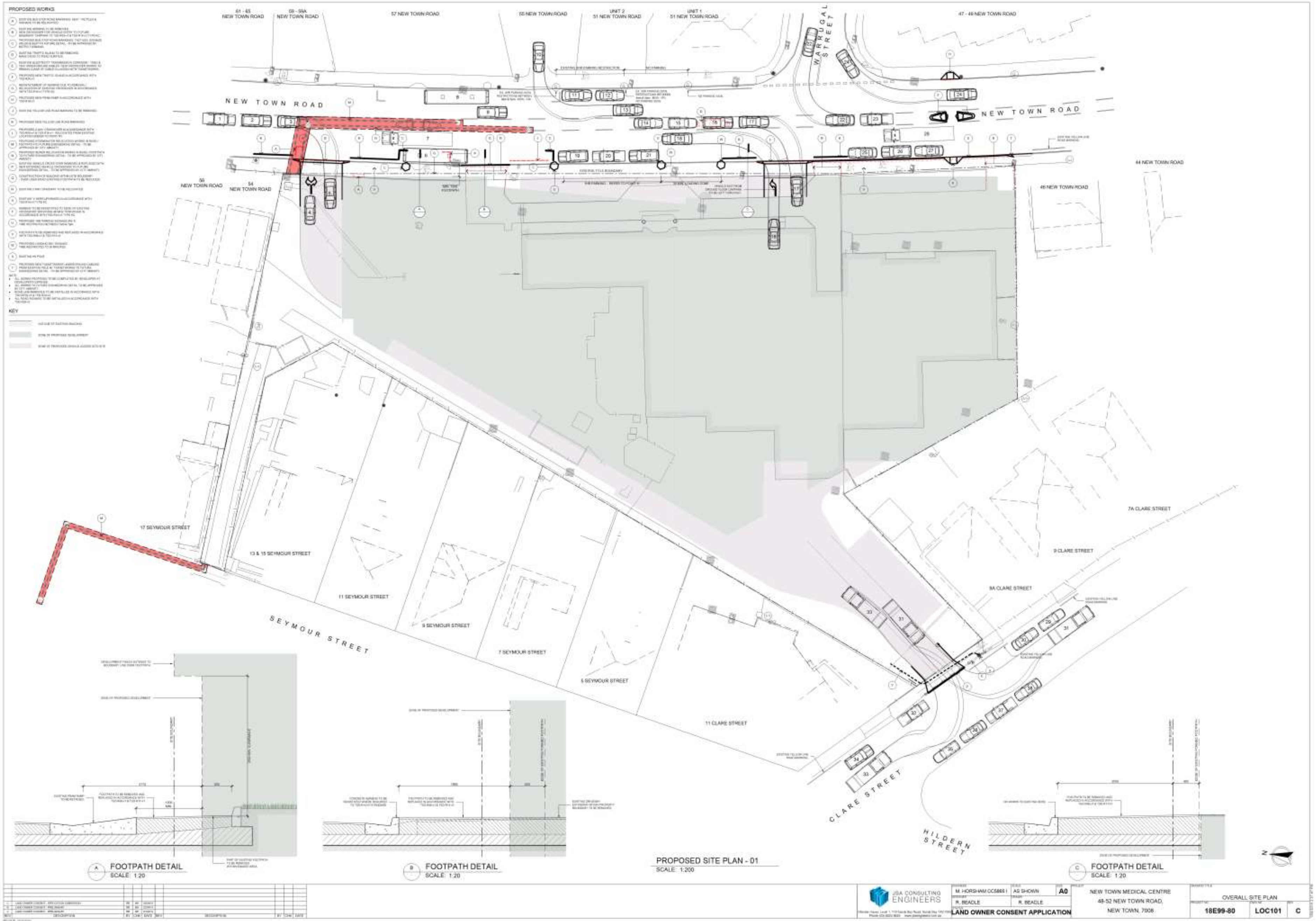
SUPPLEMENTARY ITEMS

CITY PLANNING COMMITTEE MEETING

OPEN PORTION OF THE MEETING

MONDAY, 28 OCTOBER 2019
AT 5:00 PM
VENUE: LADY OSBORNE ROOM, TOWN HALL

TABLE OF CONTENTS


PROPOSED WORKS
KEY
61 - 63 NEW TOWN ROAD
59 - 59A NEW TOWN ROAD
57 NEW TOWN ROAD
55 NEW TOWN ROAD
UNIT 2 51 NEW TOWN ROAD
UNIT 1 51 NEW TOWN ROAD
WARRUGAL STREET
47 - 49 NEW TOWN ROAD
NEW TOWN ROAD
56 NEW TOWN ROAD
54 NEW TOWN ROAD
44 NEW TOWN ROAD
46 NEW TOWN ROAD
17 SEYMOUR STREET
13 & 15 SEYMOUR STREET
11 SEYMOUR STREET
9 SEYMOUR STREET
7 SEYMOUR STREET
5 SEYMOUR STREET
SEYMOUR STREET
11 CLARE STREET
7A CLARE STREET
9 CLARE STREET
9A CLARE STREET
CLARE STREET
HILDERN STREET
FOOTPATH DETAIL
SCALE 1:20
FOOTPATH DETAIL
SCALE 1:20
FOOTPATH DETAIL
SCALE 1:20
PROPOSED SITE PLAN - 01
SCALE 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A0
R. BEADLE
R. BEADLE
LAND OWNER CONSENT APPLICATION
NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD,
NEW TOWN, 7008
OVERALL SITE PLAN
18E99-80
LOC101
C

RESULT OF SEARCH

DEPUTY RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
71337	3
EDITION	DATE OF ISSUE
3	18-Oct-2000

SEARCH DATE : 12-Jun-2019
SEARCH TIME : 03.48 PM

DESCRIPTION OF LAND

City of HOBART
Lot 3 on Diagram 71337 (formerly being 116-14NS)
Derivation : Part of 0A-3R-39Ps. Gtd. to C.Sefton
Prior CT 2287/47

SCHEDULE 1

C251768 TRANSFER to ANDREW FULLER and BETH GAYE WARDLAW
Registered 18-Oct-2000 at 12.01 PM

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
BENEFITING EASEMENT: Right of Drainage over the drainage easement marked A.B. and C.D. on D86354
89142 BOUNDARY FENCES CONDITION in Transfer
C251769 MORTGAGE to Commonwealth Bank of Australia
Registered 18-Oct-2000 at 12.02 PM

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

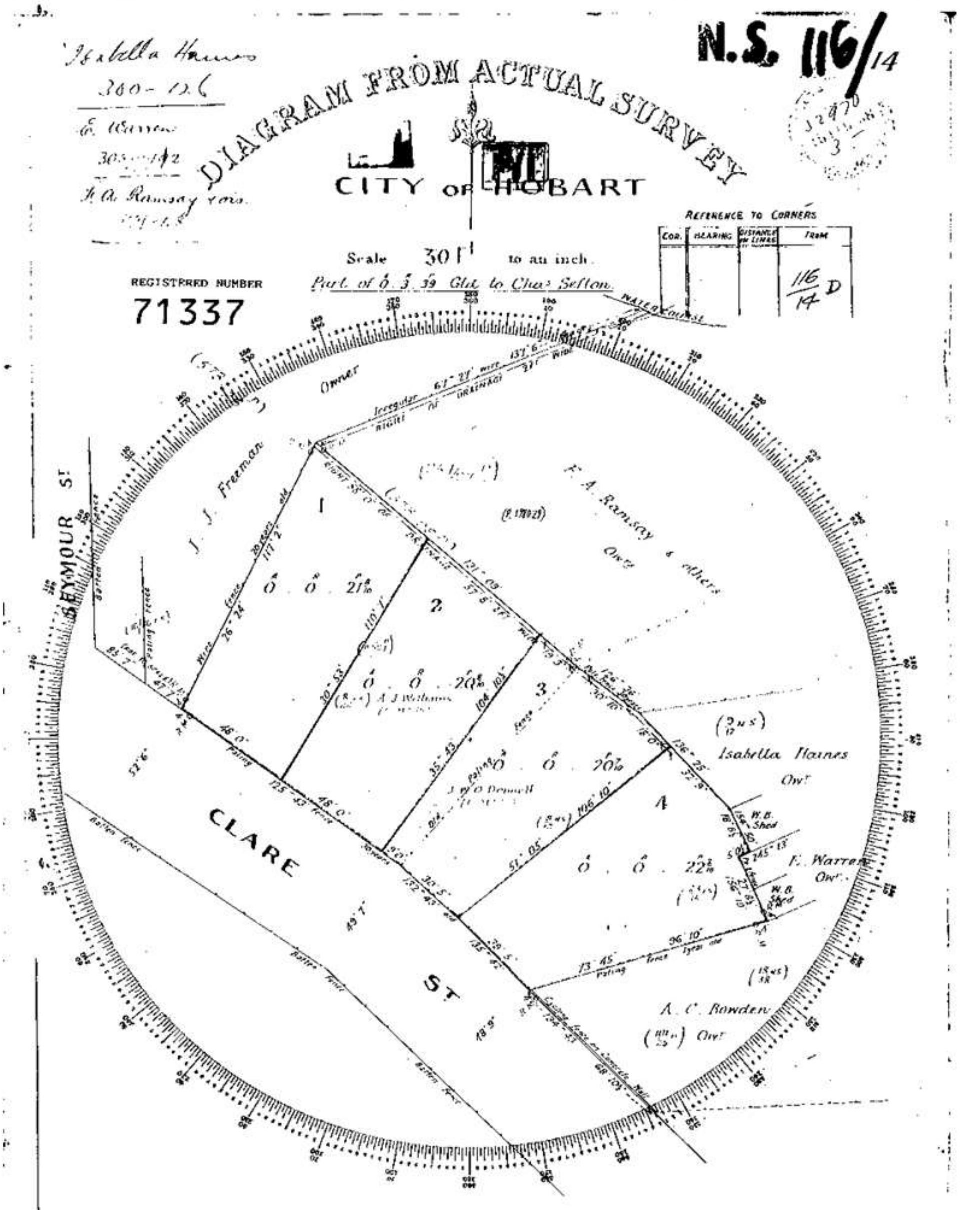
the list

FOLIO PLAN

DEPUTY RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government



To be filled in by Surveyor	Date of Instructions
	Survey commenced 11. 1. 1938
	Survey finished
	Error of close 1 in
Office examination	Plotted by
	Examined as to boundaries
	Mathematically checked
	Entered on Card by

I, William Fisher Darling of Hobart, Authorised Surveyor, of Tasmania, do hereby certify that this plan has been made from surveys executed by me or under my own personal supervision, inspection, and field check, and that both plan and survey are correct, and have been made in accordance with the by-laws of the Surveyors' Board, dated 1st May, 1913.

Dated this 1st day of Feby, 1938

W F Darling
Authorised Surveyor.

RESULT OF SEARCH

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
198029	1
EDITION	DATE OF ISSUE
3	07-Aug-2015

SEARCH DATE : 21-Jan-2019
SEARCH TIME : 11.35 AM

DESCRIPTION OF LAND

City of HOBART
Lot 1 on Plan 198029
Derivation : Whole of Lots 2 & 3 Gtd to A Woods
Prior CT 2616/7

SCHEDULE 1

M525015 TRANSFER to FROMBERG SUPER CO PTY LTD Registered 07-Aug-2015 at noon

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
BENEFITING EASEMENT: a right of drainage over the Drainage Easement marked A.B.C. on Plan No. 198029
BURDENING EASEMENT: a right of drainage (appurtenant to the land comprised in Certificate of Title Volume 562 Folio 79) over the Drainage Easement marked C.D. on Plan No. 198029
BURDENING EASEMENT: a right of drainage (appurtenant to the land comprised in Certificate of Title Volume 431 Folio 119) over the Drainage Easement marked C.E. on Plan No. 198029

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

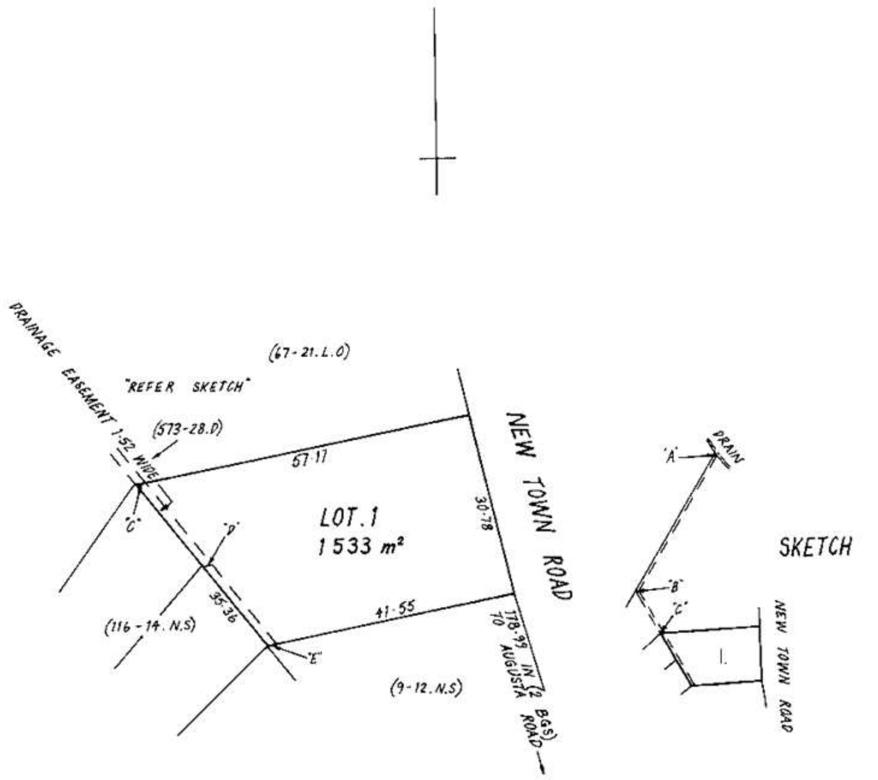
FOLIO PLAN

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

OWNER FOLIO REFERENCE CT:- 2616 - 7 GRANTEE	PLAN OF TITLE LOCATION CITY OF HOBART FIRST SURVEY PLAN No. 254 - 27.D COMPILED BY L.T.O SCALE 1: 600 LENGTHS IN METRES	Registered Number P.198029 APPROVED - 1 DEC 1997 Recorder of Titles
MAPSHEET MUNICIPAL CODE No. 114 (5225-42) LAST UPI No 2102491	LAST PLAN No.	ALL EXISTING SURVEY NUMBERS TO BE CROSS REFERENCED ON THIS PLAN



RESULT OF SEARCH

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
252465	1
EDITION	DATE OF ISSUE
6	01-Mar-2017

SEARCH DATE : 21-Jan-2019
SEARCH TIME : 11.34 AM

DESCRIPTION OF LAND

City of HOBART
Lot 1 on Plan 252465
Derivation : Whole of 0A-2R-8Ps. Gtd. to M. Everall Part of 1A-3R-10Ps. Gtd. to S. Bendall Part of 2A-1R-35.1/2Ps. Gtd. to J. Dunn.
Prior CT 2616/6

SCHEDULE 1

M527797 TRANSFER to FROMSVISION PTY LTD Registered 16-Jul-2015 at noon

SCHEDULE 2

Reservations and conditions in the Crown Grant if any

BURDENING EASEMENT: the right of drainage for William Joseph Hugh Clifford and Henry Percy Roberts and Ada Alice Rogers their executors administrators and assigns to construct on strip of land marked Drain 1.22 wide passing through the said land within described such drain or drains as may be necessary for the efficient drainage of the lands and any buildings thereon erected and to keep the same in repair with full and free right and liberty for them their heirs executors administrators or assigns and their agents or workmen to enter upon such strip of land at all times during the day and to do all such acts and things as shall be reasonably necessary for the purpose of constructing the said drains and maintaining the same in proper repair and condition.

BURDENING EASEMENT: Right of Drainage [appurtenant to the land comprised in Certificate of Title Volume 431 Folio 119, Volume 562 Folio 79, Volume 678 Folio 22 and Volume 2287 Folio 47) over the drainage easement 1.52 Wide shown passing through the said land within described.

C452904 BURDENING EASEMENT: A right of carriageway (appurtenant to Lot 1 on D.32216)over the Right of

Way shown passing through the said land within described Registered 14-May-2003 at noon

A157979 LEASE to The Hydro Electric Commission of a leasehold estate for the term of ninety-nine (99) years from 31-Dec-1961 of 0A-0R-0.6/10Ps. of the above land (Diagram No. 441/14) Together with the right to lay and maintain cables. Registered 28-Aug-1962 at noon Leasehold Title(s) issued: 82674/1

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

the list...

FOLIO PLAN

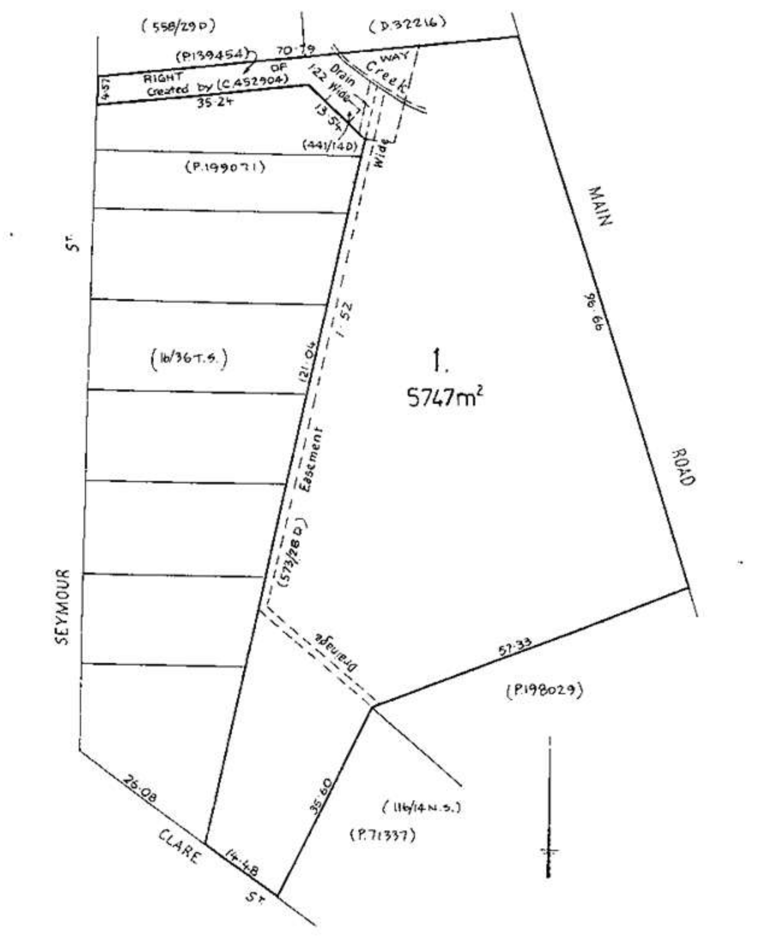
RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

OWNER FOLIO REFERENCE C.T. 2616 – 6 GRANTEE	PLAN OF TITLE LOCATION **CITY OF HOBART** FIRST SURVEY PLAN No. (C7/21 L.O.) COMPILED BY L.D.R.B. SCALE 1: 600 LENGTHS IN METRES	Registered Number **P 252465** APPROVED 9/5/03 Alice Kawa Recorder of Titles

MAPSHEET MUNICIPAL CODE No. 114 / 5225-42	LAST UPI No GJC93	LAST PLAN No. —	ALL EXISTING SURVEY NUMBERS TO BE CROSS REFERENCED ON THIS PLAN



RESULT OF SEARCH

DEPUTY RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
76403	1
EDITION	DATE OF ISSUE
3	20-Apr-2000

SEARCH DATE : 20-Mar-2019
SEARCH TIME : 01.27 PM

DESCRIPTION OF LAND

City of HOBART
Lot 1 on Diagram 76403 (formerly being 254-27D)
Derivation : Part of 0A-2R-5Ps. Gtd. to A. Woods
Prior CT 2344/73

SCHEDULE 1

C225215 DOMINIC DI CARLO Registered 20-Apr-2000 at noon

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
C225160 MORTGAGE to Perpetual Trustees Tasmania Limited Registered 20-Apr-2000 at 12.03 PM
C706423 TRANSFER of MORTGAGE C225160 to Murdoch Clarke Mortgage Management Limited Registered 09-Nov-2006 at noon

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

NVC
NOISE VIBRATION CONSULTING

Swanbury Penglase
244 Gilbert Street
Adelaide SA 5000

18 April 2019

5907.docx

Attention: Stephen Penglase

NEW TOWN MEDICAL CENTRE – DA NOISE ASSESSMENT

A 3 storey health care facility is to be built at 48 – 52 New Town Road. The development will comprise retail, consulting and day surgery spaces, and has residential dwellings around it. This letter presents an assessment of likely noise emissions from the development against the Hobart Interim Planning Scheme (Scheme), conducted by NVC in April 2019.

1. SITE DESCRIPTION

The site is situated between New Town Road and Clare Street on land that slopes down gently to the north and occupies an area of some 8,000 m^2. The site is zoned Urban Mixed Use, and surrounded by predominately residential single and multiple dwellings which are in an Inner Residential zone. There are a small group of buildings that operate as commercial activities adjacent the development that are within the Urban Mixed Use zone.

Fawn shading denotes Inner Residential zoning

Image courtesy Google Earth

Figure 1: Site and Surrounds

New Town Road is a significant traffic route between North Hobart and New Town / Moonah and as such traffic noise from it is the main ambient noise.

The proposed development is for a new private hospital providing both in-patient and out-patient care, such as surgeries and rehabilitation. The site will also provide for a number of health-based retail tenancies, conference area and hospital support facilities. Primary access to the site will be from New Town Road, which will be used for all public access. An additional entry from Clare Street will be predominately used for service vehicle access.

The site and surrounds are shown in Figure 1.

2. NOISE SOURCES

Noise sources associated with the site have been identified as listed below:

TasNetworks substation:

- The existing transformer is to be upgraded to a dual transformer substation, located on the SW boundary within a concrete panel building. Based on the transformer size (2x1.5MVA), the sound power of the transformers is predicted to be 71 dBA. When located within a concrete building, the noise at the nearest residential boundary will be less than 25 dBA. This source is not further considered in the assessment.

Traffic access to the site:

- Traffic comprises light vehicles via New Town Road and service vehicles via Clare Street.
- Only the northern access off New Town Road is considered, as this is adjacent a residential boundary and carries the bulk of the traffic to the site (an order of magnitude more traffic than central access).
- Access via New Town Road will be predominantly between 7:00AM and 6:00PM for tenancy vehicles, and 7:00AM to 8:00PM for hospital vehicles. For night time noise levels a flow rate of 10 cars per hour has been assumed.
- Service vehicles are assumed to occur within the hours indicated under the Acceptable Solutions in the Scheme; 7:00AM to 5:00PM, i.e. day time hours.
- Ambulance entrance to the site is included in the predictions in terms of general vehicle noise, but not in terms of its siren. The ambulance siren is assumed turned off on entrance to the site.
- Vehicle movements are summarised in Table 1.

Roof top mechanical plant room:

- Contains AHU's, various pumps, and supply / exhaust fans.
- In-duct fans draw / exhaust air via louvres to the plant room, for which standard noise mitigation is applicable and effective (silencers, lined ducts, acoustic louvres). Standard acoustic design during detail design / documentation stages can achieve an acceptable noise level here.
- During design / documentation it will become apparent what the room wall / ceiling construction should be to meet the Scheme requirements. It is likely an absorptive lining will be required for some of the internal surfaces, and that the wall be Colorbond plus a secondary leaf (e.g. 18mm plywood or 12mm cement sheet).
- As standard noise mitigation practices may control emissions from the plant room, it is not considered in any further detail.

Roof top plant deck:

- Comprises 16 air cooled chillers, assumed all operating at full load during the day, and 3 during the night.
- Selected units currently Hitachi RME-140AH2, with extra super low noise option.
- Fans are VSD controlled so can be run at low speed. Running two units at low speed is preferable to a single unit at full speed.

- The deck walls are to have an absorptive internal lining, and a barrier wall either end of the deck to a height of 0.5m above the units.
- The barrier wall should have a surface mass of at least 15 kg/m^2.

Emergency generator:

- For emergency power back up, and located in the basement in its own room constructed of masonry blocks with a louvre for inlet air.
- The louvre is to be acoustic-type, and located in the internal wall to the car park.
- The set is test run monthly, during the daytime. As it only runs briefly, it is assessed on its own.
- Cummins generator C400D5.

Car park exhaust fans:

- Located in the basement using a ducted system with inlet on the western side and exhaust at ground level on the southern side.
- For both supply and exhaust there is substantial lengths of ductwork between the fan and entry / exit that may be lined or have an attenuator installed. As such noise emissions from this source may be controlled using standard mitigation practices, and such mitigation will be resolved during detail design stages. This source is then not considered further in any detail.

The locations of the noise sources are shown in Figure 1, and their one-third octave sound power levels are listed in Table 2.

Table 1: Vehicle Movements

	Vehicle Movements, two-way				
		Day Time		Night Time	
	Large	Medium	Small	Medium	Small
Claire Street	1	14	4	2	10
New Town Rd, Nth.	-	-	173*		

* This is morning peak and represents maximum flow.

Table 2: Mechanical Plant One-Third Octave Sound Power Levels

		Sound Power Level, dBA								
		Frequency Band, Hz								
Source	**Qty**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**O'all**
Roof top AHU: RME-140H2	16	8	85	88	93	97	88	75	65	99
Car, 20 < km/hr	1	69	76	78	81	84	84	78	71	89
Large truck, < 20 km/hr	1	79	88	92	97	100	98	91	84	104
Medium truck, < 20 km/hr	1	81	85	90	99	100	96	88	76	104
Substation transformers	2			66	63					68
Generator, enclosed: C400D5	1									98

3. PREDICTED NOISE LEVELS

Of the sources listed in the previous section, some are either insignificant (very low sound power), or readily controlled with standard mitigation practices and hence no longer considered for detailed assessment. This leaves three noise sources for detailed assessment, viz:

- The roof top external plant deck AHU's.
- Traffic noise, from the northern access off New Town Road, and off Claire street.
- The diesel generator set.

The noise emissions from these sources have been predicted using a spreadsheet-based model which implements the ISO 9613 algorithm, using topographic data from The List, and include attenuation due to distance, screening and air absorption. The following mitigation options are included in the model:

- An acoustic barrier / screen surrounds the roof top external plant deck to a height 0.5m above the plant. The screen has an absorptive internal lining.
- A 1.8m solid boundary fence lines the Clare Street access driveway.
- The diesel generator has acoustic louvres used for intake air from the car park area.

The predicted levels at the relevant boundaries and at elevated positions in the community are listed in Table 3.

For R1 and R2, which are some 100m from the development but elevated to it, the controlling noise source is the roof top plant. Traffic accessing the site has negligible influence.

At the site boundary (R3 and R4), the traffic accessing the site is the dominant noise source as the bulk of the building provides a very effective barrier to the roof top plant.

When the diesel generator operates it is a significant source for the nearest neighbour there

Table 3: Predicted Noise Levels

Location	Sound Pressure Level, dBA	
	Day Time	Night Time
R1, Clare St Hill	47	39
R2, Argyle St Hill	42	39
R3, New Town Rd Boundary	47	39
R4, Clare St Boundary	50	40
Seymour St Boundary*	53	–

* This is for the generator only operating

4. CRITERIA

The Hobart Interim Planning Scheme 2015 defines noise criteria for an Urban Mixed Use zone under clause 15.3.1, which details Acceptable Solutions and Performance Criteria, with the objective "*To ensure that non-residential use does not unreasonably impact residential amenity.*"

Particular to noise it states:

Acceptable Solution, A2: *Noise emissions measured at the boundary of the site must not exceed the following:*

(a) 55 dB(A) (LAeq) between the hours of 7:00 am to 7:00 pm;
(b) 5dB(A) above the background (LA90) level or 40dB(A) (LAeq), whichever is the lower, between the hours of 7:00 pm to 7:00 am;
(c) 65dB(A) (LAmax) at any time.

Performance Criteria, P2: *Noise emissions measured at the boundary of the site must not cause environmental harm."*

For commercial vehicles, it states:

Acceptable Solution, A4: *Commercial vehicle movements, (including loading and unloading and garbage removal) to or from a site must be limited to within the hours of:*

(a) 7.00 am to 5.00 pm Mondays to Fridays inclusive;
(b) 8.00 am to 5.00 pm Saturdays;
(c) 9.00 am to 12 noon Sundays and Public Holidays

Unattended noise measurements were made at R2 and R4, each over a 4 day period, to determine the current background and ambient noise levels in the area, and are summarised in Table 4.

Table 4: Ambient Noise Levels

Time	Location	Sound Level, dBA 15 mins		
		L10	L90	Leq
Day	R2	52	45	50
	R3	65	48	61
	R4	54	42	51
Night	R2	45	35	42
	R3	57	39	54
	R4	47	38	46

Combining the measurements with the Planning Scheme determines the Acceptable Solutions noise criteria are 55 dBA during the day time and 40 dBA during the night time.

5. ASSESSMENT

The noise predictions are compared to the Scheme criteria in Table 5 and shows the noise emissions meet the Acceptable Solutions defined in clause 15.3.1-A2 of the Scheme.

Table 5: Assessment of Site Noise Emissions

Location	Sound Pressure Level, dBA	
	Day Time	Night Time
Criteria	**55**	**40**
R1, Clare St Hill	47	39
R2, Argyle St Hill	42	39
R3, New Town Rd Boundary	47	39
R4, Clare St Boundary	50	40
Seymour St Boundary	53	-

6. CONCLUSION

An initial noise assessment of the proposed day hospital at 48 – 52 New Town Road has been performed. The various noise sources have been identified and described, with some being determined of insignificant sound power or readily controllable with standard mitigation practices (silencers, lined ducts, high mass walls, etc.)

Noise emissions from the remaining sources; traffic at Clare and New Town Road access points, the emergency diesel generator, and the roof top external plant deck, have been assessed in more detail using predictions based on the ISO9613 algorithms. The predicted noise levels have then been compared against the Hobart Interim Planning Scheme Acceptable Solution, clause 15.3.1-A2.

The noise assessment has shown the development can satisfy the Acceptable Solution at clause 15.3.1-A2 of the Scheme with the following mitigation options implemented:

- The diesel generator room should have an absorptive lining on the ceiling, and acoustic louvres for inlet air on the internal car park wall.
- The outdoor mechanical plant deck enclosure should have a surface mass of at least 15 kg/m^2, be to a height 0.5m above the top of the plant, and have an absorptive lining on the inside (e.g. Stratocell Whisper, 50mm).
- Where boundary fences are replaced / installed, they should be to a height of 1.8m and of solid construction (>15kg/m^2). At a minimum such a fence should line the Clare Street access on both sides.
- Commercial deliveries to site be within the acceptable hours of 7:00AM to 5:00PM.
- Ambulance sirens should be turned off upon entry to the site.
- A full acoustic review of the mechanical plant noise to the community should be conducted during detail design to ensure the Scheme criteria are met.

Should you have any queries, please do not hesitate to call this office directly.
Yours faithfully

Bill Butler
NOISE VIBRATION CONSULTING

NVC
NOISE VIBRATION CONSULTING

Swanbury Penglase
244 Gilbert Street
Adelaide SA 5000

27 June 2019

5907_02.docx

Attention: Stephen Penglase

New Town Medical Centre – DA Noise Assessment

A 3 storey health care facility is to be built at 48 – 52 New Town Road. The development will comprise retail, consulting and day surgery spaces, and has residential dwellings around it. This letter presents an assessment of likely noise emissions from the development against the Hobart Interim Planning Scheme (Scheme), conducted by NVC in April 2019.

1. SITE DESCRIPTION

The site is situated between New Town Road and Clare Street on land that slopes down gently to the north and occupies an area of some 8,000 m^2. The site is zoned Urban Mixed Use, and surrounded by predominately residential single and multiple dwellings which are in an Inner Residential zone. There are a small group of buildings that operate as commercial activities adjacent the development that are within the Urban Mixed Use zone.

Fawn shading denotes Inner Residential zoning

Image courtesy Google Earth

Figure 1: Site and Surrounds

New Town Road is a significant traffic route between North Hobart and New Town / Moonah and as such traffic noise from it is the main ambient noise.

The proposed development is for a new private hospital providing both in-patient and out-patient care, such as surgeries and rehabilitation. The site will also provide for a number of health-based retail tenancies, conference area and hospital support facilities. Primary access to the site will be from New Town Road, which will be used for all public access. An additional entry from Clare Street will be predominately used for service vehicle access.

The site and surrounds are shown in Figure 1.

2. NOISE SOURCES

Noise sources associated with the site have been identified as listed below:

TasNetworks substation:

- The existing transformer is to be upgraded to a dual transformer substation, located on the SW boundary within a concrete panel building. Based on the transformer size (2x1.5MVA), the sound power of the transformers is predicted to be 71 dBA. When located within a concrete building, the noise at the nearest residential boundary will be less than 25 dBA. This source is not further considered in the assessment.

Traffic access to the site:

- Traffic comprises light vehicles via New Town Road and service vehicles via Clare Street.
- Only the northern access off New Town Road is considered, as this is adjacent a residential boundary and carries the bulk of the traffic to the site (an order of magnitude more traffic than central access).
- Access via New Town Road will be predominantly between 7:00AM and 6:00PM for tenancy vehicles, and 6:30AM to 8:00PM for hospital vehicles. For night time noise levels a flow rate of 10 trips per hour has been assumed.
- Service vehicles are assumed to occur within the hours indicated under the Acceptable Solutions in the Scheme; 7:00AM to 5:00PM, i.e. day time hours.
- Ambulance entrance to the site is included in the predictions in terms of general vehicle noise, but not in terms of its siren. The ambulance siren is assumed turned off on entrance to the site.
- The Ambulance is taken as a small vehicle and is part of the night time vehicle movements.
- Vehicle movements are summarised in Table 1.

Roof top mechanical plant room:

- Contains AHU's, various pumps, and supply / exhaust fans.
- In-duct fans draw / exhaust air via louvres to the plant room, for which standard noise mitigation is applicable and effective (silencers, lined ducts, acoustic louvres). Standard acoustic design during detail design / documentation stages can achieve an acceptable noise level here.
- During design / documentation it will become apparent what the room wall / ceiling construction should be to meet the Scheme requirements. It is likely an absorptive lining will be required for some of the internal surfaces, and that the wall be Colorbond plus a secondary leaf (e.g. 18mm plywood or 12mm cement sheet).
- As standard noise mitigation practices may control emissions from the plant room, it is not considered in any further detail.

Waste Collection:

- For emergency power back up, and located in the basement in its own room constructed of masonry blocks with a louvre for inlet air.

Roof top plant deck:

- Comprises 16 air cooled chillers, assumed all operating at full load during the day, and 3 during the night.
- Selected units currently Hitachi RME-140AH2, with extra super low noise option.
- Fans are VSD controlled so can be run at low speed. Running two units at low speed is preferable to a single unit at full speed.
- The deck walls are to have an absorptive internal lining, and a barrier wall either end of the deck to a height of 0.5m above the units.
- The barrier wall should have a surface mass of at least 15 kg/m^2.

Emergency generator:

- For emergency power back up, and located in the basement in its own room constructed of masonry blocks with a louvre for inlet air.
- The louvre is to be acoustic-type, and located in the internal wall to the car park.
- The set is test run monthly, during the daytime. As it only runs briefly, it is assessed on its own.
- Cummins generator C400D5.

Car park exhaust fans:

- Located in the basement using a ducted system with inlet on the western side and exhaust at ground level on the southern side.
- For both supply and exhaust there is substantial lengths of ductwork between the fan and entry / exit that may be lined or have an attenuator installed. As such noise emissions from this source may be controlled using standard mitigation practices, and such mitigation will be resolved during detail design stages. This source is then not considered further in any detail.

The locations of the noise sources are shown in Figure 1, and their one-third octave sound power levels are listed in Table 2.

Table 1: Vehicle Movements

	Vehicle Movements, two-way				
	Day Time†			Night Time†	
	Large	Medium	Small	Medium	Small
Claire Street	1	14	4	2	10
New Town Rd, Nth.	-	-	173*		10

† day time is 0700 – 1900, night time 1900 - 0700

* This is morning peak and represents maximum flow.

Table 2: Mechanical Plant One-Third Octave Sound Power Levels

		Sound Power Level, dBA								
		Frequency Band, Hz								
Source	**Qty**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**O'all**
Roof top AHU: RME-140H2	16	8	85	88	93	97	88	75	65	99
Car, 20 < km/hr	1	69	76	78	81	84	84	78	71	89
Large truck, < 20 km/hr	1	79	88	92	97	100	98	91	84	104
Medium truck, < 20 km/hr	1	81	85	90	99	100	96	88	76	104
Substation transformers	2			66	63					68
Generator, enclosed: C400D5	1	85	95	96	96	94	91	86	81	102

3. PREDICTED NOISE LEVELS

Of the sources listed in the previous section, some are either insignificant (very low sound power), or readily controlled with standard mitigation practices and hence no longer considered for detailed assessment. This leaves three noise sources for detailed assessment, viz:

- The roof top external plant deck AHU's.
- Traffic noise, from the northern access off New Town Road, and off Claire street.
- The diesel generator set.

The noise emissions from these sources have been predicted using a spreadsheet-based model which implements the ISO 9613 algorithm, using topographic data from The List, and include attenuation due to distance, screening and air absorption. The following mitigation options are included in the model:

- An acoustic barrier / screen surrounds the roof top external plant deck to a height 0.5m above the plant. The screen has an absorptive internal lining.
- A 1.8m solid boundary fence lines the Clare Street access driveway.
- The diesel generator has acoustic louvres used for intake air from the car park area.

The predicted levels at the relevant boundaries and at elevated positions in the community are listed in Table 3.

For R1 and R2, which are some 100m from the development but elevated to it, the controlling noise source is the roof top plant. Traffic accessing the site has negligible influence.

At the site boundary (R3 and R4), the traffic accessing the site is the dominant noise source as the bulk of the building provides a very effective barrier to the roof top plant.

When the diesel generator operates it is a significant source for the nearest neighbour there

Table 3: Predicted Noise Levels

Location	Sound Pressure Level, dBA	
	Day Time	Night Time
R1, Clare St Hill	47	39
R2, Argyle St Hill	42	39
R3, New Town Rd Boundary	47	39
R4, Clare St Boundary	50	40
Seymour St Boundary*	47	47

* This is for the generator only operating

4. CRITERIA

The Hobart Interim Planning Scheme 2015 defines noise criteria for an Urban Mixed Use zone under clause 15.3.1, which details Acceptable Solutions and Performance Criteria, with the objective "*To ensure that non-residential use does not unreasonably impact residential amenity.*"

Particular to noise it states:

Acceptable Solution, A2: *Noise emissions measured at the boundary of the site must not exceed the following:*

(a) 55 dB(A) (LAeq) between the hours of 7:00 am to 7:00 pm;
(b) 5dB(A) above the background (LA90) level or 40dB(A) (LAeq), whichever is the lower, between the hours of 7:00 pm to 7:00 am;
(c) 65dB(A) (LAmax) at any time.

Performance Criteria, P2: *Noise emissions measured at the boundary of the site must not cause environmental harm."*

For commercial vehicles, it states:

Acceptable Solution, A4: *Commercial vehicle movements, (including loading and unloading and garbage removal) to or from a site must be limited to within the hours of:*

(a) 7.00 am to 5.00 pm Mondays to Fridays inclusive;
(b) 8.00 am to 5.00 pm Saturdays;
(c) 9.00 am to 12 noon Sundays and Public Holidays

Unattended noise measurements were made at R2 and R4, each over a 4 day period, to determine the current background and ambient noise levels in the area, and are summarised in Table 4.

Table 4: Ambient Noise Levels

Time	**Location**	**Sound Level, dBA** 15 mins		
		L10	L90	Leq
Day	R2	52	45	50
	R3	65	48	61
	R4	54	42	51
Night	R2	45	35	42
	R3	57	39	54
	R4	47	38	46

Combining the measurements with the Planning Scheme determines the Acceptable Solutions noise criteria are 55 dBA during the day time and 40 dBA during the night time.

5. ASSESSMENT

The noise predictions are compared to the Scheme criteria in Table 5 and shows the noise emissions meet the Acceptable Solutions defined in clause 15.3.1-A2 of the Scheme for all operations except the standby generator when used at night.

Table 5: Assessment of Site Noise Emissions

Location	**Sound Pressure Level, dBA**	
	Day Time	Night Time
Criteria	**55**	**40**
R1, Clare St Hill	47	39
R2, Argyle St Hill	42	39
R3, New Town Rd Boundary	47	39
R4, Clare St Boundary	50	40
Seymour St Boundary	47	47

The night time standby generator noise is then assessed against the performance criteria requiring it does not cause environmental harm. The NSW Noise Policy for Industry identifies an intrusive noise as being 5dB higher than the background level. For the generator this would imply 38+5=43 dBA.

The generator, if it operates at night will be only for emergency (loss of mains power), and hence will be infrequent. To account for this infrequent operation in assessing the noise, the noise limit may be increased, the Victorian noise regulations SEPP N1 at B4 indicating a 5 dB increase at night is appropriate. A limit of 48 dBA is then indicated as reasonable.

The generator is below this and hence is determined a reasonable noise at night so unlikely to cause environmental harm.

6. CONCLUSION

An initial noise assessment of the proposed day hospital at 48 – 52 New Town Road has been performed. The various noise sources have been identified and described, with some being determined of insignificant sound power or readily controllable with standard mitigation practices (silencers, lined ducts, high mass walls, etc.)

Noise emissions from the remaining sources; traffic at Clare and New Town Road access points, the emergency diesel generator, and the roof top external plant deck, have been assessed in more detail using predictions based on the ISO9613 algorithms. The predicted noise levels have then been compared against the Hobart Interim Planning Scheme Acceptable Solution, clause 15.3.1-A2.

With the following mitigation options implemented the noise assessment has shown the development can satisfy the Acceptable Solution at clause 15.3.1-A2 of the Scheme with the exception of the emergency generator during the night time:

- The diesel generator room should have an absorptive lining on the ceiling, and acoustic louvres for inlet air on the internal car park wall.
- The outdoor mechanical plant deck enclosure should have a surface mass of at least 15 kg/m^2, be to a height 0.5m above the top of the plant, and have an absorptive lining on the inside (e.g. Stratocell Whisper, 50mm).
- Where boundary fences are replaced / installed, they should be to a height of 1.8m and of solid construction (>15kg/m^2). At a minimum such a fence should line the Clare Street access on both sides.
- Commercial deliveries to site be within the acceptable hours of 7:00AM to 5:00PM.
- Ambulance sirens should be turned off upon entry to the site.
- A full acoustic review of the mechanical plant noise to the community should be conducted during detail design to ensure the Scheme criteria are met.

Should the emergency generator operate during the night, its noise emissions exceed the Acceptable solution and the performance criteria is referred to. The assessment shows the generator to not cause environmental harm and hence its noise emissions meet the performance criteria at 15.3.1-P2 of the Scheme.

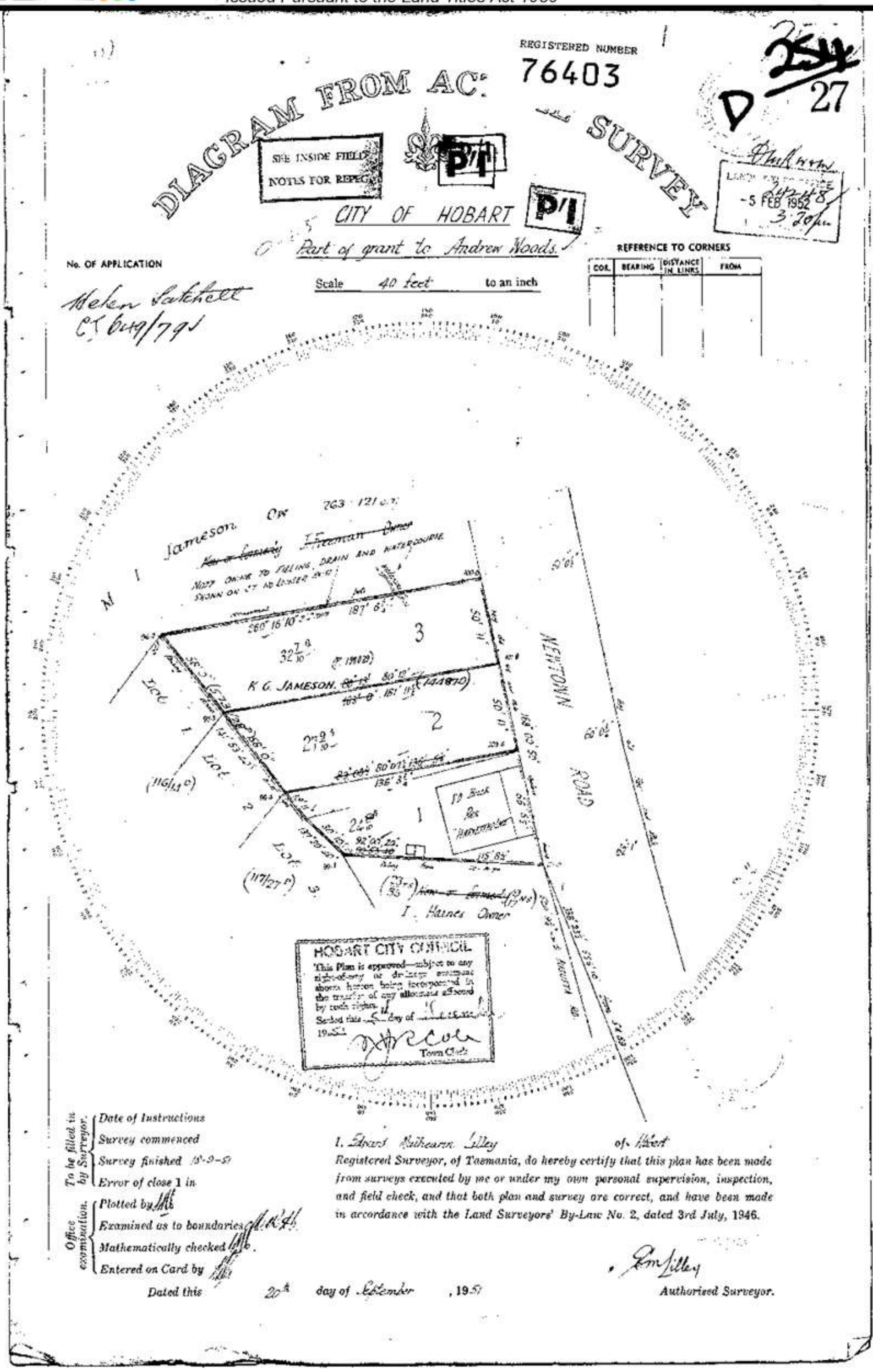
Should you have any queries, please do not hesitate to call this office directly.
Yours faithfully

Bill Butler
NOISE VIBRATION CONSULTING

FOLIO PLAN

DEPUTY RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980



pitt&sherry Building Surveying

18 April 2019

Matthew Raven
244 Gilbert Street
ADELAIDE SA 5000

Dear Matthew,

48-52 New Town Road, NEW TOWN – DA Submission Review

pitt&sherry Building Surveying has undertaken a review of critical compliance matters and design aspects for the New Town Medical Centre – 48-52 Main Road, New Town. The review has been conducted in accordance with the Building Act 2016 and compliance considerations have been undertaken to the Building Code of Australia 2016 (incorporating Amendment 1).

Key considerations for the Development Approval submission include the identification of required building fire safety systems; critical design considerations that may require a performance-based solution; and minimum requirements for fire safety, including determination of building Classification and fire resistance levels to building elements. The following includes the design considerations reviewed for DA submission –

Section C – Fire Resistance

The building has the following defined –

Building Classification:	Level 2 – Class 9a health care building
	Level 1 – Class 5 offices (assumed tenancy lease)
	Ground Floor – Class 6 retail, Class 5 office & Class 7a carpark
	Basement 1 – Class 7a carpark
Rise in Storeys:	4 (currently including basement level)
Type of Construction:	Type A Construction

The predominant use of the building will be Class 5 and Class 9a which align in respect to fire resistance levels (FRL) required by Section C of the BCA. Where other tenancy uses change the classification (e.g. retail/café), the area of use will be determined and if over 10% of the storey floor area may trigger an FRL upgrade to satisfy deemed-to-satisfy provisions.

Heightened requirements to compartmentation and separation are imposed by the BCA for Class 9a buildings (Part C2.5) used as patient care areas, treatment and ward areas. Initial consultation with the design team has indicated where appropriate fire and smoke compartments are available to achieve these requirements. The conclusion of these consultancies has indicated that several compartments (smoke and fire) will be marginally over the maximum compartment size. The acceptance of this will be via addressing performance requirements applicable in Section C, completed by the fire engineer.

Section D – Access and Egress

The minimum number of exits required to spaces within the building is defined as:

Level B1 to L1:	A single exit is required.
Level 2:	Two exits are required in addition to horizontal exits.

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199 Macquarie Street
GPO Box 94 Hobart
Tasmania 7001
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F (03) 6223 7017

Launceston
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113 Cimitiere Street
PO Box 1409 Launceston
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Incorporated as
Australian Building
Surveying Services Pty Ltd
ABN 25 143 786 234

Exit travel distances have been reviewed for each level and generally found that exit travel distances exceed maximum allowances by Part D1.4 of the BCA. Notably in Basement 1, the distance to a single exit or between alternate exits is more than 40m and 60m respectively. The exact exit travel distances are to be calculated to enable the process for determining if the performance requirements can be met through a performance solution.

Section E – Services and Equipment

The building is proposed to have fire fighting equipment including fire hydrants (including internal); fire hose reels; and a fire sprinkler system to meet the deemed-to-satisfy provision of the BCA.

Smoke hazard management systems proposed include an (AS1668.1) smoke control system, incorporated with an automatic (AS1670.1) smoke detection and alarm system. The level of smoke control and ventilation to be incorporated is yet to be determined, however fire-isolated exits to the Level 2 (Class 9a) are required to have stair pressurisation in accordance with AS1668.1.

Reporting & Function Control Authorities

This project will be required to have components referred to reporting and function control authorities as required by the Building Regulations 2016. These components include the following:

1. Secretary of the Department of Health in relation to health service establishments operating in accordance with the Health Service Establishments Act 2006.
2. The Chief Officer of the Tasmania Fire Services in relation to the operational suitability of fire safety requirements.
3. The Environmental Health Officer in relation to food safety.

The next assessment stage is the schematic design, where further investigation will be undertaken in to deemed-to-satisfy requirements and performance solutions.

Please feel free to give me a call on 6210 1453

Yours sincerely

Ash Beardwood
Building Surveyor
Hobart Office

JSA CONSULTING ENGINEERS

Ben Ikin
Senior Statutory Planner
Hobart City Council
16 Elizabeth Street
Hobart TAS 7000

12 July 2019
Your reference: PLN-19-291
JSA reference: 17L99-20-4

Dear Ben,

RE: RE: 52 NEW TOWN ROAD & 48 – 50 NEW TOWN ROAD & 46 NEW TOWN ROAD, NEWTOWN & ADJACENT ROAD RESERVE

DEMOLITION, NEW BUILDING FOR HOSPITAL SERVICES, BUSINESS AND PROFESSIONAL SERVICES, AND GENERAL RETAIL AND HIRE, SIGNAGE, AND ASSOCIATED INFRASTRUCTURE WORKS

I am writing in response to an enquiry regarding the contamination status of the land in the area zoned inner residential within the right of way at 48-52 New Town Rd.

The works proposed in this area are installation of a stormwater main, invert levels 49.63m – 49.07m from the existing maintenance structure to Seymour St.

It is noted that the Contamination and Excavation Plan by JSA Engineers marked the land in this area as potentially level 2 contamination at RL51-52, based on data from borehole BH01, however this assessment was utilised as a conservative estimate for prediction of the costs of disposal of contaminated material.

There is no fill in the area of the right of way, and per our excavation plan E111 (RL50-RL49), the works proposed for installation of the stormwater will be within natural ground which is not contaminated.

Please contact Jane Sargison on 6224 5625 or jane@jsa.com.au if you require any further information.

Yours sincerely

JSargison

Dr Jane Sargison

Director

JSA CONSULTING ENGINEERS

Anthony Cengia
Senior Assessment Officer
TasWater
169 Main Road,
Moonah TAS 7009

18 July 2019
Your reference: TWDA 2019/00712-HCC
JSA reference: 17L99-20-5

Dear Anthony,

RE: 52 NEW TOWN ROAD & 48 – 50 NEW TOWN ROAD & 46 NEW TOWN ROAD, NEWTOWN & ADJACENT ROAD RESERVE

DEMOLITION, NEW BUILDING FOR HOSPITAL SERVICES, BUSINESS AND PROFESSIONAL SERVICES, AND GENERAL RETAIL AND HIRE, SIGNAGE, AND ASSOCIATED INFRASTRUCTURE WORKS

JSA Consulting Engineers have prepared a response to the request for information from TasWater dated 18 July 2019 regarding the proposed development at 52, 48-50 & 46 New Town Road.

The following points from TasWater have been addressed:

2. *Please provide an amended concept servicing plan for water services which shows a location of the property water connection / water meter assembly located outside of the building footprint (Fire Tank & Pump Room) and into an area that provides for unfettered access to enable reading, testing, inspection, maintenance and exchange without impediment and must be kept clear of obstructions at all times.*

   Response:

   Proposed water meter location has been relocated to be in the cupboard adjacent to the fire sprinkler hydrant booster cupboard as annotated in the architectural plans. Refer to JSA proposed hydraulic plan Sheet H200-01.

3. *An amended sewer diversion long section must be provided showing the design surfaces relative to the proposed re-alignment.*
   a) *The sewer diversion proposal must include details of where the alignment passes through a structure(s).*

   Response:

   a) JSA sewer long section Sheet H210-01 to H210-03 have been amended to include design levels of the proposed development.

Please contact Emileo Tong on 6240 9925 or emileo@jsa.com.au if you require any further information.

Yours sincerely,

Emileo Tong

Graduate Civil Engineer

Directors: Dr Jane Sargison BE DPhil CPEng FIEAust NER CC6193N
Mr Matthew Horsham BE CPEng MIEAust NER CC5865I
Ellerslie House, Level 1, 119 Sandy Bay Road, Sandy Bay 7005 Phone (03) 6224 5625 Email mail@jsa.com.au
JSA Consulting Engineers Pty Ltd | ABN 45 165 277 681

JSA CONSULTING
ENGINEERS

Ben Ikin
Senior Statutory Planner
Hobart City Council
16 Elizabeth Street
Hobart TAS 7000

20 June 2019
Your reference: PLN-19-291
JSA reference: 17L99-20-3

Dear Ben,

RE: 52 NEW TOWN ROAD & 48 – 50 NEW TOWN ROAD & 46 NEW TOWN ROAD, NEWTOWN & ADJACENT ROAD RESERVE

DEMOLITION, NEW BUILDING FOR HOSPITAL SERVICES, BUSINESS AND PROFESSIONAL SERVICES, AND GENERAL RETAIL AND HIRE, SIGNAGE, AND ASSOCIATED INFRASTRUCTURE WORKS

JSA Consulting Engineers have prepared a response to the request for information from Hobart City Council dated 5 June 2019 regarding the proposed development at 52, 48-50 & 46 New Town Road.

The following points from Council have been addressed:

1. ***PLN Fi1***

   Response:

   Refer to plans by Swanbury Penglase Architects.

2. ***PLN Fi2***

   Response:

   Refer to plans by Swanbury Penglase Architects.

3. ***TW1:***
   Information to satisfy the enclosed additional information request from TasWater (TasWater Reference No. TWDA 2019/001712-HCC dated 24/5/2019). To discuss these points please call TasWater on 13 6992. Please note that all additional information intended to satisfy these points should be submitted to the City of Hobart, not TasWater.

   Response:

   Refer to TasWater conditions below.

4. ***PA5.1:***

Scaled and dimensioned plan(s) showing the layout of car parking spaces, turning areas, driveway and access designed to comply with AS/NZS 2890.1:2004 or a design which ensures that parking areas enable safe, easy and efficient use.

To satisfy Hobart Interim Planning Scheme 2015 clauses E6.7.5 Acceptable Solution A1 the scaled and dimensioned design drawings must include:

- *A layout of car parking spaces, access aisles, circulation roadways and ramps, turning areas and driveway that is designed to comply with Section 2 of AS/NZS 2890.1:2004 and must have sufficient headroom to comply with Section 5.3 of AS/NZS 2890.1:2004.*

Where the design drawing(s) do not comply with the above clauses, provide a certification by a suitably qualified engineer that the design is safe and ensures ease of access, egress and manoeuvring on site. This will then be assessed under performance criteria of the Hobart Interim Planning Scheme 2015.

To satisfy clauses E6.7.5 Acceptable Solution A1, AS/NZS 2890.1:2004 Section 2 and AS/NZS 2890.1:2004 Section 5.3, scaled and dimensioned design drawings must include:

- *Elevation or section view showing sufficient headroom to satisfy Section 5.3 of AS/NZS 2890.1:2004.*
- *Car parking layout in accordance with AS/NZS 2890.1:2004.*

Where the design drawing(s) do not comply with the above clause and/or AS/NZS 2890.1:2004 provide a certification by a suitably qualified engineer that the design provides for a safe and efficient access, this will then be assessed under Performance Criteria of the Hobart Interim Planning Scheme 2015.

Advice:

Design of access, driveway, turning area and parking spaces must satisfy either Acceptable Solutions or Performance Criteria for each clause of the Hobart Interim Planning Scheme 2015 (HIPS 2015). Documentation submitted to date does not satisfy the Acceptable Solution or provide sufficient information to support assessment under Performance Criteria for clause E6.7.5.

In order to satisfy the permitted Acceptable Solution in the Parking and Access Code (clause E.6.7.5 A1) please demonstrate the following:

- *If the access, driveway, turning area and parking spaces are below deck / awning / first floor / ceiling / roof / eaves, a height clearance for the parking area of 2.2m is required to satisfy AS/NZS 2890.1:2004 Section 5.3.*
- *Please indicate the clearance on the drawings at appropriate locations including access ramps.*
- *The use of 'Jockey Parking' for non-residential uses is generally not acceptable. Please provide an amended car parking layout without Jockey Parking*

Response:

JSA has reviewed the engineering drawings to ensure that the requirement of min. 2.2m headroom for carparks is met. The layout of the carpark is designed to comply to AS 2890.1 with sufficient aisle width and carpark area, all of which are dimensioned in JSA engineering plans Sheet C200 and Sheet C300. Please also refer to the response prepared by traffic engineer, Milan Prodanovic regarding the height clearance. The plans from the architect have also clearly indicated that the basement entrance to the carpark has a clearance of 2.2m.

For jockey parking, please refer to the response letter prepared by traffic engineer, Milan Prodanovic.

5. ***INFsw1***

Indicative drawings to demonstrate that the structure will be completely independent of the any existing or proposed Council stormwater main that traverses the subject property and it's trenching, no loading will be placed on the existing or proposed Council stormwater main, and sufficient access to the Council stormwater main will be provided. These must include but not limited to the following:

- *A scaled and dimensioned site plan showing the location and size of the existing Council stormwater main that traverses the subject property including any manholes in relation the location of all proposed footings and any alterations to the existing concrete slab; and*
- *Indicative cross-sectional drawings showing the horizontal and vertical relationship between the existing Council stormwater main and any proposed works such as proposed footings associated with the new structure.*
- *Drawings that clearly identify that Council Stormwater infrastructure (stormwater main, access chambers) can be suitably accessed by Council.*

Advice:

- *Separate Council permission from the Planning process will be required for any works within one metre of the outside edge of any existing Council stormwater main;*
- *Clearance between footings or other works must be to the nearest outside edge of the Council stormwater main and clearly shown on the drawings;*
- *Zone of influence is to be clearly shown on the drawings; and*
- *Adequate access requirements will vary with depth and size of the Council stormwater main. Please contact Council City Infrastructure on 6238 2790 to discuss further.*

Response:

JSA have prepared a set of stormwater hydraulic plans to highlight the proposed works of this development.

Sheets H100-00 to H110-02 shows the proposed council works with its relevant long section to be completed at developers cost. Sheets H120-00 to H150-04 shows the proposed private stormwater works for basement level and ground levels. Easements are shown in red, crossing the property where the stormwater mains are to benefit council. The location of the easements demonstrates that there is adequate space for access when maintenance is required. Do also note that JSA have removed stormwater maintenance structures with open lids that were previously in the basement and have proposed a new maintenance structure outside of the building footprint (MH SW3/5)

A set of cross sections in Sheet S908 to Sheet S910 is also included as part of this response to indicate the location of the proposed stormwater mains relative to the proposed building's footings. Zone of influence is also included where necessary.

JSA have also annotated in the engineering plans that all proposed public infrastructure works are to Future Engineering Design Approval by City Amenity.

At this point in the application, JSA has applied conservative modelling to the proposed catchment flows. The pipe sizes have been maintained at current size. Any refinement in pipe sizes to accommodate a more accurate calculation of existing and future expected catchment characteristic to be determined to the requirements & approval of City Amenity during detailed engineering design.

6. ***EDP Fi1***

Response:

Refer to reports and plans by Acoustic Engineering & Irene Inc.

The following points from TasWater have been addressed:

1. *TasWater condition 1*

   Response:

   Refer to engineering plans & reports by JMG Engineers & Planners.

2. *TasWater condition 2*

   Response:

   Refer to engineering plans & reports by JMG Engineers & Planners.

   Please note that the water meter location has been updated in JSA plans as indicated by JMG's plans. The connection to the water meter is now perpendicular to the existing water main.

3. *An amended sewer diversion long section must be provided showing the design surfaces relative to the proposed re-alignment.*
   a) *The sewer diversion proposal must include details of where the alignment passes through a structure(s) and outline exactly how the proposal intends to provide for unfettered access for TasWater's operational staff to affect a repair 365 days a year with an 8.8 metre service vehicle.*
   b) *The access plan must incorporate the minimum turning radii around the TasWater maintenance structures and any proposed access route as per Austroads Standards Australia – AS HB72-1995. The vehicle must be able to be parked with the rear or side of the vehicle next to the maintenance structures.*

   Response:

   a) Referring to Sheet H200-00 to H210-03, JSA have nominated to remove sewer maintenance holes that were previously located in the basement. A new sewer maintenance hole (MH S2/5) is proposed just outside of the building envelope, easily accessible via the Clare Street entrance.
   b) Proposed easements shown on JSA engineering plans are min. 3.0m wide. This would allow adequate space for TasWater's operational staff to park their 8.8m service vehicle and access the maintenance structures during periods of maintenance.

   JSA have also prepared cross sections of proposed sewer infrastructures relative to building footings. Please refer to Sheet S908 to Sheet S910

4. *TasWater condition 4*

   Response:

   Refer to & reports by Irene Inc.

5. *TasWater condition 5*

   Response:

   Refer to reports by Irene Inc.

6. *TasWater condition 6*

   Response:

   Refer to reports by Irene Inc.

Please contact Emileo Tong on 6240 9925 or emileo@jsa.com.au if you require any further information.

Yours sincerely,

Emileo Tong

Graduate Civil Engineer

Hobart City Council

Via electronic submission

26 March 2019

JSA Reference: 17L99-20-1

Your reference: 48-52 New Town Rd

RE: Contaminated fill and excavation assessment – 48-52 New Town Road

Introduction

The property 48-52 New Town Road has been subject to a significant amount of fill applied to the site historically. The Environmental Site Assessment (ESA) by GES identified the proposed development site as contaminated, due to the composition of fill on the site. The Geotechnical Assessment also by GES identified depth and geotechnical assessment of fill and base material on the site per geotechnical bore data.

Engineering drawings E101 – E115 (Appendix B) have been prepared to summarise the excavation volume for the site, and to summarise the relevant volumes of fill in accordance with the classes of contamination classification from 1 to 4 in accordance with IB105 and the result of the environmental site assessment prepared by Geo-Environmental Solutions Pty Ltd (GES). Drawings CMP01 – CMP12 (Appendix A) have been prepared solely with the contamination data in order to best interpret the contamination distribution on the site.

This document sets out the methodology utilised to apply and interpret borehole data to the site as a whole, and to calculate estimated volumes of contaminated and clean fill and natural underlying soil and rock to be excavated from the site.

Contamination volume calculation methodology

Due to the current use of the site, it was only possible to sample soils at borehole locations identified as BH01 – BH53. Five locations were also subject to geotechnical assessment (GT01 - GT05).

On the basis of the locations of the available borehole data, the site was divided by area into regions, utilising a voroni diagram method. Each bore region represents an area which includes all points which are closer to that bore hole than any other bore hole. As such each region was identified as including soil with the same soil classifications as its central bore hole. Refer to CMP02 (Appendix A) for the voroni diagram of borehole regions.

In order to interpret the data in a systematic way, the voroni diagram sections were digitised (refer CMP 03) to a 5m x 5m grid. This grid method was utilised to enable practical interpretation of soil area and for use in site excavation management.

Subsequent to identifying the area regions, the 5m x 5m grid was interpreted in 1m 'slices' in depth by RL heights. Referring to CMP04, the slice from RL 60 – RL59 includes a slice of the site between these heights, (noting that the site contours are between 51m and 61m RL). Those areas of the site between RL59 and RL60 are identified by contamination classification (Level 1, 2, etc or natural ground), and the balance of the site is classified as "Air" ie RL59 is above natural ground level.

Each grid square represents a 5m x 5m x 1m or 25m^3 block of soil.

It should be noted that BH21-BH53 were resampled for leachate and re-classified (typically to Level 2), however BH01 – BH20 were unable to be resampled but would be reviewed on site once construction commences.

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Mr Matthew Horsham BE MIEAust CPEng NER CC5865I
Ellerslie House, Level 1, 119 Sandy Bay Road, Sandy Bay 7005 Phone (03) 6224 5625 Email mail@jsa.com.au
JSA Consulting Engineers Pty Ltd | ABN 45 165 277 681

The approach to classification of the 25m^3 block was conservative, in that each block was classified as wholly containing the highest level of contamination, and where a block was partially above NGL, the entire block was considered to be soil (not part air / soil).

Where borehole data could not be obtained to the full depth of contaminated fill due the fill depth exceeding the borehole, it was assumed that the fill would continue at the last classification to the depth of natural material below. Additional testing data to verify the classification of soils at these depths would be completed during the demolition and excavation phases.

Excavation volume calculation methodology

The proposed excavation volume has been analysed with respect to the volume of fill material to be removed, and the total volume of excavation. The set E101 – E115 by JSA Engineers (refer to Appendix B) summarises the excavation of material, collating the contaminated fill and the geotechnical data, to determine the volume and classification level of material to be removed, for bulk site excavation, and preparation of foundations for the building.

The approach is conservative similarly to the contamination assessment in that a block is assumed to be excavated in its entirety if more than 50% is included in the volume to be excavated.

The arrangement of material to be excavated by RL is set out in sheets E101 – E115 with each page representing a 1m deep slice of the site.

The bulk excavation is assumed to run through from surface level, to RL 55. The basement FFL is noted at RL55.8, but the full site excavation estimate to 55m conservatively allows for excavation associated with the footings around the perimeter and allowance for excavation below the slab (potential sub-base).

From sheet E106 (RL55 – RL54) the excavation plan shows a 2.5 x 2.5 m zone of excavation at each column location, which allows for the excavation of material associated with the foundation below each column. This is a conservative estimate of excavation volume but allows for material required to be excavated below the lift core regions (which has not been separately itemised).

These column foundation zones run through to 1m into natural ground (to allow piers or piles through into solid material below the fill), and once 1m penetration into natural ground is achieved the excavation for that column is removed from the next 1m slice diagram.

Summary of excavated material

A table summarising the conservative estimate of material to be removed from the site by for each RL 'slice' and classification is provided in Appendix C. A summary of the total volumes of components excavated from the site is as follows:

Excavation Component:	**Estimated Volume Removed (m^3)**	**Notes**
Contaminated fill material (Level 2 or greater)[1]	12,718	A
Non contaminated fill (Level 1)	5,562	B
Total volume of fill material	18,281	A+B
Total volume natural ground (below fill)	3,131	C
Total volume excavated	**21,412**	**A+B+C**

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ENGINEERS

1. Note that the contaminated material is predominantly level 2, and the small amount of material classified as 3 and 4 (approximately 1125m^3 or less than 10%) will be reviewed during the bulk excavation to determine the classification with leachate testing. Should this material be deemed to remain at the initial classification is it likely to be contained on site by burying under the slab where it will be enclosed and controlled.

Please contact Jane Sargison on 6224 5625 or jane@jsa.com.au if you require any further information.

Yours sincerely

JSargison

Dr Jane Sargison

Director

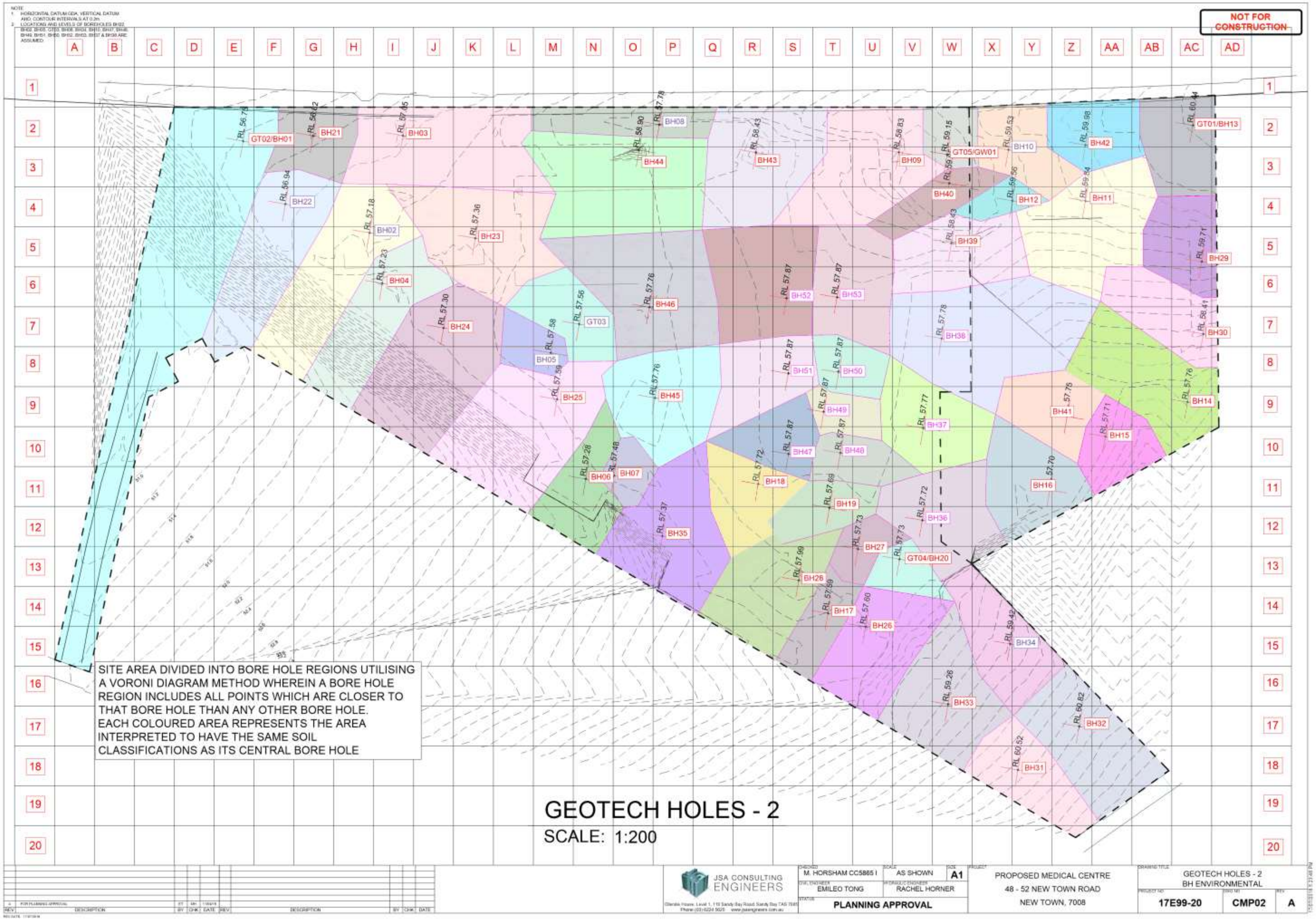
Directors: Dr Jane Sargison BE DPhil FIEAust CPEng NER CC6193N
Mr Matthew Horsham BE MIEAust CPEng NER CC5865I
Ellerslie House, Level 1, 119 Sandy Bay Road, Sandy Bay 7005 Phone (03) 6224 5625 Email mail@jsa.com.au
JSA Consulting Engineers Pty Ltd | ABN 45 165 277 681

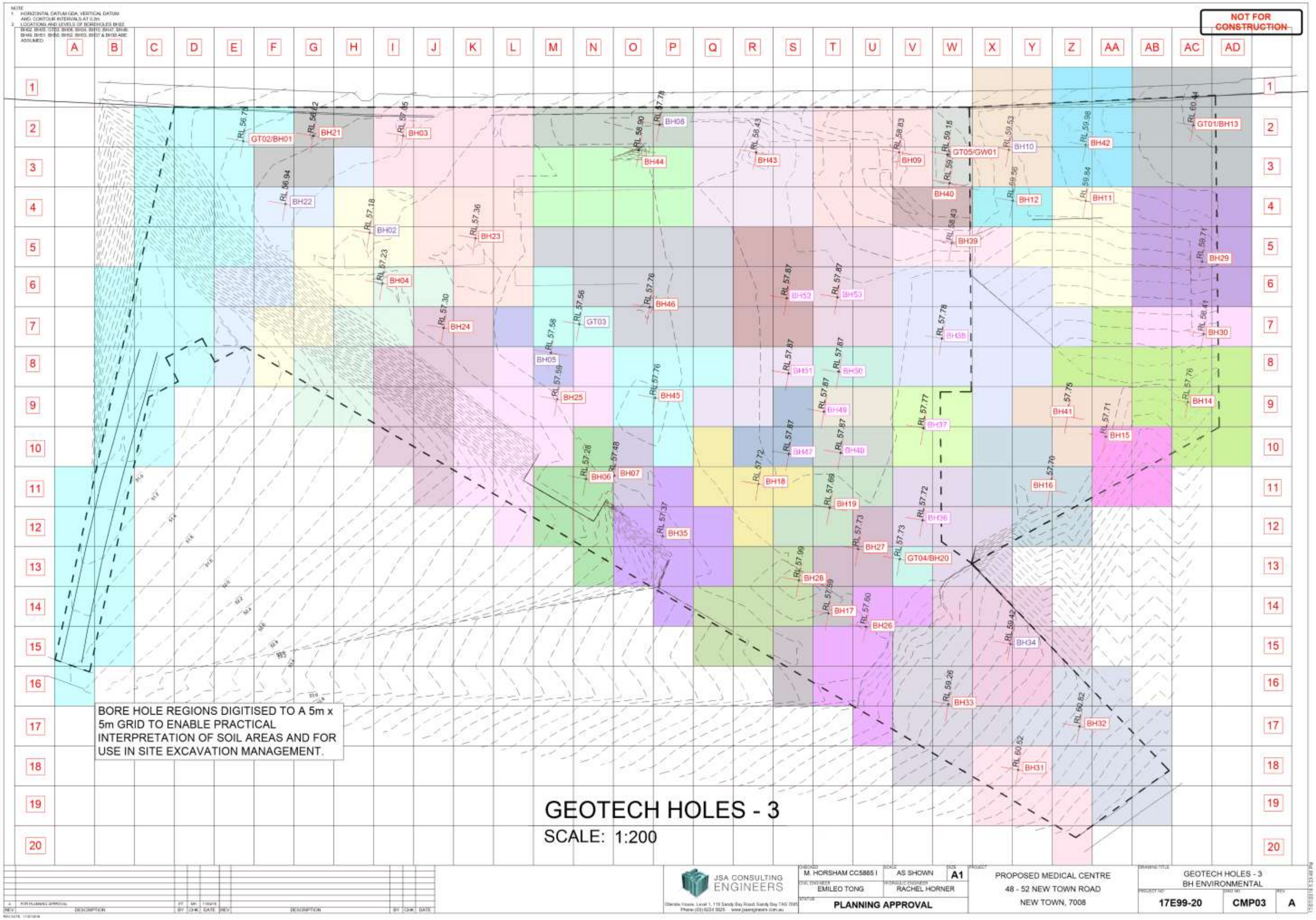
JSA CONSULTING ENGINEERS

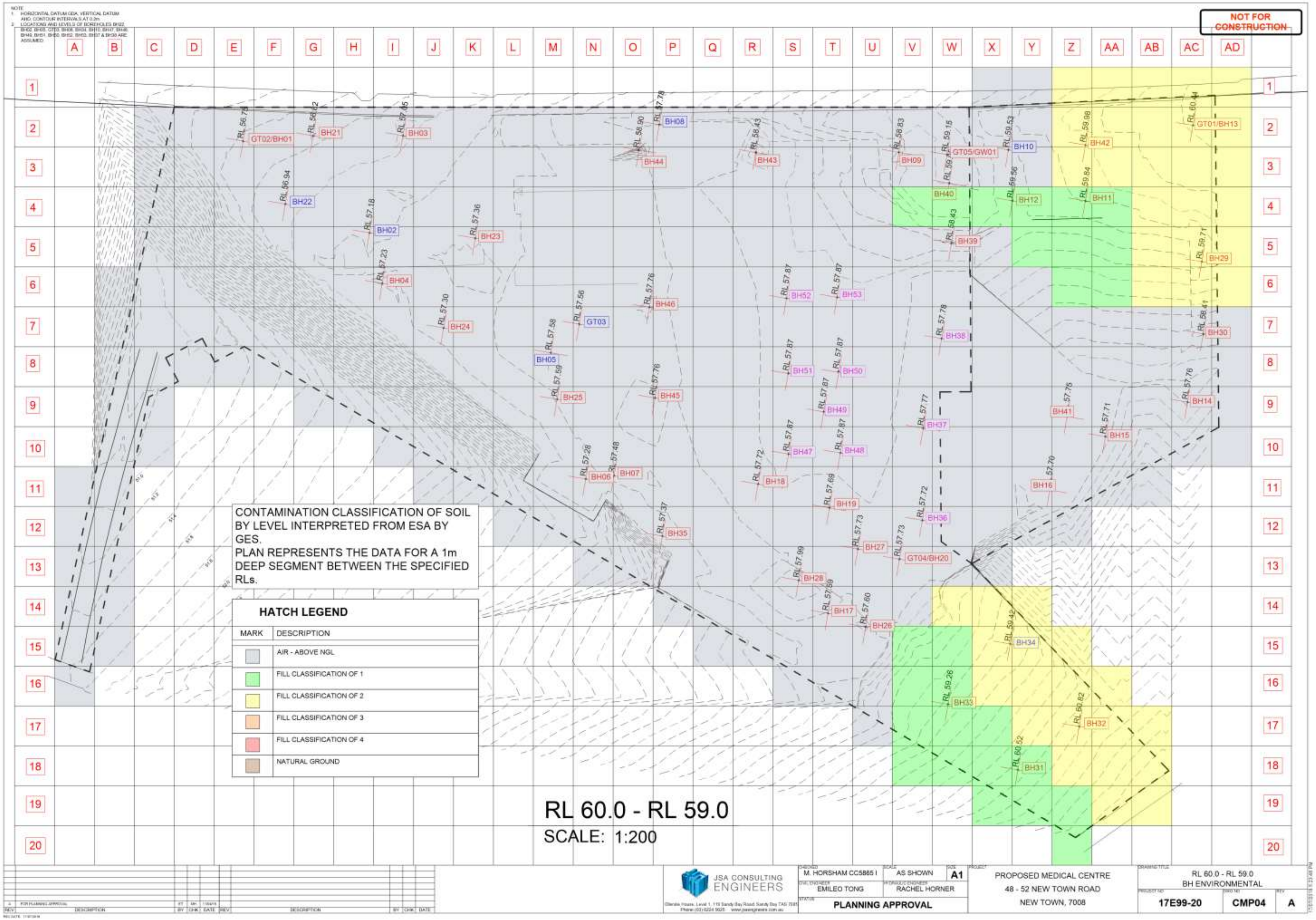
APPENDIX A – Contamination plans

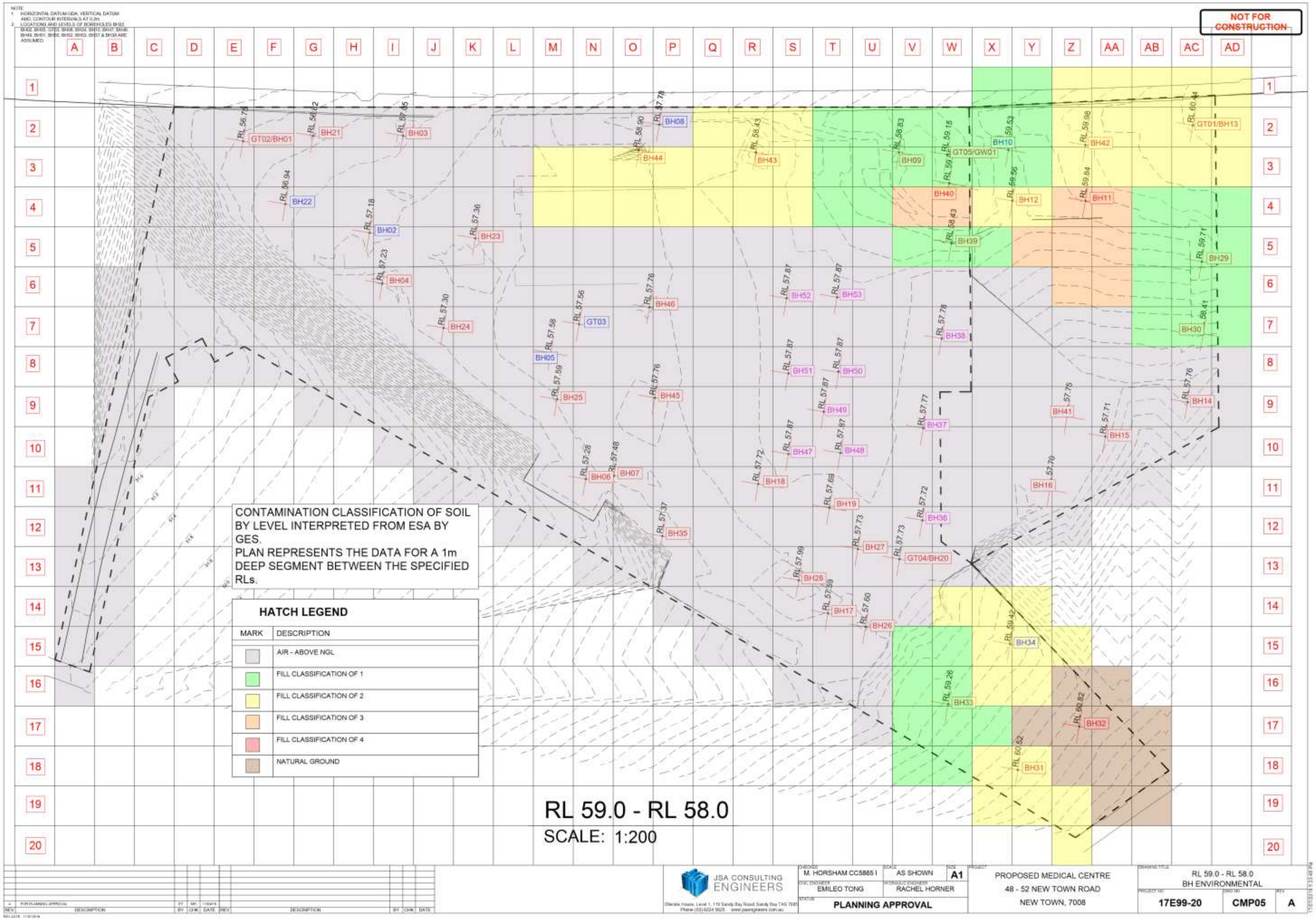
Directors: Dr Jane Sargison BE DPhil FIEAust CPEng NER CC6193N
Mr Matthew Horsham BE MIEAust CPEng NER CC5865I
Ellerslie House, Level 1, 119 Sandy Bay Road, Sandy Bay 7005 Phone (03) 6224 5625 Email mail@jsa.com.au
JSA Consulting Engineers Pty Ltd | ABN 45 165 277 681

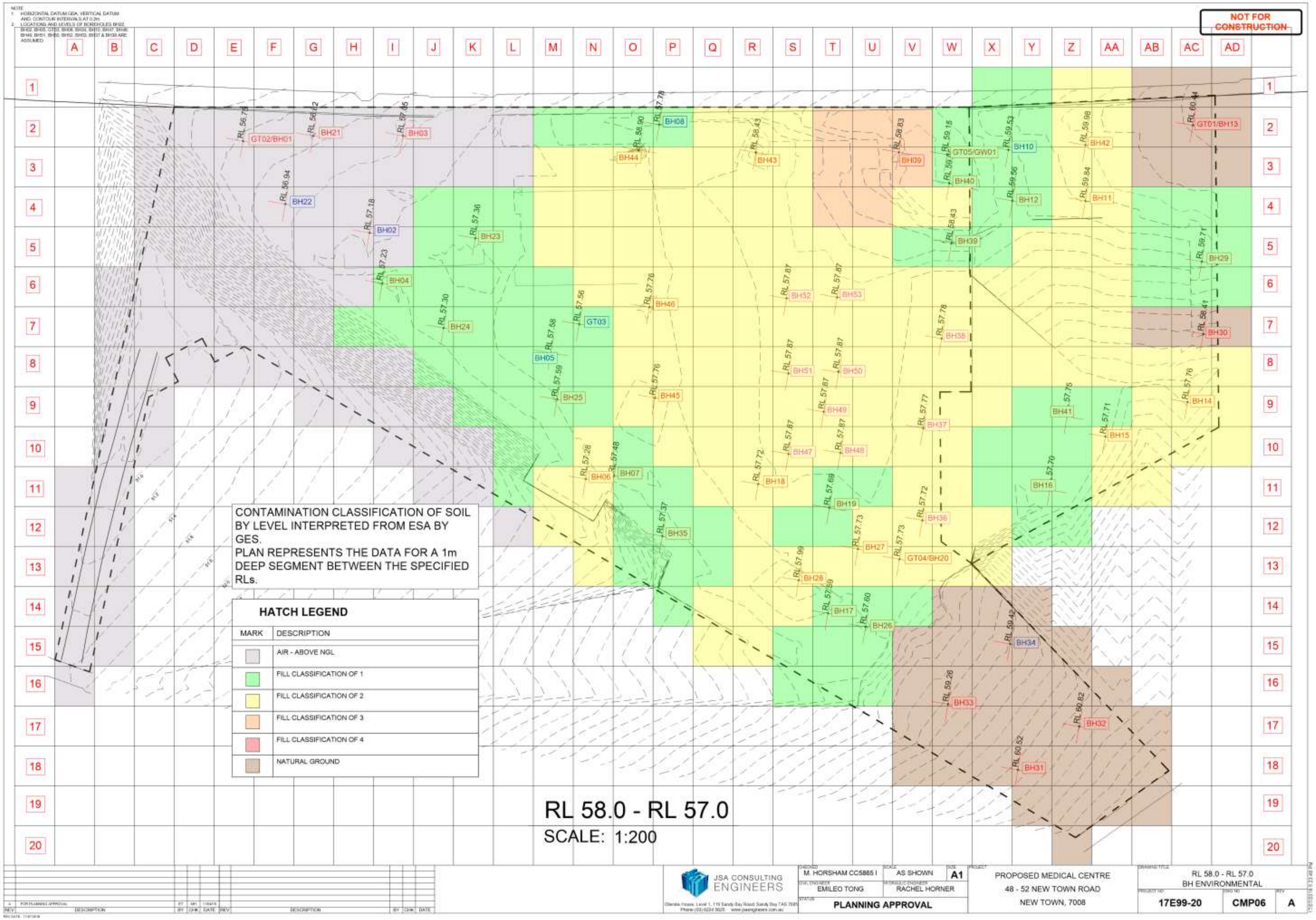

NOT FOR CONSTRUCTION
LAYOUT OF SAMPLE LOCATIONS
GT01 - GT05 - GEOTECH BORE HOLE
BH01 - BH53 - CONTAMINATION BORE HOLE
GW01 - GROUNDWATER BORE HOLE
GEOTECH HOLES - 1
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
GEOTECH HOLES - 1
BH ENVIRONMENTAL
17E99-20
CMP01
A

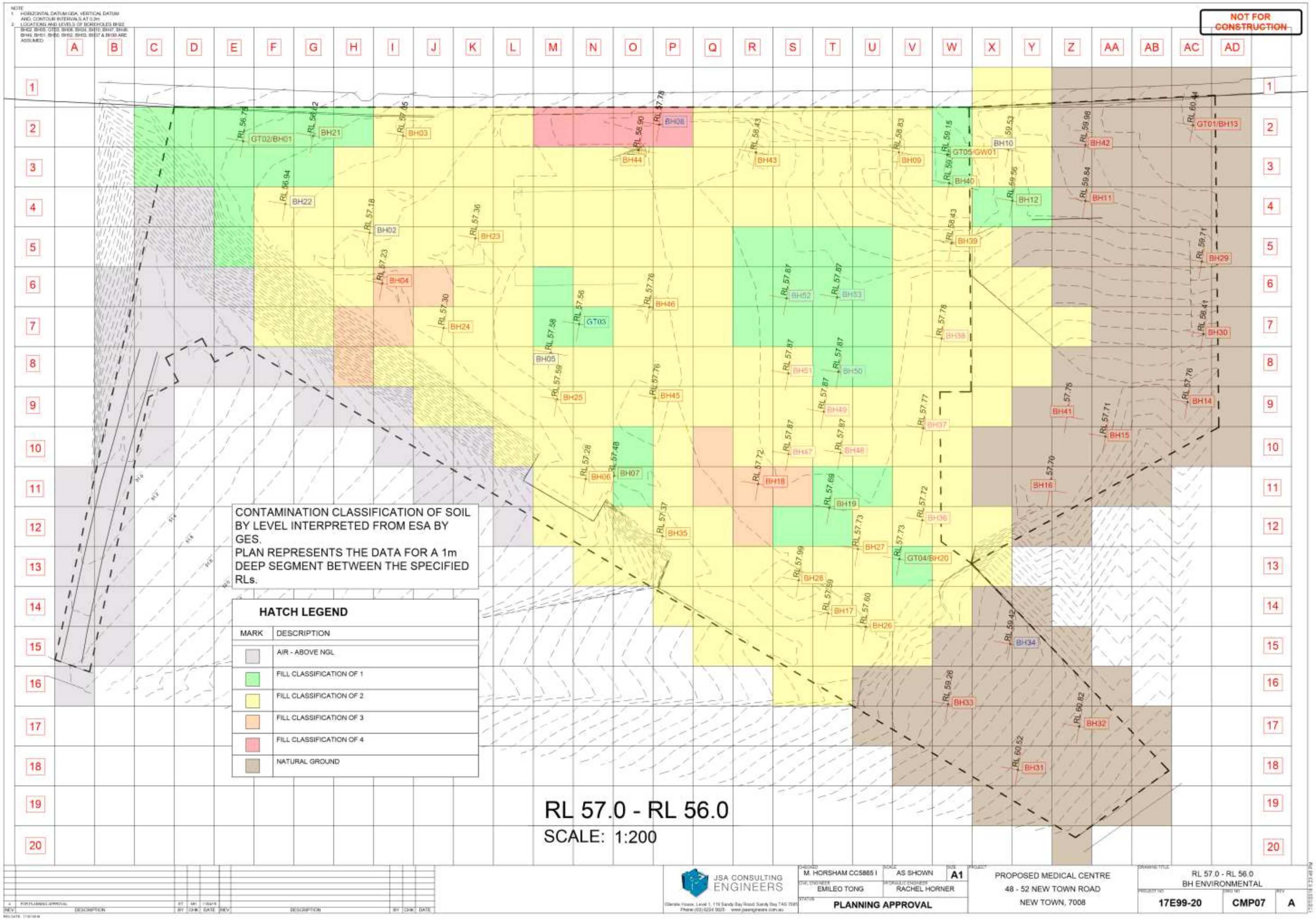

NOT FOR CONSTRUCTION
SITE AREA DIVIDED INTO BORE HOLE REGIONS UTILISING A VORONI DIAGRAM METHOD WHEREIN A BORE HOLE REGION INCLUDES ALL POINTS WHICH ARE CLOSER TO THAT BORE HOLE THAN ANY OTHER BORE HOLE.
EACH COLOURED AREA REPRESENTS THE AREA INTERPRETED TO HAVE THE SAME SOIL CLASSIFICATIONS AS ITS CENTRAL BORE HOLE
GEOTECH HOLES - 2
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
GEOTECH HOLES - 2
BH ENVIRONMENTAL
17E99-20
CMP02
A

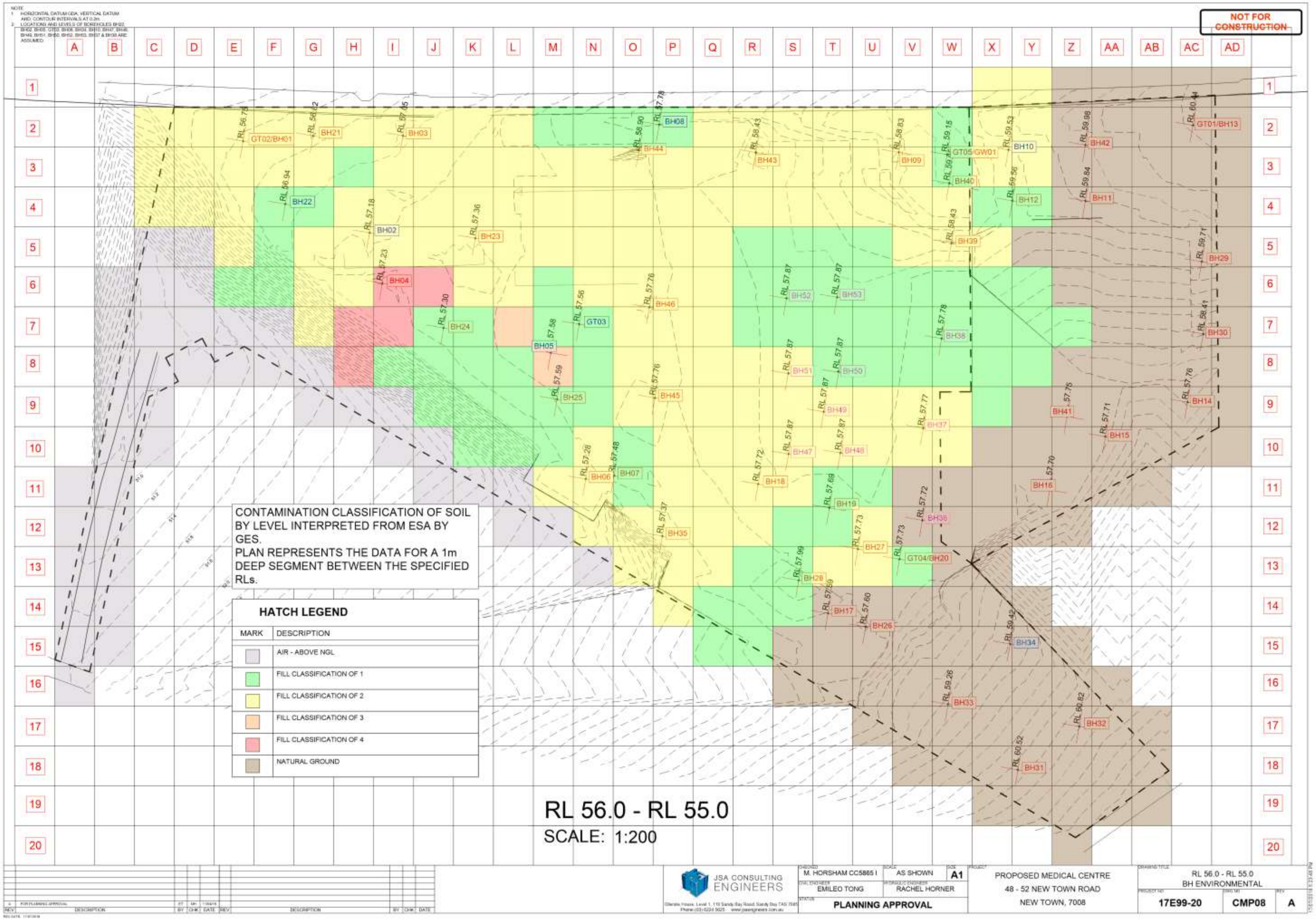

NOT FOR CONSTRUCTION
BORE HOLE REGIONS DIGITISED TO A 5m x 5m GRID TO ENABLE PRACTICAL INTERPRETATION OF SOIL AREAS AND FOR USE IN SITE EXCAVATION MANAGEMENT.
GEOTECH HOLES - 3
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
GEOTECH HOLES - 3
BH ENVIRONMENTAL
17E99-20
CMP03
A

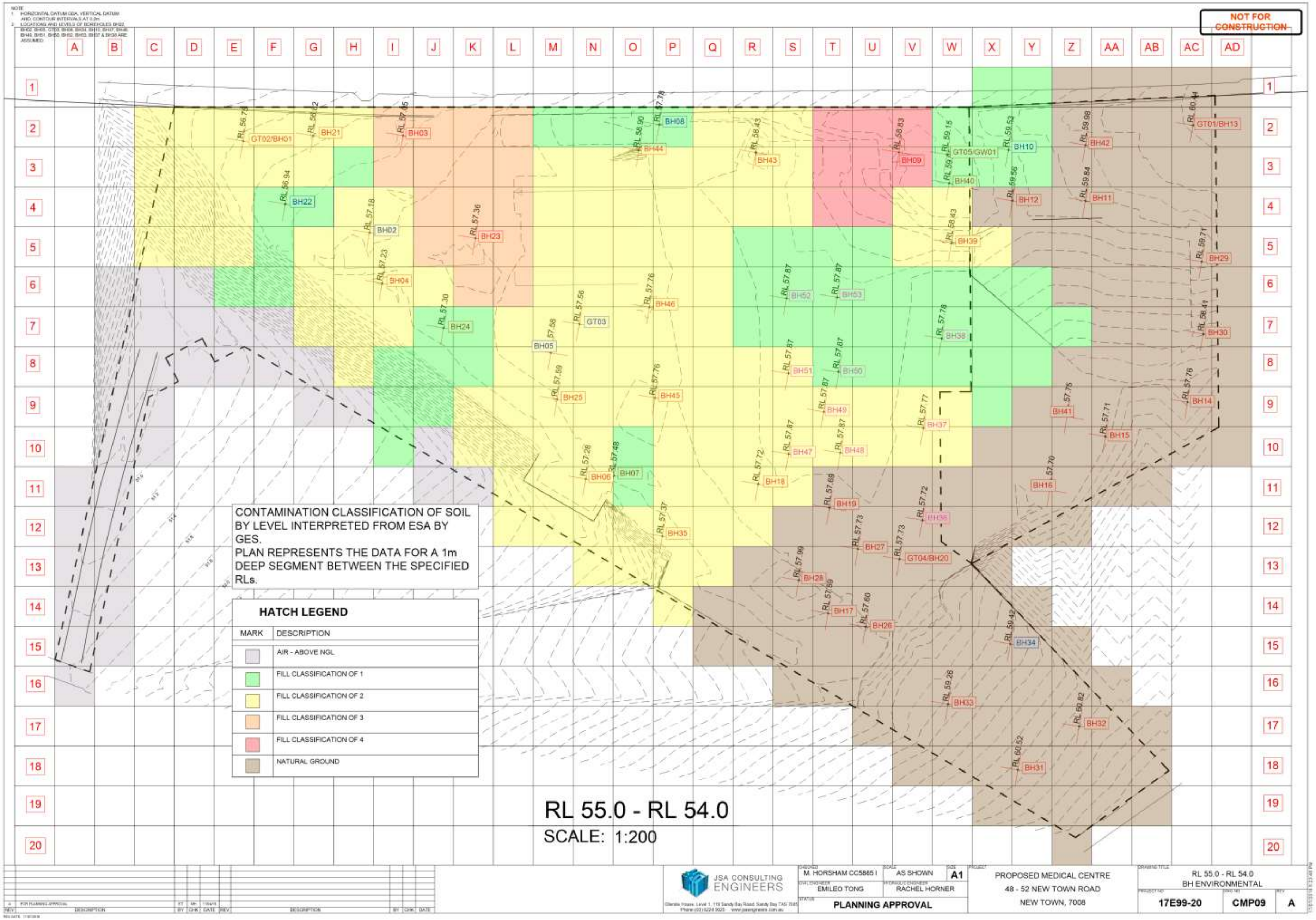

NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 60.0 - RL 59.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 60.0 - RL 59.0
BH ENVIRONMENTAL
17E99-20
CMP04
A

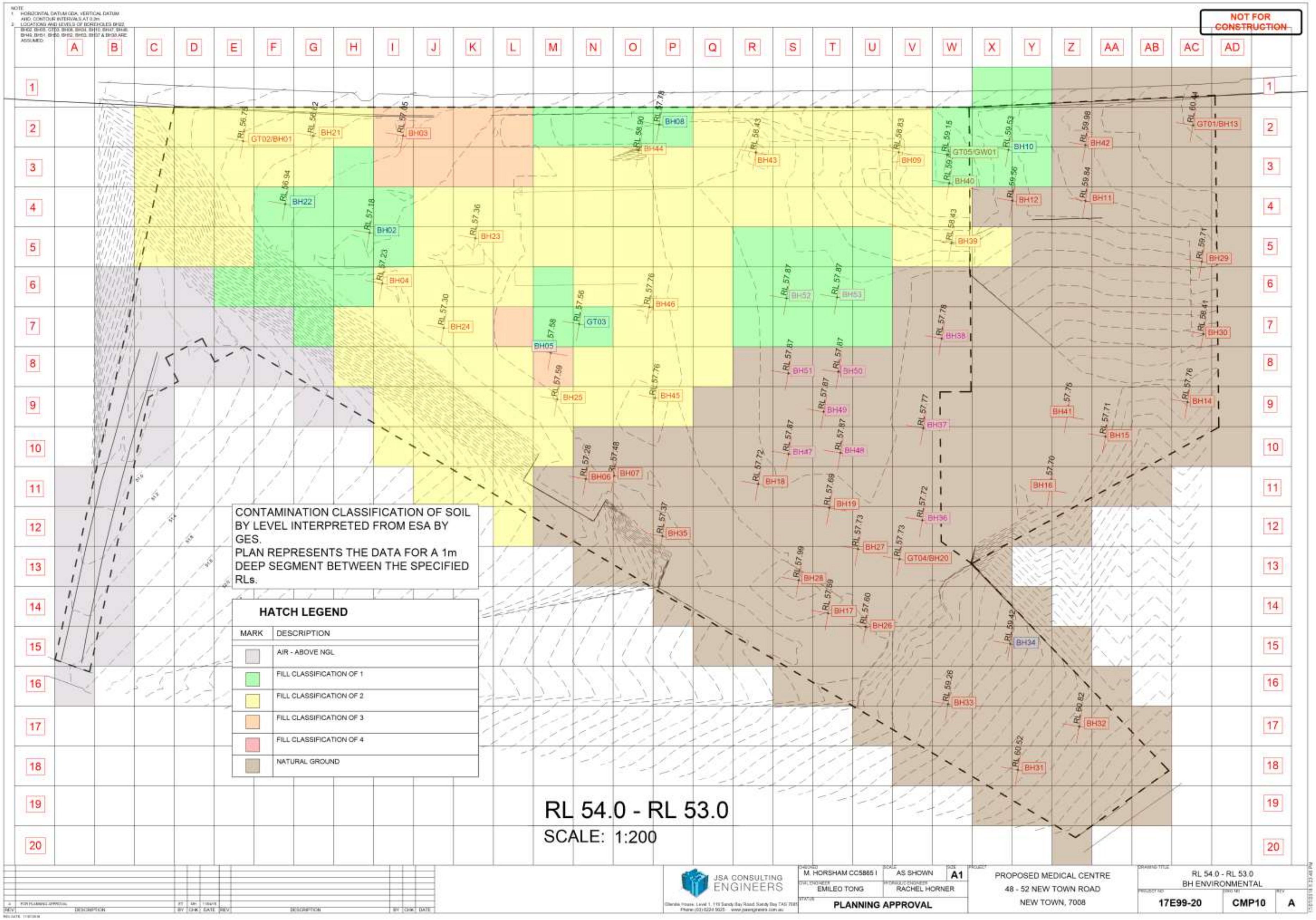

NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 59.0 - RL 58.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 59.0 - RL 58.0
BH ENVIRONMENTAL
17E99-20
CMP05
A

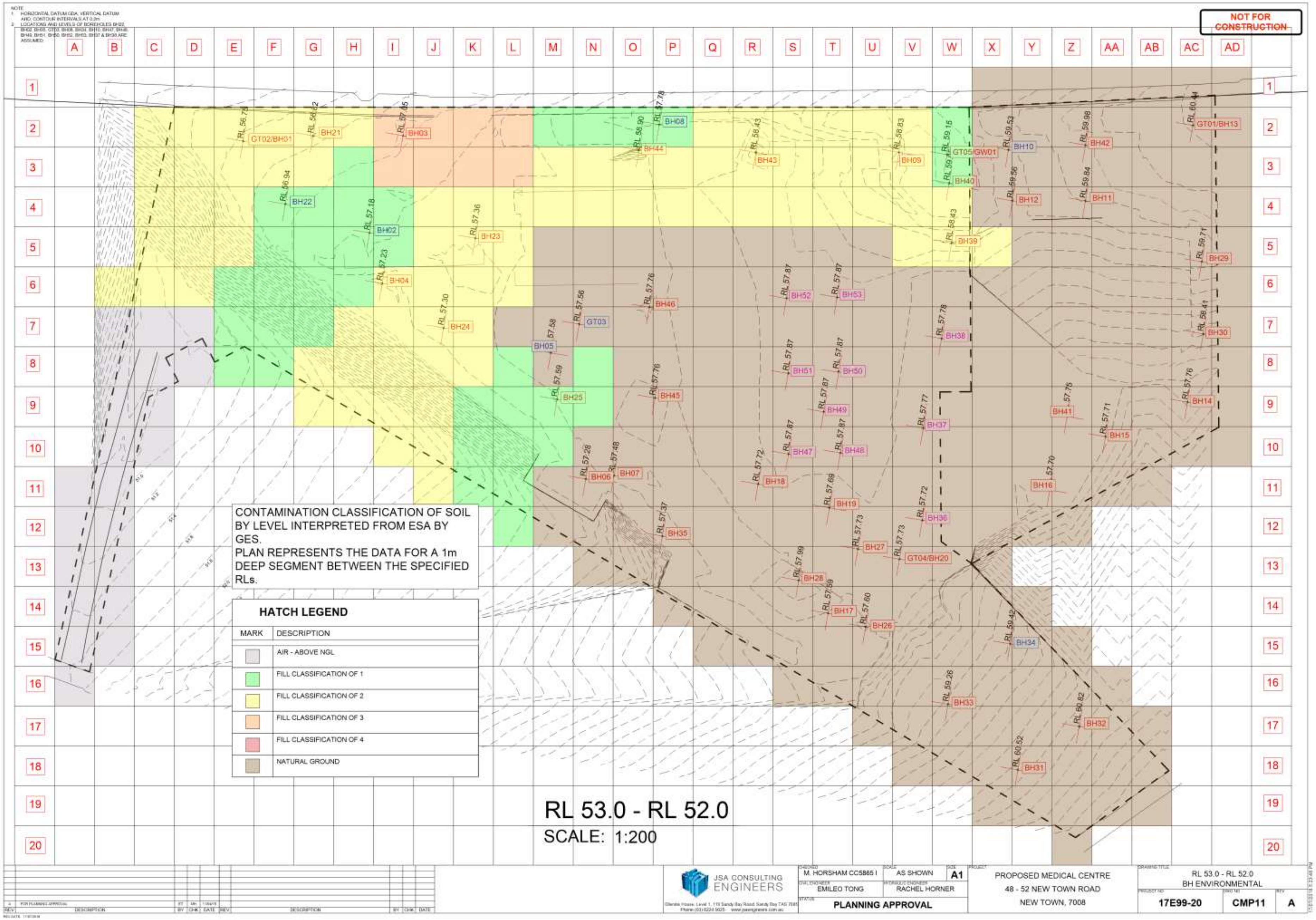

NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 58.0 - RL 57.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 58.0 - RL 57.0
BH ENVIRONMENTAL
17E99-20
CMP06
A

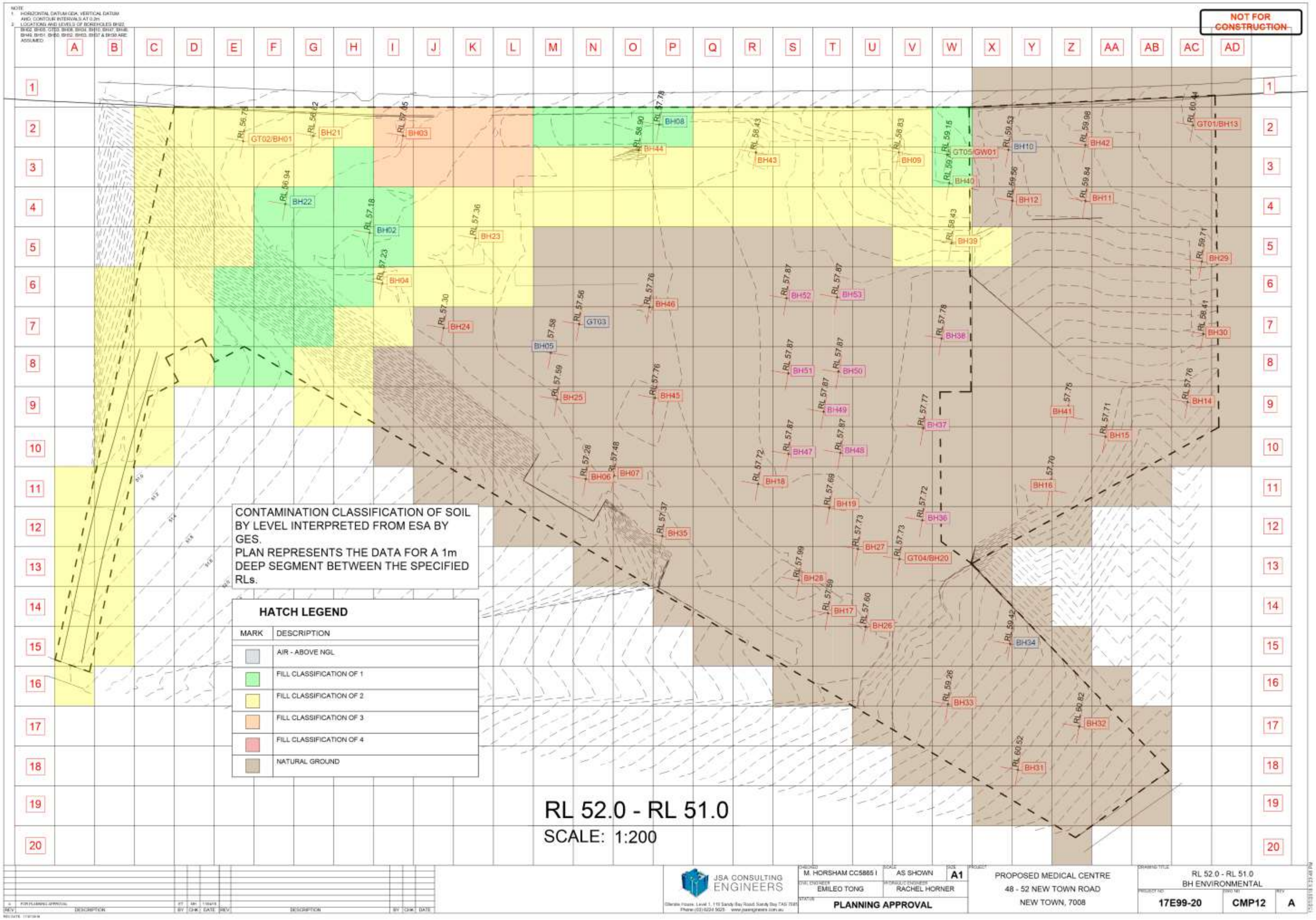

NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 57.0 - RL 56.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 57.0 - RL 56.0
BH ENVIRONMENTAL
17E99-20
CMP07
A


NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 56.0 - RL 55.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 56.0 - RL 55.0
BH ENVIRONMENTAL
17E99-20
CMP08
A


NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 55.0 - RL 54.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 55.0 - RL 54.0
BH ENVIRONMENTAL
17E99-20
CMP09
A


NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 54.0 - RL 53.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 54.0 - RL 53.0
BH ENVIRONMENTAL
17E99-20
CMP10
A


NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 53.0 - RL 52.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 53.0 - RL 52.0
BH ENVIRONMENTAL
17E99-20
CMP11
A


NOT FOR CONSTRUCTION
CONTAMINATION CLASSIFICATION OF SOIL BY LEVEL INTERPRETED FROM ESA BY GES.
PLAN REPRESENTS THE DATA FOR A 1m DEEP SEGMENT BETWEEN THE SPECIFIED RLs.
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
RL 52.0 - RL 51.0
SCALE: 1:200
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
EMILEO TONG
RACHEL HORNER
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48 - 52 NEW TOWN ROAD
NEW TOWN, 7008
RL 52.0 - RL 51.0
BH ENVIRONMENTAL
17E99-20
CMP12
A

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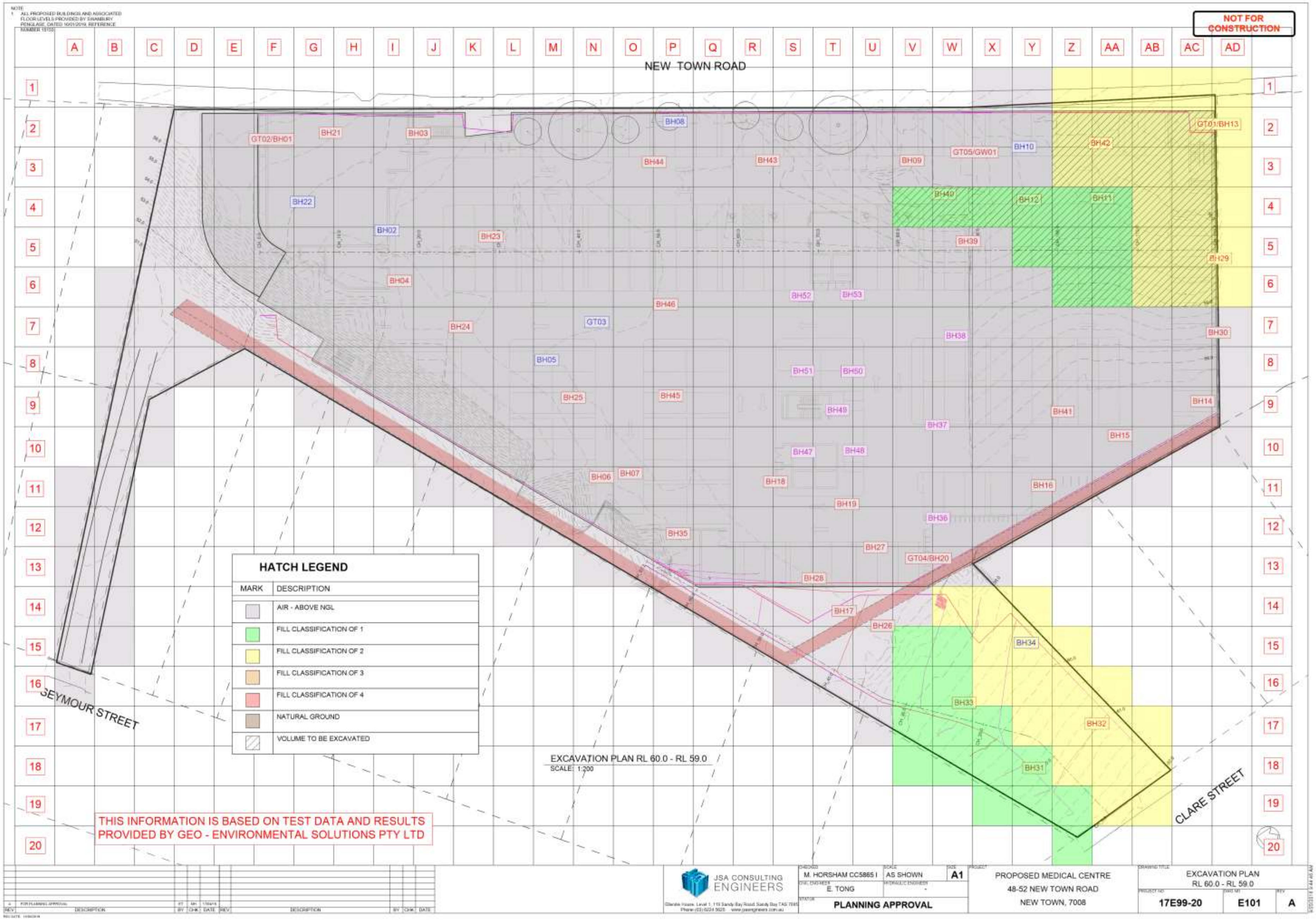
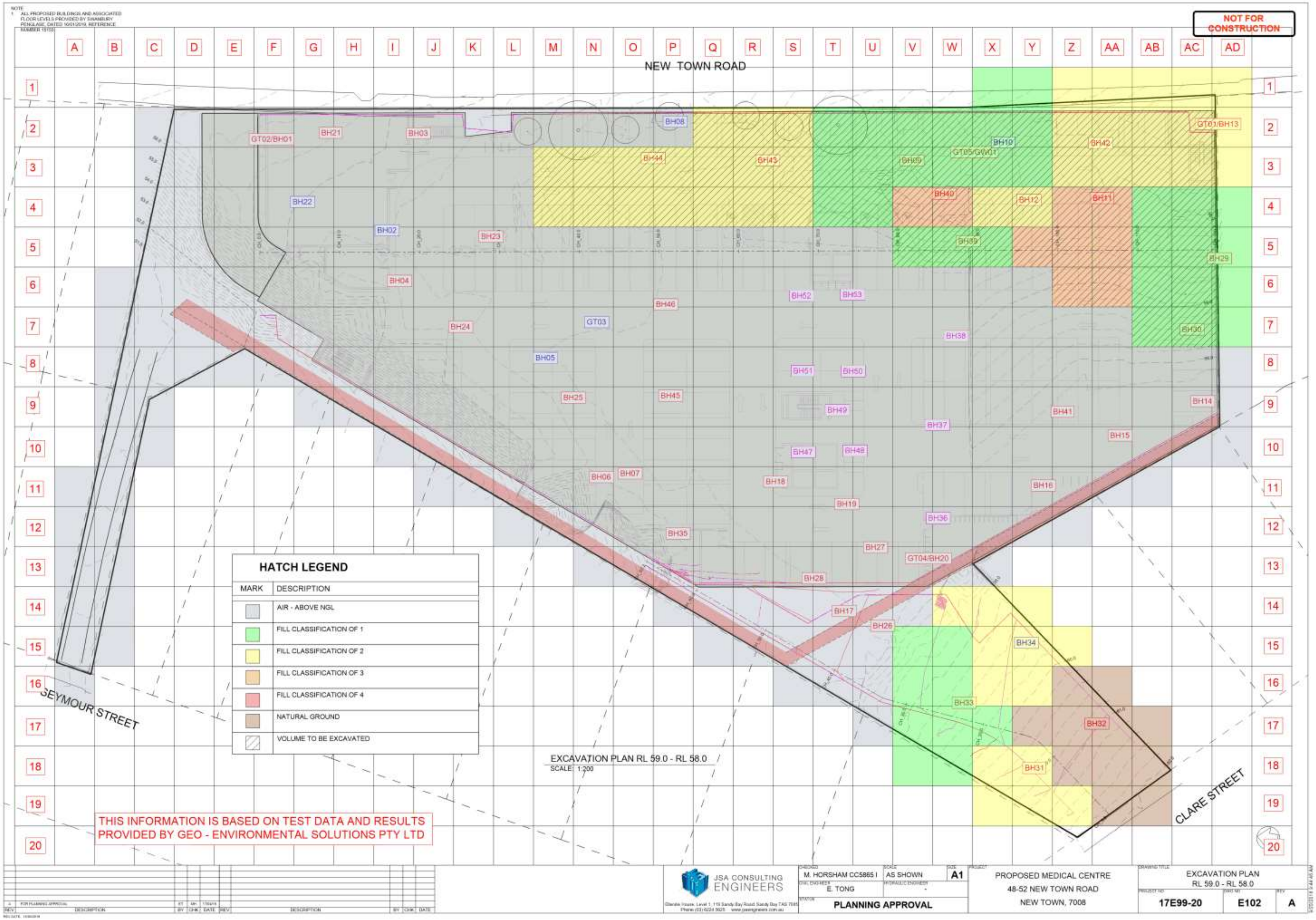
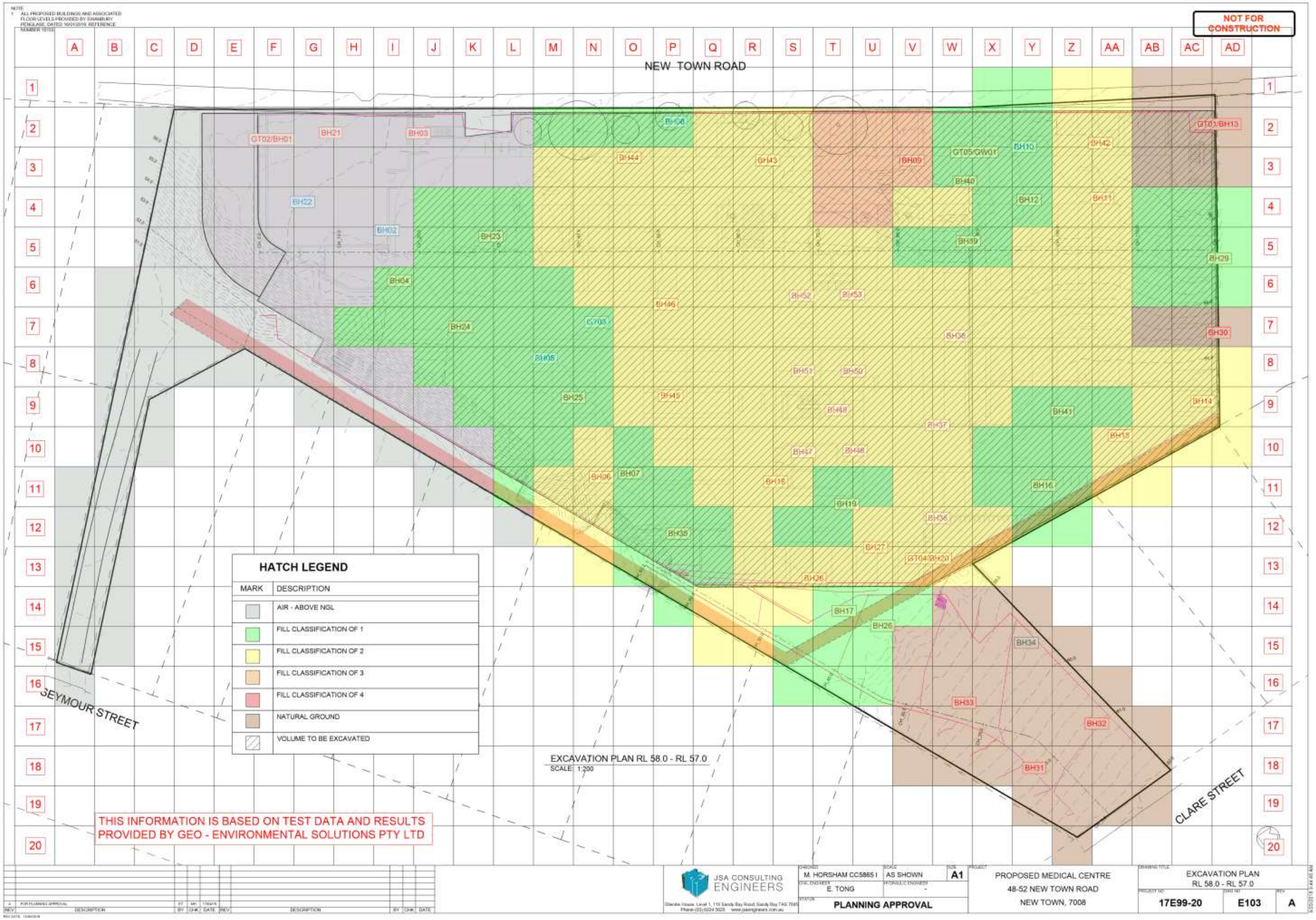
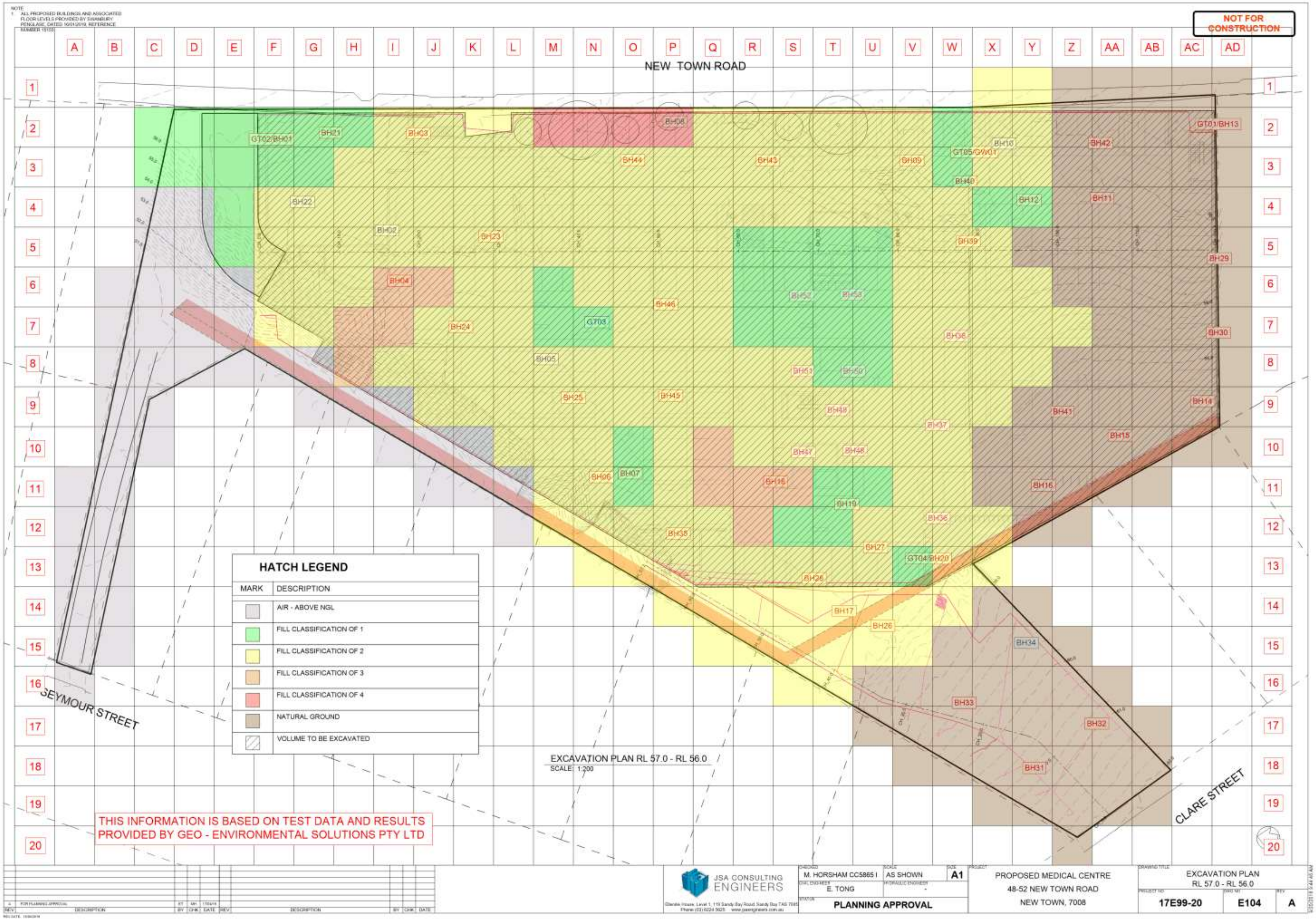
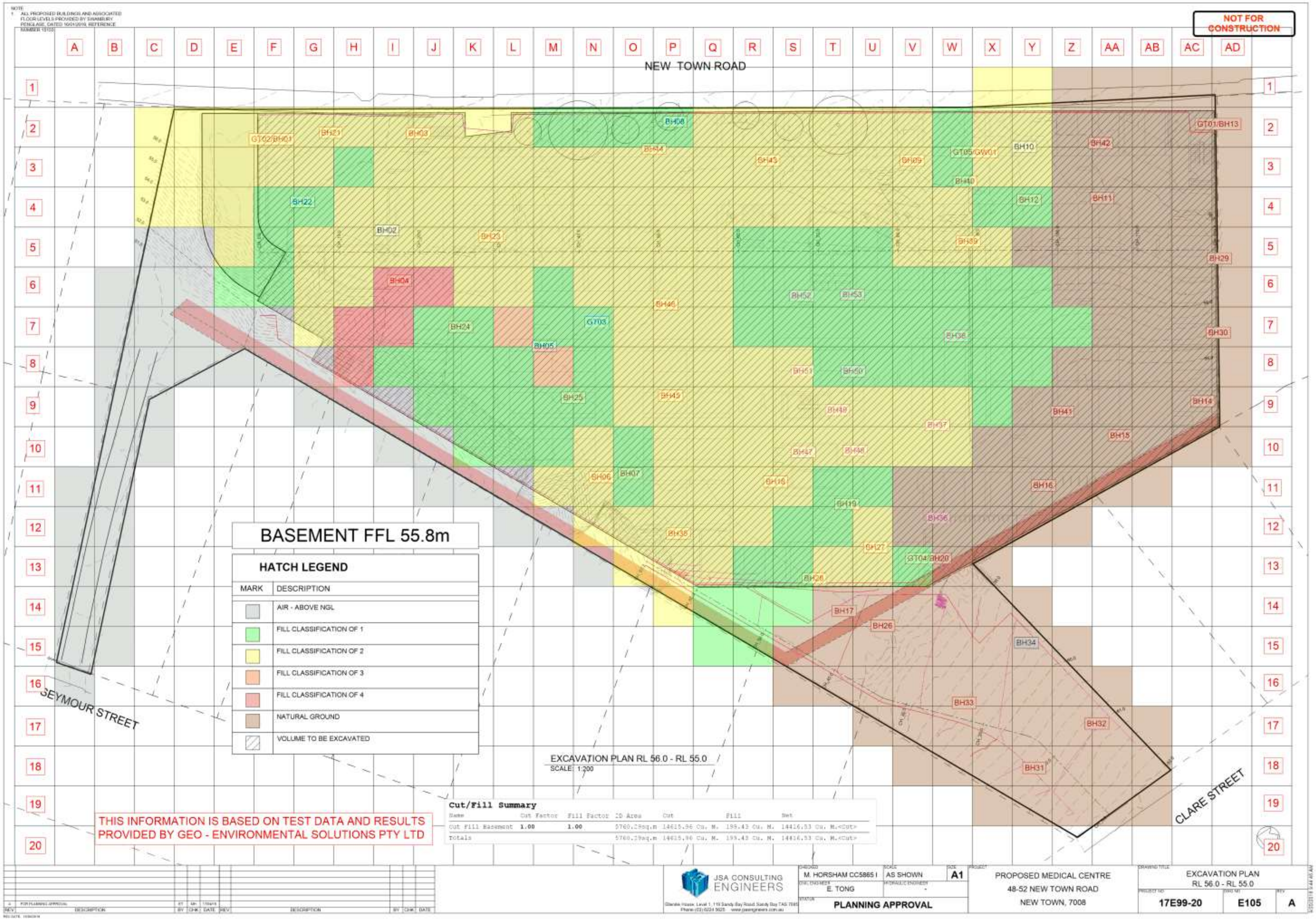
APPENDIX B – Excavation plans

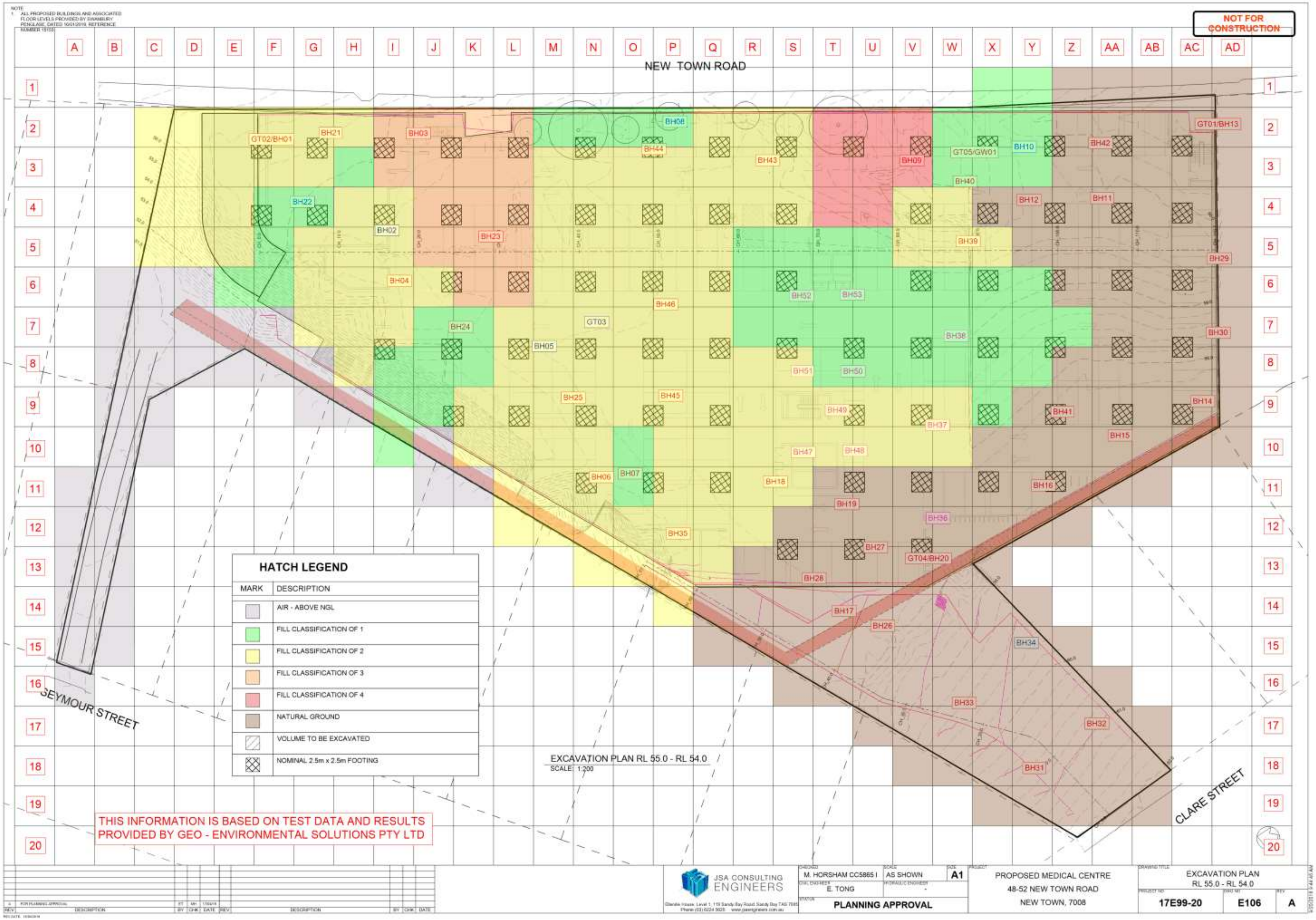

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
EXCAVATION PLAN RL 60.0 - RL 59.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS
PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 60.0 - RL 59.0
17E99-20
E101
A

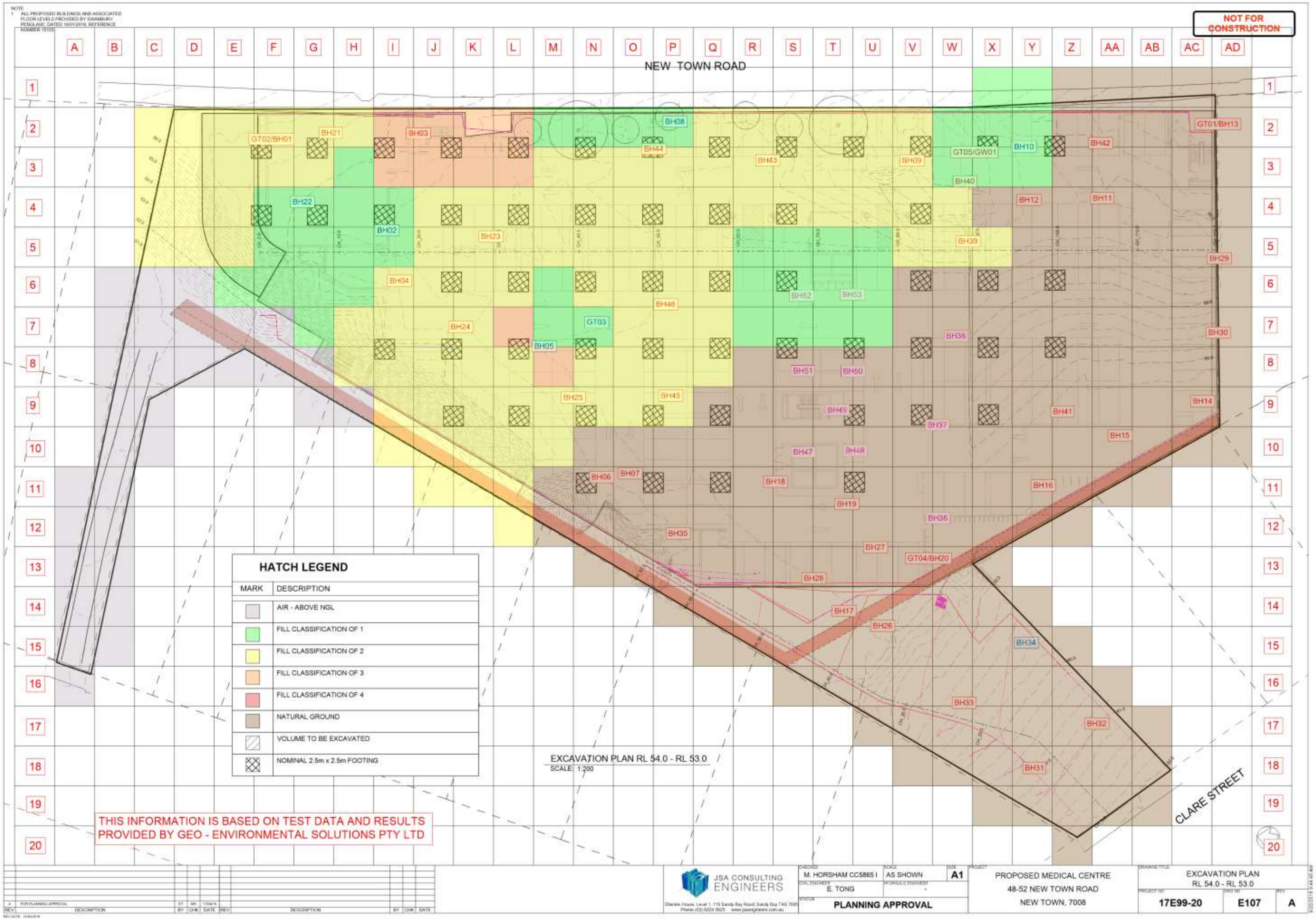

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
EXCAVATION PLAN RL 59.0 - RL 58.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS
PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 59.0 - RL 58.0
17E99-20
E102
A

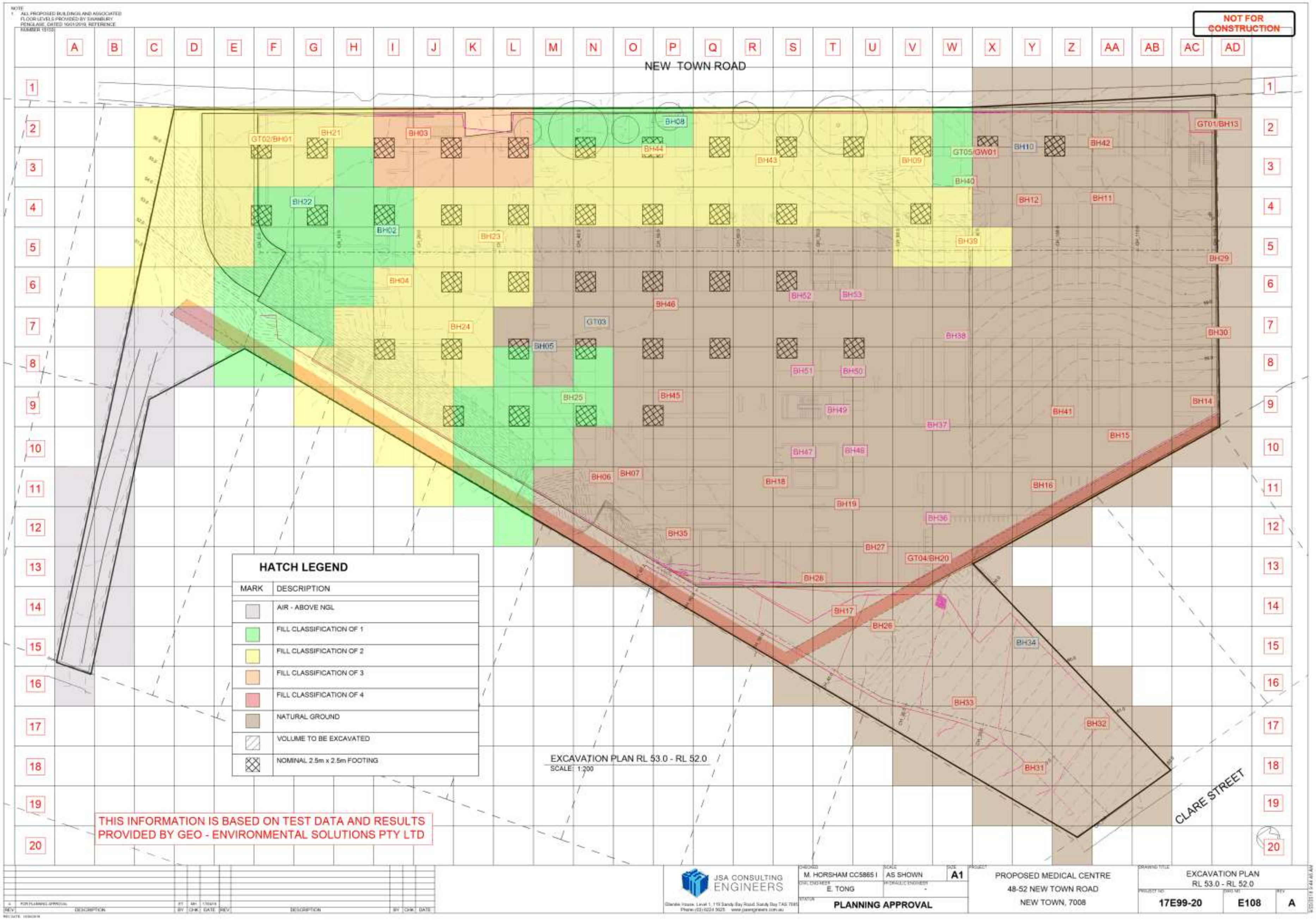

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
EXCAVATION PLAN RL 58.0 - RL 57.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 58.0 - RL 57.0
17E99-20
E103
A

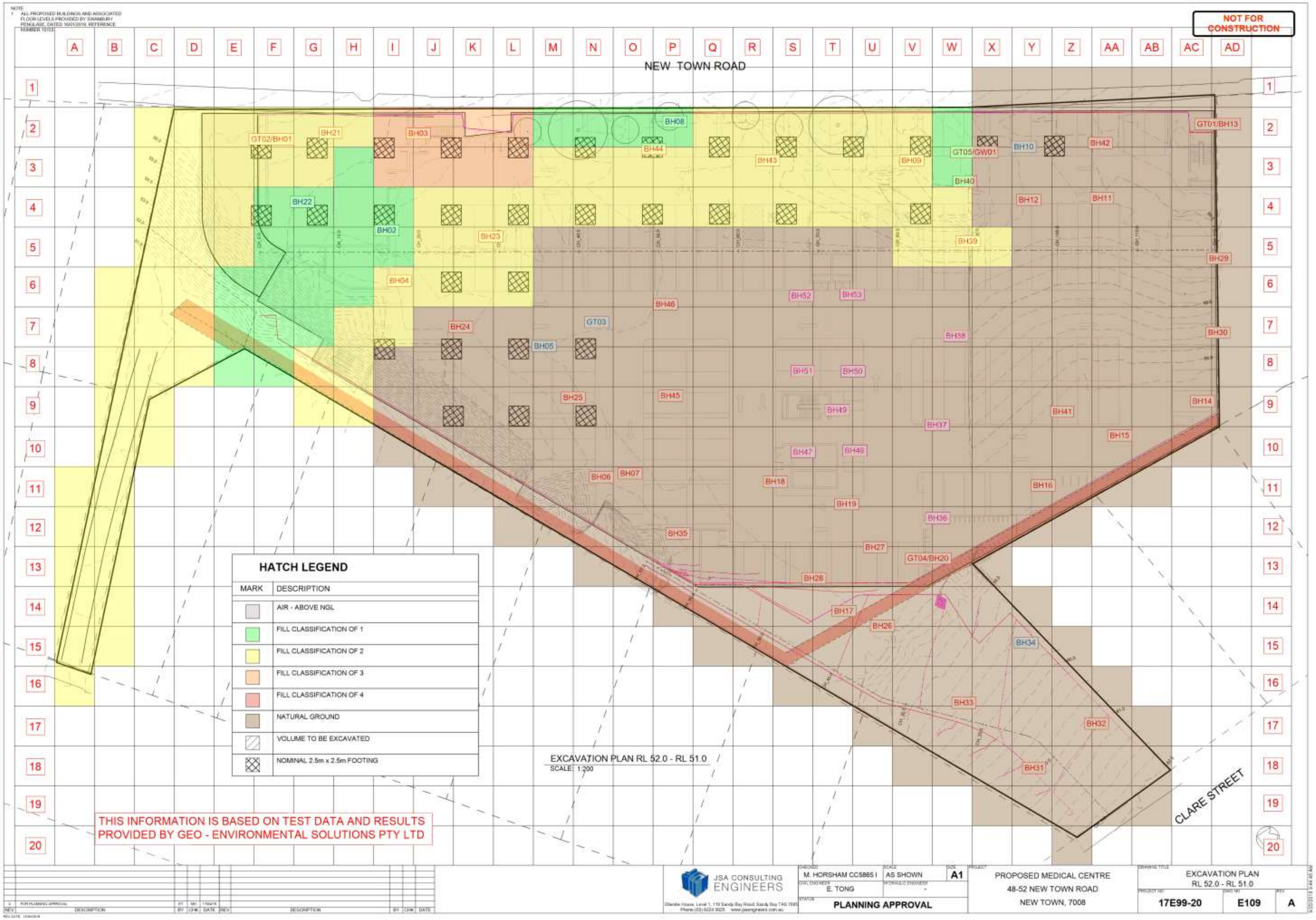

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
EXCAVATION PLAN RL 57.0 - RL 56.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 57.0 - RL 56.0
17E99-20
E104
A

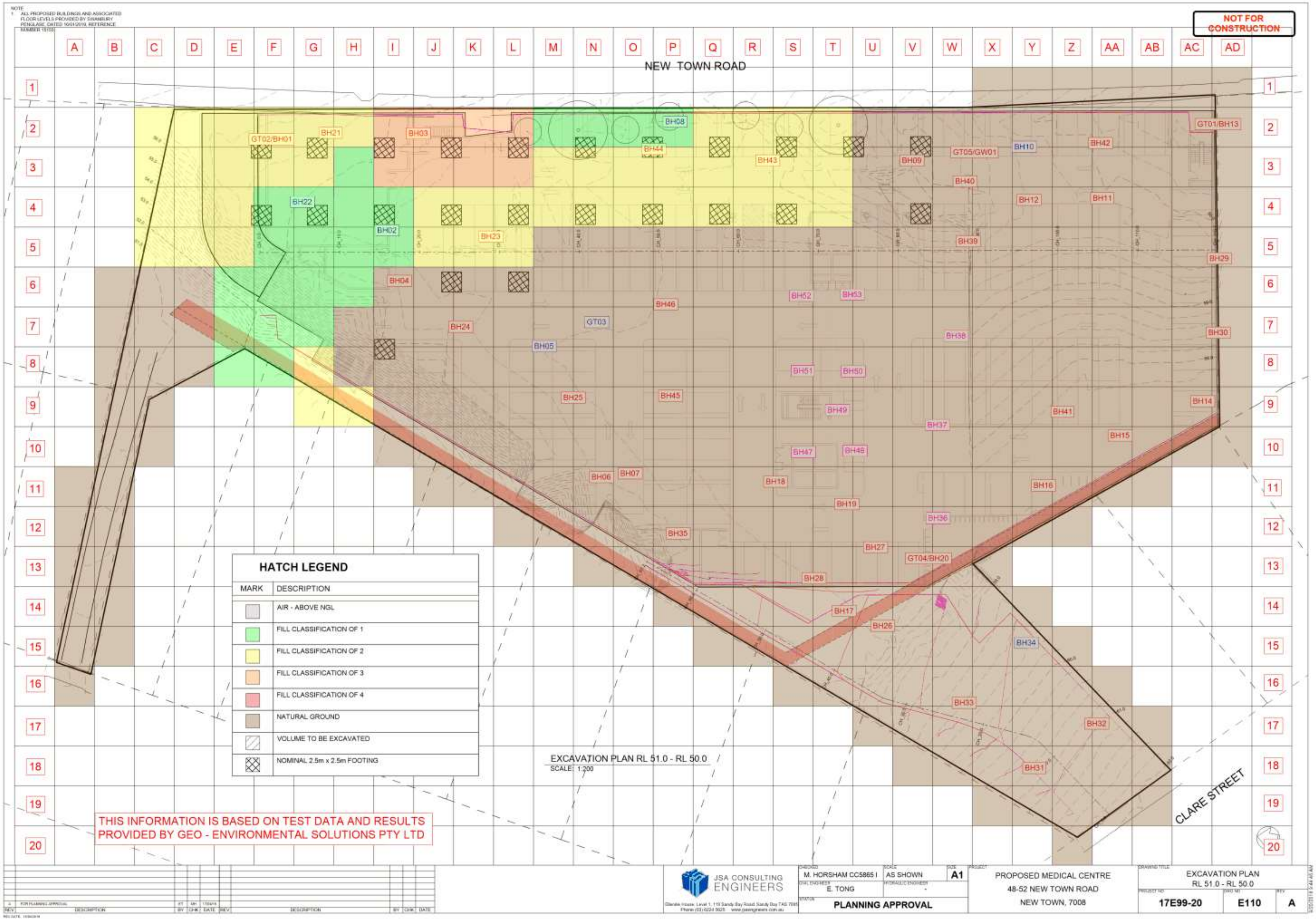

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
BASEMENT FFL 55.8m
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
EXCAVATION PLAN RL 56.0 - RL 55.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
Cut/Fill Summary
Name
Cut Factor
Fill Factor
2D Area
Cut
Fill
Net
Cut Fill Basement
1.00
1.00
5760.29sq.m
14615.96 Cu. M.
199.43 Cu. M.
14416.53 Cu. M.<Cut>
Totals
5760.29sq.m
14615.96 Cu. M.
199.43 Cu. M.
14416.53 Cu. M.<Cut>
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 56.0 - RL 55.0
17E99-20
E105
A

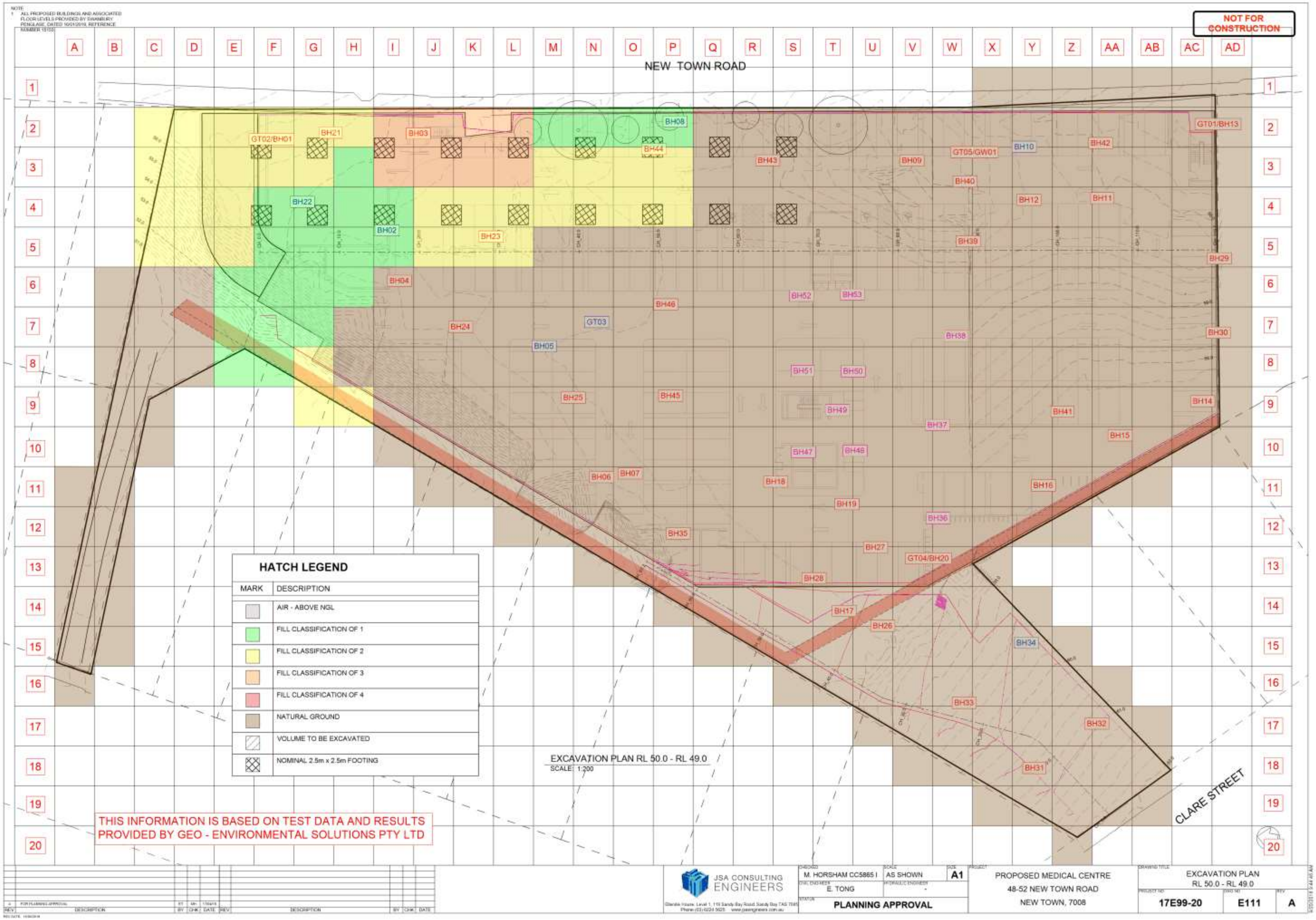

NOT FOR CONSTRUCTION
NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 55.0 - RL 54.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 55.0 - RL 54.0
17E99-20
E106
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 54.0 - RL 53.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 54.0 - RL 53.0
17E99-20
E107
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 53.0 - RL 52.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 53.0 - RL 52.0
17E99-20
E108
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 52.0 - RL 51.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS
PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 52.0 - RL 51.0
17E99-20
E109
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 51.0 - RL 50.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
JSA CONSULTING ENGINEERS
M. HORSHAM CC5865 I
AS SHOWN
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 51.0 - RL 50.0
17E99-20
E110
A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NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
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AIR - ABOVE NGL
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FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 50.0 - RL 49.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
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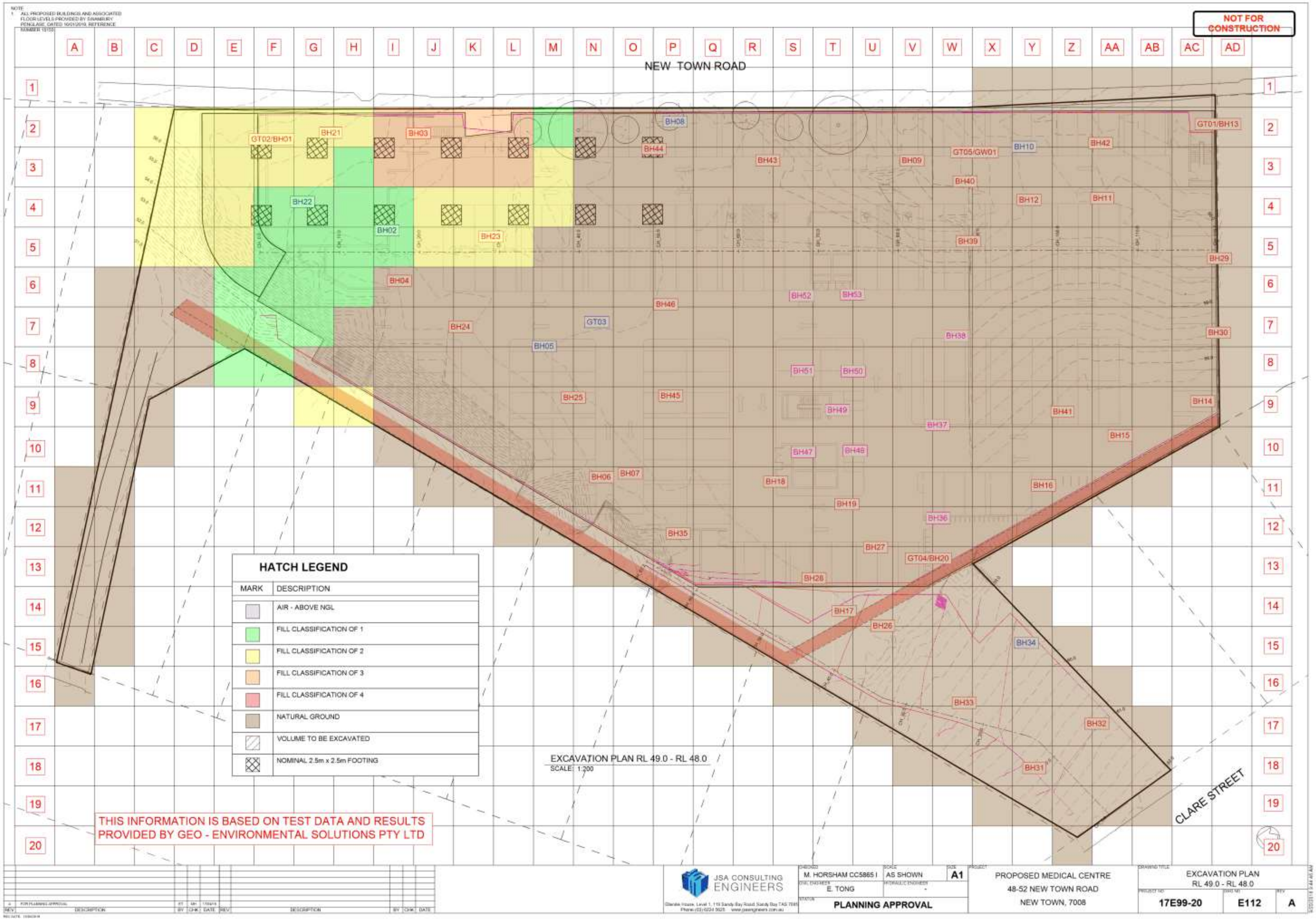
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 50.0 - RL 49.0
17E99-20
E111
A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NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 49.0 - RL 48.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
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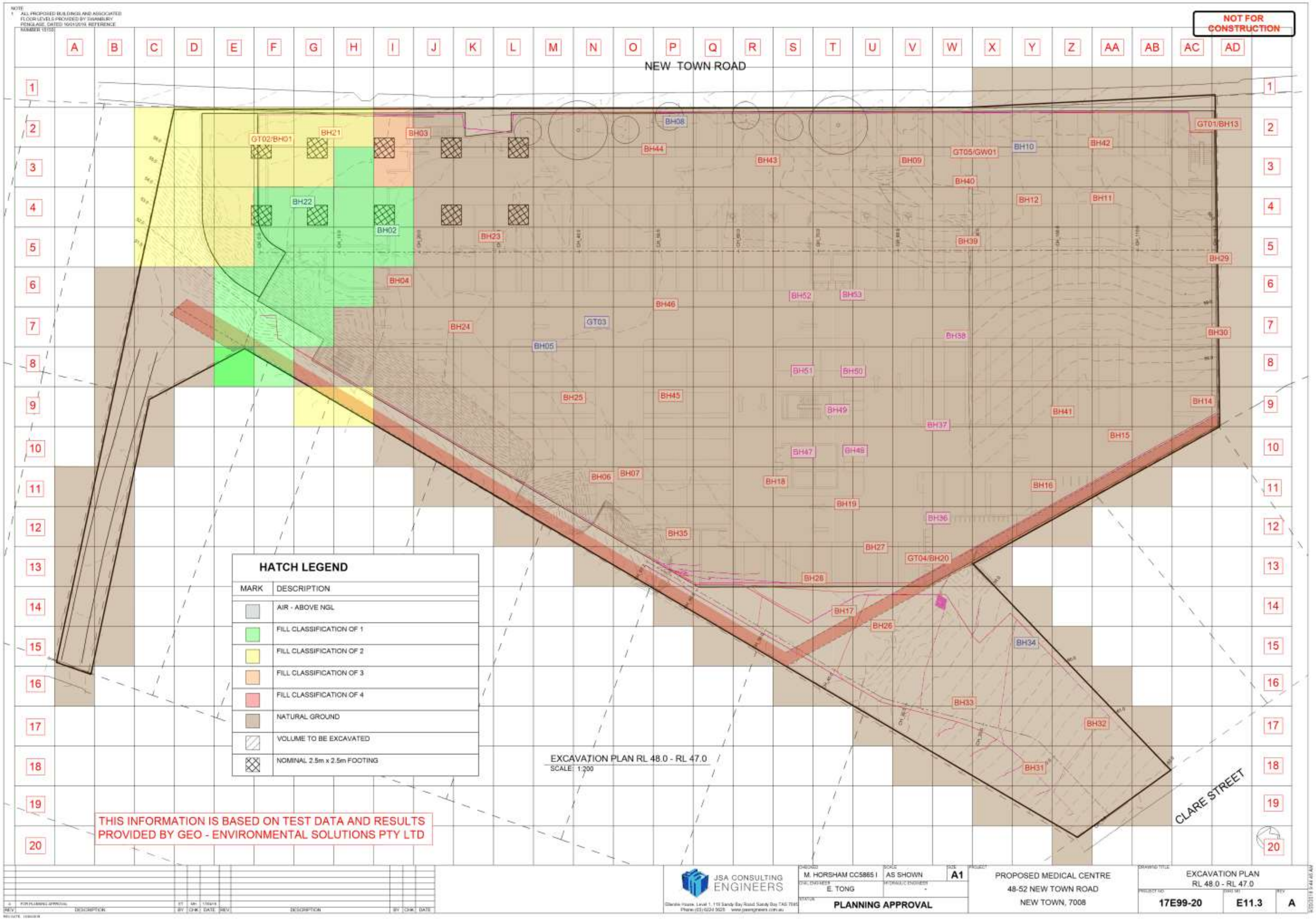
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 49.0 - RL 48.0
17E99-20
E112
A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NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
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FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 48.0 - RL 47.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS
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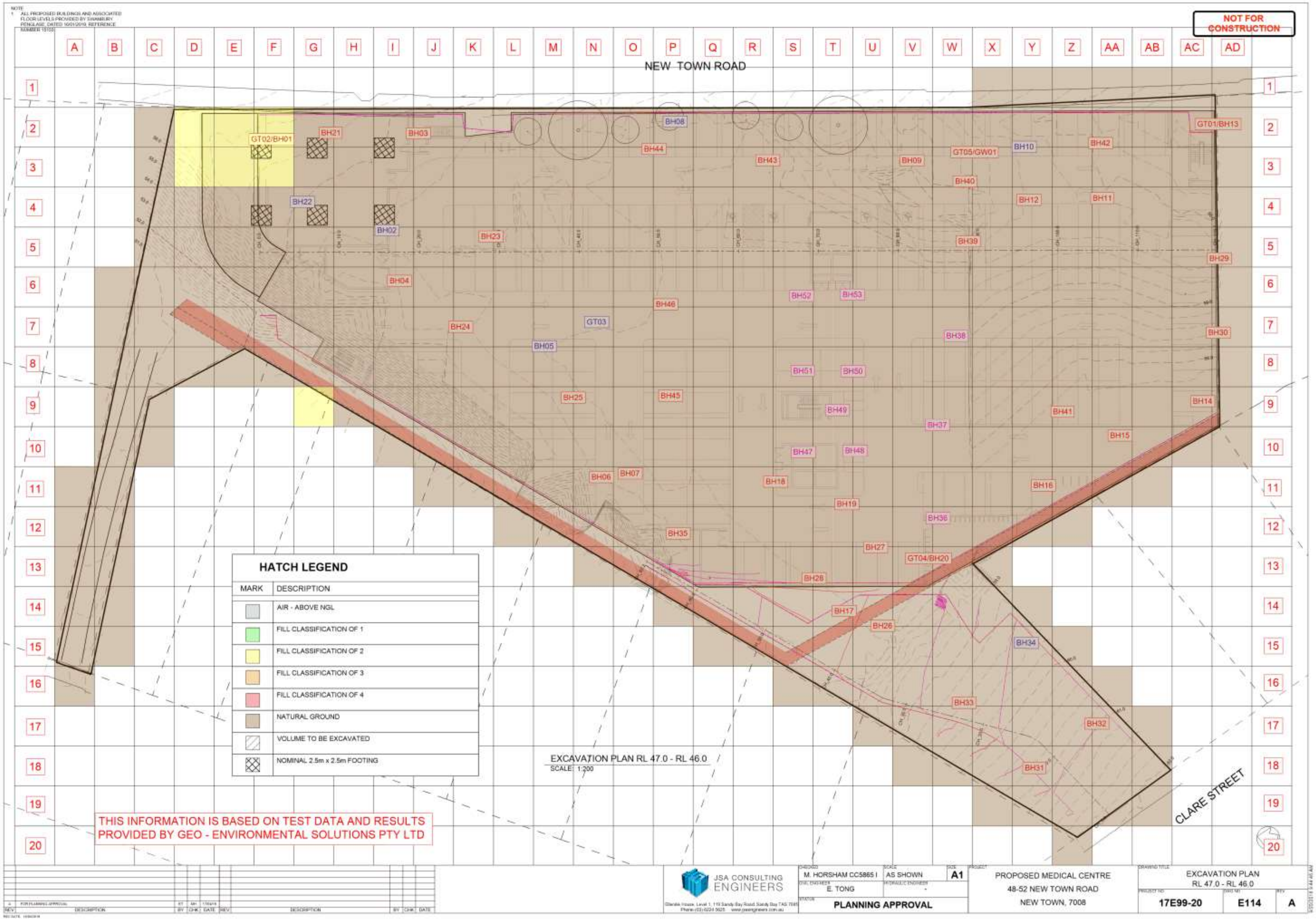
A1
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 48.0 - RL 47.0
17E99-20
E11.3
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 47.0 - RL 46.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
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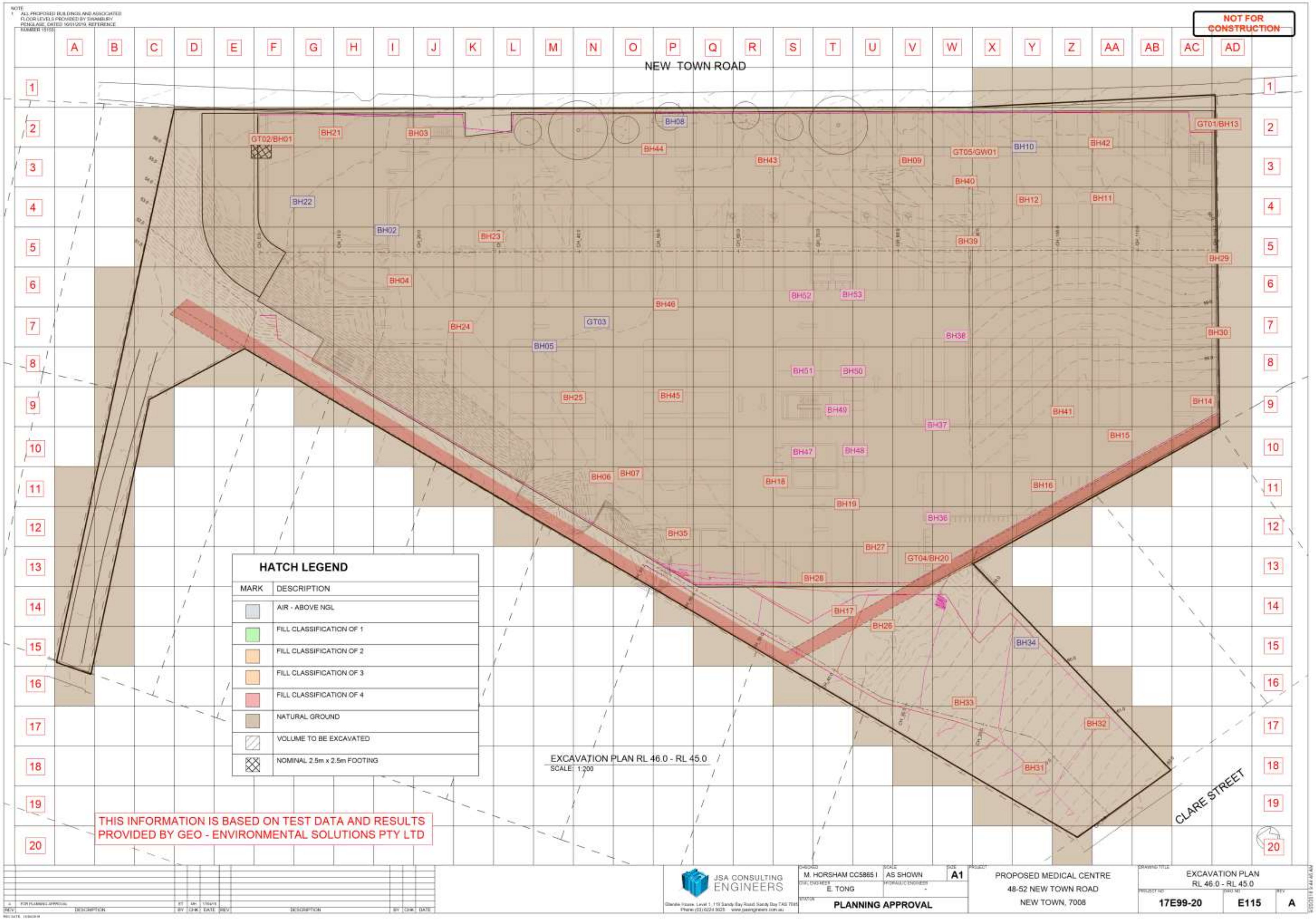
E. TONG
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 47.0 - RL 46.0
17E99-20
E114
A


NOT FOR CONSTRUCTION
NEW TOWN ROAD
CLARE STREET
HATCH LEGEND
MARK
DESCRIPTION
AIR - ABOVE NGL
FILL CLASSIFICATION OF 1
FILL CLASSIFICATION OF 2
FILL CLASSIFICATION OF 3
FILL CLASSIFICATION OF 4
NATURAL GROUND
VOLUME TO BE EXCAVATED
NOMINAL 2.5m x 2.5m FOOTING
EXCAVATION PLAN RL 46.0 - RL 45.0
SCALE: 1:200
THIS INFORMATION IS BASED ON TEST DATA AND RESULTS PROVIDED BY GEO - ENVIRONMENTAL SOLUTIONS PTY LTD
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E. TONG
AS SHOWN
A1
PLANNING APPROVAL
PROPOSED MEDICAL CENTRE
48-52 NEW TOWN ROAD
NEW TOWN, 7008
EXCAVATION PLAN
RL 46.0 - RL 45.0
17E99-20
E115
A

JSA CONSULTING ENGINEERS

APPENDIX C – Summary of excavation volumes

Directors: Dr Jane Sargison BE DPhil FIEAust CPEng NER CC6193N
Mr Matthew Horsham BE MIEAust CPEng NER CC5865I
Ellerslie House, Level 1, 119 Sandy Bay Road, Sandy Bay 7005 Phone (03) 6224 5625 Email mail@jsa.com.au
JSA Consulting Engineers Pty Ltd | ABN 45 165 277 681

Suumary of results - Excavated volumes by 25m3 block

Drawing sheet	E01	E02	E03	E04	E05	E06	E07	E08	E09	E10	E11	E12	E13	E14	E15		
	RL60-59	**RL59-58**	**RL58-57**	**RL57-56**	**RL56-55**	**RL55-54**	**RL54-53**	**RL53-52**	**RL52-51**	**RL51-50**	**RL50-49**	**RL49-48**	**RL48-47**	**RL47-46**	**RL46-45**	**Total (blocks)**	**Total (m3)**
Fill Classification 1	11	25	75	33	68	3.75	1.25	1.75	0.75	0.75	0.75	0.75	0.75	0	0	222.5	5562.5
Fill Classification 2	14	27	127	150	115	7	7.5	5	4.25	3.25	2	1	0.5	0.25	0	463.75	11593.75
Fill Classification 3	0	9	8	10	2	1.75	0.75	0.75	0.75	0.75	0.75	0.75	0.25	0	0	35.5	887.5
Fill Classification 4	0	0	0	4	5	0.5	0	0	0	0	0	0	0	0	0	9.5	237.5
Natural Ground	0	0	6	46	53	5.5	4	2.75	2.25	1.25	1	1	1	1.25	0.25	125.25	3131.25
Total material	25	61	216	243	243	18.5	13.5	10.25	8	6	4.5	3.5	2.5	1.5	0.25	856.5	21412.5
Total fill	25	61	210	197	190	13	9.5	7.5	5.75	4.75	3.5	2.5	1.5	0.25	0	731.25	18281.25
Total contaminated >=2	14	36	135	164	122	9.25	8.25	5.75	5	4	2.75	1.75	0.75	0.25	0	508.75	12718.75
Total material in m3	625	1525	5400	6075	6075	462.5	337.5	256.25	200	150	112.5	87.5	62.5	37.5	6.25		21412.5
Total fill in m3	625	1525	5250	4925	4750	325	237.5	187.5	143.75	118.75	87.5	62.5	37.5	6.25	0		18281.25
Total natural gnd in m3	0	0	150	1150	1325	137.5	100	68.75	56.25	31.25	25	25	25	31.25	6.25		3131.25

JSA CONSULTING ENGINEERS

Hobart City Council
Town Hall
Macquarie St
GPO Box 503
Hobart TAS 7001

17 April 2019
JSA Reference: 17R99-20-1

RE: 48-52 New Town Road, New Town

STORMWATER INFRASTRUCTURE – DRAINAGE REPORT

JSA Consulting Engineers have prepared a design of the stormwater system for the proposed medical centre at 48-52 New Town Road, New Town.

STORMWATER DESIGN

The stormwater infrastructure has been designed to meet the acceptable solutions and requirements of the Stormwater Code of the Hobart Interim Planning Scheme 2015, with the following key elements.

1. *Acceptable Solution E7.7.1 A1. Stormwater from new impervious surfaces must be disposed of by gravity to public stormwater infrastructure.*

   Response:

   The stormwater infrastructure collects and treats all runoff from roofs, hardstand and driveway areas. Stormwater from impervious surfaces is disposed of by gravity to the proposed stormwater lot connection as outlined on JSA stormwater plans H100-01, H120, H150.

2. *Acceptable Solution E7.7.1 A2. A stormwater system for a new development must incorporate water sensitive urban design principles for the treatment and disposal of stormwater if any of the following apply:*

   a) *the size of new impervious area is more than 600m^2;*

   b) *new car parking is provided for more than 6 cars;*

   c) *a subdivision is for more than 5 lots.*

   Response:

   The stormwater system will incorporate water sensitive urban design principles for the treatment and disposal of stormwater (the size of new impervious area is more than 600m^2).

   Performance Criteria E7.7.1 P2. A stormwater system for a new development must incorporate a stormwater drainage system of a size and design sufficient to achieve the stormwater quality and quantity targets in accordance with the State Stormwater Strategy 2010, as detailed in Table E7.1 unless it is not feasible to do so.

   Response:

   Stormwater from 1500m^2 of roof area will be directed to an in-ground detention tank (22.5kL) with 7.5kL for reuse in garden areas. Discharge from the tank, and runoff from all other impervious surfaces will be piped to a central treatment system (SPEL Hydrosystem 1000). Discharge from the central treatment system is to the proposed lot connection for the property, with a high flow bypass installed to prevent flooding of the system should the inflow exceed the design flows. The arrangement of the detention and treatment systems is detailed on JSA stormwater plans H120. A summary of MUSIC modelling is provided in Appendix 2. Information brochures for each of these products is included in Appendix 4.

The stormwater treatment achieves the following reductions in average annual load based on typical urban stormwater concentrations: 87% reduction in total suspended solids (TSS), 44.8% reduction in total phosphorous (TP), and 49.4% reduction in total nitrogen (TN). Stormwater collected from all roof areas, hardstand and driveway areas is treated to achieve these quality targets.

3. *Acceptable Solution E7.7.1 A3. A minor stormwater drainage system must be designed to comply with all of the following:*

   a) *be able to accommodate a storm with an ARI of 20 years in the case of non-industrial zoned land and an ARI of 50 years in the case of industrial zoned land, when the land serviced by the system is fully developed;*

   b) *stormwater runoff will be no greater than pre-existing runoff or any increase can be accommodated within existing or upgraded public stormwater infrastructure.*

Response:

Assessment of the catchment serviced by the existing DN450 concrete pipe servicing 48-52 New Town Rd (exiting site at SW1/4, refer JSA stormwater plan H100-01) suggests that the pipe is at capacity. This is verified by on site investigations which have indicated evidence of flooding at 54 New Town Rd.

Detention to pre-development flows

The detention volume for the site was calculated to ensure that the stormwater runoff rate for a 1 in 20 year ARI event was not increased compared with the current, pre-development situation for a 5 minute duration 1 in 20 year ARI event. Based on the catchment data outlined in Appendix 1, the runoff was calculated utilising the rational method.

Runoff rate from 5 minute, 1 in 20 year ARI event **PRE-DEVELOPMENT = 157.24 L/s**

Refer to Appendix 3 Sheet 1. The post-development runoff for 5 and 6 minute duration events (195.72L/s and 182.93L/s respectively) are greater than pre-development 5 minute duration runoff (157.24L/s). The post-development runoff for 10 minute and longer duration events (143.01L/s) are less than pre-development 5 minute duration runoff.

Hence, the detention volume has been specified to ensure the flow is not increased from 5 and 6 minute duration post-development compared with runoff from pre-development 5 minute duration event.

The detention infrastructure proposed is indicated on JSA stormwater plan H120-04 and includes a 22.5kL detention system (in-ground tank) collecting runoff from 1500m^2 of roof area, with a 25mm orifice plate installed at sufficient height to maintain a capacity of at least 15kL to detain the 1:20 year ARI event.

From the detention tank, stormwater discharges under gravity to the proposed municipal stormwater lot connection point. With the inclusion of in-ground stormwater detention tank fitted with 25mm orifice plate to restrict outflow, the post development runoff is limited to 154.85 L/s (5 minute duration event, refer to Appendix 3 Sheet 6 & 7).

Based on the runoff rate for the site as calculated for the 1 in 20 year ARI events, the stormwater infrastructure is sufficient to treat the site runoff, detain the flow and provide controlled flow discharge to the lot connection.

Lot connection size

The lot connection has been sized for a 1 in 100 year ARI event as DN450. Refer to Appendix 3 Sheet 23.

Downpipes sizing

The roof is proposed to be pitched, with box gutters and downpipes along eastern, north-western and south-western walls. The down pipes size and location have been calculated as per AS3500.3 Clause 3.7, with 10 downpipes along the eastern wall, and 6 downpipes each along the north-western and south-western walls. Downpipes are to be DN150 (PVC). Refer to JSA stormwater plans H120 for downpipe locations.

Assessment of wider catchment

The catchment serviced by the existing DN450 concrete Council stormwater pipe at the northern end of 48-52 New Town Road, which exits the property at SW1/4, was determined from LIST map contours, Google street view and the Hobart City Council stormwater network data (available online).

The catchment is approximated to be 7.235ha and includes: road reserve for sections of New Town Rd, Warragul Ave, Archer St, Wilson St and Carr St; and private properties zoned inner residential and urban mixed use.

The road reserve area is assumed to be 70% impervious. Two calculations for private lot area have been completed, with 60% and 75% impervious area (assumed half roof and half hardstand). These calculations are included in Appendix 3 Sheet 10-12 and Sheet 13-15 respectively. The critical duration storm event for the catchment is assumed to be 10 minutes (Appendix 3 Sheet 9).

From hydraulic design charts, the DN450 concrete pipe does not have capacity for the runoff from the catchment, and if at minimum grade of 1:100, the pipe size required would be DN750 (StormPRO). The proposal for upgrade to the stormwater system includes a new DN525 StormPRO pipe at SW1/4, with the existing DN450 concrete pipe to be maintained as an overflow pipe (refer to JSA stormwater plan H100-01).

4. *Acceptable solution E7.7.1 A4. A major stormwater drainage system must be designed to accommodate a storm with an ARI of 100 years.*

   Response:

   Refer to JSA overland flow paths plan H140. Structures to deviate and control overland flow are specified, to future engineering detail, to direct the overland flows from Clare St entrance through to Seymour St.

CONCLUSIONS

This document has outlined the stormwater drainage and treatment infrastructure to service the proposed development.

The effectiveness of the stormwater treatment train has been modelled using MUSIC to provide an 87% reduction in total suspended solids, 44.8% reduction in total phosphorus, 49.4% reduction in total nitrogen and 98% reduction in gross pollutants. This meets the requirements of the State Stormwater Strategy.

The stormwater drainage system has been designed to detain the runoff from the site and control the release to the lot connection at 154.84 L/s which is below the predevelopment level of discharge (157.24 L/s).

Please contact Rachel Horner on 6224 5625 or rachel@jsa.com.au if you require any further information.

Yours sincerely

RHorner

Rachel Horner

Graduate Civil / Environmental Engineer

APPENDIX 1: Calculations

Calculation of Stormwater Runoff for the Proposed Development

The runoff volumes and flow rates for the site are calculated using the rational method, based on runoff coefficients as specified by AS3500 and an ARI of 1 in 20 years. The inundation rate for this rainfall event is determined from Bureau of Meteorology data for Hobart. Calculation sheets included in Appendix 3 support the proposed design summarised in this report and JSA stormwater plans H100-H150.

It is proposed that all stormwater runoff from the site will be collected via gravity flow to a central treatment system, prior to discharge to the municipal stormwater system via the lot connection for the property.

The catchment areas are separated into three regions:

- *Roof area*. This is assumed to have a runoff coefficient, C = 1.0, and total area for the site of 2250m^2 (pre-development) and 5893m^2 (post-development).

- *Hardstand area,* including all uncovered hardstand, access road and parking areas. This is assumed to have a runoff coefficient, C = 0.9, and total area for the site of 3232m^2 (pre-development) and 1028m^2 (post-development).

- *Landscaped area*, which includes the balance of the site area including open space. This will comprise landscaped areas with grass and garden beds, but is conservatively assumed to have a runoff coefficient, C = 0.2, based on clay soil and fully grassed surface, and total area for the site of 2229m^2 (pre-development) and 790m^2 (post-development).

The areas listed above were determined based on survey data, architectural and engineering design plans.

APPENDIX 2: MUSIC Model

MUSIC Modelling of Stormwater Treatment for the Proposed Development

The system outlined above has been modelled utilising MUSIC software.

The model input was based on the Hobart Ellerslie Rd 1/5/1996 – 1/10/2001 6 minute rainfall, which includes only valid data (no accumulated or missing data).

Catchment areas are summarised in Appendix 3 Sheet 1.

Roof area nodes are classified as "roof" zoning/surface type. As the Tasmanian Interim Planning Scheme Zoning of the property is "Urban Mixed Use", hardstand and landscaped area nodes are classified as "mixed" zoning/surface type.

Treatment system efficiency was modelled utilising the manufacturer data for the proprietary SPEL components specified.

Treatment train effectiveness is summarised in Figure 1, which indicates that the treatment system meets the requirements for best practice.

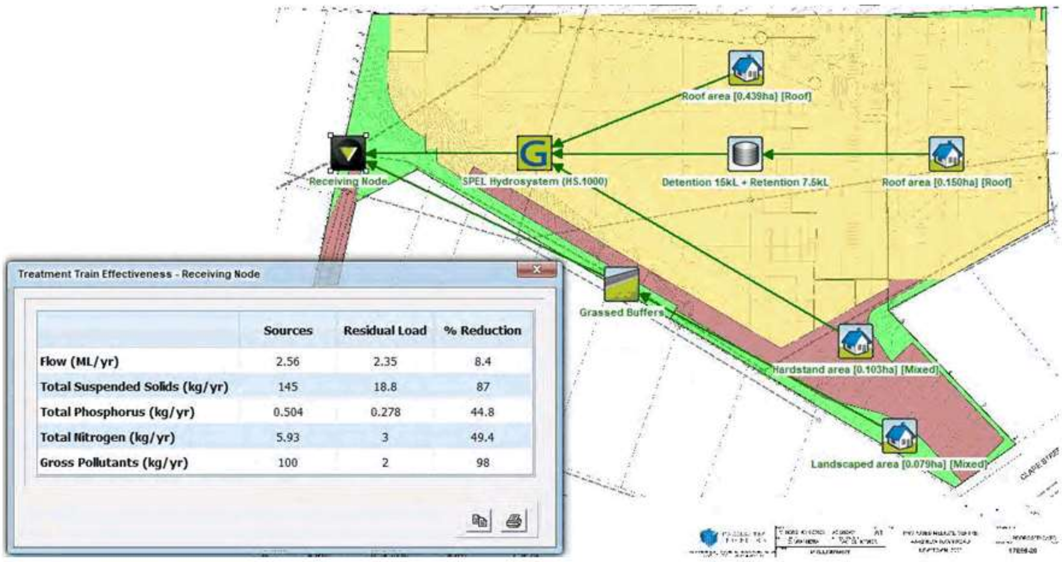


Figure 1: MUSIC model output

APPENDIX 3: Calculation Sheets

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 20 years Runoff summary - no detention	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 1

Pre-dev runoff rate 5 minute event 157.24 L/s

Pre-Development Areas

Proposed catchment 1 area	2250 m2	Area 1
Runoff coefficient, C1	1	Roof area
Proposed catchment 2 area	3232 m2	Area 2
Runoff coefficient, C2	0.9	Driveway area
Proposed catchment 3 area	2229 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	7711 m2	

Post - Development Areas

Proposed catchment 1a area	1500 m2	Area 1a
Runoff coefficient, C1	1	Roof area - to tank
Proposed catchment 1b area	4393 m2	Area 1b
Runoff coefficient, C1	1	Roof area - to pipe
Proposed catchment 2 area	1028 m2	Area 2
Runoff coefficient, C2	0.9	Driveway area
Proposed catchment 3 area	790 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	7711 m2	

Storm duration	Storm mean intensity	Runoff rate pre - dev	Runoff volume pre - dev	Runoff rate post-dev	Runoff volume post-dev	Increase in runoff rate	Increase in volume
minutes	mm/hr	L/s	L	L/s	L	L/s	L
5	101	157.24	47172	195.72	58716	38.48	11544
6	94.4	146.97	52907	182.93	65855	35.97	12948
10	73.8	114.89	68937	143.01	85807	28.12	16871
20	48.6	75.66	90795	94.18	113014	18.52	22220
30	37.6	58.54	105366	72.86	131153	14.33	25786
60	24.5	38.14	137313	47.48	170917	9.33	33604
120	16.7	26.00	187194	32.36	233005	6.36	45811
180	13.6	21.17	228668	26.35	284629	5.18	55961
360	9.74	15.16	327533	18.87	407689	3.71	80156
720	6.83	10.63	459353	13.24	571769	2.60	112416
1440	4.52	7.04	607987	8.76	756778	1.72	148791
2880	2.82	4.39	758639	5.46	944298	1.07	185660
4320	2.14	3.33	863557	4.15	1074893	0.82	211336

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town AS3500 Example runoff calculation ARI 1 in 20 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 2

ARI	**1:20**	years	CCC
Duration	**5**	minutes	
Inundation, I	**101**	mm/hr	BOM

Flow rates calculated using rational method:

Q = (C I A) / 3600 L/s

C= runoff coefficient (AS3500 5.4.6)

I = inundation mm/hr

A = plan area m2

Coefficient, C: AS 3500.3 section 5.4.6

Surface	C	Surface	C
Roof	1		
Hardstand	0.9		
Grass (clay soil)	0.2	(sand)	0.15
Gravel	0.85		

Pre-Development Areas

Proposed catchment 1 area	2250	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	3232	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	2229	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Post - Development Areas

Proposed catchment 1a area	1500	m2	Area 1a
Runoff coefficient, C1	1		Roof area - to tank
Proposed catchment 1b area	4393	m2	Area 1b
Runoff coefficient, C1	1		Roof area - to pipe
Proposed catchment 2 area	1028	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	790	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town AS3500 Example runoff calculation ARI 1 in 20 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 3

ARI	**1:20**	years	CCC
Duration	**5**	minutes	
Inundation, I	**101**	mm/hr	BOM

Flow rates calculated using rational method:

Q =	(C I A) / 3600	L/s
C=	runoff coefficient (AS3500 5.4.6)	
I =	inundation	mm/hr
A =	plan area	m2

Coefficient, C: AS 3500.3 section 5.4.6

Surface	**C**	**Surface**	**C**
Roof	1		
Hardstand	0.9		
Grass (clay soil)	0.2	(sand)	0.15
Gravel	0.85		

Pre-Development Areas Runoff

Runoff from area 1, Q1	63.13	L/s	Area 1
Total flow from Area 1 5 min, Vol1:	**18938**	**L / 5 min**	Roof area
Runoff from area 2, Q2	81.61	L/s	Area 2
Total flow from Area 2 5 min, Vol 2:	**24482**	**L / 5 min**	Driveway area
Runoff from area 3, Q3	12.51	L/s	Area 3
Total flow from Area 3 5 min, Vol 3:	**3752**	**L / 5 min**	Landscape area
Runoff from site:	157.24	L/s	Total area
Total flow from site 5 min:	**47172**	**L / 5 min**	**Total pre-development**

Post - Development Areas Runoff

Runoff from area 1a, Q1a	42.08	L/s	Area 1a
Total flow from Area 1a 5 min, Vol1a:	**12625**	**L / 5 min**	Roof area - to tank
Runoff from area 1b, Q1b	123.25		Area 1b
Total flow from Area 1b 5 min, Vol1b:	**36974**		Roof area - to pipe
Runoff from area 2, Q2	25.96	L/s	Area 2
Total flow from Area 2 5 min, Vol 2:	**7787**	**L / 5 min**	Driveway area
Runoff from area 3, Q3	4.43	L/s	Area 3
Total flow from Area 3 5 min, Vol 3:	**1330**	**L / 5 min**	Landscape area
Runoff from site:	195.72	L/s	Total area
Total flow from site 5 min:	**58716**	**L / 5 min**	**Total area post-development**

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 20 years Detention summary	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 4

Pre-dev runoff rate 5 minute event 157.24 L/s

Post - Development Areas			
Proposed catchment 1a area	1500	m2	Area 1a
Runoff coefficient, C1	1		Roof area - to tank
Proposed catchment 1b area	4393	m2	Area 1b
Runoff coefficient, C1	1		Roof area - to pipe
Proposed catchment 2 area	1028	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	790	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Design Detention Volume	15000	L	
Number of tanks (orifice outlets)	1		
Tank area	15	m2	Assume tank 1m height
Tank height	1.00	m	
Velocity coefficient, Cv	1.00		
Orifice plate diameter	25	mm	
Orifice area	0.00049	m^2	
Discharge coefficient, Cd	0.61		

Storm duration	Storm mean intensity	Roof runoff rate (to tank)	Roof runoff volume (to tank)	Depth to orifice plate	Velocity from orifice	Total discharge from tank outlets	Overflow from tanks
minutes	mm/hr	L/s	L	m	m/s	L/s	L/s
5	101	42.08	12625	0.84	4.06	1.22	0.00
6	94.4	39.33	14160	0.94	4.30	1.29	0.00
10	73.8	30.75	18450	1.00	4.43	1.33	30.75
20	48.6	20.25	24300	1.00	4.43	1.33	20.25
30	37.6	15.67	28200	1.00	4.43	1.33	15.67
60	24.5	10.21	36750	1.00	4.43	1.33	10.21
120	16.7	6.96	50100	1.00	4.43	1.33	6.96
180	13.6	5.67	61200	1.00	4.43	1.33	5.67
360	9.74	4.06	87660	1.00	4.43	1.33	4.06
720	6.83	2.85	122940	1.00	4.43	1.33	2.85
1440	4.52	1.88	162720	1.00	4.43	1.33	1.88
2880	2.82	1.18	203040	1.00	4.43	1.33	1.18
4320	2.14	0.89	231120	1.00	4.43	1.33	0.89

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town Example detention tank calculation ARI 1 in 20 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 5

Pre develop't runoff rate Qa:	47172	L/5min	pre		
Post develop't runoff rate Qb:	58716	L/5min	post		

Detention volume require to ensure no increase in runoff rate after development

Detention volume: **58716** - **47172** = **11544 L**

Roof runoff volume: **12625 L** directed to tank

Calculate depth to orifice in tank, h, to satisfy detention volume and orifice diameter to limit discharge flow

Detention of roof runoff

Tank area, A	15.00	m2		
Distance from top of tank, h	0.84	m	Depth to orifice plate	
Calculated detention volume	12625	L	OK	equal to roof runoff
Peak discharge velocity, V	4.1	m/s	$V = c_v\sqrt{2gh}$	
Velocity coefficient, Cv	1			
Orifice plate diameter, d	25	mm		
Orifice plate area, A	0.000491	mm2		
Discharge coefficient, Cd	0.61			
Flow rate from orifice, Q	1.22	L/s	$Q = Cd\,VA$	
Overflow volume	0	L/5min		
Overflow rate	0.00	L/s		

Confirm tank emptying time

Tank area, A	15.00	m2	
Depth to orifice	0.84	m	
Cd	1		
Orifice plate area, a	0.000491	m2	
T	12658.2	s	$T = \dfrac{2A(\sqrt{H_1} - \sqrt{H_2})}{C_d.a.\sqrt{2g}}$
	211	min	

Flow rate from orifice after 20 minutes

T	20	min
	1200	s
sqrt(H2)	0.83	
H2	0.69	m
V	3.68	m/s
Q	1.10	L/s

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 20 years Runoff summary - with detention	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 6

Pre-dev runoff rate 5 minute event 157.24 L/s

Post - Development Areas

Proposed catchment 1a area	1500 m2	Area 1a
Runoff coefficient, C1	1	Roof area - to tank
Proposed catchment 1b area	4393 m2	Area 1b
Runoff coefficient, C1	1	Roof area - to pipe
Proposed catchment 2 area	1028 m2	Area 2
Runoff coefficient, C2	0.9	Driveway area
Proposed catchment 3 area	790 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	7711 m2	

Storm duration	Storm mean intensity	Discharge from tank	Runoff rate from remaining roof area	Runoff rate from driveway area	Runoff rate from grassed area	Overflow from tanks	Post-dev runoff rate with tanks
minutes	mm/hr	L/s	L/s	L/s	L/s	L/s	L/s
5	101	1.22	123.25	25.96	4.43	0.00	154.85
6	94.4	1.29	115.19	24.26	4.14	0.00	144.89
10	73.8	1.33	90.06	18.97	3.24	30.75	144.34
20	48.6	1.33	59.31	12.49	2.13	20.25	95.51
30	37.6	1.33	45.88	9.66	1.65	15.67	74.19
60	24.5	1.33	29.90	6.30	1.08	10.21	48.80
120	16.7	1.33	20.38	4.29	0.73	6.96	33.69
180	13.6	1.33	16.60	3.50	0.60	5.67	27.68
360	9.74	1.33	11.89	2.50	0.43	4.06	20.20
720	6.83	1.33	8.33	1.76	0.30	2.85	14.56
1440	4.52	1.33	5.52	1.16	0.20	1.88	10.09
2880	2.82	1.33	3.44	0.72	0.12	1.18	6.79
4320	2.14	1.33	2.61	0.55	0.09	0.89	5.47

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town Example Design Flow Check ARI 1 in 20 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 7

Pre development runoff rate (5 min event):	**157.24 L/s**	**Sheet 2**	**(Total area)**
Post development runoff rate Q1a:	42.08 L/s	Sheet 2	(Roof area to tank)
Post development runoff rate Q1b:	123.25 L/s	Sheet 2	(Remaining roof area)
Post development runoff rate Q2:	25.96 L/s	Sheet 2	(Driveway area)
Post development overland runoff rate Q3:	4.43 L/s	Sheet 2	(Landscaped area)

Total post development runoff

Total Flow Rate	**42.08**	
+	**123.25**	
+	**25.96**	
+	**4.43**	
=	**195.72** L/s	No detention

APPLY DETENTION TANKS

Post development piped runoff - roof:	1.22 L/s	Sheet 5	Discharge flow from detention
Post development piped runoff - overflow:	0.00 L/s	Sheet 5	Overflow from tanks
Post development piped runoff - roof:	123.25 L/s	Sheet 2	(Remaining roof area)
Post development piped runoff - driveway:	25.96 L/s	Sheet 2	(Driveway area)
Post development overland runoff rate Q3:	4.43 L/s	Sheet 2	(Landscaped area)

Total post development runoff with detention tanks and orifice plates installed

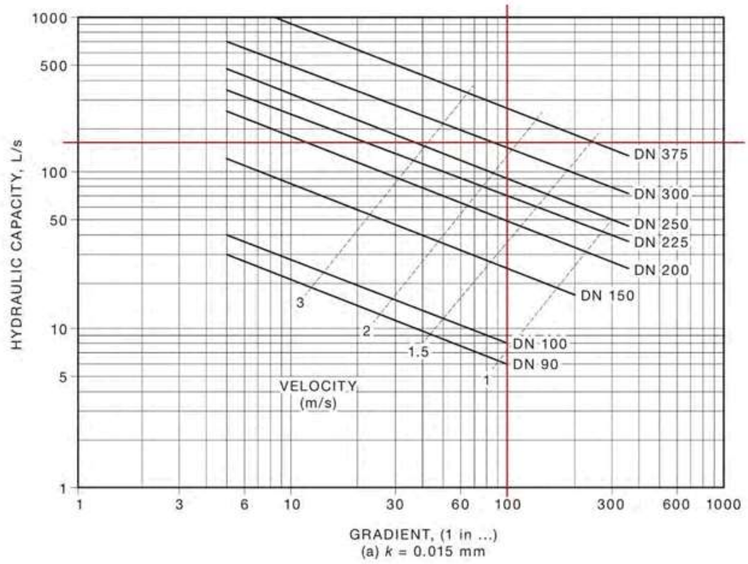
Total Flow Rate	**1.22**	
+	**0.00**	
+	**123.25**	
+	**25.96**	
+	**4.43**	
=	**154.85** L/s	With detention

Design Summary:
Flow rate from post development with detention tanks and orifice plates installed is 154.85L/s. Therefore detention and controlled release system will not increase runoff compared with current state for the flow from a 5min, 20 year ARI event

JSA CONSULTING ENGINEERS

48-52 New Town Rd, New Town
ARI 1 in 20 years
Pipe size summary

PROJECT No: 17E99-20
BY: RH
DATE: 20/03/2019
SHEET No: 8



Ref: AS3500.3:2015 Figure 5.4.11.2

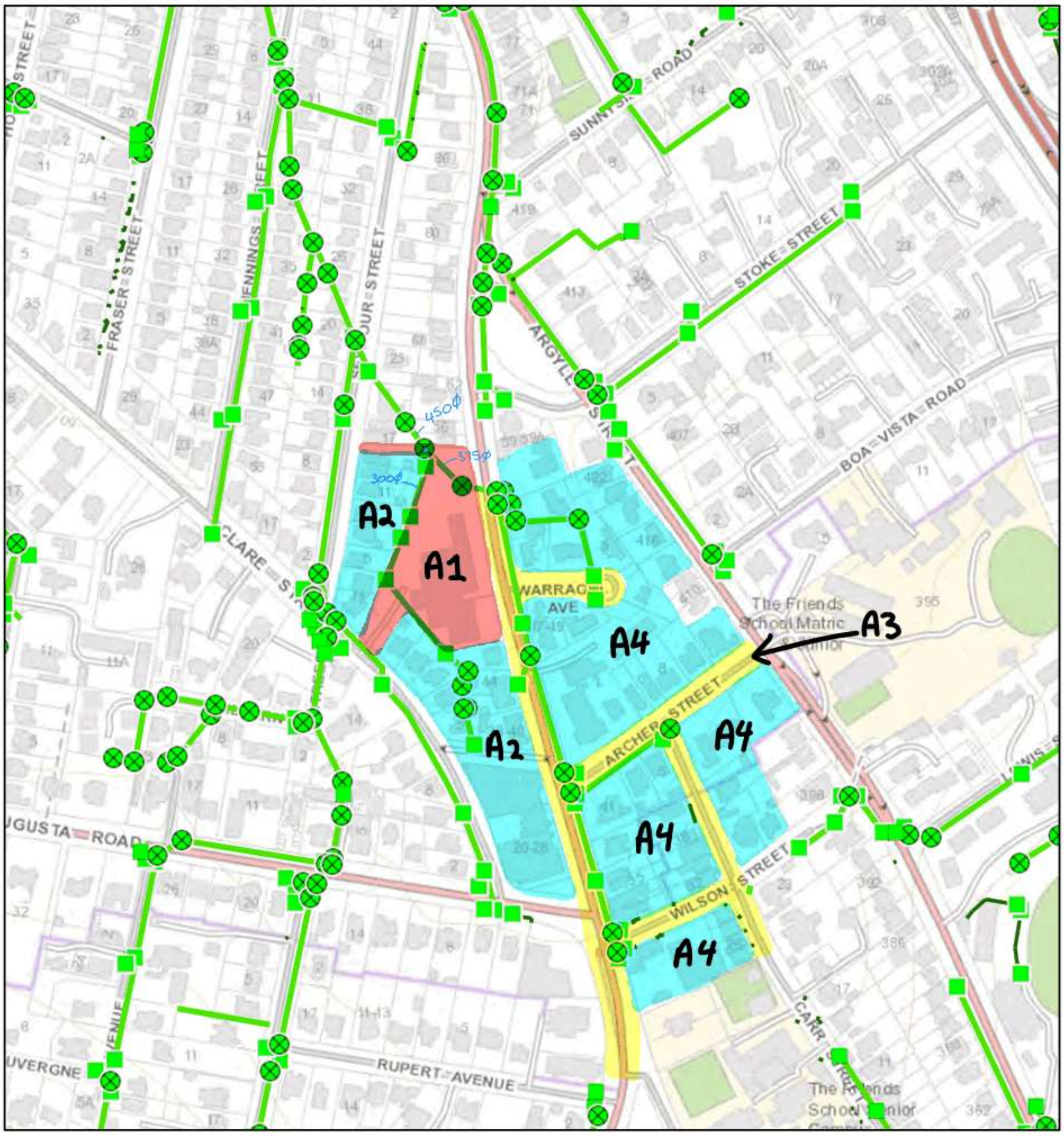
Storm duration	Storm mean intensity	Total tank outflow	Runoff from remaining roof areas	Runoff from hardstand areas	Total runoff from impervious areas	Runoff from pervious surfaces	Total site runoff
minutes	mm/hr	L/s	L/s	L/s	L/s	L/s	L/s
5	101	1.22	123.25	25.96	150.42	4.43	154.85
6	94.4	1.29	115.19	24.26	140.74	4.14	144.89
10	73.8	32.08	90.06	18.97	141.10	3.24	144.34
20	48.6	21.58	59.31	12.49	93.37	2.13	95.51
30	37.6	16.99	45.88	9.66	72.54	1.65	74.19
60	24.5	11.53	29.90	6.30	47.73	1.08	48.80
120	16.7	8.28	20.38	4.29	32.96	0.73	33.69
180	13.6	6.99	16.60	3.50	27.08	0.60	27.68
360	9.74	5.38	11.89	2.50	19.77	0.43	20.20
720	6.83	4.17	8.33	1.76	14.26	0.30	14.56
1440	4.52	3.21	5.52	1.16	9.89	0.20	10.09
2880	2.82	2.50	3.44	0.72	6.67	0.12	6.79
4320	2.14	2.22	2.61	0.55	5.38	0.09	5.47

Max runoff for 5 minute duration event between 150.42L/s and 154.85L/s, therefore DN375 lot connection required (assuming 1:100 grade).

TABLE 6 – Full Discharges and Velocities DN300 – DN375

Gradient H/L	Velocity/ Discharge k (mm)	DN 300 Di 0.3				DN 375 Di 0.374			
		0.003	0.006	0.015	0.03	0.003	0.006	0.015	0.03
1/10	m/s	7.5	7.3	7.1	6.8	8.6	8.4	8.1	7.8
	L/s	527.7	519.1	500.1	479.4	940.8	924.8	889.8	852.4
1/20	m/s	5.1	5.1	4.9	4.7	5.9	5.8	5.6	5.4
	L/s	363.6	359.0	348.0	335.2	649.0	640.3	619.9	596.7
1/30	m/s	4.1	4.1	4.0	3.8	4.7	4.7	4.6	4.4
	L/s	292.1	288.9	281.1	271.6	521.8	515.7	501.1	483.8
1/40	m/s	3.5	3.5	3.4	3.3	4.1	4.0	3.9	3.8
	L/s	250.0	247.5	241.4	233.8	446.8	442.1	430.6	416.6
1/50	m/s	3.1	3.1	3.0	2.9	3.6	3.6	3.5	3.4
	L/s	221.5	219.5	214.4	208.0	396.0	392.2	382.7	370.8
1/60	m/s	2.8	2.8	2.8	2.7	3.3	3.2	3.2	3.1
	L/s	200.6	198.9	194.6	189.0	358.8	355.6	347.4	337.1
1/70	m/s	2.6	2.6	2.5	2.5	3.0	3.0	2.9	2.8
	L/s	184.5	183.0	179.2	174.3	330.0	327.2	320.1	311.0
1/80	m/s	2.4	2.4	2.4	2.3	2.8	2.8	2.7	2.6
	L/s	171.5	170.2	166.9	162.5	307.0	304.5	298.1	289.9
1/90	m/s	2.3	2.3	2.2	2.2	2.6	2.6	2.5	2.5
	L/s	160.9	159.7	156.7	152.7	287.9	285.7	280.0	272.5
1/100	m/s	2.1	2.1	2.1	2.0	2.5	2.5	2.4	2.3
	L/s	151.9	150.8	148.1	144.4	271.9	269.9	264.7	257.8
1/120	m/s	1.9	1.9	1.9	1.9	2.2	2.2	2.2	2.1
	L/s	137.5	136.6	134.3	131.1	246.2	244.6	240.1	234.2
1/140	m/s	1.8	1.8	1.7	1.7	2.1	2.0	2.0	2.0
	L/s	126.4	125.6	123.6	120.8	226.4	225.0	221.1	215.9
1/160	m/s	1.7	1.7	1.6	1.6	1.9	1.9	1.9	1.8
	L/s	117.5	116.8	115.0	112.5	210.5	209.2	205.8	201.1
1/180	m/s	1.6	1.6	1.5	1.5	1.8	1.8	1.8	1.7
	L/s	110.2	109.6	107.9	105.7	197.4	196.3	193.2	189.0
1/200	m/s	1.5	1.5	1.4	1.4	1.7	1.7	1.7	1.6
	L/s	104.0	103.4	102.0	99.9	186.4	185.3	182.5	178.7
1/250	m/s	1.3	1.3	1.3	1.3	1.5	1.5	1.5	1.4
	L/s	92.0	91.6	90.4	88.7	165.0	164.1	161.9	158.7
1/300	m/s	1.2	1.2	1.2	1.1	1.4	1.4	1.3	1.3
	L/s	83.2	82.9	81.9	80.4	149.3	148.6	146.7	143.9
1/400	m/s	1.0	1.0	1.0	1.0	1.2	1.2	1.1	1.1
	L/s	71.1	70.8	70.0	68.9	127.5	127.0	125.5	123.4
1/500	m/s	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
	L/s	62.8	62.6	62.0	61.1	112.8	112.4	111.2	109.5

City of Hobart: Stormwater Network



March 18, 2019

1:5,053

0 0.03 0.06 0.12 mi
0 0.05 0.1 0.2 km

DRAINAGE Catchment
DRAINAGE Branch Connections
DRAINAGE Network Nodes
DRAINAGE Network Pipes
Deflector Pit
Double Gully Pit
Man Hole
Single Gully Pit

LIST Topographic
Red: Band_1
Green: Band_2
Blue: Band_3

Catchment Areas:
road reserve
lots (inner residential & urban mixed use zoning)
property (48-52 New Town Rd) (urban mixed use zoning)

HCCGISEB

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town Time of concentration calculation 7.235ha catchment	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 9

Kerby-Kirpich Method

$$t_c = t_{ov} + t_{ch}$$

Time of concentration for overland flow:

$$t_{ov} = 1.44 \times (L_{ov} \times n_{ov})^{0.467} \times (S_{ov})^{-0.235}$$

t_ov	-	mins
L_ov	-	m
n_ov	-	
S_ov	-	

Table 1: retardance coefficient n_ov

Terrain	n_ov
Pavement	0.02
Smooth, bare, packed soil	0.1
Poor grass, cultivated row crops, or moderately rough packed surfaces	0.2
Pasture, average grass $t = (A_{inf} d\emptyset)/(K_h A_{inf})$	0.4
Deciduous forest $V = A_{inf} d\emptyset$	0.6
Dense grass, coniferous forest, or deciduous forest with deep litter	0.8

Time of concentration for channel flow:

$$t_{ch} = 0.0195 \times L_{ch}{}^{0.770} \times S_{ch}{}^{-0.385}$$

$$V_{out} = \left[A_{inf} + Pd/2\right] \times U \times K_h \times D/60/1000$$

t_ch	8	mins
L_ch	515	m
S_ch	0.05	

Applicable to:
65 ha < A < 40 000 ha
1.6 km < L_ch < 80.5 km
0.002 < S_0 < 0.02 (if S_0 < 0.2%, S_ch = S_0 + 0.0005)

Total time of concentration:

$$t_c = t_{ov} + t_{ch}$$

t_c	8	mins

Check result reasonable by using rough calculation:

$$t_c = 3.75\sqrt{A}$$

t_c	10	mins
A	7.235	ha

Reference: http://onlinemanuals.txdot.gov/txdotmanuals/hyd/time_of_concentration.htm

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town Catchment Areas Wider catchment - lots 75% impervious	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 10

Pre-development Catchment Areas

	Area 1 (SHEET 1)	Area 2	Area 3	Area 4	DN300	DN375	**DN450 (Total)**
Area (m2)	7711	13625	21950	29064	13625	51014	**72350**
Area Description	48-52 New Town Rd	Lots west of New Town Rd	Road reserve	Lots East of New Town Rd	Area 2	Area 3 + Area 4	-
% Impervious	-	75	70	75			-
% Roof	-	37.5	0	37.5			-
% Hardstand	-	37.5	70	37.5			-
% Pervious	-	25	30	25			-
Roof area	2250	5109	0	10899	5109	10899	**18258**
Hardstand area	3232	5109	15365	10899	5109	26264	**34605**
Pervious area	2229	3406	6585	7266	3406	13851	**19486**
					13625	**51014**	**72350**

Post-development Catchment Areas

	Area 1 (SHEET 1)	Area 2	Area 3	Area 4	DN300	DN375	**DN450 (Total)**
Area (m2)	7711	13625	21950	29064	13625	51014	**72350**
Area Description	48-52 New Town Rd	Lots west of New Town Rd	Road reserve	Lots east of New Town Rd	Area 2	Area 3 + Area 4	-
% Impervious	-	75	70	75			-
% Roof	-	37.5	0	37.5			-
% Hardstand	-	37.5	70	37.5			-
% Pervious	-	25	30	25			-
Roof area	5893	5109	0	10899	5109	10899	**21901**
Hardstand area	1028	5109	15365	10899	5109	26264	**32401**
Pervious area	790	3406	6585	7266	3406	13851	**18047**
					13625	**51014**	**72350**

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 20 years - DN300 & DN375 Runoff summary - lots 75% impervious	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 11

DN300 Catchment Areas (SHEET 10)

Proposed catchment 1 area	5109	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	5109	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	3406	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	13625	m2	

DN375 Catchment Areas (SHEET 10)

Proposed catchment 1 area	10899	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	26264	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	13851	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	51014	m2	

Storm duration	Storm mean intensity	Runoff rate DN300	Runoff volume DN300	Runoff rate DN375	Runoff volume DN375
minutes	mm/hr	L/s	L	L/s	L
5	101	291.47	87441	1046.66	313999
6	94.4	272.42	98073	978.27	352176
10	73.8	212.98	127785	764.79	458874
20	48.6	140.25	168303	503.64	604370
30	37.6	108.51	195314	389.65	701368
60	24.5	70.70	254532	253.89	914017
120	16.7	48.19	346995	173.06	1246047
180	13.6	39.25	423874	140.94	1522117
360	9.74	28.11	607137	100.94	2180209
720	6.83	19.71	851488	70.78	3057665
1440	4.52	13.04	1127006	46.84	4047042
2880	2.82	8.14	1406264	29.22	5049848
4320	2.14	6.18	1600747	22.18	5748232

JSA CONSULTING ENGINEERS

48-52 New Town Rd, New Town
ARI 1 in 20 years - DN450
Runoff summary - lots 75% impervious

PROJECT No: 17E99-20
BY: RH
DATE: 20/03/2019
SHEET No: 12

Pre-development runoff rate 5 minute event 1495 L/s

Pre-Development Areas (SHEET 10)

Proposed catchment 1 area	18258	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	34605	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	19486	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	72350	m2	

Post - Development Areas (SHEET 10)

Proposed catchment 1 area	21901	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	32401	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	18047	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	72350	m2	

Storm duration	Storm mean intensity	Runoff rate pre - dev	Runoff volume pre - dev	Runoff rate post-dev	Runoff volume post-dev	Increase in runoff rate	Increase in volume
minutes	mm/hr	L/s	L	L/s	L	L/s	L
5	101	1495.37	448612	1533.86	460157	38.48	11544
6	94.4	1397.66	503156	1433.62	516104	35.97	12948
10	73.8	1092.66	655596	1120.78	672466	28.12	16871
20	48.6	719.56	863467	738.07	885687	18.52	22220
30	37.6	556.69	1002049	571.02	1027835	14.33	25786
60	24.5	362.74	1305861	372.07	1339466	9.33	33604
120	16.7	247.25	1780235	253.62	1826047	6.36	45811
180	13.6	201.36	2174659	206.54	2230620	5.18	55961
360	9.74	144.21	3114879	147.92	3195035	3.71	80156
720	6.83	101.12	4368506	103.73	4480922	2.60	112416
1440	4.52	66.92	5782034	68.64	5930825	1.72	148791
2880	2.82	41.75	7214751	42.83	7400410	1.07	185660
4320	2.14	31.68	8212535	32.50	8423871	0.82	211336

JSA CONSULTING ENGINEERS

48-52 New Town Rd, New Town
Catchment Areas
Wider catchment - lots 60% impervious

PROJECT No: 17E99-20
BY: RH
DATE: 20/03/2019
SHEET No: 13

Pre-development Catchment Areas

	Area 1 (SHEET 1)	Area 2	Area 3	Area 4	DN300	DN375	**DN450 (Total)**
Area (m2)	7711	13625	21950	29064	13625	51014	**72350**
Area Description	48-52 New Town Rd	Lots west of New Town Rd	Road reserve	Lots East of New Town Rd	Area 2	Area 3 + Area 4	-
% Impervious	-	60	70	60			-
% Roof	-	30	0	30			-
% Hardstand	-	30	70	30			-
% Pervious	-	40	30	40			-
Roof area	2250	4088	0	8719	4088	8719	**15057**
Hardstand area	3232	4088	15365	8719	4088	24084	**31404**
Pervious area	2229	5450	6585	11626	5450	18211	**25890**
					13625	**51014**	**72350**

Post-development Catchment Areas

	Area 1 (SHEET 1)	Area 2	Area 3	Area 4	DN300	DN375	**DN450 (Total)**
Area (m2)	7711	13625	21950	29064	13625	51014	**72350**
Area Description	48-52 New Town Rd	Lots west of New Town Rd	Road reserve	Lots East of New Town Rd	Area 2	Area 3 + Area 4	-
% Impervious	-	60	70	60			-
% Roof	-	30	0	30			-
% Hardstand	-	30	70	30			-
% Pervious	-	40	30	40			-
Roof area	5893	4088	0	8719	4088	8719	**18700**
Hardstand area	1028	4088	15365	8719	4088	24084	**29200**
Pervious area	790	5450	6585	11626	5450	18211	**24451**
					13625	**51014**	**72350**

JSA CONSULTING ENGINEERS

48-52 New Town Rd, New Town
ARI 1 in 20 years - DN300 & DN375
Runoff summary - lots 60% impervious

PROJECT No:	17E99-20
BY:	RH
DATE:	20/03/2019
SHEET No:	14

DN300 Catchment Areas (SHEET 13)

Proposed catchment 1 area	4088 m2	Area 1
Runoff coefficient, C1	1	Roof area
Proposed catchment 2 area	4088 m2	Area 2
Runoff coefficient, C2	0.9	Road/driveway areas
Proposed catchment 3 area	5450 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	13625 m2	

DN375 Catchment Areas (SHEET 13)

Proposed catchment 1 area	8719 m2	Area 1
Runoff coefficient, C1	1	Roof area
Proposed catchment 2 area	24084 m2	Area 2
Runoff coefficient, C2	0.9	Road/driveway areas
Proposed catchment 3 area	18211 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	51014 m2	

Storm duration	Storm mean intensity	Runoff rate DN300	Runoff volume DN300	Runoff rate DN375	Runoff volume DN375
minutes	mm/hr	L/s	L	L/s	L
5	101	248.47	74540	954.93	286479
6	94.4	232.23	83603	892.53	321310
10	73.8	181.55	108932	697.76	418656
20	48.6	119.56	143471	459.50	551401
30	37.6	92.50	166498	355.50	639897
60	24.5	60.27	216978	231.64	833909
120	16.7	41.08	295799	157.89	1136839
180	13.6	33.46	361335	128.58	1388714
360	9.74	23.96	517559	92.09	1989128
720	6.83	16.80	725858	64.58	2789681
1440	4.52	11.12	960726	42.74	3692345
2880	2.82	6.94	1198782	26.66	4607262
4320	2.14	5.26	1364571	20.23	5244436

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 20 years - DN450 Runoff summary - lots 60% impervious	PROJECT No: 17E99-20 BY: RH DATE: 20/03/2019 SHEET No: 15

Pre-development runoff rate 5 minute event 1361 L/s

Pre-Development Areas (SHEET 13)

Proposed catchment 1 area	15057	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	31404	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	25890	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	72350	m2	

Post - Development Areas (SHEET 13)

Proposed catchment 1 area	18700	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	29200	m2	Area 2
Runoff coefficient, C2	0.9		Road/driveway areas
Proposed catchment 3 area	24451	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	72350	m2	

Storm duration	Storm mean intensity	Runoff rate pre - dev	Runoff volume pre - dev	Runoff rate post-dev	Runoff volume post-dev	Increase in runoff rate	Increase in volume
minutes	mm/hr	L/s	L	L/s	L	L/s	L
5	101	1360.64	408191	1399.12	419735	38.48	11544
6	94.4	1271.72	457821	1307.69	470769	35.97	12948
10	73.8	994.21	596525	1022.33	613395	28.12	16871
20	48.6	654.72	785667	673.24	807887	18.52	22220
30	37.6	506.53	911761	520.86	937548	14.33	25786
60	24.5	330.06	1188200	339.39	1221804	9.33	33604
120	16.7	224.98	1619832	231.34	1665643	6.36	45811
180	13.6	183.21	1978716	188.40	2034678	5.18	55961
360	9.74	131.21	2834220	134.92	2914377	3.71	80156
720	6.83	92.01	3974892	94.61	4087308	2.60	112416
1440	4.52	60.89	5261058	62.61	5409849	1.72	148791
2880	2.82	37.99	6564683	39.06	6750342	1.07	185660
4320	2.14	28.83	7472564	29.64	7683900	0.82	211336

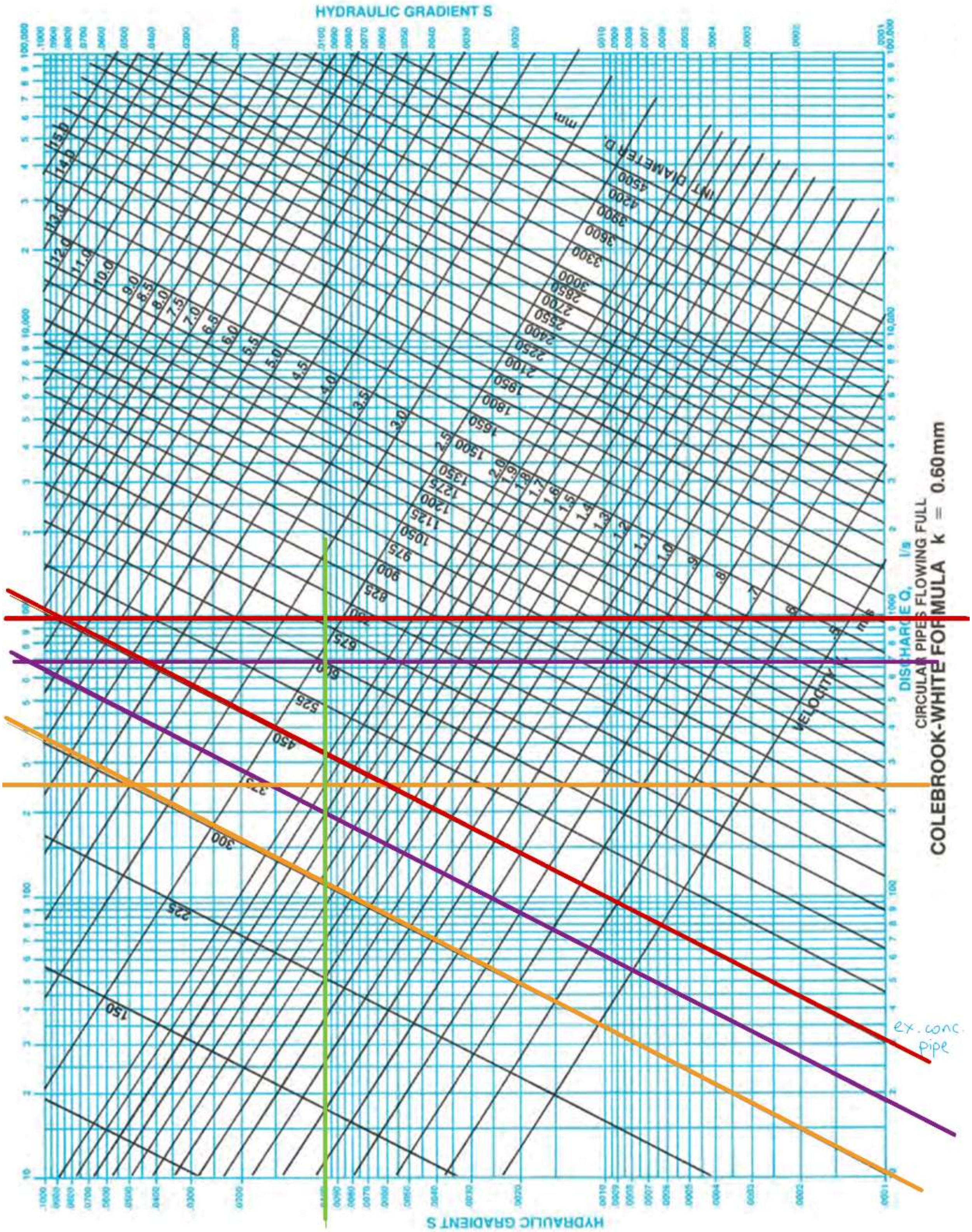

HYDRAULIC GRADIENT S
COLEBROOK-WHITE FORMULA k = 0.60mm
CIRCULAR PIPES FLOWING FULL
DISCHARGE Q, l/s
VELOCITY
INT DIAMETER D, mm
ex. conc. pipe

TABLE 6 – Full Discharges and Velocities DN300 – DN375

Gradient H/L	Velocity/ Discharge k (mm)	DN 300 Di 0.3				DN 375 Di 0.374			
		0.003	0.006	0.015	0.03	0.003	0.006	0.015	0.03
1/10	m/s	7.5	7.3	7.1	6.8	8.6	8.4	8.1	7.8
	L/s	527.7	519.1	500.1	479.4	940.8	924.8	889.8	852.4
1/20	m/s	5.1	5.1	4.9	4.7	5.9	5.8	5.6	5.4
	L/s	363.6	359.0	348.0	335.2	649.0	640.3	619.9	596.7
1/30	m/s	4.1	4.1	4.0	3.8	4.7	4.7	4.6	4.4
	L/s	292.1	288.9	281.1	271.6	521.8	515.7	501.1	483.8
1/40	m/s	3.5	3.5	3.4	3.3	4.1	4.0	3.9	3.8
	L/s	250.0	247.5	241.4	233.8	446.8	442.1	430.6	416.6
1/50	m/s	3.1	3.1	3.0	2.9	3.6	3.6	3.5	3.4
	L/s	221.5	219.5	214.4	208.0	396.0	392.2	382.7	370.8
1/60	m/s	2.8	2.8	2.8	2.7	3.3	3.2	3.2	3.1
	L/s	200.6	198.9	194.6	189.0	358.8	355.6	347.4	337.1
1/70	m/s	2.6	2.6	2.5	2.5	3.0	3.0	2.9	2.8
	L/s	184.5	183.0	179.2	174.3	330.0	327.2	320.1	311.0
1/80	m/s	2.4	2.4	2.4	2.3	2.8	2.8	2.7	2.6
	L/s	171.5	170.2	166.9	162.5	307.0	304.5	298.1	289.9
1/90	m/s	2.3	2.3	2.2	2.2	2.6	2.6	2.5	2.5
	L/s	160.9	159.7	156.7	152.7	287.9	285.7	280.0	272.5
1/100	m/s	2.1	2.1	2.1	2.0	2.5	2.5	2.4	2.3
	L/s	151.9	150.8	148.1	144.4	271.9	269.9	264.7	257.8
1/120	m/s	1.9	1.9	1.9	1.9	2.2	2.2	2.2	2.1
	L/s	137.5	136.6	134.3	131.1	246.2	244.6	240.1	234.2
1/140	m/s	1.8	1.8	1.7	1.7	2.1	2.0	2.0	2.0
	L/s	126.4	125.6	123.6	120.8	226.4	225.0	221.1	215.9
1/160	m/s	1.7	1.7	1.6	1.6	1.9	1.9	1.9	1.8
	L/s	117.5	116.8	115.0	112.5	210.5	209.2	205.8	201.1
1/180	m/s	1.6	1.6	1.5	1.5	1.8	1.8	1.8	1.7
	L/s	110.2	109.6	107.9	105.7	197.4	196.3	193.2	189.0
1/200	m/s	1.5	1.5	1.4	1.4	1.7	1.7	1.7	1.6
	L/s	104.0	103.4	102.0	99.9	186.4	185.3	182.5	178.7
1/250	m/s	1.3	1.3	1.3	1.3	1.5	1.5	1.5	1.4
	L/s	92.0	91.6	90.4	88.7	165.0	164.1	161.9	158.7
1/300	m/s	1.2	1.2	1.2	1.1	1.4	1.4	1.3	1.3
	L/s	83.2	82.9	81.9	80.4	149.3	148.6	146.7	143.9
1/400	m/s	1.0	1.0	1.0	1.0	1.2	1.2	1.1	1.1
	L/s	71.1	70.8	70.0	68.9	127.5	127.0	125.5	123.4
1/500	m/s	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
	L/s	62.8	62.6	62.0	61.1	112.8	112.4	111.2	109.5

TABLE 7 – Full Discharges and Velocities DN450 – DN525

Gradient H/L	Velocity/ Discharge k (mm)	DN 450 Di 0.448				DN 525 Di 0.523			
		0.003	0.006	0.015	0.03	0.003	0.006	0.015	0.03
1/10	m/s	9.6	9.4	9.0	8.7	10.5	10.3	9.9	9.5
	L/s	1509.7	1482.8	1425.3	1364.8	2263.4	2221.7	2133.7	2042.5
1/20	m/s	6.6	6.5	6.3	6.1	7.3	7.2	6.9	6.7
	L/s	1042.4	1027.7	994.0	956.2	1564.2	1541.1	1489.3	1431.9
1/30	m/s	5.3	5.3	5.1	4.9	5.9	5.8	5.6	5.4
	L/s	838.6	828.3	804.0	775.6	1258.8	1242.7	1205.2	1162.0
1/40	m/s	4.6	4.5	4.4	4.2	5.0	5.0	4.8	4.7
	L/s	718.3	710.4	691.2	668.2	1078.6	1066.2	1036.5	1001.4
1/50	m/s	4.0	4.0	3.9	3.8	4.5	4.4	4.3	4.2
	L/s	636.8	630.4	614.5	595.0	956.6	946.4	921.7	891.9
1/60	m/s	3.7	3.6	3.5	3.4	4.0	4.0	3.9	3.8
	L/s	577.1	571.7	558.0	541.1	867.1	858.5	837.3	811.3
1/70	m/s	3.4	3.3	3.3	3.2	3.7	3.7	3.6	3.5
	L/s	531.0	526.2	514.3	499.2	797.9	790.4	771.8	748.7
1/80	m/s	3.1	3.1	3.0	3.0	3.5	3.4	3.3	3.3
	L/s	494.0	489.8	479.1	465.5	742.4	735.8	719.2	698.3
1/90	m/s	2.9	2.9	2.9	2.8	3.2	3.2	3.1	3.1
	L/s	463.4	459.7	450.1	437.7	696.6	690.7	675.7	656.6
1/100	m/s	2.8	2.8	2.7	2.6	3.1	3.0	3.0	2.9
	L/s	437.7	434.3	425.5	414.1	658.0	652.6	638.9	621.4
1/120	m/s	2.5	2.5	2.4	2.4	2.8	2.8	2.7	2.6
	L/s	396.5	393.6	386.1	376.3	596.1	591.6	579.9	564.8
1/140	m/s	2.3	2.3	2.3	2.2	2.6	2.5	2.5	2.4
	L/s	364.6	362.1	355.6	347.0	548.3	544.4	534.2	520.8
1/160	m/s	2.2	2.1	2.1	2.1	2.4	2.4	2.3	2.3
	L/s	339.1	336.9	331.1	323.3	510.0	506.6	497.5	485.5
1/180	m/s	2.0	2.0	2.0	1.9	2.2	2.2	2.2	2.1
	L/s	318.0	316.1	310.9	303.8	478.4	475.3	467.2	456.3
1/200	m/s	1.9	1.9	1.9	1.8	2.1	2.1	2.1	2.0
	L/s	300.3	298.5	293.8	287.3	451.8	449.0	441.6	431.6
1/250	m/s	1.7	1.7	1.7	1.6	1.9	1.9	1.8	1.8
	L/s	265.9	264.5	260.6	255.3	400.1	397.9	391.8	383.5
1/300	m/s	1.5	1.5	1.5	1.5	1.7	1.7	1.7	1.6
	L/s	240.7	239.5	236.3	231.7	362.3	360.4	355.3	348.2
1/400	m/s	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4
	L/s	205.7	204.8	202.3	198.7	309.7	308.3	304.3	298.8
1/500	m/s	1.2	1.2	1.1	1.1	1.3	1.3	1.3	1.2
	L/s	182.0	181.3	179.3	176.3	274.2	273.0	269.8	265.2

Vinidex

StormPRO® & SewerPRO®

TABLE 8 – Full Discharges and Velocities DN600 – DN750

Gradient H/L	Velocity/ Discharge k (mm)	DN 600 Di 0.596				DN 750 Di 0.731			
		0.003	0.006	0.015	0.03	0.003	0.006	0.015	0.03
1/10	m/s	11.4	11.2	10.7	10.3	12.9	12.7	12.2	11.6
	L/s	3184.8	3124.5	2998.6	2869.6	5427.6	5320.2	5100.5	4879.5
1/20	m/s	7.9	7.8	7.5	7.2	9.0	8.8	8.5	8.2
	L/s	2202.4	2168.9	2094.3	2012.8	3757.2	3697.2	3565.8	3425.1
1/30	m/s	6.4	6.3	6.1	5.9	7.2	7.1	6.9	6.6
	L/s	1773.2	1749.7	1695.5	1634.0	3026.8	2984.5	2888.6	2781.9
1/40	m/s	5.4	5.4	5.2	5.0	6.2	6.1	5.9	5.7
	L/s	1519.7	1501.6	1458.6	1408.5	2595.3	2562.5	2486.2	2399.0
1/50	m/s	4.8	4.8	4.7	4.5	5.5	5.4	5.3	5.1
	L/s	1348.1	1333.2	1297.5	1254.9	2302.9	2276.0	2212.4	2138.0
1/60	m/s	4.4	4.3	4.2	4.1	5.0	4.9	4.8	4.6
	L/s	1222.1	1209.6	1178.8	1141.6	2088.3	2065.5	2010.7	1945.6
1/70	m/s	4.0	4.0	3.9	3.8	4.6	4.5	4.4	4.3
	L/s	1124.8	1113.8	1086.9	1053.7	1922.3	1902.5	1854.3	1796.2
1/80	m/s	3.8	3.7	3.6	3.5	4.3	4.2	4.1	4.0
	L/s	1046.6	1037.0	1012.9	982.9	1789.2	1771.6	1728.5	1676.0
1/90	m/s	3.5	3.5	3.4	3.3	4.0	4.0	3.9	3.8
	L/s	982.2	973.5	951.7	924.4	1679.3	1663.5	1624.5	1576.4
1/100	m/s	3.3	3.3	3.2	3.1	3.8	3.7	3.7	3.6
	L/s	927.9	920.0	900.1	874.9	1586.6	1572.4	1536.7	1492.3
1/120	m/s	3.0	3.0	2.9	2.9	3.4	3.4	3.3	3.2
	L/s	840.8	834.2	817.2	795.3	1438.1	1426.1	1395.6	1357.0
1/140	m/s	2.8	2.8	2.7	2.6	3.2	3.1	3.1	3.0
	L/s	773.5	767.8	752.9	733.6	1323.3	1312.9	1286.2	1252.0
1/160	m/s	2.6	2.6	2.5	2.5	2.9	2.9	2.9	2.8
	L/s	719.5	714.5	701.3	683.9	1231.2	1222.0	1198.3	1167.5
1/180	m/s	2.4	2.4	2.4	2.3	2.8	2.7	2.7	2.6
	L/s	675.0	670.5	658.6	642.8	1155.3	1147.0	1125.6	1097.6
1/200	m/s	2.3	2.3	2.2	2.2	2.6	2.6	2.5	2.5
	L/s	637.5	633.4	622.6	608.1	1091.3	1083.8	1064.3	1038.5
1/250	m/s	2.0	2.0	2.0	1.9	2.3	2.3	2.3	2.2
	L/s	564.8	561.5	552.6	540.6	967.1	961.0	945.0	923.5
1/300	m/s	1.8	1.8	1.8	1.8	2.1	2.1	2.0	2.0
	L/s	511.5	508.7	501.2	490.8	876.0	870.9	857.4	838.9
1/400	m/s	1.6	1.6	1.5	1.5	1.8	1.8	1.8	1.7
	L/s	437.3	435.2	429.5	421.3	749.4	745.5	735.0	720.5
1/500	m/s	1.4	1.4	1.4	1.3	1.6	1.6	1.6	1.5
	L/s	387.2	385.5	380.8	374.1	663.7	660.6	652.1	640.1

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 100 years Runoff summary - no detention	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 16

Pre-dev runoff rate 5 minute event 247.54 L/s

Pre-Development Areas

Proposed catchment 1 area	2250	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	3232	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	2229	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Post - Development Areas

Proposed catchment 1a area	1500	m2	Area 1a
Runoff coefficient, C1	1		Roof area - to tank
Proposed catchment 1b area	4393	m2	Area 1b
Runoff coefficient, C1	1		Roof area - to pipe
Proposed catchment 2 area	1028	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	790	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Storm duration	Storm mean intensity	Runoff rate pre - dev	Runoff volume pre - dev	Runoff rate post-dev	Runoff volume post-dev	Increase in runoff rate	Increase in volume
minutes	mm/hr	L/s	L	L/s	L	L/s	L
5	159	247.54	74261	308.12	92435	60.58	18174
6	148	230.41	82948	286.80	103248	56.39	20300
10	113	175.92	105553	218.98	131385	43.05	25832
20	71.1	110.69	132829	137.78	165336	27.09	32507
30	53.5	83.29	149923	103.67	186613	20.38	36690
60	33.9	52.78	189996	65.69	236493	12.92	46497
120	22.9	35.65	256691	44.38	319510	8.72	62819
180	18.7	29.11	314418	36.24	391365	7.12	76947
360	13.6	21.17	457335	26.35	569258	5.18	111923
720	9.61	14.96	646322	18.62	804495	3.66	158173
1440	6.38	9.93	858176	12.36	1068196	2.43	210019
2880	3.99	6.21	1073393	7.73	1336082	1.52	262689
4320	3.05	4.75	1230770	5.91	1531974	1.16	301203

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town AS3500 Example runoff calculation ARI 1 in 100 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 17

ARI	**1:100**	years	CCC
Duration	**5**	minutes	
Inundation, I	**159**	mm/hr	BOM

Flow rates calculated using rational method:

Q = (C I A) / 3600 L/s

C= runoff coefficient (AS3500 5.4.6)

I = inundation mm/hr

A = plan area m2

Coefficient, C: AS 3500.3 section 5.4.6

Surface	**C**	**Surface**	**C**
Roof	1		
Hardstand	0.9		
Grass (clay soil)	0.2	(sand)	0.15
Gravel	0.85		

Pre-Development Areas

Proposed catchment 1 area	2250	m2	Area 1
Runoff coefficient, C1	1		Roof area
Proposed catchment 2 area	3232	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	2229	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Post - Development Areas

Proposed catchment 1a area	1500	m2	Area 1a
Runoff coefficient, C1	1		Roof area - to tank
Proposed catchment 1b area	4393	m2	Area 1b
Runoff coefficient, C1	1		Roof area - to pipe
Proposed catchment 2 area	1028	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	790	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town AS3500 Example runoff calculation ARI 1 in 100 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 18

ARI	**1:100**	years	CCC
Duration	**5**	minutes	
Inundation, I	**159**	mm/hr	BOM

Flow rates calculated using rational method:

Q =	(C I A) / 3600	L/s
C=	runoff coefficient (AS3500 5.4.6)	
I =	inundation	mm/hr
A =	plan area	m2

Coefficient, C: AS 3500.3 section 5.4.6

Surface	C	Surface	C
Roof	1		
Hardstand	0.9		
Grass (clay soil)	0.2	(sand)	0.15
Gravel	0.85		

Pre-Development Areas Runoff

Runoff from area 1, Q1	99.38	L/s	Area 1
Total flow from Area 1 5 min, Vol1:	**29813**	**L / 5 min**	Roof area
Runoff from area 2, Q2	128.47	L/s	Area 2
Total flow from Area 2 5 min, Vol 2:	**38542**	**L / 5 min**	Driveway area
Runoff from area 3, Q3	19.69	L/s	Area 3
Total flow from Area 3 5 min, Vol 3:	**5907**	**L / 5 min**	Landscape area
Runoff from site:	247.54	L/s	Total area
Total flow from site 5 min:	**74261**	**L / 5 min**	**Total pre-development**

Post - Development Areas Runoff

Runoff from area 1a, Q1a	66.25	L/s	Area 1a
Total flow from Area 1a 5 min, Vol1a:	**19875**	**L / 5 min**	Roof area - to tank
Runoff from area 1b, Q1b	194.02		Area 1b
Total flow from Area 1b 5 min, Vol1b:	**58207**		Roof area - to pipe
Runoff from area 2, Q2	40.86	L/s	Area 2
Total flow from Area 2 5 min, Vol 2:	**12259**	**L / 5 min**	Driveway area
Runoff from area 3, Q3	6.98	L/s	Area 3
Total flow from Area 3 5 min, Vol 3:	**2094**	**L / 5 min**	Landscape area
Runoff from site:	308.12	L/s	Total area
Total flow from site 5 min:	**92435**	**L / 5 min**	**Total area post-development**

JSA CONSULTING ENGINEERS

48-52 New Town Rd, New Town
ARI 1 in 100 years
Detention summary

PROJECT No:	17E99-20
BY:	RH
DATE:	1/04/2019
SHEET No:	19

Pre-dev runoff rate 5 minute event 247.54 L/s

Post - Development Areas

Proposed catchment 1a area	1500	m2	Area 1a
Runoff coefficient, C1	1		Roof area - to tank
Proposed catchment 1b area	4393	m2	Area 1b
Runoff coefficient, C1	1		Roof area - to pipe
Proposed catchment 2 area	1028	m2	Area 2
Runoff coefficient, C2	0.9		Driveway area
Proposed catchment 3 area	790	m2	Area 3
Runoff coefficient, C3	0.2		Landscape area
Total area	7711	m2	

Design Detention Volume	15000	L	
Number of tanks (orifice outlets)	1		
Tank area	15	m2	Assume tank 1m height
Tank height	1.00	m	
Velocity coefficient, Cv	1.00		
Orifice plate diameter	25	mm	
Orifice area	0.00049	m^2	
Discharge coefficient, Cd	0.61		

Storm duration	Storm mean intensity	Roof runoff rate (to tank)	Roof runoff volume (to tank)	Depth to orifice plate	Velocity from orifice	Total discharge from tank outlets	Overflow from tanks
minutes	mm/hr	L/s	L	m	m/s	L/s	L/s
5	159	66.25	19875	1.00	4.43	1.33	66.25
6	148	61.67	22200	1.00	4.43	1.33	61.67
10	113	47.08	28250	1.00	4.43	1.33	47.08
20	71.1	29.63	35550	1.00	4.43	1.33	29.63
30	53.5	22.29	40125	1.00	4.43	1.33	22.29
60	33.9	14.13	50850	1.00	4.43	1.33	14.13
120	22.9	9.54	68700	1.00	4.43	1.33	9.54
180	18.7	7.79	84150	1.00	4.43	1.33	7.79
360	13.6	5.67	122400	1.00	4.43	1.33	5.67
720	9.61	4.00	172980	1.00	4.43	1.33	4.00
1440	6.38	2.66	229680	1.00	4.43	1.33	2.66
2880	3.99	1.66	287280	1.00	4.43	1.33	1.66
4320	3.05	1.27	329400	1.00	4.43	1.33	1.27

JSA CONSULTING ENGINEERS	**48-52 New Town Rd, New Town** Example detention tank calculation ARI 1 in 100 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 20

Pre develop't runoff rate Qa:	74261	L/5min	pre		
Post develop't runoff rate Qb:	92435	L/5min	post		

Detention volume require to ensure no increase in runoff rate after development

Detention volume: **92435** - **74261** = **18174 L**

Roof runoff volume: **19875 L** directed to tank

Calculate depth to orifice in tank, h, to satisfy detention volume and orifice diameter to limit discharge flow

Detention of roof runoff

Tank area, A	15.00	m2		
Distance from top of tank, h	1.00	m	Depth to orifice plate	
Calculated detention volume	15000	L	**OVER**	tank overflows
Peak discharge velocity, V	4.4	m/s	$V = c_v\sqrt{2gh}$	
Velocity coefficient, Cv	1			
Orifice plate diameter, d	25	mm		
Orifice plate area, A	0.000491	mm2		
Discharge coefficient, Cd	0.61			
Flow rate from orifice, Q	1.33	L/s	$Q = Cd\, VA$	
Overflow volume	4875	L/5min		
Overflow rate	66.25	L/s		

Confirm tank emptying time

Tank area, A	15.00	m2	
Depth to orifice	1.00	m	
Cd	1		
Orifice plate area, a	0.000491	m2	
T	13797.5	s	$T = \dfrac{2A(\sqrt{H_1} - \sqrt{H_2})}{C_d.a.\sqrt{2g}}$
	230	min	

Flow rate from orifice after 20 minutes

T	20	min
	1200	s
sqrt(H2)	0.91	
H2	0.83	m
V	4.04	m/s
Q	1.21	L/s

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 100 years Runoff summary - with detention	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 21

Pre-dev runoff rate 5 minute event 247.54 L/s

Post - Development Areas

Proposed catchment 1a area	1500 m2	Area 1a
Runoff coefficient, C1	1	Roof area - to tank
Proposed catchment 1b area	4393 m2	Area 1b
Runoff coefficient, C1	1	Roof area - to pipe
Proposed catchment 2 area	1028 m2	Area 2
Runoff coefficient, C2	0.9	Driveway area
Proposed catchment 3 area	790 m2	Area 3
Runoff coefficient, C3	0.2	Landscape area
Total area	7711 m2	

Storm duration	Storm mean intensity	Discharge from tank	Runoff rate from remaining roof area	Runoff rate from driveway area	Runoff rate from grassed area	Overflow from tanks	Post-dev runoff rate with tanks
minutes	mm/hr	L/s	L/s	L/s	L/s	L/s	L/s
5	159	1.33	194.02	40.86	6.98	66.25	309.44
6	148	1.33	180.60	38.04	6.50	61.67	288.13
10	113	1.33	137.89	29.04	4.96	47.08	220.30
20	71.1	1.33	86.76	18.27	3.12	29.63	139.11
30	53.5	1.33	65.28	13.75	2.35	22.29	105.00
60	33.9	1.33	41.37	8.71	1.49	14.13	67.02
120	22.9	1.33	27.94	5.89	1.01	9.54	45.70
180	18.7	1.33	22.82	4.81	0.82	7.79	37.56
360	13.6	1.33	16.60	3.50	0.60	5.67	27.68
720	9.61	1.33	11.73	2.47	0.42	4.00	19.95
1440	6.38	1.33	7.79	1.64	0.28	2.66	13.69
2880	3.99	1.33	4.87	1.03	0.18	1.66	9.06
4320	3.05	1.33	3.72	0.78	0.13	1.27	7.24

JSA CONSULTING ENGINEERS	**48-52 New Town Rd, New Town** Example Design Flow Check ARI 1 in 100 year, 5 minute duration	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 22

Pre development runoff rate (5 min event):	**247.54 L/s**	**Sheet 2**	**(Total area)**
Post development runoff rate Q1a:	66.25 L/s	Sheet 2	(Roof area to tank)
Post development runoff rate Q1b:	194.02 L/s	Sheet 2	(Remaining roof area)
Post development runoff rate Q2:	40.86 L/s	Sheet 2	(Driveway area)
Post development overland runoff rate Q3:	6.98 L/s	Sheet 2	(Landscaped area)

Total post development runoff

Total Flow Rate	**66.25**	
+	**194.02**	
+	**40.86**	
+	**6.98**	
=	**308.12** L/s	No detention

APPLY DETENTION TANKS

Post development piped runoff - roof:	1.33 L/s	Sheet 5	Discharge flow from detention
Post development piped runoff - overflow:	66.25 L/s	Sheet 5	Overflow from tanks
Post development piped runoff - roof:	194.02 L/s	Sheet 2	(Remaining roof area)
Post development piped runoff - driveway:	40.86 L/s	Sheet 2	(Driveway area)
Post development overland runoff rate Q3:	6.98 L/s	Sheet 2	(Landscaped area)

Total post development runoff with detention tanks and orifice plates installed

Total Flow Rate	**1.33**	
+	**66.25**	
+	**194.02**	
+	**40.86**	
+	**6.98**	
=	**309.44** L/s	With detention

Design Summary:
Flow rate from post development with detention tanks and orifice plates installed is 309.44L/s.

JSA CONSULTING ENGINEERS	48-52 New Town Rd, New Town ARI 1 in 100 years Pipe size summary	PROJECT No: 17E99-20 BY: RH DATE: 1/04/2019 SHEET No: 23

TABLE 6 – Full Discharges and Velocities DN300 – DN375

Gradient H/L	Velocity/ Discharge k (mm)	DN 300 Di 0.003	0.3 0.006	0.015	0.03	DN 375 Di 0.003	0.374 0.006	0.015	0.03
1/100	m/s	2.1	2.1	2.1	2.0	2.5	2.5	2.4	2.3
	L/s	151.9	150.8	148.1	144.4	271.9	269.9	264.7	257.8

TABLE 7 – Full Discharges and Velocities DN450 – DN525

Gradient H/L	Velocity/ Discharge k (mm)	DN 450 Di 0.003	0.448 0.006	0.015	0.03	DN 525 Di 0.003	0.523 0.006	0.015	0.03
1/100	m/s	2.8	2.8	2.7	2.6	3.1	3.0	3.0	2.9
	L/s	437.7	434.3	425.5	414.1	658.0	652.6	638.9	621.4

Reference: Vinidex StormPRO & SewerPRO catalogue

Storm duration	Storm mean intensity	Total tank outflow	Runoff from remaining roof areas	Runoff from hardstand areas	Total runoff from impervious areas	Runoff from pervious surfaces	Total site runoff
minutes	mm/hr	L/s	L/s	L/s	L/s	L/s	L/s
5	159	67.58	194.02	40.86	302.46	6.98	309.44
6	148	62.99	180.60	38.04	281.63	6.50	288.13
10	113	48.41	137.89	29.04	215.34	4.96	220.30
20	71.1	30.95	86.76	18.27	135.99	3.12	139.11
30	53.5	23.62	65.28	13.75	102.65	2.35	105.00
60	33.9	15.45	41.37	8.71	65.53	1.49	67.02
120	22.9	10.87	27.94	5.89	44.70	1.01	45.70
180	18.7	9.12	22.82	4.81	36.74	0.82	37.56
360	13.6	6.99	16.60	3.50	27.08	0.60	27.68
720	9.61	5.33	11.73	2.47	19.53	0.42	19.95
1440	6.38	3.98	7.79	1.64	13.41	0.28	13.69
2880	3.99	2.99	4.87	1.03	8.88	0.18	9.06
4320	3.05	2.60	3.72	0.78	7.10	0.13	7.24

Max runoff for 5 minute duration event between 302.46L/s and 309.44L/s, therefore DN450 lot connection required (assuming 1:100 grade).

APPENDIX 4: Product Brochures

SPELFilter Hydrosystem

Environmentally aware and efficient.

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SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

The Technology

A specialist rainwater filter, designed for installation within load bearing shafts and chambers of concrete or plastic construction. The pre fitted plastic housing is safe and easy to fit at site.

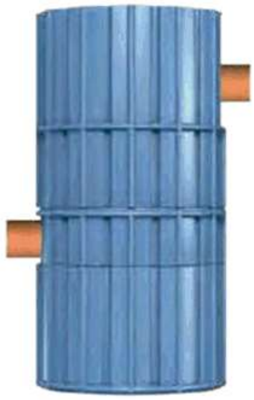
The Hydrosystem 1000 Filter uses an up-flow process. This means there is a minimal head drop between the inlet and the outlet. The cleaned water is of an outstanding water quality. The rainwater is treated within the unit by the following processes: sedimentation, filtration, adsorption and precipitation.

The initial treatment steps take place in the Dynamic Separator, where sedimentation of solid particles occurs within a radial flow regime, characterised by secondary flows.

A settling funnel to the silt trap chamber entrance ensures sediments are not remobilised. Above the separator are the filter inserts, covering the entire diameter of the unit's housing, where the second treatment step takes place.

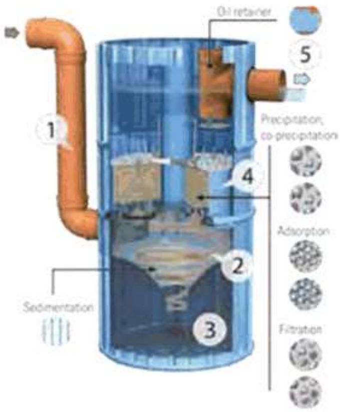
Water flows upwards through the removable filter element. As a result of both the upward flow within the filter element and the fact that the filter remains saturated, the rate of filter clogging by solids is both very limited and slow.

The filter inserts are easy to exchange.



How it works

1. The stormwater from the drained area is fed into the inlet, which is at the lower end of the shaft. A deflector plate sets up a radial flow.
2. Here, sedimentation of particles, especially the sand faction and above, takes place in the hydrodynamic separator. This is due to turbulent secondary flows within a radial laminar flow regime.
3. The settlable solids are collected via an opening in the silt trap chamber. This chamber is evacuated periodically, via the by-pass central tube at intervals.
4. Four filter elements are located within the filter shaft. As waters flow upwards the finer particles are filtered out, whilst the dissolved pollutants are precipitated and absorbed. The filter is easily backwashed, and if completely clogged or exhausted, is easily replaced.
5. Clean water above the filter elements passes to discharge via an oil trap assembly. In the event of major spill, free floating oils etc are retained here. Normal concentrations of dissolved oils are retained within the filter elements.



Technical Data

Stormwater filter complying with DIN 1989-2. Connections: DN 200; the various types of filter elements have different material structures.

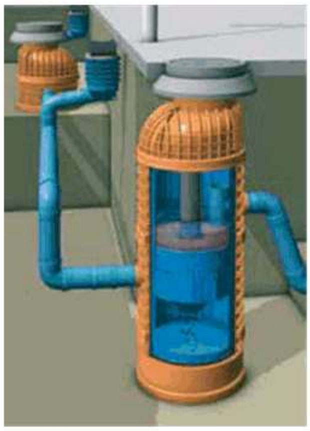
Housing material: Polyethylene
Housing weight: 68 kg
Total weight: 220 to 350 kg depending on filter type
Packing unit SPEL Hydrosystem 1000: Pallet: 1 piece

Accessories 1

SPELFilter element
Weight per filter element:
34 kg (roof / traffic)

Accessories 2

SPELFilter element
Weight per filter element:
54 kg (heavy traffic)
66 kg (metal)



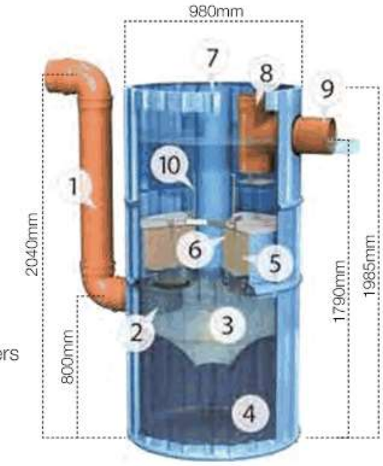
Example: Installation in a shaft made of plastic

Example:

The SPEL Hydrosystem 1000 traffic installed in a concrete shaft DN1000.

Product structure:

1. Stormwater inlet (DN 200)
2. Deflector plate
3. Hydrodynamic separator
4. Silt trap
5. Filter element
6. Extraction aid for filter element
7. Overflow and suction pipe
8. Oil trap
9. Outlet stormwater storage, soakaway system or surface waters
10. Buoyancy restraint for filter elements



The SPEL Hydrosystem is available with various filter types, depending on the usage of the connected area. The Roof type is used for roof areas that do not have a significant proportion of uncoated metals; the Metal type is employed for metal roof areas, and the Traffic type is used for slightly polluted traffic areas.

The Heavy Traffic type is employed for heavily polluted traffic areas and has been granted general technical approval (Z-84.2-4) by the German Institute for Structural Engineering (DIBt). The maximum areas that may be drained depend on the nature of the surfaces. These are given in the following table.

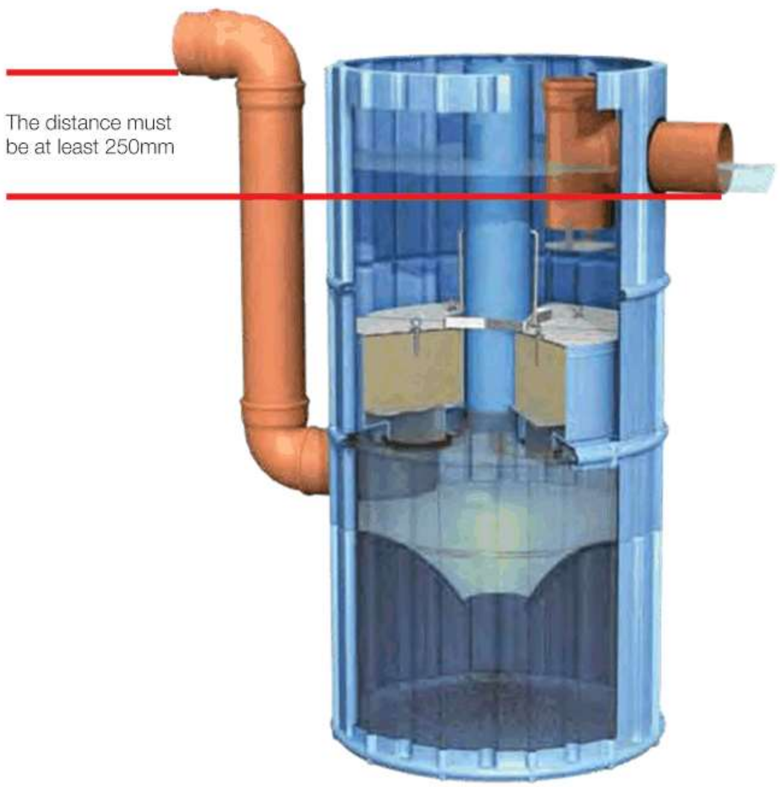
Type	Nature of the surface to be drained	Weight of filter element / piece	Total Weight
Heavy traffic with technical approval (Z-84.2-4)	Highly polluted traffic areas (car parks in front of supermarkets, main roads, HGV access roads)	54kg	300kg
Traffic	Slightly polluted traffic areas (side streets, staff car parks, yards)	34kg	220kg
Roof	Roofs without a significant proportion of uncoated metals (< 50m²)	34kg	220kg
Metal	Roofs made of uncoated metals (copper, zinc, lead)	66kg	350kg

Parameter	Unit	Non Metal Roof		Copper Roof		Zinc Roof		Parking lot, residential street		Main road Distributer		1 Aims of LAWA	2 Drinking Water	3 Seepage	4 SPEL Hydrosystem
		from	to	from	to	from	to	from	to	from	to	permissible limit	permissible limit	control value	aim
Phsico-chemical parameters												90 Percentile			
electrical conductivity	[uS/cm]	25	270	25	270	25	270	50	2400	110	2400	–	2500	–	< 1500
pH value	[-]	4.7	6.8	4,7	6,8	4,7	6,8	6,4	7,9	6,4	7,9	–	6,5 – 9,5	–	7,0 – 9,5
Nutrients															
phosphorous (P ges)	[mg/l]	0,06	0,50	0,06	0,50	0,06	0,50	0,09	0,30	0,23	0,34	–	–	–	0,20
ammonium (NH_4)	[mg/l]	0,1	6,2	0,1	6,2	0,1	6,2	0,0	0,9	0,5	2,3	–	0,5	–	0,3
nitrate (NO_3)	[mg/l]	0,1	4,7	0,1	4,7	0,1	4,7	0,0	16,0	0,0	16,0	–	50,0	–	–
Heavy Metals															
cadmium (Cd)	[µg/l]	0,2	2,5	0,2	1,0	0,5	2,0	0,2	1,7	0,3	13,0	1,0	5,0	5,0	< 1,0
zinc (Zn)	[µg/l]	24	4.880	24	877	1.731	43674	15	1.420	120	2.000	500	–	500	< 500
copper (Cu)	[µg/l]	6	3.416	2.200	8.500	11	950	21	140	97	104	20	2000	50	< 50
lead (Pb)	[µg/l]	2	493	2	493	4	302	98	170	11	525	50	10	25	< 25
nickel (Ni)	[µg/l]	2	7	2	7	2	7	4	70	4	70	50	20	50	< 20
chromium (Cr)	[µg/l]	2	6	2	6	2	6	6	50	6	50	50	50	50	< 50
Organic Substances															
polynuclear aromatic hydrocarbons (PAK)	[ug/l]	0.4	0.6	0.4	0.6	0.4	0.6	0,2	17,1	0,2	17,1	–	0,1 6 compounds	0,2	< 0,2
petroleum-derived hydrocarbons (MKW)	[mg/l]	0,1	3,1	0,1	3,1	0,1	3,1	0,1	6,5	0,1	6,5	–	–	0,2	< 0,2

1 Aims of the German working group on water issues of the Federal States and the Federal Government (LAWA) for surface water, usage as potable water (1998). 2 Permessible of the German Drinking Water Ordinance (2001). 3 Control value for seepage of the German Federal Soil Protection Act an Ordinance (1999) according to § 8 1,2. 4 The aims of the system refer to average annual loads.

Installation

CAUTION! Important information, please observe.



The following is to be checked before installation:

The filter must be installed with a so-called fall. This means that the incoming pipe (stormwater inlet) is led downwards just ahead of the shaft and can be connected to the lower connection as described.

The difference in invert between the incoming pipe and the outlet to discharge must be at least 250mm.

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ACN 009 547 139
as trustee for Johnstone McGee & Gandy Unit Trust

www.jmg.net.au

JMG Ref: J175029SH
19.07.19

TASWATER
Development Services

Attention: Anthony Cengia

RE: TWDA 2019/00712-HCC (48-50 New Town Rd, New Town)

Anthony,

In relation to issues raised in RAI DA2019-00712HCC I offer the following response.

Initial modelling from Taswater indicates potential that the available pressure and flows from the Ø200 RCP in Main Rd New Town will supply fire fighting requirements. We intend on making the connection to the main and directly testing from the connection point to confirm, this will be undertaken post DA stage. Currently, we have made provision for storage tanks and pumps for fire services in the event that the mains supply cannot provide required service.

Item 1. (a)
Domestic cold water + Mechanical PSD allowance: *5.0L/s*

Item 1. (b)
Total Fire flow: 40L/s @ 800kPa (TBC in DD)

- Hydrants: *20L/s*
- Sprinklers: *20L/s (excludes drenchers-TBC)*

Item 1. (d)
Total equivalent tenements:

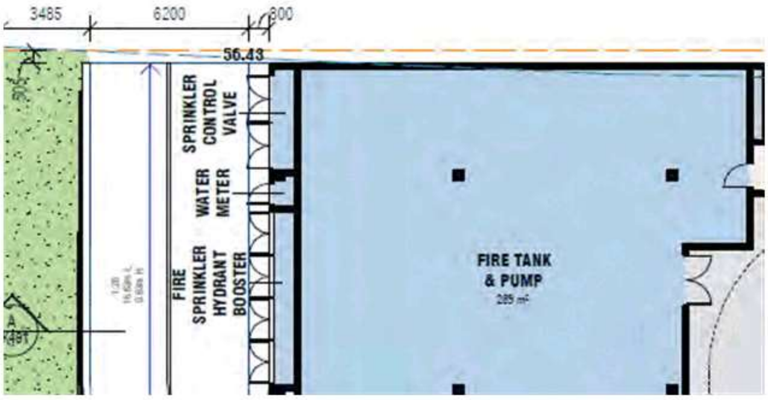
- Sewer: 330
- Water: 294

Item 2.
Refer to JSA response 17L99-20-5 (see attached excerpt below from JSA)

Yours faithfully
JOHNSTONE McGEE & GANDY PTY LTD

Adam Johnson
Hydraulic Services

jineers & Planners



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JMG Ref: J175029SH
12.06.19

TASWATER
Development Services

Attention: Anthony Cengia

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Initial modelling from Taswater indicates potential that the available pressure and flows from the Ø200 RCP in Main Rd New Town will supply fire fighting requirements. We intend on making the connection to the main and directly testing from the connection point to confirm, this will be undertaken post DA stage. Currently, we have made provision for storage tanks and pumps for fire services in the event that the mains supply cannot provide required service.

Item 1. (a)
Domestic cold water + Mechanical PSD allowance: *5.0L/s*

Item 1. (b)
Total Fire flow: 40L/s @ 800kPa (TBC in DD)

- Hydrants: *20L/s*
- Sprinklers: *20L/s (excludes drenchers-TBC)*

Item 1. (d)
Total equivalent tenements:

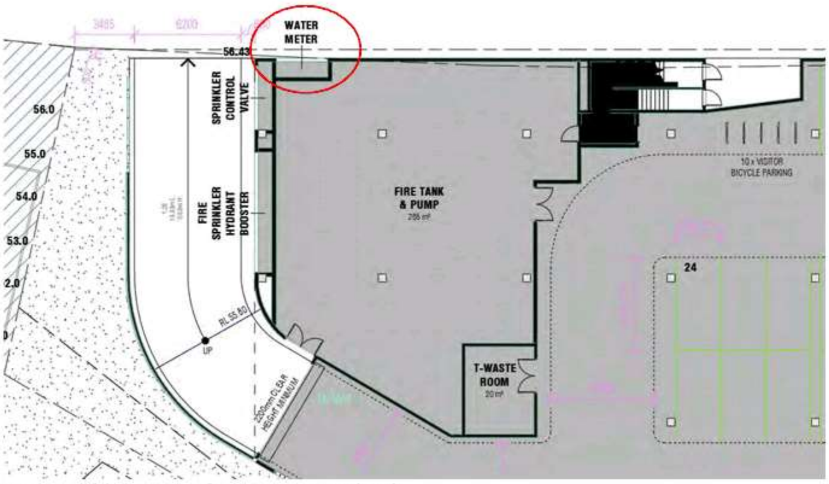
- Sewer: 330
- Water: 294

Item 2.
Property water connection, water meter and valve assembly will be located external of the property in a clearly labelled cabinet. The cabinet doors will be locked with required authority service key. The cabinet will open out to the street side of the property and will not be in a trafficable location. (see markup on Page.2)
I trust that this information satisfies the queries related to our submission.

Yours faithfully
JOHNSTONE McGEE & GANDY PTY LTD

Adam Johnson
Hydraulic Services

Engineers & Planners



Proposed location of Water Meter (nts)

117 Harrington Street
Hobart 7000
Phone (03) 6231 2555
Fax (03) 6231 1535
infohbt@jmg.net.au

49-51 Elizabeth Street
Launceston 7250
Phone (03) 6334 5548
Fax (03) 6331 2954
infoltn@jmg.net.au

Johnstone McGee &
Gandy Pty Ltd
ABN 76 473 834 852
ACN 009 547 139
as trustee for Johnstone
McGee & Gandy
Unit Trust

www.jmg.net.au

MILAN PRODANOVIC B.E. PEng
TRAFFIC ENGINEERING & ROAD SAFETY

TRAFFIC IMPACT ASSESSMENT

PROPOSED

TASMAN PRIVATE HOSPITAL

DEVELOPMENT

48 – 52 NEW TOWN ROAD

NEW TOWN

MAY 2019

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TRAFFIC IMPACT ASSESSMENT

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DEVELOPMENT

48 – 52 NEW TOWN ROAD
NEW TOWN

MAY 2019

11 KYTHERA PLACE, ACTON PARK TASMANIA 7170
TEL: (03) 6248 7323 MOBILE: 0402 900 106
EMAIL: milglad@bigpond.net.au ABN: 51 345 664 433

CONTENTS

REFERENCES:

- Australian Standard AS 1742.2-2009 – Manual of uniform traffic control devices Part 2: Traffic control devices for general use
- AUSTROADS – Guide to Road Safety Part 6: Road Safety Audit
- AUSTROADS – Guide to Road Design Part 4: Intersections and Crossings General (2017)
- AUSTROADS – Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2017)
- AUSTROADS – Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings
- Road Traffic Authority NSW – Guide to Traffic Generating Developments, 2002
- HOBART Interim Planning Scheme 2015

1. INTRODUCTION

The site at 48-52 New Town Road is to be redeveloped with the construction of a new building for the Tasman Private Hospital, a private hospital that will provide health care for in-patients and out-patients including surgeries in a hospital environment as well as a range of medical services in a number of tenancies.

This Traffic Impact Assessment (TIA) report discusses the traffic implications of the proposed development. It describes the existing road and traffic environment on the adjacent streets that will be affected by traffic movements to and from the development site.

It determines the traffic activity that the proposed hospital development is likely to generate, and an assessment is made of the impact of this traffic activity on the adjacent street network.

Consideration is also given to the proposed access, traffic circulation and parking that is proposed for the site, including required on-street traffic managements measures.

The report is based on the Department of Infrastructure Energy and Resources (DSG) Traffic Impact Assessment Guidelines. The techniques used in the investigation and assessment incorporate best practice road safety, and traffic management principles.

2. SITE DESCRIPTION

The proposed Tasman Private Hospital site is located on the western side of New Town Road midway between the Argyle Street intersection to the north and Augusta Road intersection to the south. The site also has a frontage to Clare Street.

While the surrounding area is predominantly residential, there is a mix of other uses in the area including retail businesses, health services, clubs, visitor accommodation and school activities, as can be seen on an extract of the street atlas for the area, presented as Figure 2.1.

The location of the development site also highlighted in Figure 2.1.

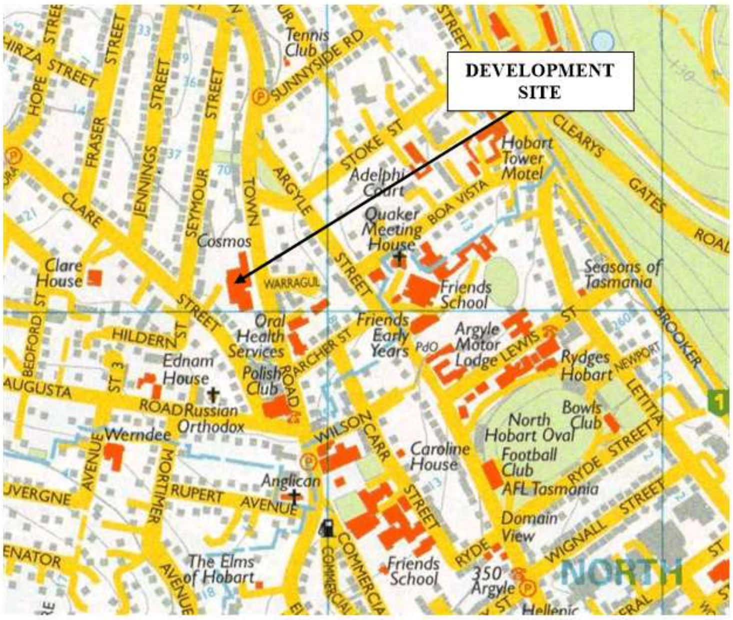


Figure 2.1: Street atlas extract showing location of proposed hospital

3. DEVELOPMENT PROPOSAL

The development site has in the past been a television and radio station base and currently used by an electrical contractor.

To allow for the proposed development, the existing building will be demolished, and a new building constructed to the design requirements of the proposed hospital and medical services.

Views of the site are seen in Photographs 3.1 to 3.3.

The new hospital building will have four floor levels. The basement floor level and half the ground floor level will be for car parking. The other half of the ground floor level and the first-floor level will be predominantly for medical service, where there will be potentially up to 18 tenancies.

One of the ground floor tenancies, next to the main entrance is expected to be a café. There will also be a conference room plus a stores area with associated office.

The second-floor level will have one medical tenancy and the hospital with operating theatres, recovery rooms and chairs as well as 24 beds for those requiring overnight stay.

The total floor area of all 18 tenancies will be around 6,706m^2. The hospital floor area will be around 4,452m^2. The conference room will have an area of 147m^2, and the stores area will have an area of 100m^2.

The development site will include provision of 235 car parking spaces, 16 motorcycle parking spaces and 58 bicycle parking spaces located on the basement floor level and part of the ground floor level of the building.

The ground floor parking will be totally for employees/staff. The basement floor parking will be almost totally for visitor/patient parking.

The parking on the basement floor level and ground floor level will be accessed via separate new driveways off New Town Road.

There will also be a servicing area at the rear of the site, accessed via an existing driveway off Clare Street. In this area there will be provision for seven car parking spaces (included in above 235 spaces) as well as a loading bay/servicing area.

Architectural drawings of the layout for each floor level and the site overall are included with this report as Attachment A.

In order to accommodate the new driveways onto New Town Road, it is proposed changes be made to pedestrian refuges. It is also access off Clare Street be improved as well as of a number of on-street parking control measures be installation. These are also detailed on drawings included in Attachment B.

Photograph 3.1: View of development site from southern New Town Road approach

Photograph 3.2: View of development site from northern New Town Road approach

Photograph 3.3: View of development site driveway from Clare Street

4. EXISTING ROAD AND TRAFFIC ENVIRONMENT

4.1 Road Characteristics

There are several arterial roads which are adjacent to or near the development site. These include New Town Road which passes along the eastern frontage of the development site, Argyle Street which junctions with New Town Road around 200m to the north of the development site and Augusta Road which junctions with New Town Road - Elizabeth Street some 240m to the south of the development site.

Clare Street which passes along the rear western boundary of the development site would function as a minor collector road for this part of New Town.

Adjacent to the development site New Town Road has a width between kerb lines of 13.4m near the northern end of the site and around 13.9m at the southern end of the site. There is a 2.0m wide two way right turn median treatment along the middle of New Town Road so that the traffic lane plus parking lane for each direction of travel is around 6.0m wide at the southern end of the development site and around 5.7m at the northern end of the development site.

Views along New Town Road are seen in Photographs 4.1 and 4.2.

Clare Street has a varying width along its length between Augusta Road and Seymour Street. It is around 11.8m and up to around 13.1m between kerb at or near the development site.

Views along Clare Street are seen in Photographs 4.3 and 4.4.

Photograph 4.1: View to north along New Town Road with development site on left

Photograph 4.2: View to south along New Town Road with development site on right

Photograph 4.3: View to south along Clare Street with Seymour Street on left and development site access ahead on left near sign

Photograph 4.4: View to north along Clare Street with development site access ahead on right near sign

4.2 Traffic Activity

Enquiries were made with the Hobart City Council regarding available traffic data on New Town Road and Clare Street near the development site.

New Town Road

Council staff advised that there is no available data for New Town Road between Augusta Road and Argyle Street. The nearest survey sites with available traffic volume data are on New Town Road between Roope Street and Pirie Street (around 600m to the north of the development site).

The survey was undertaken in August 2017 and the recorded traffic volumes at the site has been presented graphically in Figures 4.1 to 4.3.

The graphs show that during weekdays the traffic volume along that section of New Town Road was around 1,200 - 1,300 vehicles/hour for most of the afternoon while on Saturday and Sunday the volume is around 1,100 – 1,300 vehicles/hour for a couple of hours during the middle of the day.

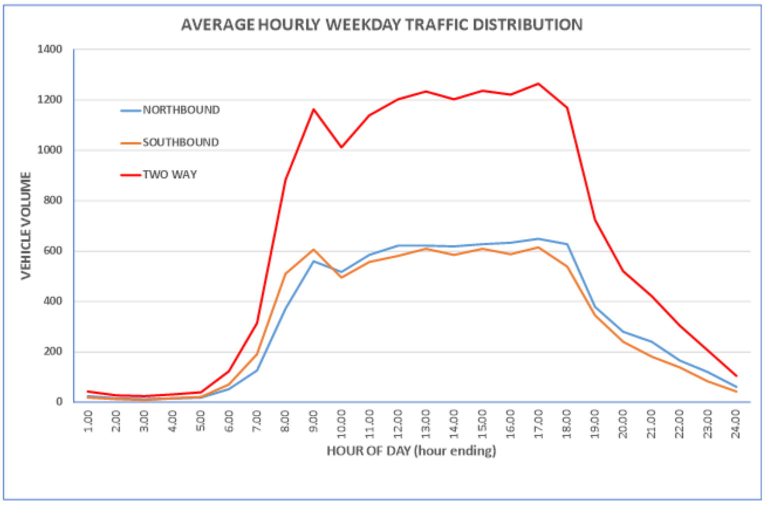


Figure 4.1: Average hourly weekday traffic distribution along New Town Road north of Pirie Street – August 2017

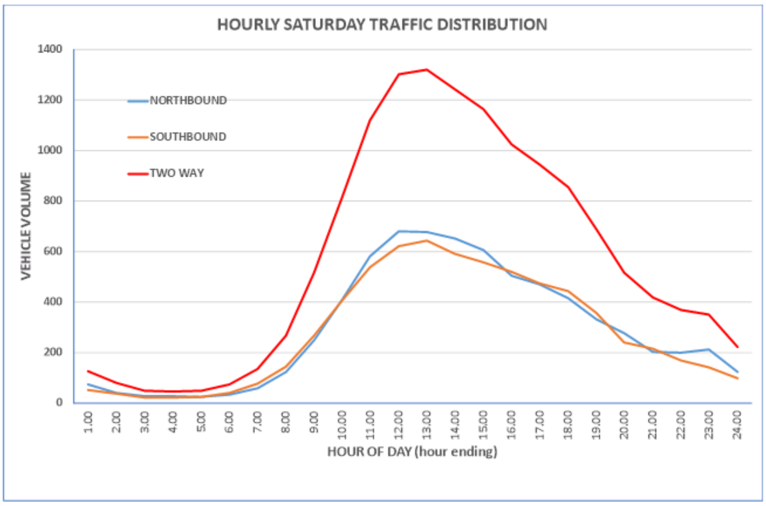


Figure 4.2: Average hourly Saturday traffic distribution along New Town Road north of Pirie Street – August 2017

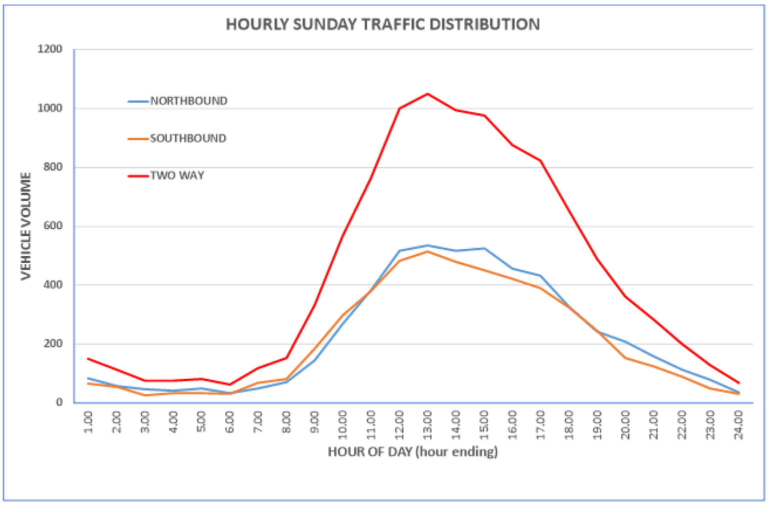


Figure 4.3: Average hourly Sunday traffic distribution along New Town Road north of Pirie Street – August 2017

As this survey site is somewhat distant from the development site and located to the north of the Argyle Street junction, a turning movement survey was undertaken at the junction of New Town Road with Argyle Street on 13 March 2019 between 4:40pm and 5:40pm.

The results from this turning movement survey has been summarised in Figure 4.4.

When comparing the recent turning movement traffic volumes (Figure 4.4) with the Council data from 2017 (to the north of Argyle Street), the recent survey recorded several hundred vehicles more for the one hour, all of which would not be due to side road traffic or an annual growth in the traffic volume over last than two years since the council survey.

The above traffic volume data has also been compared with other traffic volume data for roads and intersections in this area. The data was obtained from surveys undertaken several years ago, when work on the preparation of the TIA report for the development site was first started; this data is included with this report as Attachment C.

The comparison shows the traffic volume on New Town Road past the development site during the afternoon peak traffic period, based on the survey data for Argyle Street/New Town Road in 2019 and 2015, is around 100 vehicles/hour higher now than it was in 2015. It also shows that in 2015 the passing traffic volume during the late morning was around the same as during the afternoon peak hour.

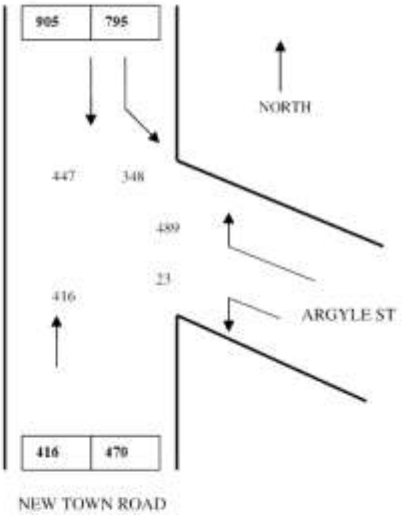


Figure 4.4: Turning traffic at Argyle Street/New Town Road junction - 4:40pm to 5:40pm

Clare Street

Traffic volume data has been received from the council from a survey undertaken on Clare Street in December 2009, at a point around 50m to the south of the development site. The recorded traffic volumes would therefore be representative of the traffic passing the development site.

The recorded traffic volumes at the site have been presented graphically in Figure 4.9. The recorded traffic volume along Clare Street was 3,027 vehicles/day with peaks of 357 vehicles/hour and 319 vehicles/hour during the morning and afternoon, respectively.

Again, due to the date of this survey, a turning movement survey was also undertaken at the junction of Clare street and Seymour Street on 21 March 2019 between 4:00pm and 5:00pm. The time was chosen due to the end of working day for current workers at the development site.

The results from this turning movement survey has been summarised in Figure 4.6.

Comparing both, the turning movement survey recorded some 50 vehicles more than the council data shows for the same afternoon period.

However, Figure 4.5 indicates the peak hour volumes are still higher than for the 4:00pm to 5:00pm period.

During this period there were eight vehicles that exited the development site driveway and turned left into Clare Street.

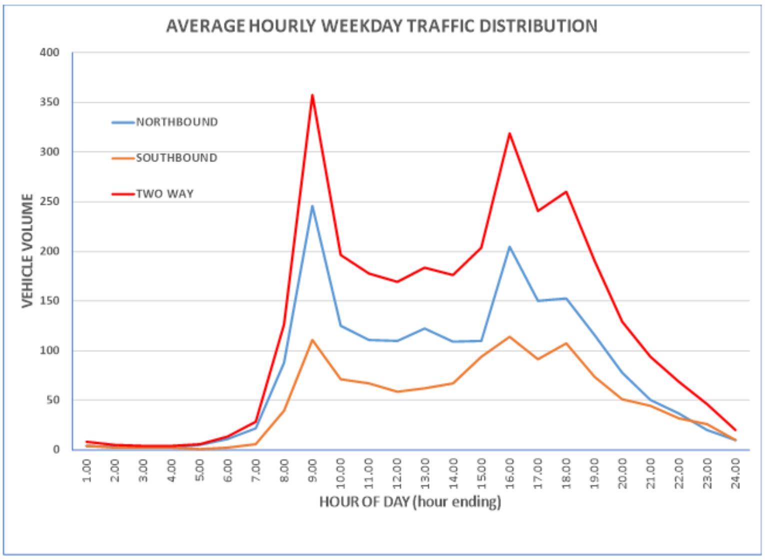


Figure 4.5: Hourly traffic distribution along Clare Street near development site – December 2009

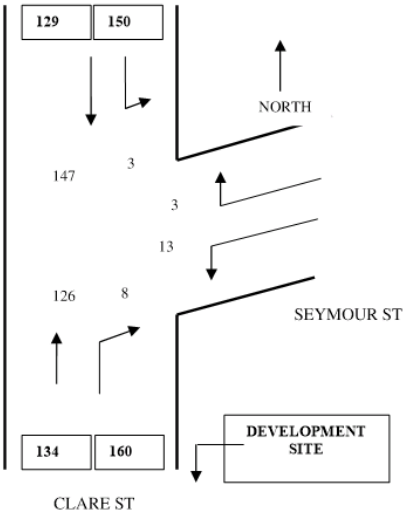


Figure 4.6: Turning traffic at Argyle Street/New Town Road junction - 4:00pm to 5:00pm

4.3 Crash Record

All crashes that result in personal injury are required to be reported to Tasmania Police. Tasmania Police record all crashes that they attend. Any crashes that result in property damage only, which are reported to Tasmania Police, are also recorded even though they may not visit the site.

Details of reported crashes are collated and recorded on a computerised database that is maintained by DSG.

Information was requested from DSG about any reported crashes over the last five and a quarter years along New Town Road and Clare Street in the general area of the development site.

Advice has been received that the database has record of 25 reported crashes along New Town Road between Augusta Road and Argyle Street. This number includes 10 crashes at the Augusta Road/Elizabeth Street/New Town Road junction and 3 crashes at the Argyle Street/New Town Road junction with the remaining 12 crashes having occurred between these two intersections.

There have been three crashes in each of 2014, 2015 and 2016 at the Augusta Road/Elizabeth Street/New Town Road junction and since then only one crash in 2017. The crashes have been mostly rear end collisions (seven rear end crashes) with only two angle crashes and one loss of control incident.

The three crashes at the New Town Road/Argyle Street junction occurred in 2014 and 2015. Each was a different type of angle collision.

The 12 midblock crashes along New Town Road have been quite mixed in their nature. They have included five rear end type incidents and two crashes with vehicles emerging from driveways.

Of all the crashes along New Town Road, only one of the angle collisions at Argyle Street resulted in injury; all other crashes were property damage only.

The database has record of eight reported crashes along Clare Street between Augusta Road and Honora Avenue. Six of these occurred at the Clare Street/Augusta Road junction with five being angle type collisions.

The crashes at the Clare Street/Augusta Road junction have been angle collisions apart from one collision with a pedestrian. There has been only one collision since May 2012. All crashes resulted in property damage only.

Of the other two crashes along Clare Street, one was a reversing incident in 2017, just to the south of the development site; the other was a loss of control crash in 2018 just to the south of Fraser Street. Again, both resulted in property damage only.

Overall the crash record in this area is not of real concern.

5. TRAFFIC GENERATION AND PARKING DEMAND BY THE DEVELOPMENT

The development under consideration is the redevelopment of the site at 48-52 New Town Road to construct a hospital with associated medical services.

The hospital floor area will be around 4,452m^2 and the total floor area of the 17 medical tenancies will be around 6,583m^2. One other tenancy will be a café with an area of 123m^2, a conference room with an area of 147m^2 and the stores/receiving area of 100m^2.

5.1 Traffic Generation

In order to determine the level of traffic that the hospital development is likely to generate when fully occupied use has been made of the survey data for the current Health Centre and reference made to the New South Wales Road Traffic Authority (RTA) document – Guide to Traffic Generating Developments. The guide is a nationally well accepted document that gives advice on trip generation rates and vehicle parking requirements for new developments.

The RTA guide does not provide specific advice on the type of facility proposed with the hospital. The nearest type of facility discussed in the guide is an extended hours medical centre mainly for medical practitioners rather than other types of health providers. However, it is worth considering the advice with there being some similarities, even though the total floor area of these centres was much smaller than will be the case for the hospital. The guide indicates that the mean traffic generation rate at surveyed sites was 10.4 vehicles/100m^2 of floor area for the morning period of 9am to 12 noon, with a range of 4.4 – 19.0 vehicles/hour/100m^2 of floor area.

A general finding with specific types of developments is that the larger the total floor area of the development the lower the traffic generation rate and it is considered this would also be the case for this hospital and medical centre development.

As another reference to traffic generation rates for this type of development, several years ago surveys of vehicles and pedestrian traffic generated by the health centre in Rosny Park found that the vehicle generation rate was around 3.5 trips/100m^2 of floor area during the late morning period and around 2.6 trips/100m^2 of floor area during the late afternoon period.

As another reference to traffic generation rates for this type of development, several years ago surveys of vehicles and pedestrian traffic generated by the health centre in Rosny Park found that the vehicle generation rate was around 3.5 vehicles/hour/100m^2 of floor area during the late morning period and around 2.6 vehicles/hour/100m^2 of floor area during the late afternoon period.

Allowing for the fact that the health centre is at least many times larger than the average site surveyed for the RTA guide, these traffic generation rates compare well with lower end of the above figures from the RTA guide.

Finally, Transportation Engineers *Trip Generation Manual* indicates the traffic generation rate for this type of development is 3.84 vehicles/hour/100m^2.

Notwithstanding the above comparisons, it is preferable where possible to use traffic generation figures from surveyed sites that are much the same type as the proposed development and in the same or similar locations.

It is not known what use activities will occupy the 17 tenancies at this stage other than they will be medical uses. It is therefore also not known how many medical practitioners there will be within the tenancies. A pathology or pharmacy use will have different traffic generation movements to other medical activities and expected to be somewhat lower than for normal medical services, as visits to these two use activities are more likely to be as part of the same visit to medical practitioners.

In the same way the café, meeting rooms and stores area will not generate separate vehicle trips to that allowed for below.

No reliable trip generation data has been found for a hospital such as proposed, which will be predominantly a day surgery hospital with overnight stays by a few patients. Therefore, it has been assumed that the traffic generation by the hospital will be the same as for the medical tenancies.

On this basis, the expected traffic generation by the proposed development is as follows:

- 3.5 x 11,035/100 = 386 trips/hour during morning period;
- 2.6 x 11,035/100 = 287 trips/hour during afternoon period.

It is known the hospital will have some 130 staff and all hospital staff will be on site for a 7:00am start of patient arrivals; hospital staff will be on site until 8:00pm (allowing for a shift change), other than night shift staff.

All other staff, in the medical tenancies are expected to be on site by 8:00am to 9:00am.

The expected traffic turning activity at the junction of the proposed two driveways to the development site off New Town Road during the morning and afternoon peak traffic period, in 10 years' time, is as shown in Figures 5.1 and 5.2.

The passing traffic volumes on New Town Road in these figures are the peak hour volumes from the recent surveys and increased to allow for a 1.5% p.a. growth over the next 10 years to 2029.

Advice has been received that the hospital will generate an average of 20 small to medium size commercial vehicles each day (40 vehicle movements per day). The medical tenancies will also generate similar commercial vehicles with the delivery of medical and office supplies and food to the café as well as collection of waste. Based on the above it is expected the tenancies will generate a further 20 vehicle movements per day.

Many of these movements will be via the driveway off Clare Street but possibly up to a third are expected to use the proposed loading zone on New Town Road outside the development site.

The RTA guide indicates surveys that were undertaken for that document found the average percentage of patients arriving by car at medical centres was 66% and average length of stay was 27 minutes.

The above calculation of the expected traffic generation by the proposed development is largely based on the surveys at the Rosny Park medical centre. These surveys recorded vehicles as well as pedestrian groups visiting the centre. In applying these findings, no allowance has been made for any modal split factors. In addition, a number of staff and visitors to the development site will be users of bicycles and motorcycles.

Therefore, these estimated traffic generation volumes are somewhat higher than what will occur, but they will be applied as a worst case situation in the assessment of the traffic impact of the proposed development.

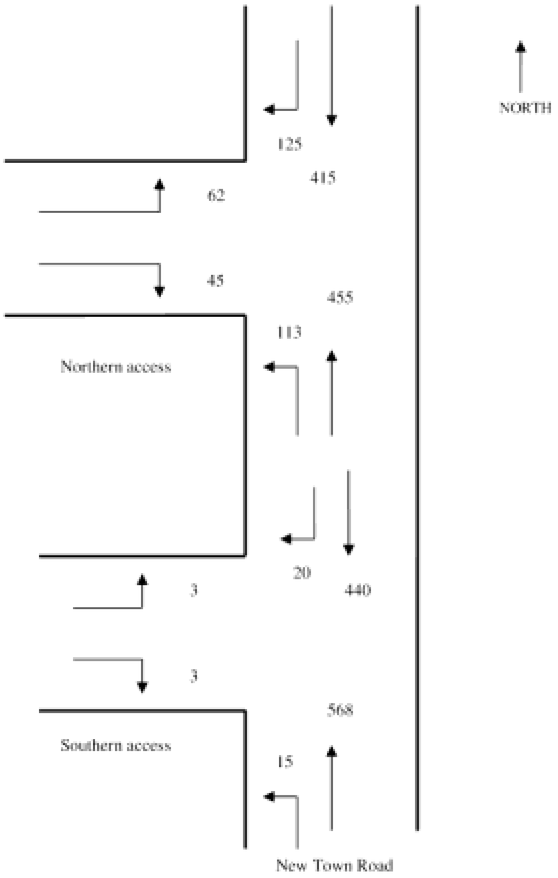


Figure 5.1: Expected future turning traffic at development site driveways during morning period

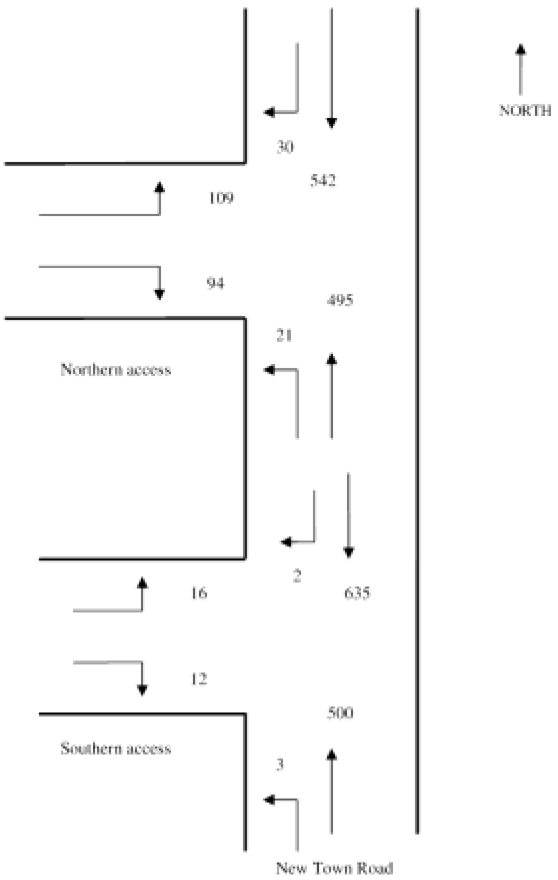


Figure 5.2: Expected future turning traffic at development site driveways during afternoon period

5.2 Parking Supply and Demand

The Hobart Planning Scheme requires 1 parking space per $40m^2$ of floor area for a hospital. The proposed hospital floor area will be $4,452m^2$ and the required parking supply is 111 spaces.

The 17 traffic generating medical tenancies will have a floor area of $6,583m^2$. As the number of practitioners that will be working in these tenancies is not known, assessment of the required parking might be based on 'business and professional' use, which requires 1 parking space per $30m^2$ of floor area. The parking supply on this basis would be 219.

The resultant total required parking supply according to the planning scheme would be 330 spaces.

An existing Nexus Day Hospital with similar medical centre tenancies (in a very similar location in Adelaide to this proposed New Town site) and where the medical tenancies have almost the same floor area ($6,564m^2$) has a total car parking allocation is 165 cars. This would be in proportion with what would be available for the proposed medical centre part of the proposed development.

Consideration has also been given to the performance criteria in the planning scheme in relation to the required parking supply, i.e. Clause E6.6.1.

The criteria are as follows:

P1

The number of onsite car parking spaces must be sufficient to meet the reasonable needs of users, having regard to all of the following:

(a) car parking demand;

(b) the availability of onstreet and public car parking in the locality;

(c) the availability and frequency of public transport within a 400m walking distance of the site;

(d) the availability and likely use of other modes of transport;

(e) the availability and suitability of alternative arrangements for car parking provision;

(f) any reduction in car parking demand due to the sharing of car parking spaces by multiple uses, either because of variation of car parking demand over time or because of efficiencies gained from the consolidation of shared car parking spaces;

(g) any car parking deficiency or surplus associated with the existing use of the land;

(h) any credit which should be allowed for a car parking demand deemed to have been provided in association with a use which existed before the change of parking requirement, except in the case of substantial redevelopment of a site;

(i) the appropriateness of a financial contribution in lieu of parking towards the cost of parking facilities or other transport facilities, where such facilities exist or are planned in the vicinity;

(j) any verified prior payment of a financial contribution in lieu of parking for the land;

(k) any relevant parking plan for the area adopted by Council;

(l) the impact on the historic cultural heritage significance of the site if subject to the Local Heritage Code;

m) whether the provision of the parking would result in the loss, directly or indirectly, of one or more significant trees listed in the Significant Trees Code.

The main criteria applicable to this development are criteria (a) to (d).

The above assessment of parking demand has determined the planning scheme requires 330 car parking spaces. This does not directly allow for any variation to the car parking demand due to a consideration of criteria (a) to (d).

The development site will have 235 car parking spaces, 16 motorcycle parking spaces and 58 bicycle parking spaces. The proposed one hour parking restrictions along New Town Road at the frontage of the development site will provide a further seven car parking spaces. Effectively there will be 316 vehicle parking spaces available for users of the development site, which is very near to the number of car parking spaces required by the scheme.

It would seem the scheme requires a defined number of car parking spaces for all users of a development and then also requires additional motorcycle and bicycle parking spaces, which would have to be for the same number users. In the case of disabled car parking spaces, the required total car parking supply includes the disabled car parking spaces; hence with the above inclusion of all parking spaces, there will be 316 vehicle parking spaces available for users of the development site.

No allowance is made in the planning scheme parking requirement for any modal split. The RTA guide indicates surveys that were undertaken for that document found the average percentage of patients arriving by car at medical centres was 66%, which means that around one third of patients use other forms of transport.

A 66% use of other transport modes by staff and patients at the proposed development would reduce the planning scheme car parking demand to 218 car parking spaces, which is less than the supply of 242 car parking spaces with the inclusion of the on street parking along the New Town Road frontage.

There will be provision for a significant number of staff and visitors to the development site as users of bicycles and motorcycles with a total 74 motorcycle and bicycle parking spaces.

In regard to access to public bus services, there are bus stops on New Town Road outside the development site for both direction of travel. There are also bus stops on Augusta Road near New Town Road for both direction of travel. These bus stops are within some 300m walking distance of the development site, less than maximum desirable distances (usually 400m for residential development and some 800m to services).

Based on all the above it is concluded that the total parking supply at the development site will be sufficient to meet the parking demand.

6. TRAFFIC ASSESSMENT AND IMPACT

This section of the report considers the effect of the traffic that the proposed development is expected to generate on the adjacent street network.

Consideration is also given to sight distances at the driveways, proposed access arrangements, internal traffic circulation and parking.

6.1 Impact of Additional Traffic from Development Site

The proposed development is expected to generate some 386 trips/hour during morning period and 287 trips/hour during afternoon period.

While this estimated traffic generation volumes are somewhat higher than what will occur, they will be applied as a worst case situation in the assessment of the traffic impact and all this traffic has been assigned to the proposed two driveways off New Town Road in Figure 5.1 and 5.2, which show the expected 2029 traffic volumes at both driveways.

A SIDRA analysis has been undertaken of the traffic conflict at the driveway junctions with New Town Road with the peak hour traffic volumes in Figures 5.1 and 5.2.

The level of service has been based on Delay. The analysis has allowed for all turns at the southern driveway as well as allowed for the nearby Warragul Avenue traffic which traffic exiting the site will need to give way to.

The outputs from SIDRA analysis have been summarised in Table 6.1.

The analysis has determined traffic movements along New Town Road will operate at Level of Service A in all cases.

For traffic entering New Town Road, vehicle delays will be at Level of Service C respectively during both peak hours at both driveways and queueing will be up to three cars.

This analysis found the operation would continue to operate efficiently over the day well beyond the next 10 years.

At the Clare Street driveway, it is expected there will be up to 60 vehicles/day entering and exiting the development site. As a result, there may be up to 10-15 vehicles/hour during exceptionally busy hours of the day. This level of traffic activity over an hour will not create any operational issues.

Based on traffic data in Section 4.2 of this report, Clare Street carries a traffic volume of between 200 vehicles/hour to nearly 400 vehicles/hour over the working day.

Intersections and junctions reach capacity when the total conflicting approach traffic volumes are around 1,500 vehicles/hour.

The conflicting traffic volume at the development site driveway with Clare Street will only be less than 30% of this maximum conflicting traffic volume.

YEAR/LOCATION	TIME/DAY	LEVEL OF SERVICE
Year 2029 NORTHERN DRIVEWAY	WEEKDAY AM PEAK	- New Town Rd Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.32 on New Town Rd - Longest 95% Queue on New Town Rd (RT) is 5m - Longest 95% Queue on driveway is 7m
Year 2029 NORTHERN DRIVEWAY	WEEKDAY PM PEAK	- New Town Rd Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.5 on driveway - Longest 95% Queue on New Town Rd (RT) is 1m - Longest 95% Queue on driveway is 22m
Year 2029 SOUTHERN DRIVEWAY	WEEKDAY AM PEAK	- New Town Rd Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.32 on New Town Rd - Longest 95% Queue on New Town Rd (RT) is 5m - Longest 95% Queue on driveway is 7m
Year 2029 SOUTHERN DRIVEWAY	WEEKDAY PM PEAK	- New Town Rd Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.5 on driveway - Longest 95% Queue on New Town Rd (RT) is 1m - Longest 95% Queue on driveway is 22m

Table 6.1: SIDRA output findings for various times of day

6.2 Sight Distance Considerations

The proposed two driveways onto New Town Road and the existing driveway onto Clare Street are all located on the outside of a slight horizontal curve. This assists with achieving good sight lines along an intersection street.

Measurements have confirmed the available sight distances along both New Town Road and Clare Street to and from the location of turning vehicles are well over 100m in both directions, subject to any parked car up to the driveway.

As can be seen on the drawings in Attachment B, 'no stopping' markings are proposed on each side of the New Town Road driveways to ensure good sight lines for vehicles exiting the driveways.

With such existing measures and other nearby driveways in Clare Street, no interventions are required in this street.

The speed limit along both streets is 50km/h while the 85th percentile speed is estimated to be around the speed limit on New Town Road and around 45km/h on Clare Street.

Views along New Town Road and Clare Street from each of the driveway locations are seen in Photographs 6.1 to 6.7.

The required sight distance for an 85th percentile approach speed of 50km/h is 97m, based on current Austroads guidelines. These guidelines are the highest available standard which generally requires longer sight distances than Code E5 of the planning scheme or AS 2890.1 (which would normally be applicable to these driveways.

The available sight distances are more than required; there is no concern about their adequacy.

Photograph 6.1: View to north along New Town Road from proposed northern driveway to development site

Photograph 6.2: View to south along New Town Road from proposed northern driveway to development site

Photograph 6.3: View to north along New Town Road from proposed southern driveway to development site

Photograph 6.4: View to south along New Town Road from proposed southern driveway to development site

Photograph 6.5: View towards Warragul Avenue from proposed southern driveway to development site

Photograph 6.6: View to north along Clare Street from existing driveway to development site

Photograph 6.7: View to south along Clare Street from existing driveway to development site

6.3 Internal Access, Traffic Circulation and Parking Arrangements

Car Park Access

All three driveways to the development site will carry two way traffic; two off New Town Road and one off Clare Street.

The southern driveway off New Town Road will have a width of 5.6m and the other two driveways will have a width of at least 6.2m.

These widths are sufficient for the traffic that will use each driveway.

It is proposed that a B3 centreline marking be installed along both driveways off New Town Road from the property boundary to the start of the car parking area, to guide cars into separate lanes and through curved sections of the driveway.

The southern driveway off New Town Road will be slightly offset from the centreline of Warragul Avenue on the opposite side of New Town Road. Its location was raised as a concern by Council officers. Therefore, a Traffic Advice statement was prepared to address this, supporting the proposed location of this driveway and its full use by all vehicle movements.

If all existing vehicles from the southern driveway were to be required to only turn left into New Town Road, it will introduce U-turn movements on New Town Road which can be hazardous, but more concerning would be the increase use of the Stoke Street/Argyle Street intersection by motorists wanting to travel to the south.

Advice about this development site access is included with this report as Attachment D.

Due to the location of this driveway, advice in Attachment C refers to the proposed relocation of the existing pedestrian refuge to the north of Warragul Avenue to a location some 40m to the south. The relocation of the refuge has been shown on the drawings in Attachment B.

No issues or concerns have been identified with the location of the other driveways.

Internal Traffic Circulation

The traffic circulation areas and parking bays in both the basement floor and ground floor car parking area off New Town Road have been examined and found to comply with the requirements of AS 2890.1.

The following design details have been checked:

- All parking spaces in the ground floor car park will be 5.4m long and 2.4m wide (generally 2.6m wide) in accordance with User Class 1A for employee parking (as detailed in Figure 2.2 of AS 2890.1 for 90-degree parking);

- The width of the parking aisles in the ground floor car park will be at least 5.8m (in places 6.0m to 6.2m) in the ground floor car park (as required in Figure 2.2 of AS 2890.1 for Class 1A 90-degree parking);
- All parking spaces in the basement floor car park will be 5.4m long and 2.6m wide in accordance with User Class 3 for short term parking (as detailed in Figure 2.2 of AS 2890.1 for 90-degree parking);
- The width of the parking aisles in the basement floor car park will be at least 5.8m (mostly 6.0m) (as required in Figure 2.2 of AS 2890.1 for Class 3 90-degree parking);
- There will be at least a 300mm clearance to the side walls and columns for door opening and manoeuvring (as detailed in Figure 2.2 of AS 2890.1).
- Dead end aisles open to public parking will have no more than six parking bays;
- All columns have been located correctly between 0.75m and 1.75m from the rear of parking bays as required;
- There will be a 1.0m extension to the end of the parking aisle where required for cars to reverse out of spaces. In some cases, parking bays have been designated as jockey parking for use by staff to avoid the loss of parking bays; no separate turnaround area is required because of this;
- All vehicles will be able to enter and exit the car parking areas in a forward direction;
- Because all dimensions of the parking bays and parking aisle meet the dimensions of Figure 2.2 of AS 2890.1, therefore there is not a need to demonstrate that the turn paths all work;
- There are no height clearance issues (minimum clearance will be more than 2.2m in all trafficable parts of the parking area);
- There is not a need for any pavement arrow markings on the basement floor level or ground floor level because all parking aisles will be two way (there is not a mandatory requirement for pavement arrows in the standard). Pavement arrows are required only at the one short section of 'one way' circulation road at the main building entrance;
- The driveways off New Tow Road will have a minimal to flat grade (5% or less);
- The design of the disabled parking spaces complies with the requirements of AS 2890.6 including the shared areas;

- The motorcycle parking spaces comply with requirements of AS 2890.1 with bays being 2.5m long and 1.2m wide.

- The bicycle parking spaces comply with requirements of AS 2890.3, both in respect to bay sizes as well as storage requirements and end of trip facilities for employees.

A feature that can be included in the car park layout is jockey parking (defined as double stacked on site drawings). Jockey parking is a fairly common feature of private parking areas nowadays and it can be allowed if the spaces are allocated only for staff/employee use and suitable arrangements are made for staff/employees to access and egress to the parking bays.

Jockey parking is not disallowed in the Australian Standard. In fact, advice from Standards Australia has suggested such parking can be considered as an additional feature of parking practice that does not require any technical standards to be set other than the dimensions of the bays needing to meet the requirements of the Standard.

The driveway off Clare Street will be secured with entry only by arrangement or internal control, including entry for ambulances.

Within this part of the site, there will be provision for ambulances and smaller vehicles to turnaround on a 16m diameter or larger medium rigid trucks undertake three point turns (as demonstrated with the turning path diagram in the civil design drawings).

It is proposed that a 'no stopping area' pavement message be painted within part of the turning area, immediately to the north of the angle parking bays, to ensure this area is not used for parking.

The grade of the driveway/parking aisle past the proposed parking spaces will be around 12%. This is more than the normally required 6.25% for car parking bays. For this reason, the seven parking bays have been widened from the normal 2.5m to 3.5m. This is consistent with accepted practice in other municipalities/jurisdictions where the wider bay compensates for the steeper grade in providing more side clearance for door opening and manoeuvring/access on the grade.

Parking on public streets with a higher grades, both sideways and longitudinally, is not uncommon on Hobart street (e.g. Molle Street).

Disabled Parking

There is a requirement in AS 2890.1 for one disabled car parking space for each 50 car parking spaces. A sufficient number of disabled car parking spaces have been provided, with two disabled car parking space in the ground floor car park (where there are 69 spaces) and four disabled car parking space in the basement floor car park (where there are 134 spaces).

Bicycle Parking

There will be 20 visitor and 38 staff bicycle parking spaces in the basement floor car parking area. This is sufficient to meet the requirements of the planning scheme. As indicated above, the required storage and shower facilities for employees have also been provided.

Motorcycle Parking

There will be 10 visitor motorcycle parking spaces in the basement floor car parking area and 6 staff motorcycle parking spaces in the ground floor car parking area. This is sufficient to meet the requirements of the planning scheme.

Pedestrian Access

All three driveways will have the required clear sight triangle (2m x 2.5m) between motorists exiting the driveway and pedestrians approaching along the adjacent Clare Street footpath.

Due to the level of traffic activity at the northern car parking driveway onto New Town Road, it is proposed full unobstructed pedestrian sight lines are available with low ground cover planting or similar (less than 600mm in height) within the sight triangle.

The full unobstructed sight triangle will exist at the southern car park driveway as there will not be any physical structures/installations in this area.

At the Clare Street driveway, the line of sight from the vehicle exiting the site will slightly encroach across the corner of the parking bay nearest Clare Street.

As this bay is wider than a normal parking bay, vehicles parked centrally within the bay will not be within the sight triangle.

This will be a gated driveway where exiting vehicles are expected to be propped just before the gate and move forward through the gate from a stationary position and any pedestrian on the Clare Street footpath would be aware of the opening gate. For this reason, the minimum sight line, normally required by council, is proposed at this driveway.

Pedestrian will have access to and from hospital building at the front of the building, next the southern vehicle driveway.

There will be no pedestrian access to or from Clare Street at the security gated driveway.

Commercial Vehicles - Servicing of Development Site

The development site will have an access off Clare Street for commercial vehicles and service of the building.

There will be parking for seven cars or small rigid vehicles as well as a turning area for vehicles up to medium rigid trucks plus a receiving area for patients arriving by ambulance.

As the driveway off Clare Street will be via a secured gate, a loading zone is proposed on New Town Road, near the pedestrian access to the building, to assist with easier access and quicker small deliveries or collections.

Details of these servicing arrangements are seen on the site drawings.

Bus stops

Currently, there are bus stops on both sides of New Town Road near the northern end of the development site.

The bus stop on the western side of New Town Road is located where the proposed northern driveway to the development site will be. For this reason, this bus stop will be relocated southwards as detailed on design drawings.

7. SUMMARY AND RECOMMENDATIONS

The Tasman Private Hospital development is proposed on the site at 48-52 New Town Road. The building will accommodate a private hospital that will provide health care for in-patients and out-patients including surgeries in a hospital environment as well as a range of medical services in some 17 tenancies.

This Traffic Impact Assessment has been undertaken to address all traffic related matters and assist the Hobart City Council in assessing the development application.

The assessment has reviewed the existing road and traffic environment in the area of the development site and found there currently are no significant traffic issues of concern.

The traffic volume on New Town Road past the development site is around 8,000 vehicles/day and along Clare Street is around 3,200 vehicles/day.

Over the last five and a quarter years since January 2014, 12 crashes have occurred between Augusta Road/Elizabeth Street/New Town Road junction and the Argyle Street/New Town Road junction.

These 12 midblock crashes along New Town Road have been quite mixed in their nature. They have included five rear end type incidents and two crashes with vehicles emerging from driveways.

There have been eight reported crashes along Clare Street between Augusta Road and Honora Avenue with six of these at the Clare Street/Augusta Road junction.

Of the two crashes along Clare Street, one was a reversing incident in 2017, just to the south of the development site; the other was a loss of control crash in 2018 just to the south of Fraser Street. Again, both resulted in property damage only.

Overall the crash record in this area is not of real concern.

In order to determine the level of traffic that the hospital development is likely to generate, various references to medical centres have been considered. As no clear data was found for a hospital as is proposed for this development, it has been assumed that the traffic generation by the hospital will be the same as for the medical tenancies.

It has been determined the development will generate up to 386 trips/hour during the morning period and 287 trips/hour during afternoon period via the two proposed driveways off New Town Road. Based on various other factors, it is considered these estimated traffic volumes that the development is expected to generate are somewhat higher than what will actually occur.

It is also expected the development will generate an average of 60 small to medium size commercial vehicles each day at the Clare Street commercial access of the proposed loading zone on New Town Road.

The estimated traffic volumes have bene assigned to the driveways with passing traffic volumes on New Town Road increased to allow for a 1.5% p.a. growth over the next 10 years to 2029.

A SIDRA analysis of the peak hour traffic conflicts at the driveways in year 2029 has found the traffic movements along New Town Road will operate at Level of Service A. For the driveway traffic entering New Town Road it will be Level of Service C during the AM and PM peak hour periods respectively.

The traffic conflict at the Clare Street driveway will be less than 30% of the maximum capacity.

An assessment has been undertaken of the available sight distances at the junction of the development site driveways with New Town Road and Clare Street. This has found sight distances to be more than adequate in meeting the highest standard requirements.

The Hobart Planning Scheme requires 1 parking space per 40m^2 of floor area for a hospital. The parking requirement of the medical tenancies has been considered as 'business and professional' use which requires 1 parking space per 30m^2 of floor area. The resultant total required parking supply according to the planning scheme would be 330 spaces.

The development site will have 235 car parking spaces, 16 motorcycle parking spaces and 58 bicycle parking spaces. The proposed one hour parking restrictions along New Town Road at the frontage of the development site will provide a further seven parking spaces. Effectively there will be 316 vehicle parking spaces available for users of the development site, which is very near to the number of car parking spaces required by the scheme.

When considering applicable factors such as modal split, for which the RTA guide indicates is 66% (car use) at medical centres, easy access to public bus services and the supply of motorcycle and bicycle parking spaces for employees and the public it is concluded that the total parking supply at the development site will be sufficient to meet the parking demand.

These factors are included in the performance criteria (Clause E6.6.1) in the planning scheme as relevant considerations in determining the required parking supply.

No issues or concerns have been identified with the location of the driveways and their full use by all vehicle movements.

The traffic circulation areas and parking bays in both the basement floor and ground floor car parking area off New Town Road have been examined and found to comply with the requirements of AS 2890.1.

Other matters that have been addressed are:

- There will be a sufficient number of disabled car parking spaces in the car parking areas;
- There will be a sufficient number of visitor and staff bicycle parking spaces with the required bicycle storage and shower facilities provided for employees;
- There will be a sufficient number of visitor and staff motorcycle parking spaces.

These meet the requirements of the planning scheme.

All three driveways will have the sufficient required sight triangle between motorist exiting the driveway and pedestrians approaching along the adjacent footpath.

The grade of the driveway/parking aisle off Clare Street will be around 12%. As this is more than the normally required 6.25% for car parking bays, the seven parking bays along the driveway have been widened from the normal 2.5m to 3.5m.

The Clare Street access for commercial vehicles and service of the building as well as ambulances. The driveway will be via a secured gate. A loading zone is proposed on New Town Road to assist with easier access for quicker small deliveries or collections.

Currently, there are bus stops on both sides of New Town Road near the northern end of the development site. The bus stop on the western side of New Town Road will be relocated southwards clear of the northern driveway, which will be where the bus stop is currently located.

Overall the proposed development will not create any operational issues, the internal traffic arrangements meet required standards and practices, therefore the development is supported on traffic grounds.

ATTACHMENT A

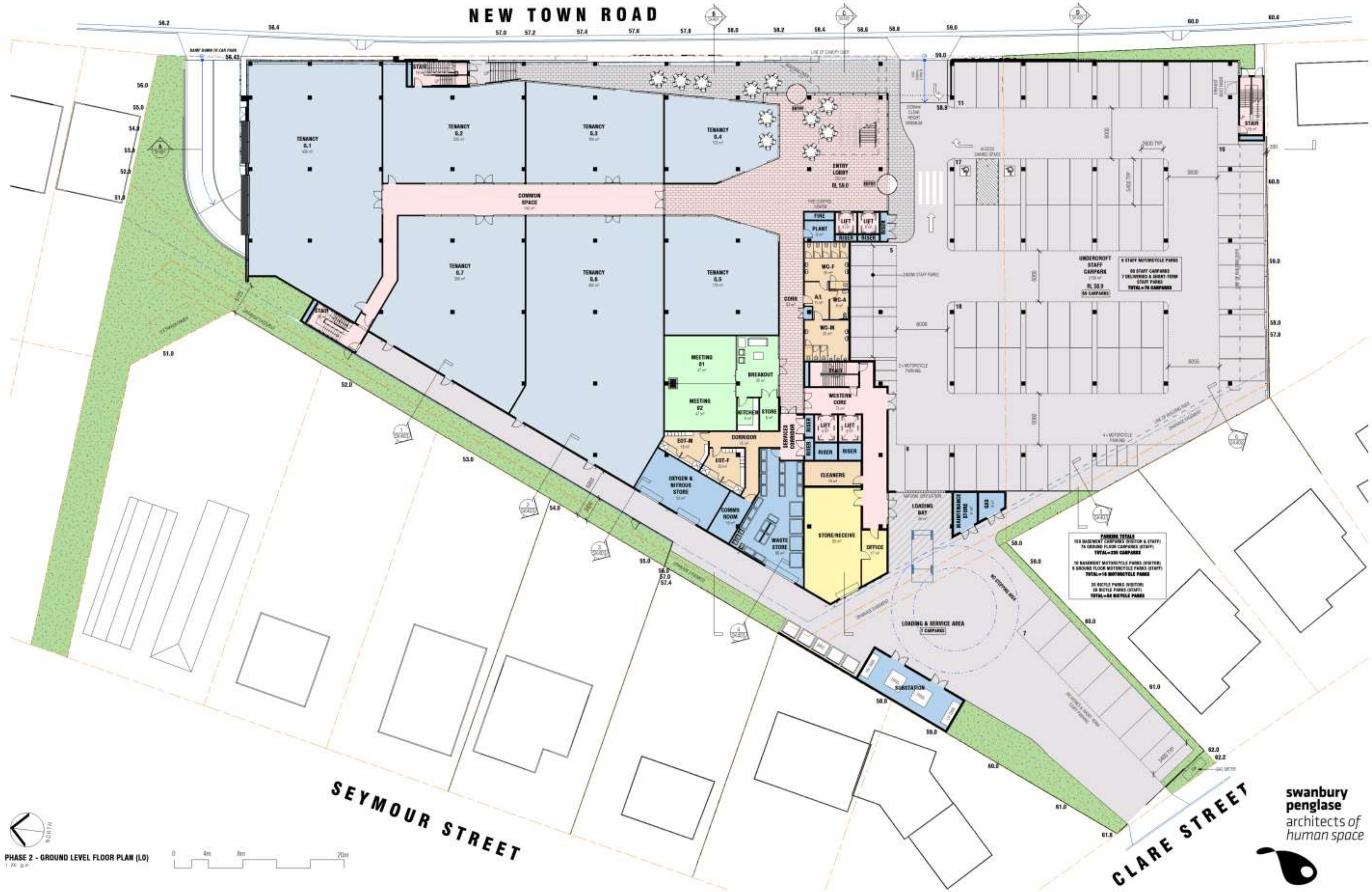
Drawings of development site layout

swanbury penglase
architects of human space

NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

14/05/2019
15153 SK202 - Q

ORIGINAL SHEET SIZE A1



NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

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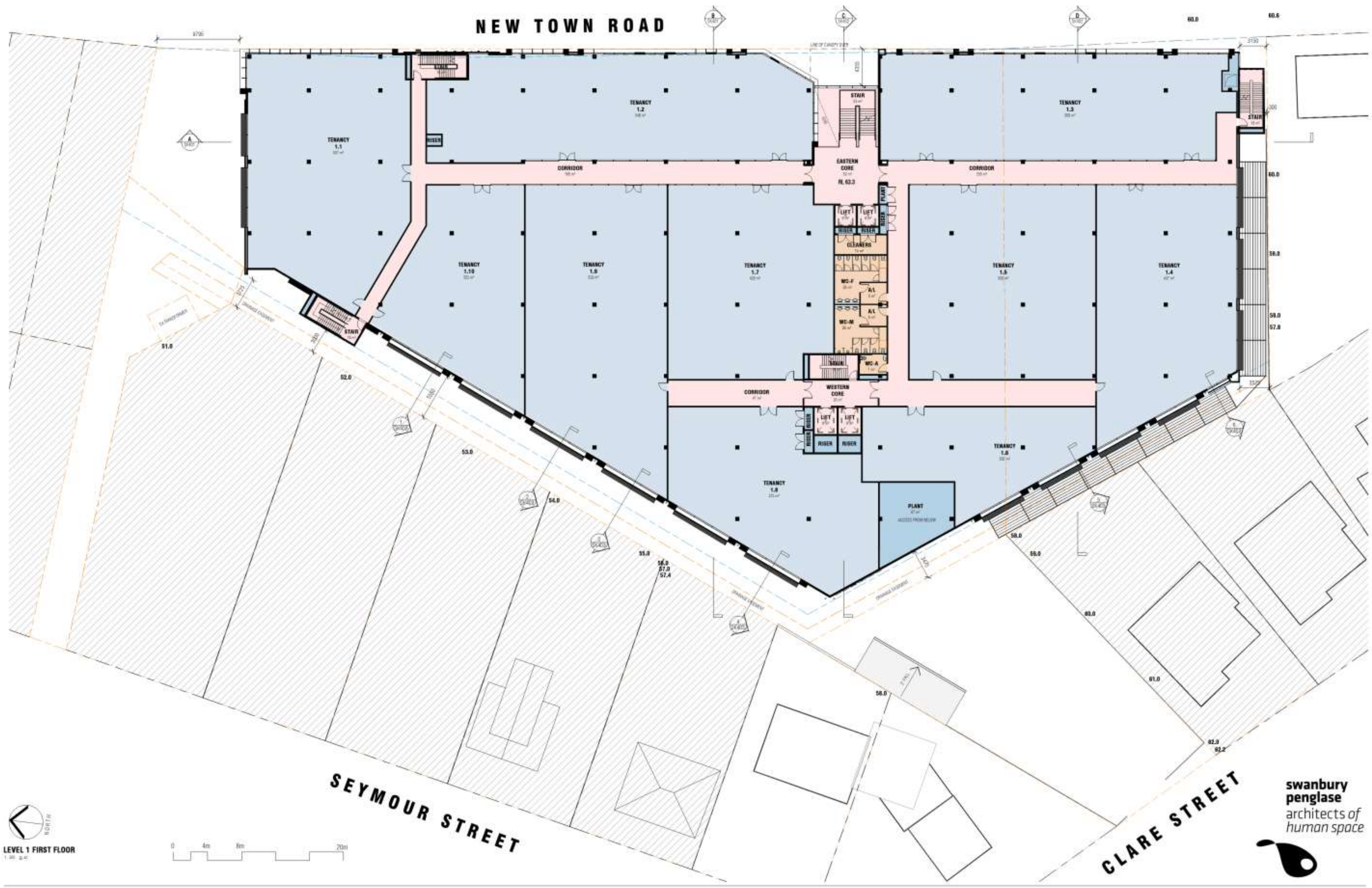

NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

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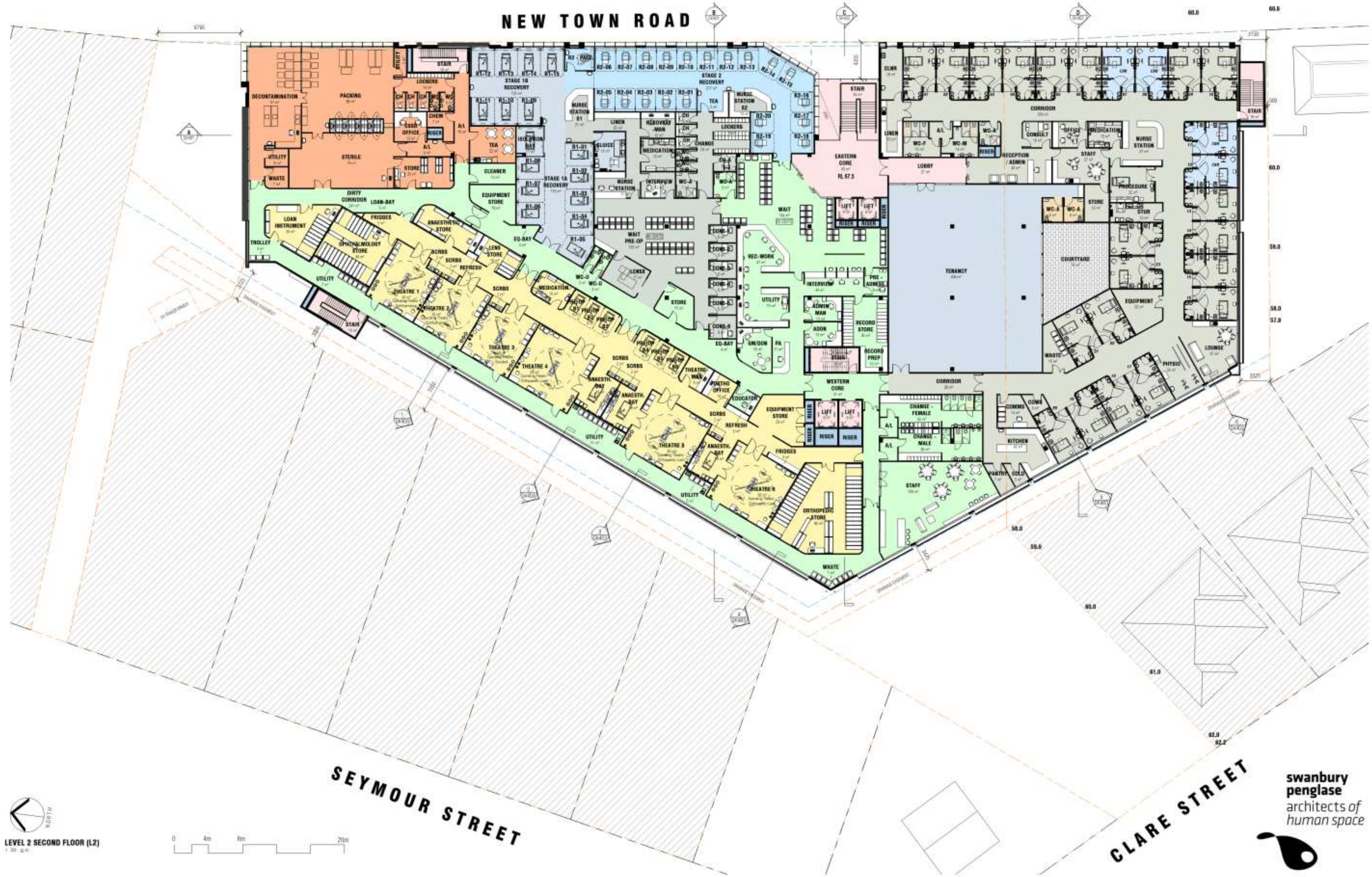

NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

14/05/2019
15153 SK205 - P

ATTACHMENT B

Engineering drawings of on-street traffic control and parking measures and details of parking arrangements in on-site car parking areas

Refer to in particular to
Sheets 5, 7, 9, 10

OF Civil Hydraulic Set_RevC

ATTACHMENT C

Supplementary traffic survey data

HISTORIC TRAFFIC VOLUME DATA FOR NEW TOWN ROAD IN AREA OF DEVELOPMENT SITE

Enquiries with the Hobart City Council in 2015 about available traffic data in the area of the development site traffic resulted in volume data being obtained for New Town Road just north of Cross Street (around one kilometre to the north of the development site) and on Elizabeth Street south of Lyndhurst Avenue (around half a kilometre to the south of the development site).

These surveys were undertaken in December 2011

The recorded traffic volumes at these two sites have been presented graphically in Figures 1 and 2.

The graphs show that during the day the traffic volume was around 1,100 - 1,300 vehicles/hour on New Town Road south of Cross Street and around 1,400 – 1,700 vehicles/hour on Elizabeth Street south of Lyndhurst Avenue.

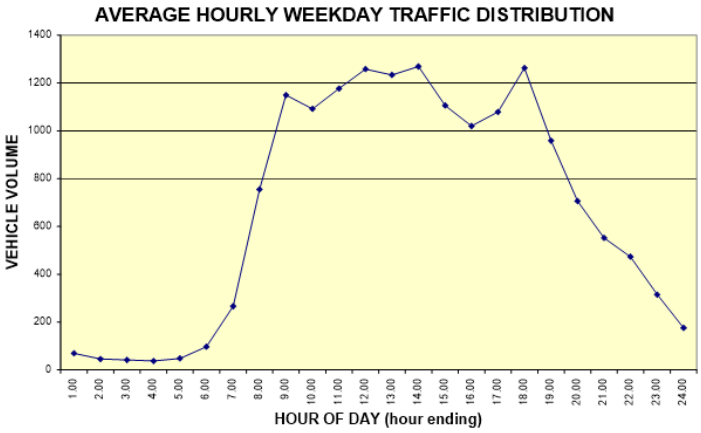

Figure 1: Hourly traffic distribution along New Town Road south of Cross Street – December 2011

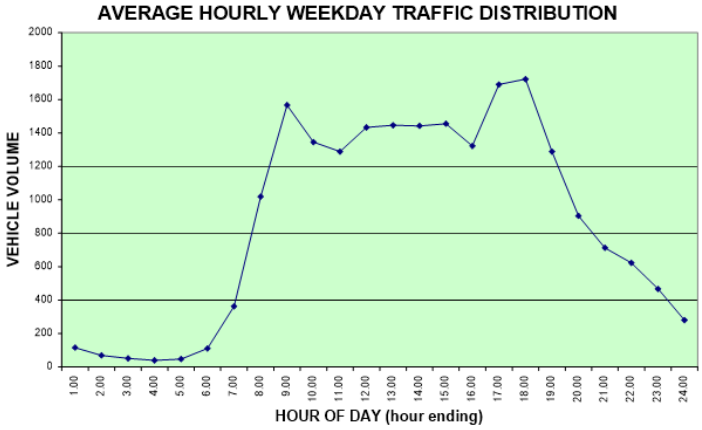

Figure 2: Hourly traffic distribution along Elizabeth south of Lyndhurst Avenue – December 2011

In addition, turning movement surveys were undertaken at the junction of New Town Road with Augusta Road/Elizabeth Street and also Argyle Street. The surveys were undertaken during the week of 3 August 2015 between 11:00am and 12:00noon as well as 4:30pm and 5:30pm.

The results from these turning movement surveys have been summarised in Figures 3 to 6.

When comparing the recent turning movement survey traffic volumes with the Council data from 2011, it was found the two sets of data are consistent, allowing for expected variations due to separation distances between sites and the four year time interval.

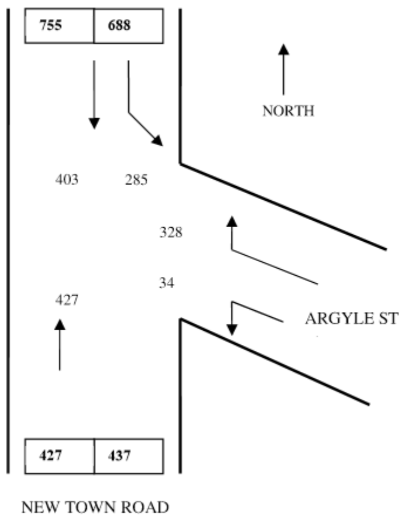

Figure 3: Turning traffic at Argyle Street/New Town Road junction - 11:00am to 12:00noon August 2015

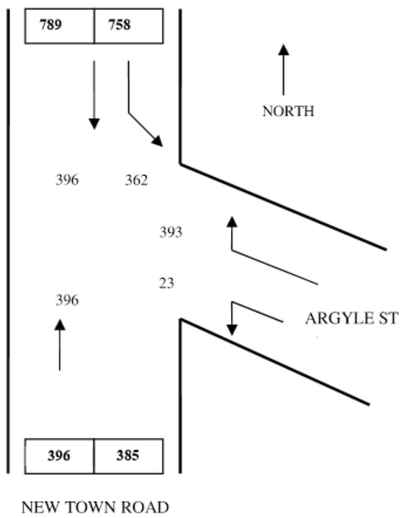

Figure 4: Turning traffic at Argyle Street/New Town Road junction - 4:30pm to 5:30pm August 2015

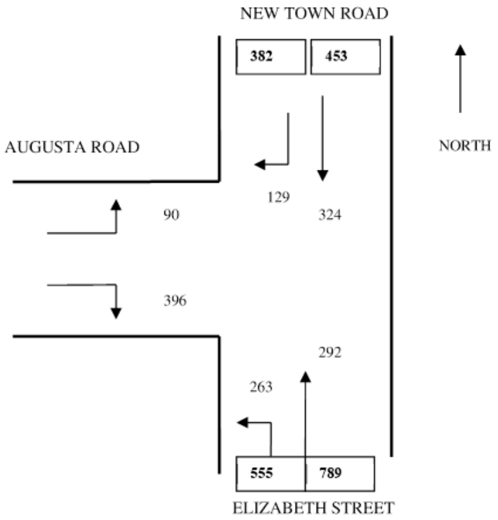

Figure 4.5: Turning traffic at Augusta Road/New Town Road junction - 11:00am to 12:00noon August 2015

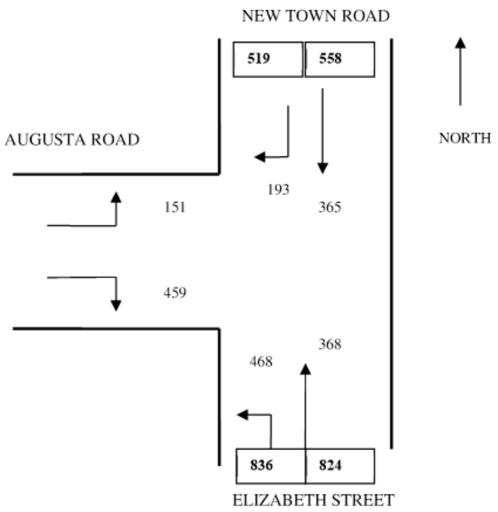

Figure 4.6: Turning traffic at Augusta Road/New Town Road junction - 4:30pm to 5:30pm August 2015

ATTACHMENT D

Traffic advice regarding proposed location of southern New Town Road driveway and traffic management

MILAN PRODANOVIC B.E. PEng
TRAFFIC ENGINEERING & ROAD SAFETY

TRAFFIC ADVICE

CAR PARK ACCESS

48-52 NEW TOWN ROAD, NEW TOWN

1. INTRODUCTION

The site at 48-52 New Town Road is to be redeveloped with the construction of the Tasman Private Hospital.

The new hospital building will have four floor levels with car parking on the basement floor level and half the ground floor level.

In order to best utilise the slope of the site, it is proposed that the access driveway to the ground floor car park be located at a point slightly offset to the north of the centre line of Warragul Avenue which is located on the opposite side of New Town Road to the development site.

The other access driveway to the lower ground floor car park will be located at the northern end of the site, some 80m to the north of the above proposed car park driveway.

Some concern has been raised by Hobart City Council officers about the closeness of the proposed car park driveway to the Warragul Avenue junction.

The advice below has been prepared to address these concerns and detail why the proposed location for the car park driveway is supported.

2. DISCUSSION OF TRAFFIC FACTORS AND CONSIDERATIONS

Proposed driveway location

It is understood the main concern that council has with the location of the proposed driveway is that it will be located within the junction area where Figure 3.1 and Clause 3.2.3 of AS 2890.1 indicate there should not be a driveway, except in certain circumstances.

Advice has been received that Council has suggested the driveway be located at the southern boundary of the development site.

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The discussion in this standard suggests the main reasons for not allowing the driveway in the junction area is traffic conflicts, possibly with a high volume of traffic to and from the side road as well as adverse impacts on passing through traffic. It would seem the standard for this situation is based on the side road carrying a significant traffic volume.

If the standard was to be met in this case, it would require the proposed driveway to be located some 12m to the north of its proposed location. With the current traffic environment in this area and the existing and proposed traffic management along New Town Road, it is considered there would be nothing to be gained in moving the driveway away from the junction area with respect to safety or traffic efficiency.

Existing situation

There currently is an existing small car park on the development site with entry to the car park some 30m to the south of Warragul Avenue and exit directly opposite Warragul Avenue.

The proposal, in effect, is to move this exit driveway a few metres to the north where it will become a two-way driveway but with significantly greater traffic use.

Concerns with driveway at southern boundary

There is a two-way right turn median treatment along this section of New Town Road and it would have been installed to either improve traffic efficiency (not having right turning vehicles waiting for a gap in the opposing traffic stream while in the through lane) but most likely for safety reasons due to rear end collision resulting from these right turning vehicles.

When considering the implications of the driveway located at the southern boundary of the development site, it would be located some 30m to the south of Warragul Avenue (distance between centrelines).

One of the main concerns with this is the overlapping right turn movement that would result between Warragul Avenue and the development site driveway in this location, with very short median storage length so that most of, and possibly all, the deceleration by the right turning vehicles would be within the through lane. In addition, at times the volume of the right turn movement to the car park possibly may exceed the available storage length at his location and readily extend back into the through lane.

These issues will not occur with the driveway at the proposed location; the traffic management would be used to gain maximum safety and efficiency benefits for public road users.

Pedestrian refuges

Locating the proposed driveway in the area of the Warragul Avenue junction will require the relocation of the median traffic island on the northern side of the Warragul Avenue junction. The traffic island at present is some 50m from a pedestrian refuge to the north and some 150m from a pedestrian refuge to the south.

This relocation provides the opportunity to locate median island further to the south, midway between the existing two refuges and also install the island as a pedestrian refuge.

The two-way right turn median treatment along New Town Road ideally would have traffic islands as pedestrian refuges around 100m apart.

Having regard for the location of other driveways, it is proposed the refuge be positioned some 20m to the south of the Warragul Avenue centreline to provide a deceleration and storage length for the right turn movement to Warragul Avenue.

Crash history

Advice received from the Department of State Growth about the crash record along New Town Road over the last five years shows there have been 12 midblock crashes between Augusta Road and Argyle Street junctions.

None of these crashes occurred at the Warragul Avenue junction or anywhere along the frontage of the development site.

Current and future traffic activity

In order to determine the future traffic activity at the New Town Road - Warragul Avenue – development site driveway area, a recent morning turning movement survey was undertaken at the New Town Road/Warragul Avenue junction over the 8:30am to 9:00am period.

The results have been summarised in Figure 1 as hourly traffic volumes.

In regard to the afternoon peak hour, a turning movement survey was undertaken at the New Town Road/Argyle Street junction on 13 March 2019 between 4:40pm and 5:40pm.

The results from that survey have been applied to the New Town Road/Warragul Avenue junction, with assumptions made for the Warragul Avenue traffic based on Figure 1.

The current afternoon peak hour traffic at the New Town Road/Warragul Avenue junction therefore would be that presented in Figure 2.

It is expected the New Town Road traffic may increase at a rate of 1% p.a. over the next decade while the Warragul Avenue traffic will not change.

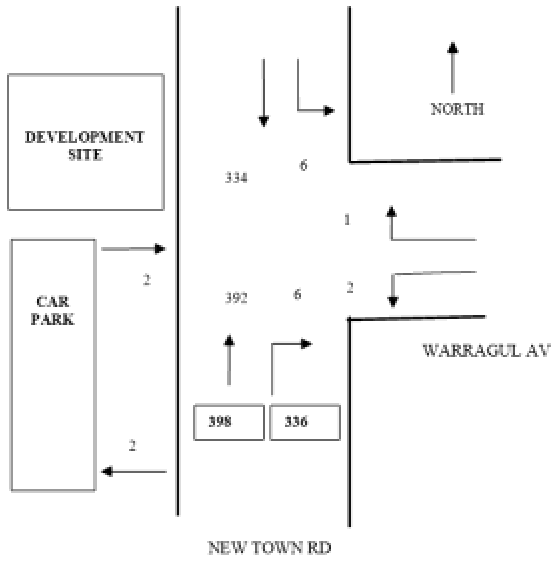

Figure 1: Turning traffic at New Town Road/Warragul Ave junction - 8:30am to 9:00am April 2019 (hourly rate)

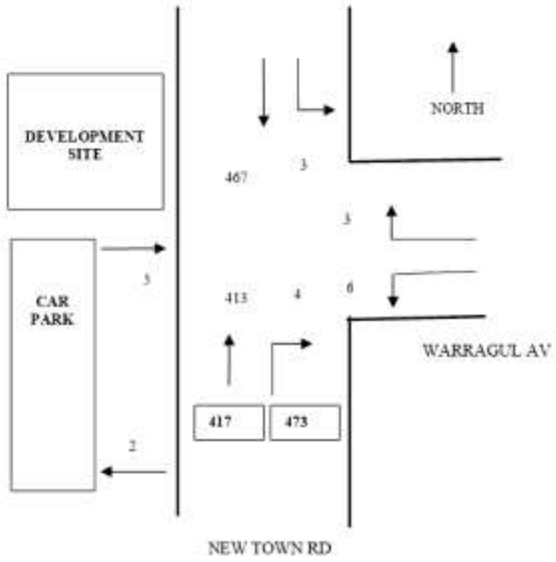

Figure 2: Turning traffic at New Town Road/Warragul Ave junction - 4:40pm to 5:40pm March 2019

The future car park on the ground floor of the development site will have 70 car parking spaces. All spaces will be allocated to staff/employees.

A significant proportion of the staff will be in the building before 8:00am. The hospital on the top floor will start operations at 8:00am so all staff on this floor level will start work by 7:00am.

Staff at the various tenancies on the other two levels in the building are expected to arrive a little later up to 9:00am.

For the purpose of assessing the traffic activity on New Town Road, it will be assumed that half the parked cars (half the capacity of the car park) will arrive during the morning peak hour and around 40% will leave during the afternoon peak hour for New Town Road. A few vehicles are also expected to make the reverse movements at these times.

These proportions in traffic movement are considered to be on the high side but will be applied as a worst case situation.

Therefore, in the future (10 years' time) with the site fully developed and occupied, the expected traffic activity at the New Town Road/Warragul Avenue junction is expected to be as seen in Figures 3 and 4.

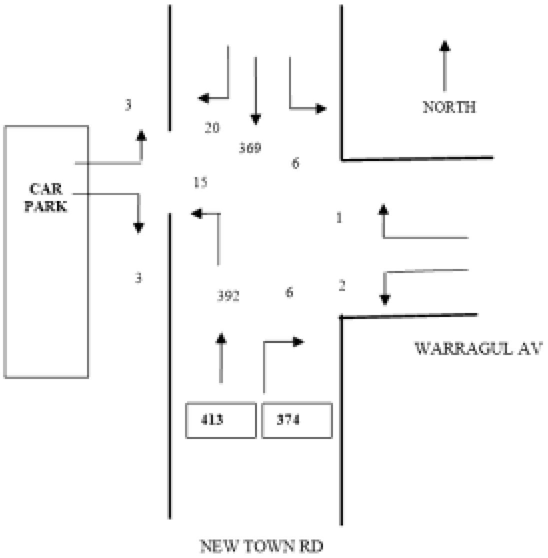

Figure 3: Turning traffic at New Town Road/Warragul Ave junction - 8:00am to 9:00am 2029

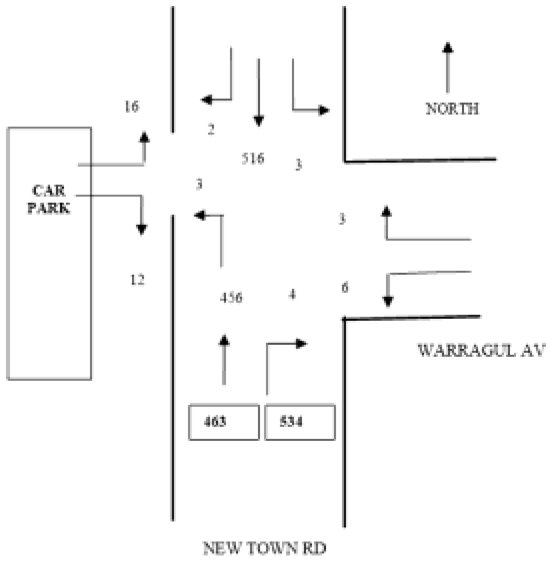

Figure 4: Turning traffic at New Town Road/Warragul Ave junction - 4:40pm to 5:40pm 2029

It is quite clear that the total level of conflict at the New Town Road/Warragul Ave junction will be well less than capacity. Intersections and junctions reach capacity when the total conflicting approach traffic volumes are around 1,500 vehicles/hour.

This has been confirmed with a SIDRA analysis which found for the traffic volumes in Figures 3 and 4 that all movements in the morning peak hour will operate Level of Service B or better and all movements in the afternoon peak hour will operate Level of Service C or better, with minimal queueing on any approach.

The proposed management in this area has been widely applied and is well understood, vehicle priorities will not be confusing and not give rise to any adverse outcomes.

4. CONCLUSIONS

While there may be some concern about the proposed location of the driveway not meeting standards, it is necessary to understand that the standard cannot cover all practical situations that will arise.

There is a need to understand there are such limits and to have regard to the totality of the situation as well as implications of alternative options; i.e. take a view of the whole situation.

It is considered this has been the case with the above assessment and with consideration given primarily to public road users rather than the development.

Having made the assessment on this basis, it is concluded the proposed location of the southern car park driveway for the development site, in the area of the Warragul Avenue junction, should be support.

Milan Prodanovic

3 April 2019

MILAN PRODANOVIC B.E. P.Eng
TRAFFIC ENGINEERING & ROAD SAFETY

12 June 2019

Phil Gartrell
Ireneinc Planning and Urban Design
49 Tasma Street
NORTH HOBART TAS 7001

Dear Phil

PROPOSED TASMAN PRIVATE HOSPITAL DEVELOPMENT
48-52 NEW TOWN ROAD, NEW TOWN

I refer to the letter dated 5 June 2019 from the Hobart City Council requesting further information regarding the proposed development at 48-52 New Town Road, New Town.

The following advice is provided in regard to the two items raised under Parking and Access.

Item 1. Height Clearance

The architectural drawings of the two parking levels, which were attached to the TIA report, include an annotation near the entrances to the car parking areas that there would be a minimum clearance of 2.2m in both car parking areas. This was confirmed in the TIA report.

In order to reinforce this further, the architectural section drawings of the building, attached to other responses to the above council letter, detail this height clearance.

Item 2. Jockey Parking

Occasionally opponents of developments try to argue against the use of jockey parking or that it is contrary to acceptable standards to have this form of parking within car parking areas that are on private land.

Private car parks are areas that are assigned for parking of vehicles that belong to the residents, employees or visitors of the building connected with the car parking area. Managers of the development can direct car park users on how the parking areas are to be used.

As the Australian Standard has at no time provided any advice on jockey parking it cannot be concluded that such a form of parking is disallowed. On the contrary, Standards Australia has advised me a few years ago it can be considered as an additional feature of the parking practice. Standards Australia has further advised jockey parking can be considered as an acceptable form of parking for employees where the jockey parking is managed among such users, provided other technical elements of the car parking areas such as bay size, aisle width and manoeuvring areas meet the specifications of the Standard.

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Obviously, it can only be used in a car park or part(s) of a car park which is assigned to employee or private car parking where adequate arrangements can be made for moving of vehicles.

Jockey parking has been used fairly extensively with different commercial buildings in the Hobart Municipality, at the office development on corner of Harrington Street/Melville Street as well as many smaller car parks.

Jockey parking has also been approved by Hobart City Council at Calvary Hospital for employee parking. The parking arrangements within the Calvary Hospital campus are not unlike that proposed for this development, catering for both employees and visitors/patients.

Within the Calvary Hospital campus, the hospital management has directed staff on the use of the jockey parking spaces by signing sections of the jockey parking areas for use by different employee units or groups within the hospital.

The jockey parking bays in the three small areas in the basement car park within the proposed Tasman Private Hospital are ideal for such an employee parking arrangement. It also allows use of areas of the car park which cannot be designated for parking by visitors/patients.

It is therefore not accepted that jockey parking is acceptable only for residential parking.

Yours sincerely

M Prodanovic

Milan Prodanovic

GEO-ENVIRONMENTAL SOLUTIONS

GEOTECHNICAL ASSESSMENT

Client
Swanbury Penglase

Proposed Medical Building

48 – 52 New Town Road, New Town

September 2018

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Point 7004. Ph 6223 1839 Fax 6223 4539

1 INTRODUCTION

Geo-Environmental Solutions Pty Ltd (GES) were engaged by Swanbury Penglase Architects to carry out a geotechnical investigation assessment of the proposed medical centre at 48 – 52 New Town Road – hereby referred to as 'The Site' (CT 252465/1 and CT 198029/1).

The proposed development site is a brownfield site which is currently be occupied by Contact Group. The site location has been presented in Figure 1 and Figure 2.

GES have carried out a geotechnical and environmental investigation assessment of the site. This report outlines the key findings of the geotechnical investigation assessment, which comprised 5 no. Geotechnical boreholes with Standard Penetration Testing (SPT).

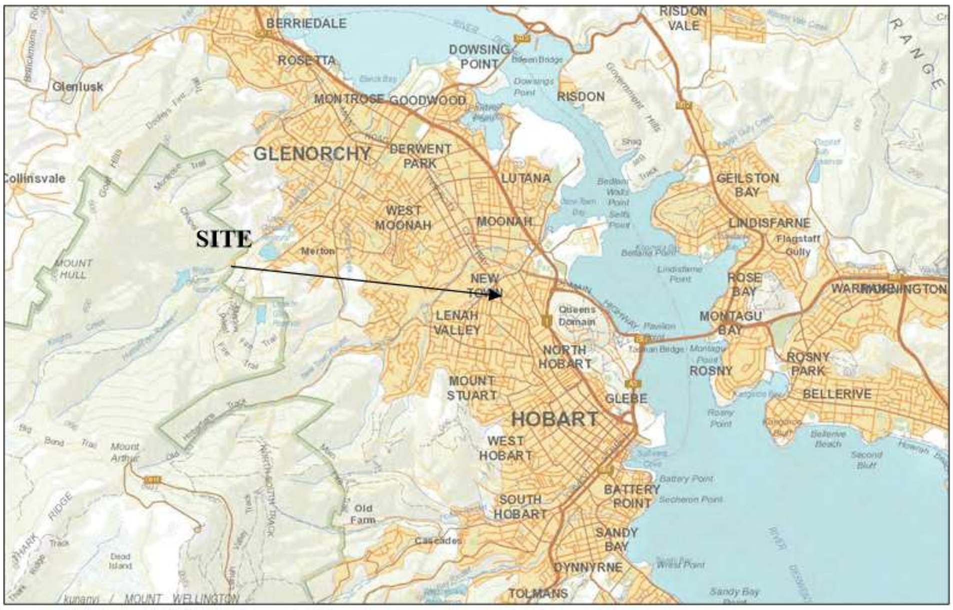

Figure 1 Location of the site.

1.1 Proposed Development

It is understood that the proposed new development will comprise a medical facility as follows:

- Basement Level (B1) – Car Parking Area;
- Ground Level – Car Parking Area, tenancy space, meeting rooms;
- First Level - Tenancy Space; and
- Second Level – Theatres, recovery units, waiting rooms

2 OBJECTIVES AND SCOPE OF WORK

2.1 Project Objectives

Based on our understanding of the project and the information provided by the client, the following outlines the main objectives of the geotechnical investigation:

- Assess the subsurface conditions at the site relevant to the proposed development;
- Assess soil/rock allowable bearing capacity for footings;
- Provide information on likely depth to rock and assess likely excavatability;
- Comment on expected depth of groundwater;
- Provide retention design parameters; and
- Provide any necessary geotechnical recommendations and construction considerations.

2.2 Scope of Work

The scope of work for the geotechnical investigation is as follows:

- Carry out a geotechnical investigation below the existing ground surface to below the proposed design level of the development comprising;
    - 6 no. geotechnical boreholes with Standard Penetration Testing (SPT).
- Provide a suitably qualify engineer to log photograph and sample core and direct *in-situ* testing onsite.

3 INFORMATION PROVIDED

3.1 Client Supplied Information

GES has been provided with the following information in relation to the project:

- Architectural Plan by Swanbury Penglase, dated 13th April 2018 (drawing Reference No: 15153 SK201 – B to 15153 SK204).

3.2 Previous Investigations

No previous investigation has been carried out at this site. The recent site investigation carried out by GES was carried out in conjunction with an environmental assessment of the site. A total of 19 no. push probe boreholes were completed across the site to sample and test the sub-surface fill material for potential contaminants. Push probes were drilled to a depth range of 0.4 to 6.4 m depth.

4 GEOLOGICAL CONTEXT

4.1 Site Details and Setting

The proposed development covers an area of approximately 7,400 m^2, including proposed structures and associated car parking areas. The site is currently occupied by Contact Group. Based on preliminary desktop studies, it is understood a substantial thickness of fill has been placed over the site.

Overall, the site is gently sloping by 3° downhill to the north. Elevation of the site ranges from 60.3 m AHD to the south-east, 56.2 m AHD to the north and 57.5 m AHD to the west. Along the north-western edge of the site, the site slopes off significantly, likely to form the edge of the fill pad. To the east and west of the site, the site is surfaced by concrete and asphalt forming car parking and hard stranding areas. The central and southern portion of the site is occupied by a series of office and warehouse buildings, covering 35% of the site. The north-western portion of the site is covered by a levelled grassed area.

4.2 Geological Setting

The 1:25,000 scale geology map of Hobart (Map Number 5225), indicates the site is underlain by the following geological unit:

- Map Unit Rv - Undifferentiated volcaniclastic, quartz-rich lithic and quartzose sandstone, siltstone, mudstone, carbonaceous beds and coal seams; and
- Map Unit Rvvl - Interbedded yellow brown or grey carbonaceous siltstone, mudstone and thin to thick-bedded quartz-rich lithic arkosic sandstone, some fossil plants, common siltstone palaeosols.

The Rv unit is located to the north of the site, which covers the majority of Stage 1 development site area. The entire Stage 2 development site and the southwestern portion of Stage 1 development site is underlain by the Rvvl unit. The contact between the Rv and Rvvl map units are indicated to be located close to the boundary between stage 1 and stage 2 works, which the deposits are orientated in a north-west south-east orientation. It should be noted that the contact between the two geological units has not been mapped as a fault, only as a geological contact.

4.3 Groundwater

During the investigation, a groundwater monitoring well was installed in GT05 to enable groundwater samples to be collected and to monitor the future groundwater levels. During the investigation, the soil was observed to be wet in Environmental boreholes BH08 below 4.6 m depth, BH10 below 4.8 m depth, BH18 below 3.2 m and in geotechnical boreholes GT02 below 6.7 m depth and GT05 below 5.0 m depth. It is likely the groundwater encountered is a combination of perched groundwater within the fill and natural groundwater levels on the contact with the underlying bedrock.

5 GEOTECHNICAL INVESTIGATION

5.1 Field Investigations

The fieldwork was performed by GES who located the boreholes and push probes, nominated sampling and testing, recovered samples, photographed samples and prepared engineering logs.

The geotechnical investigation was carried out by GES between 25th July and 31st July 2018, carrying out rotary cored drilling, push probe and standard penetration (SPT) testing at the proposed development site. A total of 5 no. auger/rotary cored boreholes were drilled by Tasmanian Drilling Services to a depth of between 7.1 to 13.2 m depth. A total of 19 no. push probes were carried out by a GES geotechnican as part of the environmental investigation using a push probe rig. Push probe boreholes were drilled to between 0.4 to 6.4 m depth.

The investigation locations were designed to be in general accordance with the locations as per the scope of works.

The following activities were carried out during the investigation:

- Push probe boreholes were drilled using a GeoProbe drilling rig operated by GES;
- Push probe boreholes were terminated on reaching their target depth or by refusal on bedrock;
- Auger/Rotary Cored boreholes were drilled using a truck mounted Drillmac 500 Explorer drilling rig operated by Tasmanian Drilling Services;

- Rotary Cored Boreholes were auger through fill and soil, then rotary cored through bedrock using a combination of HQ and NQ sized coring equipment;
- Rotary cored boreholes were terminated on reaching their target depth or on encountering suitable founding bedrock;
- All fieldwork was carried out in accordance with AS1726 – 2017 'Geotechnical Site Investigation';
- All boreholes were logged by visual assessment and in general accordance with AS1726-2017. The photographs were taken for each borehole; and
- On completion of the boreholes and test pits, each location was surveyed using a Garmin hand-held GPS (horizontal accuracy ± 3 m).

Table 1 below presents a summary of the geotechnical fieldwork carried out, including coordinates, borehole locations, termination depths and estimated ground surface level.

Table 1 Summary of Fieldwork

Borehole Location ID	*Approximate Coordinates **		*Estimated Ground Surface Level (m AHD)^*	*Termination Depth below ground surface level (m)*
	Easting (m)	*Northing (m)*		
GT01	525,400	5,254,008	60.324	7.1
GT02	525,379	5,254,126	56.38	13.2
GT03	525,361	5,254,078	57.58	10.45
GT04	525,340	5,254,032	57.69	9.96
GT05	525,390	5,254,041	59.04	11.5

Notes:

*Coordinates are provided in GDA94 MGA Zone 55 coordinate system.

^Australian Height Datum (m AHD) has been estimated based on survey data provided due to the low reliability of the GPS elevation data and has been estimate using surface contouring.

5.2 Field Geotechnical Testing

5.2.1 Standard Penetration Testing

Standard Penetration Testing (SPT) was undertaken in accordance with AS 1289.6.3.1 (2000). Testing was carried out within clay-rich materials and fill material to collect samples using a split-spoon sampler. A summary of the results of the testing can be found in the engineering logs in Appendix A.

5.2.2 Hand Shear Vane

Hand shear vane testing was carried out within GT02 on encountering clay-rich material. Testing was carried out in accordance with AS 1289.6.2.1-2001. The results have been summarised in Table 2. It should be noted, undrained shear strengths provided have been adjusted to consider plasticity index.

Table 2 Hand Shear Vane Testing Results

Hole ID	*From (m)*	*To (m)*	*Vane Diameter (mm)*	*Vane Length (mm)*	*Torque (Nm)*	*Undrained Shear Strength s_u (kN/m²)**	*Clay Consistency*
GT02	2.5	2.6	35	70	22	123	CVST

Note: *Undrained Shear Strength values have been corrected for a Plasticity Index of 35%.

5.3 Laboratory Geotechnical Testing

During the investigation, core samples were collected from selected boreholes. Samples were sent to Civil Geotechnical Services (CGS), a Victoria-based NATA accredited laboratory to carry out Uniaxial Compressive Strength (UCS) with Youngs Modulus testing. Laboratory testing was carried out in accordance with AS 4133.4.2.1.

6 RESULTS

6.1 Sub-surface Conditions

During the investigation variable thicknesses of fill material were encountered across the site. Table 3 provides as summary of the ground conditions encountered across the site.

On the Stage 1 development site, fill material was found to be highly variable in both thickness and composition, ranging from 7.7 m to 9.25 m to the northeast and southeast of the site, respectively, which reduced to 2.5 m thickness to the centre of the site (GT03) and 1.2 m thickness to the south. To the centre of the site, (GT03) the site is underlain by approximately 4.3 m thickness of pale brown grey, high plasticity 'silty CLAY', which is likely to represent natural residually weathered bedrock. The fill and natural surficial materials are underlain by an interbedded sequence of Triassic (Map Unit : Rv) sandstone, siltstone and mudstone, described as dark grey and orange brown, low strength, distinctly to slightly weathered, thinly laminated.

On the Stage 2 development area, fill was found to be approximately 1.75 m thickness to the south and east of the site, reducing to 1.2 m depth to the west. Fill material generally comprised a brown, firm to stiff, medium to high plasticity 'sandy CLAY' and a brown, medium dense, low plasticity 'sandy clayey GRAVEL', which contained brick and glass fragments as well as dolerite and mudstone throughout. The fill material was underlain by a pale grey/brown and yellow brown, medium strength, slightly weathered interbedded Triassic sandstone/siltstone and mudstone relating to the Upper Parmeener Supergroup (Map Unit : Rvvl). The mudstone was generally thinly laminated with bedding dipping sub-horizontal. Bedding fractures were commonly closely spaced.

Table 3 Summary of Subsurface Borehole Geology (depths in metres)

Material / Unit	*GT01*	*GT02*	*GT03*	*GT04*	*GT05*
CONCRETE/ASPHALT	0.0 – 0.15	0.0 – 0.05	-	0.0 – 0.1	0.0 – 0.1
TOPSOIL	-	-	0.0 – 0.1	-	-
FILL: Sandy gravelly CLAY/Gravelly silty SAND, Sandy clayey GRAVEL, brown to dark brown, medium to high plasticity, firm to stiff/medium dense. Contains occasional boulders. Highly variable.	0.15 – 1.75	0.05 – 9.25	0.1 – 2.5	0.1 – 1.2	0.1 – 7.7
RESIDUAL SOIL: Silty CLAY, SILT trace gravels, pale brown, stiff, moist, medium to high plasticity.	1.75 – 2.5	-	2.5 – 6.83	-	-
INTERBEDDED SILTSTONE/MUDSTONE with SANDSTONE (Map Unit: Rv): Dark grey and pale-yellow brown, very low to low strength, distinctly to slightly weathered.	-	9.25 – 13.2*	6.83 – 10.45*	-	7.7 – 11.5*
INTERBEDDED MUDSTONE/SANDSTONE with SILTSTONE (Map Unit: Rvvl): Pale yellow brown, locally dark grey, low to medium strength, distinctly to slightly weathered.	2.5 – 7.1*	-	-	1.2 – 9.95*	-

Note: * Borehole terminated on reached target depth.

Borehole logs have been presented in Appendix A of this report.

6.2 Geotechnical Testing Summary

6.3 Laboratory Test Results

Table 4 presents a summary of the Uniaxial Compressive Strength (UCS) results with test certificates presented in Appendix 3. Laboratory test certificates have been presented in Appendix C of this report.

Table 4 – Summary of Uniaxial Compressive Strength (UCS) Testing

Hole ID	*From (m)*	*To (m)*	*Rock Description*	*Field Moisture Content (%)*	*Dry Density (t/m^3)*	*Specimen Length (mm)*	*Specimen Diameter (mm)*	*Uniaxial Compressive Strength (MPa)*	*Youngs Modulus (GPa)*
GT01	6.44	6.66	SILTSTONE[1], Pale brown and brown	9.4	2.13	123.7	60.2	17.51	1.82
GT04	7.81	7.91	SILTSTONE[1], grey	7.2	2.27	140.8	60.4	18.84	1.50
GT05	9.9	10.16	SILTSTONE[2], grey and dark grey	7.0	2.27	153.4	60.1	4.16	0.35

1 Rvvl
2 Rv

The test results indicate the rock mass to be generally medium in strength, with UCS between 17.51 to 18.84 MPa within the Rvvl unit. The sample tested on GT05 located in the Rv unit indicates a rock strength of 4.16 MPa, which is low strength. The GT05 sample failed along a 45° bedding plane.

6.3.1 Point Load Strength Index

PLSI testing conducted on both HQ3 and NQ3 core was converted to IS(50). Bad breaks through healed defects were not included in the results. Thirty-one (31) PLSI tests were carried out on both Rv and Rvvl samples and the results are summarised in Table 5. The results have been divided based on the appropriate rock types.

Table 5 Summary of Point Load Strength Index Test Results

Strength Classification IS(50) (MPa)	*Class*	*Number of test results within this strength classification*	
		Rv	*Rvvl*
0 to 0.03	Extremely Low	-	-
0.03 to 0.1	Very Low	6	1
0.1 to 0.3	Low	6	8
0.3 to 1	Medium	1	6
1 to 3	High	1	2
3 to 10	Very High	-	-
>10	Extremely High	-	-

The results indicate the strength of the Rv unit is generally very low to low strength, with rock strength increasing with depth. The Rvvl unit generally ranged between low to medium strength, with strength also increased with depth.

The results of the PLSI are presented on the engineering logs in Appendix A.

It should be noted the PLSI results provide an indication of the strength of the rock that was encountered during the investigation and that rock with higher or lower strengths than tested may be present at the site.

7 DISCUSSION AND RECOMMENDATIONS

7.1 Geotechnical Design Parameters

The following design parameters have been assigned based on laboratory test results, available published literature and engineering judgement and are summarised below in Table 6.

Table 6 Geotechnical Design Parameters

Layers/Units	*Consistency / Density / Strength*	*Unit Weight (kN/m3)*	*Undrained Shear Strength c_u (kPa)*	*Effective Friction Angle (°)*	*Cohesion (kPa)*	*Elastic Modulus / Youngs Modulus (MPa)*	*Poisson's Ratio*
FILL (Variable)	Firm to Stiff / Medium Dense	15	20	18	5	4	0.3
RESIDUAL SOIL	Stiff	18	75	23	5	6	0.35
INTERBEDDED SILTSTONE/MUDSTONE with SANDSTONE (Map Unit: Rv):	Very Low to Low Strength	21	-	35	120	1660	0.2
INTERBEDDED MUDSTONE/SANDSTONE with SILTSTONE (Map Unit: Rvvl):	Low to Medium Strength	21	-	32	100	1660	0.2

Note: Undrained Shear Strength values estimated from in-situ test results.

7.2 Building Foundations

It is understood the proposed development will comprise a three storey medical facility with 1 level of underground car parking with a design level of 55.8 m AHD. To achieve the proposed design level, a retaining wall is required to be constructed along the east of the site (along New Town Road) to retain the fill material and underlying bedrock. Based on the ground conditions encountered during the investigations, two cross-sections have been developed and presented in Figure 5, which run north-south and northeast-southwest across the site.

The cross-sections indicates that once the development site is excavated to a design RL of 55.8 m AHD, a significant thickness of fill material is present to the north and north-east of the site, with up to 4 m thickness of fill material expected to the north (GT02). Figure 4 presents an isopach of the elevation of the base of the fill material.

Based on the presence of the shallow bedrock under the majority of the site, GES recommend placing the foundations of the proposed development on slightly weathered mudstone/sandstone/siltstone. This will require deeper excavation works to the north of the site to remove all fill material and place pad footings onto the underling bedrock, or alternatively leave remaining fill material *in-situ* and progress shallow piers through to the underlying bedrock. It should be noted that due to the spacing of the deeper investigation boreholes, lateral and vertical variability in ground conditions may be expected in depth of rock.

7.2.1 Pad Footings

Table 7 presents the estimated ultimate and allowable bearing capacities for pad footings, assuming a 1 m embedment depths slightly weathered bedrock under the entire site. High variability of rock strength was encountered over the site. Therefore, conservative rock strengths have been considered to allow for this. GES are not recommending founding the pads on the extremely weathered material or fill material, which should be removed during excavation works. The bearing capacities have been estimated based on point load (PLSI) and unconfined compressive strength (UCS) results and a Factor of Safety (FOS) of 2.5 has been applied.

Table 7 Estimated Bearing Capacities for Pad Footings

Material	*Excavation elevation (m AHD)*	*Ultimate Bearing Capacity (kPa)*	*Allowable Bearing Capacity (kPa)**
MUDSTONE/SANDSTONE: Slightly weathered	51	860	345

Note: Allowable bearing capacities have been calculated using rock mass characteristics & point load index strength/uniaxial compressive strength test results using a IS50 to UCS conversion factor of 16 and an allowable safety factor of 2.5

Based on the ultimate bearing capacities and pad founding depths outlined in Table 7, for 2 m square pad footings, settlement of less than 10 mm is expected. However, settlements of pads depend on the actual pad type and pad layout (pad diameter, founding depths, etc.) and rock mass condition encountered. At this stage, no detailed settlement analysis has been carried out.

7.2.2 Pile Foundations

GES have provided pile/pier foundation design parameters to place foundations through the deep fill material encountered to the north-east of the site. The piers are to be socketed into the competent (slightly weathered) bedrock to resist axial and lateral loads. GES have not assigned properties to the heterogeneous fill material or the residual clays, which are irregularly distributed.

Table 8 presents preliminary design values for bored piers, assuming a pile diameter of 900 mm, boring through up to 4 m thickness of fill material to the north-east of the site, end-bearing into slightly weathered bedrock (mudstone, siltstone and sandstone). Pile design parameters have been estimated based on the strength properties, rock mass characteristics including joint spacing and joint aperture of the rocks encountered. The table includes ultimate values for skin friction and end bearing for use in pile design. At this stage, no settlement analysis has been carried out for deep pile foundations due limited data available.

Table 8 Preliminary Pile Design Parameters

Material	*Elevation Range to top of Unit (m AHD)*	*Ultimate Skin Friction (kPa)a,*	*Ultimate End Bearing (kPa)b*
FILL	NA	NA	
SILTY CLAY (CH)		NA	NA
MODERATELY WEATHERED BEDROCK	50.78 – 51.34	NA	400
SLIGHTLY WEATHERED BEDROCK	46.58 – 49.34	150	1200

a - Assumes typical socket roughness achieved
b - Assumes clean socket and base of bored pile and rock strengths encountered in GT02, GT05 and GT03.
c - Minimum of 3 pile diameters into slightly weathered bedrock
NA - Not Applicable

Based on the weathering profiles observed, GES recommend a minimum pile embedment depth of three (3) pile diameters into slightly weathered bedrock.

It is recommended for GES to observe pile boring activities to identify when suitable end-bearing materials (slightly weathered bedrock) has been achieved.

7.3 Construction Considerations and Recommendations

7.3.1 Earthworks Recommendations

During construction, the following earthworks recommendations should be adhered to:

- Uncontrolled, contaminated fill and organic materials at footing and subgrade locations should be stripped and removed appropriately from site. This may require multiple stockpiles to separate contaminated and non-contaminated fill materials;
- Earthworks are to be carried out in accordance with methods outlined in AS 3798-2007;
- Clay, low strength rock and fill material encountered below the proposed basement levels should be stripped prior to construction; and
- Given the presence of deep fill and excavatable rock to the north-east of the site at depths of up to 4 m below the proposed basement level, a cost benefit analysis may indicate that an additional sub- basement carpark may be cost effective.

7.3.2 Site Excavation Considerations

- It is recommended for earthworks activities to be carried out during drier periods of the year. If this is carried out, the risk of water ponding, trafficability and clay softening (reducing shear strength of foundation material) will be reduced;
- Care should be taken to avoid disturbing the concrete foundation structures. Care should be taken to ensure that the base of the pad excavation is clear of any loose material, water or clay smear prior to pouring concrete;
- All surface water should be diverted away from the excavations;
- Excavation of fill materials and natural soils to required depths at all locations is likely to be achieved with relative ease with conventional hydraulic excavation machinery;
- Care should also be taken due to the underground services which are likely to be present below the surface fill on site;
- Although not recovered during the investigation, boulders and cobbles may be expected to be encountered within the fill materials, which was found to be highly variable. On encountering oversized materials, these should be removed from site;
- Construction contractors should be made aware of the fill that covers much of the site. Soil dermal contact, ingestion and dust inhalation risks have not been identified at the site. However, there remains the possibility that residual secondary hydrocarbons are present in soil and groundwater at the site from the former underground storage tanks, and as such ambient air in excavations will need to be screened for vapour inhalation and explosive risk by GES. Excavation spoil may contain contaminates including hydrocarbons and heavy metals, such that any excavated material must be tested and classified according to EPA IB105 prior to removal from site. When considering such earthworks activities, refer to GES's ESA report; and
- It is recommended that excavations be observed by a Geotechnical Engineer/Geologist during construction to ensure that founding conditions are consistent with those on which the design recommendations are based.

7.3.3 Unsupported Batters and Earth Retaining Systems

Based on the drawings provided, it is estimated the proposed retaining wall structure will be constructed along the eastern boundary of the site adjacent New Town Road. GES suggest a sheet pile retaining wall is likely to be suitable within the fill material. The retaining wall will be excavated up to 8 m below the existing ground surface towards the south-eastern corner of the site and 5 m depth to the north-east of the site. At these locations, a retaining structure is recommended, with most of the retaining material expected to comprise fill.

Table 9 presents the expected lateral earth pressures expected for retention works at this site.

Table 9 Lateral Earth Pressures and Unsupported Safe Batter Slopes

Material Type	Dry Density (kN/m^3)	*Internal Friction Angle ϕ'*	Cohesion c' (kPa)	Coefficient of At Rest Earth Pressure (Ko)	Coefficient of Active Earth Pressure (Ka)*	Coefficient of Passive Earth Pressure (Kp)*
FILL – Highly variable	15	18	5	0.69	0.53	1.90
RESIDUAL SOIL	17	23	5	0.61	0.44	2.30
MUDSTONE/ SANDTSONE /SILTSTONE	21	35	120	0.43	0.27	3.70

Note - *Vertical Dry Frictionless Wall Supporting Horizontal Soil

7.3.4 Pad Footing Construction Considerations

Water inflows may also be encountered during excavation which may cause softening of the founding material. Therefore, it is recommended that all clayey, loose or water affected material be removed from the base of all excavations prior to construction (as much as practically possible). Pads should be socketed into the mudstone/sandstone/siltstone with an equal embedment depth to width ratio.

It is also recommended that the foundation/pavement excavations be inspected by a suitably qualified professional in order confirm the foundations conditions are consistent with engineering design parameters and foundation embedment depths outlined above are suitable.

It is recommended that:

- Levelling and compaction of footprints with either natural rock fill or imported Class 1 fill should follow AS 1289 5.1.1;
- All earthworks onsite be compliant with AS3798-2007 “Guidelines for Earthworks on commercial and residential subdivision”;
- Stormwater be connected as soon as any roofing is sealed; and
- Drainage of the ground surface and pavements be designed to flow away from footing areas and towards stormwater discharge points.

7.3.5 Bore Pile Design Factors

In order to assess pile capacity, a Geotechnical Strength Reduction Factor as required by AS 2159-2009 should be applied to the above ultimate unit stresses in Table 8. For preliminary bored pile design, $\Phi g = 0.45$ is recommended. However, designers should make their own assessment of appropriate φg values based on the particular risk circumstances, experience and testing regime appropriate for their design and a different value may apply. Should load testing be undertaken on constructed piles, then a higher φg value may be adopted in accordance with the procedures of AS2159-2009. The Basic Geotechnical Strength Reduction Factor Φgb should be determined which can be affected by factors including:

- Boring method;
- Design experience and methods adopted;
- Level of construction control and performance monitoring; and
- Level of testing during installation;

It is recommended that skin friction from the encountered fill be neglected in calculating pile capacity. Skin friction should only be considered for piles that penetrate at least one (1) pile diameter into the competent bedrock.

7.3.6 Pile Construction Recommendations

In order for the skin frictions given in Table 8 to be adopted, the pile shaft must be free of clay smear and be rough. A suitable roughness is grooves and scratches about 5mm deep at an average spacing of 100mm to 200mm. With good drilling practices this level of roughness is generally achieved without the need for additional roughening.

It is recommended bored pile excavations be observed by an Engineering Geologist from GES during construction to ensure that founding conditions are consistent with those on which the design recommendations are based. Such observations should involve a full-time presence by GES during excavation, to assess materials encountered, and to allow the refinement of actual pile depths to achieve design loads.

Care should be taken to ensure that the base and sides of each pile excavation is clear of any loose material, water or clay smear prior to pouring concrete. Considering the possible difficulties in achieving thorough machine cleaning of the pile base and ability to undertake observations to confirm cleanliness, it is recommended that the bored pile designers consider a construction reduction factor, unless the piling contractor can demonstrate that a higher level of cleanliness can be achieved.

Due to the limited depth of investigation, groundwater may be as shallow as 6 m depth. An allowance for encountering shallow groundwater should be accounted for by the piling contractor.

7.3.7 Foundation Maintenance

Optimal foundation maintenance is concerned with keeping soils in the founding zone at low and constant moisture contents to limit ground surface movement. Ground surface movement associated with endemic soils on site have long term implications for footing maintenance and it is recommended that:

- Adequate consideration be given to drainage around the building as well as the entire site to prevent surface and subsurface moisture accumulation around footings;
- Stormwater be connected as soon as the roof is sealed; and
- Drainage of the ground surface and pavements be designed to flow away from footing areas and towards stormwater discharge points.

7.3.8 Site Seismic Factor

Based on the subsurface conditions encountered and the location of the site, it is considered that a site subsoil classification of Class Ce – shallow soil site, which on removal of soil and fill material and placement of footings on the underlying bedrock, the building can be classified as Class B_e. However, a Class Ce will remain for the retaining wall. A Site Hazard Factor (Z) of 0.03 is applicable in accordance with Section 4 of AS1170.4-2007 “Structural Design Actions Part:4 Earthquake actions in Australia”.

8 RECOMMENDATIONS

The following recommendations have been made by GES for further geotechnical investigation and consideration:

- GES does not recommend placing footings within the shallow clay-rich material or fill material, but on bedrock due to the likely significant settlement that will be encountered. GES have provided pad and pile foundation options for the proposed development given up to 4 m thickness of fill is present under the proposed design level;
- Given the presence of deep fill and excavatable rock to the north-east of the site at depths of up to 4 m below the proposed basement level, a cost benefit analysis may indicate that an additional sub-basement carpark may be cost effective;
- GES recommend an Engineering Geologist should observe foundation excavations during construction to ensure that founding conditions are consistent with those on which the design recommendations are based.

9 LIMITATIONS STATEMENT

This Assessment Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and the Swanbury Penglase ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that discussed in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible geotechnical parameter or soil contaminant over the whole area of the site. Soil and rock samples collected from the investigation area are assumed to be representative of the areas from where they were collected and not indicative of the entire site. The conclusions discussed within this report are based on observations and/or testing at these investigation points.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

10 REFERENCES

AS 1289.6.2.1 (2001). Australian Standards. Method 6.2.1: Soil strength and consolidation tests – Determination of the shear vane of soil – Field test using a vane. Methods of testing soils for engineering purposes. This Australian Standard was prepared by Committee CE-009. Testing of Soils for Engineering Purposes. It was approved on behalf of the Council of Standards Australia on 25 May 2001 and published on 12 July 2001.

AS1289 (2000). Australian Standard. Various methods as Prepared by Committee CE/9, Testing of Soils for Engineering Purposes. Approved on behalf of the Council of Standards Australia on 3 December 1999 and published on 28 February 2000.

AS1170.4 (2007). Australian Standard. Structural design actions. Part 4: Earthquake actions in Australia. prepared by Committee BD-006, General Design Requirements and Loading on Structures. It was approved on behalf of the Council of Standards Australia on 22 May 2007. This Standard was published on 9 October 2007.

AS1726 (2017). Australian Standard. Geotechnical site investigations. Prepared by Committee CE-015, Site Investigations. Approved on behalf of the Council of Standards Australia on 7 April 2017 and published on 2 May 2017.

AS4133.4.1 (2007). Australian Standard. Methods of testing rocks for engineering purposes. Method 4.1: Rock strength tests – Determination of point load strength index. Prepared by Committee CE-009 Approved on behalf of the Council of Standards Australia on 13 June 2007 2013 and published on 12 September 2007.

AS4133.4.2.1 (2013). Australian Standard. Methods of testing rocks for engineering purposes. Method 4.3.2: Rock strength tests – Determination of the deformability of rock materials in uniaxial compression – Rock strength less than 50 MPa. Prepared by Committee CE-009 Approved on behalf of the Council of Standards Australia on 4 September 2013 and published on 2 October 2013.

11 FIGURES

Figure 2 Borehole Layout Plan.

(Coordinate System: GDA94 MGA Zone 55)

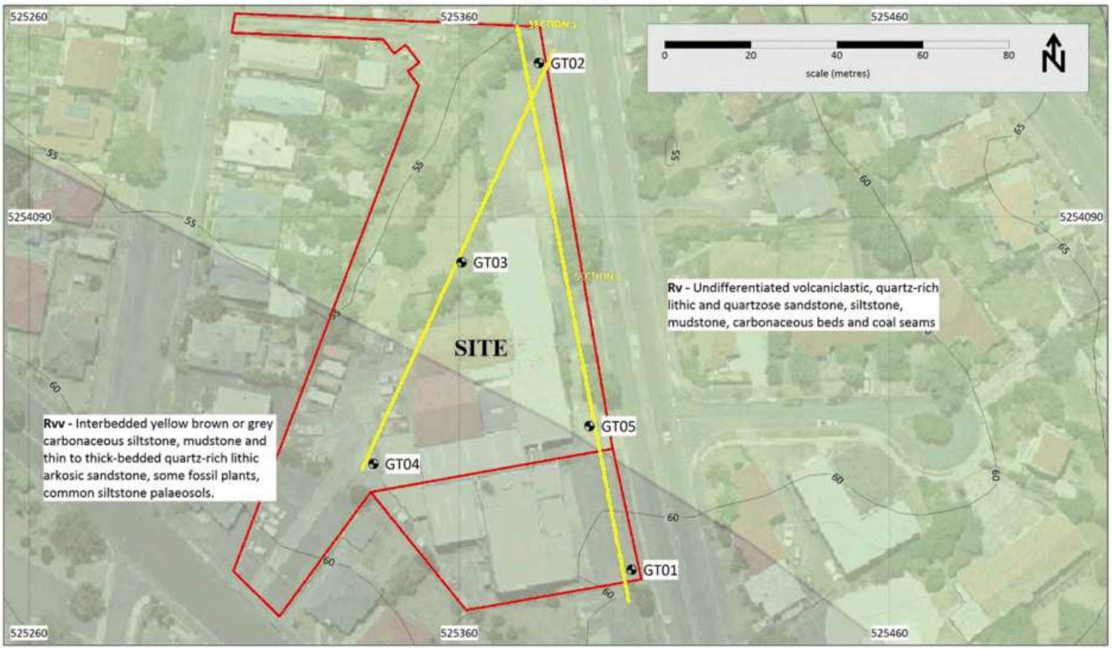

Figure 3 Site Geology

(Coordinate System: GDA94 MGA Zone 55)

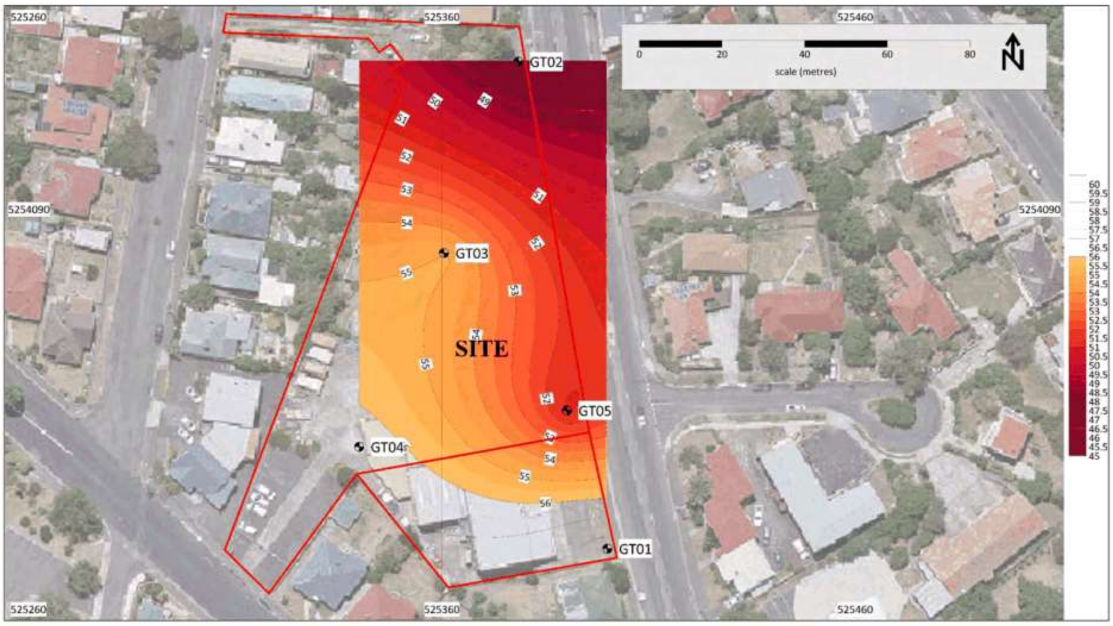

Figure 4 Elevation of the base of fill material encountered (area in read and orange and red indicates fill underlying expected design level of 55.8 m AHD)
(Coordinate System: GDA94 MGA Zone 55)

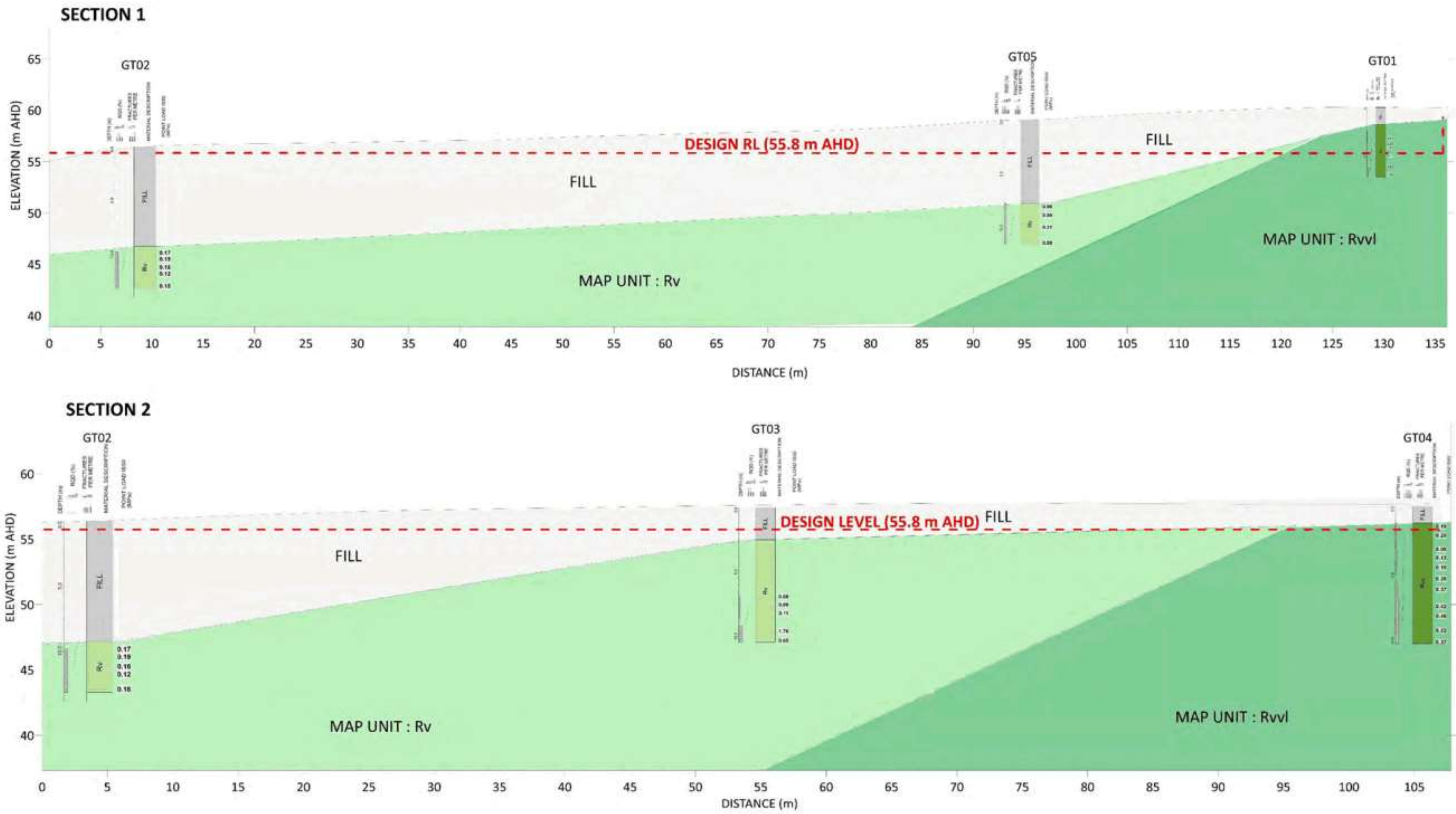

Figure 5 Geological Cross-Sections

APPENDIX A – Borehole Logs

GEO-ENVIRONMENTAL SOLUTIONS

EXPLANATORY NOTES FOR GEOTECHNICAL REPORTING

Introduction

These notes have been provided to assist in the interpretation of this geotechnical report in regards to classification methods, field procedures and terminology.

Geotechnical reporting is based on information gained from limited subsurface test boring and sampling, integrated with knowledge of local geology and geotechnical engineering experience. For this reason, these reports must be regarded as interpretive rather than factual documents, limited by the scope of data on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based largely on Australian Standard 1726 – Geotechnical Site Investigations (AS 1726), with reference to Australian Standard 1289 – Methods for testing soils for engineering purposes (AS 1289).

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 – 0.06mm
Fine/Medium Sand	0.06 – 2.0mm
Coarse Sand	2.0mm – 4.75mm
Gravel	4.75mm – 60.00mm

Grain size analysis is performed by two processes depending on particle size. Sand silt and clay particles are assessed using a standardised hydrometer test, and coarse sand and larger is assessed through sieving by USCS certified sieves. For more detail see the following section.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil and rock. Disturbed samples taken during drilling provide information on colour, lithology, grain sizes, horizon, rock unit etc. as well as some information on strength and structure.

Undisturbed samples are taken by pushing a thin walled sample tube into the soil and removing a sample of soil in a relatively undisturbed state. These samples provide information on soil bulk density, structure, strength, and are necessary for laboratory testing of linear shrinkage and atterburg limits where appropriate.

Drilling Methods

The following is a brief summary of drilling methods currently in use by Geo Environmental Solutions, along with some comments on their uses and applications.

Test Pits – These are excavated with a backhoe or a tracked excavator allowing close examination of the in-situ soils if it safe to do so. Any excavation over 1.5m deep is benched to ensure consultant safety. Test pitting allows for easy access to soil horizons of interest and ease of associated shear vane, DCP or PSP testing.

Hydraulic Direct Push Tube Sampling – A 1200mm solid push tube with a plastic inner liner is advanced into the ground by a hydraulic percussion hammer drill, and removed to extrude the sample. This is a highly reliably drilling method as the core of soil remains intact, and thus soil moisture and structure remains largely unchanged. The rig is mounted on a 4WD Nissan Patrol is highly mobile and simultaneously very capable.

Continuous Spiral Flight Augers – The hole is advanced using a 90-115mm diameter continuous spiral auger which can be withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in cohesive soils. Augering in non-cohesive soils, and in particular below any water table is ineffective with this drilling method. Samples returned are highly disturbed and as such make assessment of soil structure difficult. Information from the drilling is of relatively lower reliability due to remoulding, contamination or softening of samples by groundwater.

Rotary Air Blast Drilling – The hole is advanced by a rotary bit, with air being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only significant changes in stratification can be determined from the cuttings, together with some information from rate of penetration and drilling resistance.

Diamond Core Drilling – A continuous core samples is obtained using a diamond tipped core barrel, 62mm internal diameter. Providing full core recovery is achieved (which is not always possible in very weak rocks and granular or non-cohesive soils), this technique provides a very reliable method of investigation. A number of various geotechnical tests may be carried out on the core, such as point load testing of recovered material. The only downfall of this technique is that it is relatively expensive method of drilling.

Standard Penetration Tests – Standard penetration tests (SPT) are used in most soils types as a means of determining density of strength, however samples that are collected are often disturbed. The test procedure is described in AS 1289 Test 6.3.1.

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GENERAL SITE INVESTIGATION NOTES

The test is carried out in a borehole by driving a 50mm diameter split tube under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm may not be practicable, and the test is discontinued – indicated by 'Ref' on the logs.

SPT results are commonly displayed in two ways. In the case where full penetration is obtained with successive blow counts an N is provided in the logs. In the case where the test is discontinued short of full penetration an N value is replaced with 'Ref'. The results of the tests can be related empirically to the engineering properties of the soil.

Shear Vane Testing – This test is used for determining the shear strength of soils in the field by measuring the torque required to cause a vane of cruciform section to shear the soil, in accordance with AS 1289, method 6.2.1. The method is used for very soft to firm non-fissured clays. The advantage of this test is that it can be performed at any depth, in situ, in association with push tube sampling.

Point Load Testing – This test is used to determine the point load strength index of rock cores. This index test is performed by subjecting a rock specimen to an increasingly concentrated load until failure occurs by splitting the specimen. The concentrated load is applied through coaxial, truncated conical platens. The failure load is used to calculate the point load strength index and to estimate the uniaxial compressive strength.

DCP and PSP weighted penetrometer tests – Dynamic Cone Penetrometer (DCP) and Perth Sand Penetrometer (PSP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150mm increments of penetration. Normally, there is a depth limitation of 1.2m but this may be extended in certain conditions by the use of extension rods. The methods for the two tests are quite similar.

- Dynamic Cone Penetrometer – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS 1289, Test 6.3.2).
- Perth Sand Penetrometer – a 16mm diameter flat-ended rod is driven with a 9kg hammer, dropping 600mm (AS 1289 Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.

Bore Logs – The Bore Logs presented herein are an engineering and/or geological interpretation of the subsurface condition, and their reliability will depend to some extent on frequency of sampling and the method of drilling. The units are defined according to the geological map sheet referenced in the geology section of this report. Regardless of drilling process used, it is important to note that boreholes represent only a very small sample of the total subsurface profile. Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Groundwater – Where groundwater levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changed. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole is water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, seal in a particular stratum, may be advisable in low permeability soils or where there may be interference a perched water table.

Engineering Results – Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg a three story building), the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty story building).

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, Geo-Environmental Solutions cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will depend partly on bore spacing and sampling frequency.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, Geo Environmental Solutions will be pleased to assist in investigation or advice to resolve the matter.

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GENERAL SITE INVESTIGATION NOTES

Site Anomalies – In the event conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Geo Environmental Solutions requests that it be immediately notified.

Reproduction of Information for Contractual Purposes
Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Geo Environmental Solutions would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection – Geo Environmental Solutions will provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

GES

SOIL CLASSIFICATION FOR ENGINEERING PURPOSES

NON COHSIVE - SAND

Description	Code	Field Test	Relative Density	Dynamic Cone Penetrometer blows/150 mm	Perth Sand Penetrometer blows/150 mm	SPT, N blows/300 mm	CPT Resistance MPa
Very loose sand	NVLO	Easily penetrated with 13 mm reinforcing rod pushed by hand.	0 - 15	0 – 1.5	0 - 1	0 - 5	0 - 2
Loose sand	NLO	Easily penetrated with 13 mm reinforcing rod pushed by hand. Can be excavated with a spade; 50 mm wooden peg can be easily driven.	15 - 35	1.5 - 4.5	1-3	5-10	2-5
Medium dense sand	NMDE	Penetrated 300 mm with 13 mm reinforcing rod driven with 2 kg hammer, - hard shovelling.	35 - 65	4.5 – 12.0	3-4	10-30	5-15
Dense sand	NDE	Penetrated 300 mm with 13 mm reinforcing rod driven with 2 kg hammer, requires pick for excavation: 50 mm wooden peg hard to drive.	65 - 85	12.0 – 22.5	4-8	30 - 50	15 - 25
Very dense sand	NVDE	Penetrated only 25 - 50 mm with 13 mm reinforcing rod driven with 2 kg hammer.	85 - 100	>22.5	>8	>50	>25

COHESIVE - SILT & CLAY

Consistency	Code	Field Test	Undrained Shear Strength c_u Torvane (kPa)	Unconfined Compressive Strength q_u Pocket Penetrometer (kPa) **	Dynamic Cone Penetrometer blows/150 mm *	SPT, N blows/300 mm	CPT Resistance MPa
Very soft	CVSO	Easily penetrated >40 mm by thumb. Exudes between thumb and fingers when squeezed in hand.	<12	<25	<1.5	0 - 2	<0.2
Soft	CSO	Easily penetrated 10 mm by thumb. Moulded by light finger pressure	12-25	25 - 50	1.5 – 3.0	2 - 4	0.2 - 0.4
Firm	CFI	Impression by thumb with moderate effort. Moulded by strong finger pressure	25 - 50	50 - 100	3.0 – 5.0	4 - 8	0.4 - 0.8
Stiff	CST	Slight impression by thumb cannot be moulded with finger.	50 - 100	100 - 200	5.0 – 10.0	8 - 15	0.8 - 1.5
Very Stiff	CVST	Very tough. Readily indented by thumbnail.	100 - 200	200 - 400	10.0 – 19.0	15 - 30	1.5 - 3.0
Hard	CHARD	Brittle. Indented with difficulty by thumbnail.	>200	>400	>19.0	>30	>3.0

NON COHESIVE - GRAVEL

Description	Code	Field Test	SPT	CPT Resistance
Loose	NLO	By inspection of voids and particle packing	See sand	Divide result by 2 and use sand
Dense	NDE			

GES

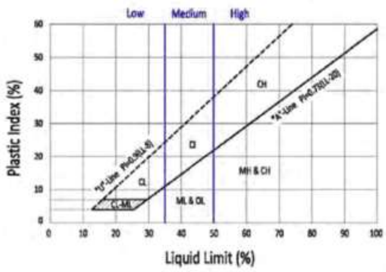
SOIL CLASSIFICATION FOR ENGINEERING PURPOSES

SOIL MOISTURE	
Code	**Description**
W	Wet
M	Moist
SM	Slightly Moist
D	Dry

Major Divisions		Particle size mm	USCS Group Symbol	Typical Names	Laboratory Classification					
						% < 0.075 mm (2)	Plasticity of fine fraction	$C_u = \frac{D_{60}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})}$	NOTES
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	BOULDERS	200								
	COBBLES	63								
	GRAVELS (more than half of coarse fraction is larger than 2.36 mm)	coarse 20 medium 6 fine 2.36	GW	Well graded gravels and gravel-sand mixtures, little or no fines	Use the gradation curve of material passing 63 mm for classification of fractions according to the criteria given in 'Major Divisions'	0-5	—	>4	Between 1 and 3	(1) Identify fines by the method given for fine-grained soils.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels		0-5	—	Fails to comply with above		
			GM	Silty gravels, gravel-sand-silt mixtures (1)		12-50	Below 'A' line or PI<4	—	—	
			GC	Clayey gravels, gravel-sand-clay mixtures (1)		12-50	Above 'A' line and PI>7	—	—	(2) Borderline classifications occur when the percentage of fines (fraction smaller than 0.075 mm size) is greater than 5% and less than 12%. Borderline classifications require the use of SP-SM, GW-GC.
	SANDS (more than half of coarse fraction is smaller than 2.36 mm)	coarse 0.6 medium 0.2 fine 0.075	SW	Well graded sands and gravelly sands, little or no fines		0-5	—	>6	Between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		0-5	—	Fails to comply with above		
			SM	Silty sands, sand silt mixtures (1)		12-50	Below 'A' line or PI<4	—	—	
			SC	Clayey sands, sand-clay mixtures (1)		12-50	Above 'A' line and PI>7	—	—	
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	SILTS & CLAYS (Liquid Limit ≤50%)		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity		Plasticity Chart				
			CL CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays						
			OL	Organic silts and clays of low plasticity						
	SILTS & CLAYS (Liquid Limit >50%)		MH	Inorganic silts, mic- aceous or diato-maceous fine sands or silts, elastic silts						
			CH	Inorganic clays of high plasticity, fat clays						
			OH	Organic silts and clays of high plasticity						
	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils						

Plasticity Chart

For classification of fine grained soils and fine fraction of coarse grained soils.



GES ROCK CLASSIFICATION FOR ENGINEERING PURPOSES

Degree of Weathering

Code	ISRM GRADE	Description		Decolourant Extent	Fracture Condition	Surface Characteristics
F	1	**FRESH**, Rock shows no sign of decomposition or staining.		None	Closed or discoloured	Unchanged
SW	2	**SLIGHTY WEATHERED**, Rock is slightly discoloured but shows little or no change of strength from fresh rock.		<50% has modest discolouration	Discoloured may contain thin filling	Partial discolouration
MW	3	**MODERATLY WEATHERED**, Modest discolouration is evident throughout the rock fabric, often with some change in the constituent minerals. The intact rock strength is usually noticeably weaker than that of the fresh rock.	Distinctly Weathered	>50% has modest discolouration	Discoloured may contain thick filling	Partial to complete discolouration, not friable except poorly cemented rocks
HW	4	**HIGHLY WEATHERED**, Strong discolouration is evident throughout the rock mass, often with significant change in the constituent minerals. The intact rock strength is generally much weaker than that of the fresh rock.	Distinctly Weathered	100% has strong discolouration	Filled with alteration minerals	Friable and possible pitted
XW	5	**EXTREMELY WEATHERED**, Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded in water, but substance fabric and rock structure still recognisable.		100% has strong discolouration	Filled with alteration minerals	Resembles soil
RS	6	**RESIDUAL SOIL**, All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.		100% has strong discolouration	N/A	Resembles soil

Rock Strength

Term	Symbol	Field Guide*	Point Load Index [$I_{S(50)}$] MPa	Approx Unconfined Compressive Strength (q_u)
Extremely Low	EL	Easily remoulded by hand to a material with soil properties.	<0.03	<0.6
Very Low	VL	Material crumbles under firm blows with sharp end of geological pick; can be peeled with a knife; too hard to cut a triaxial sample by hand. SPT will refuse. Pieces up to 30mm thick can be broken by finger pressure.	0.03 – 0.1	0.6 – 2
Low	L	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the geological pick point; has dull sound under hammer. A piece of core 150mm long by 40mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	0.1 – 0.3	2 – 6
Medium	M	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.	0.3 – 1	6 – 20
High	H	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken with geological pick with a single firm blow; rock rings under hammer.	1 – 3	20 – 60
Very High	VH	Hand specimen breaks with geological pick after more than one blow; rock rings under hammer.	3 – 10	60 – 200
Extremely High	EH	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.	>10	>200

Note that these terms refer to strength of rock and not to the strength of the rock mass, which may be considerably weaker due to rock defects.

* The field guide visual assessment of rock strength may be used for preliminary assessment or when point load testing is not able to be done.

** AS1726

*** The approximate unconfined compressive strength (q_u) shown in the table is based on an assumed ratio to the point load index (PLI) of 20:1. This ratio may vary widely. This ratio applies unless specific rock calibration studies have been conducted for the site.

GES ROCK CLASSIFICATION FOR ENGINEERING PURPOSES

Degree of Fracturing

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks. The orientation of rock defects is measured as an angle relative to a plan perpendicular to the core axis.

Note the recording of actual spacing and range of spacing is preferred in place of the terms below.

Term	Description
Fragmented	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter.
Highly fractured	Core lengths are generally less than 20mm to 40mm with occasional fragments.
Fractured	Core lengths are mainly 30mm to 100mm with occasional shorter and longer sections.
Slightly fractured	Core lengths are generally 300mm to 1000mm with occasional longer sections and occasional sections of 100mm to 300mm.
Unbroken	The core does not contain any fracture.

Rock Quality Designation (RQD)

This is defined as the ratio of sound (ie low strength or better) core in lengths of greater than 100mm to the total length of the core, expressed in precent. If the core is broken by handling or by the drilling process (i.e. fracture surfaces are fresh, irregular breaks rather than joint surfaces), the fresh broken pieces are fitted together and counted as one piece.

Bedding/Foliation Spacing

Code	Term	Spacing
VWB	Very Widely Bedded/Foliated	>2m
WB	Widely Bedded/Foliated	0.6 – 2m
MB	Moderately Bedded/Foliated	0.2 – 0.6m
CB	Closely Bedded/Foliated	0.06 – 0.2m
VCB	Very Closely Bedded/Foliated	20mm – 60mm
L	Laminated	6mm – 20mm
CL	Closely Laminated	<6mm

GES ROCK CLASSIFICATION FOR ENGINEERING PURPOSES

Defect Type

Code	Structure
FO	Natural foliation parting or fracture.
BD	Natural bedding plane fracture.
JT	Natural geological joint.
FT	Geological fault with slickensides.
VN	Vein cemented with infill.
CO	Geological contact.
SH	Shear zone (zone of closely spaced shear fractures not classed as FT).
XX	Zone of multiple core breaks induced by drilling.

Defect Roughness

Code	Description	Jr	JRC	Amplitude
PP	Planar – Polished/Slickensided	0.5	0.5	0.1%
PS	Planar – Smooth	1	1.5	0.4%
PR	Planar – Rough	1.5	2.5	0.5%
UP	Undulating – Polished/Slickensided	1.5	7	1.5%
US	Undulating – Smooth	2	11	2.0%
UR	Undulating – Rough	3	14	3.0%
SP	Stepped – Polished/Slickensided	2	11	2.0%
SS	Stepped – Smooth	3	14	3.0%
SI	Stepped - Irregular	4	20	4.5%

GEO-ENVIRONMENTAL SOLUTIONS

Log of GT01

PROJECT:	48-52 New Town Road		
CLIENT:	JSA Consulting Engineers	EASTING (GDA94):	525399.8
LOCATION:	New Town	NORTHING (GDA94):	5254008
SAMPLING METHOD:	Rotary Drilling; AZIMUTH: 0; INCLINATION: -90	ELEVATION (m ~AHD):	60.324; TOTAL DEPTH (m): 7.1
CONTRACTOR:	Tasmanian Drilling Services	WATER TABLE (m BGS):	Not Encountered
DRILL RIG:	Drillmac 500 Explorer	LOGGED BY:	MT; NATURAL GROUND (m): 1.75
METHOD/INTERVAL:	Auger to 2.5 m; HQ coring below 2.5 m	DATE STARTED:	25.07.18; DATE FINISHED: 25.07.18

Column headings: DEPTH (m) | STRENGTH INDEX – SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH | SPT BLOWS (N) 0 10 20 30 | DCP Bearing Cap. (FS 2) | Point Load Is(50) | SHEAR VANE Cu (FS 2) | HAND PENOTROM Undrained Shear Strength (kPa) | UCS (kPa) | WEATHERING | USCS / JOINT SET # | % CORE RECOVERY | % RQD | FRACTURES SPACING (CM) 0 50 100 | DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM) | DESCRIPTION | DEPTH (m) | GEOLOGICAL UNIT | STAND PIPE DETAILS | ELEVATION (m AHD)

Depth (m)	Description	USCS	% Core Recovery	Geological Unit
0.0	ASPHALT		100	FILL
	CONCRETE		100	FILL
	FILL: Sandy clayey GRAVEL: Brown, medium dense, fine to coarse grained, moist, low plasticity. Gravel comprises fine to coarse angular brick, glass, dolerite and mudstone.	GP	83	FILL
	FILL: Layer of brick and concrete.		100	FILL
	FILL: Sandy CLAY: Brown, firm becoming stiff, moist, high plasticity. Contains occasional fragments of brick.	CH	100	FILL
	SILT: Pale brown, stiff, non-plastic, moist.	ML	100	
	Silty CLAY: Pale brown mottled orange, stiff, medium to high plasticity, moist.	CH	100	
2.5	SANDSTONE INTERBEDDED WITH MUDSTONE: Fine to medium grained, pale grey brown, medium strength, slightly weathered. Occasional 20 degree joint. Bedding fractures are 150 mm spaced, sub-horizontal, clean. Sandstone is quartz rich		100 (RQD 28, fractures 7)	Rvv
	MUDSTONE: Fine grained, pale yellow brown, medium strength, slightly weathered, thinly laminated. Fractures are generally sub-horizontal with occasional 10-45° joints, closely spaced.		97 (RQD 31, fractures 15)	Rvv
	SANDSTONE: Quartz rich, fine to medium grained, pale			Rvv

SPT blows: 5, 3, 8; N = 11

Point Load Is(50): 0.81, 0.87, 1.01, 0.11

Weathering: SW

# Defects	Defect Type	Roughness	Alteration	Appeture (mm)	Alpha°	Beta°	Infill Type	Infill Thickness (mm)
5	BD	UR	C	2.0	80			
1	JT	PR	C		15			
5	BD	PR	C	2.0	85			
1	JT	PR	C	2.0	45		FE	
5	BD	PR	C	1.0	80		FE	
2	JT	PR	C	1.0	10		FE	
7	BD	PR	C	1.0	85		FE	
4	BD	PR	H1	5.0	80		CY	5.0

Elevation (m AHD) scale: 60.0, 59.6, 59.2, 58.8, 58.4, 58.0, 57.6, 57.2, 56.8, 56.4, 56.0, 55.6, 55.2

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road

Log of GT01

CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525399.8	
LOCATION: New Town		NORTHING (GDA94): 5254008	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 60.324	TOTAL DEPTH (m): 7.1
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Not Encountered	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 1.75
METHOD/INTERVAL: Auger to 2.5 m	HQ coring below 2.5 m	DATE STARTED: 25.07.18	DATE FINISHED: 25.07.18

Depth (m)	Point Load Is(50)	% Core Recovery	% RQD	Fractures Spacing (cm)	# Defects	Defect Type	Roughness	Alteration	Aperture (mm)	Alpha°	Description	Elevation (m AHD)
5.5		100	36	10	6	BD	PR	C	1.0	80	grey brown, medium strength, slightly weathered. Sandstone contains rounded inclusions of mudstone (<10 mm).	54.8
6.0	0.29				1	JT	UR	C	1.0	15		54.4
6.5		100	74	20	4	BD	PR	C	1.0	80	MUDSTONE: Fine grained, pale yellow brown, medium strength, slightly weathered, thinly laminated. Fractures are generally sub-horizontal with occasional 10-45° joints, closely spaced. Borehole terminated at 7.1 m depth on reaching target depth.	54.0
7.0	1.03											53.6

Column headings also printed: STRENGTH INDEX (SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH), SPT BLOWS (N) 0 10 20 30, DCP Bearing Cap. (FS 2), SHEAR VANE Cu (FS 2), HAND PENOTROM Undrained Shear Strength (kPa), UCS (kPa), WEATHERING, USCS / JOINT SET #, BETA°, INFILL TYPE, INFILL THICKNESS (MM), GEOLOGICAL UNIT, STAND PIPE DETAILS.

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road

Log of GT02

CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525378.5	
LOCATION: New Town		NORTHING (GDA94): 5254126	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 56.38	TOTAL DEPTH (m): 13.2
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Not Encountered	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 9.25
METHOD/INTERVAL: Auger to 4.55 m	NQ coring below 4.55 m	DATE STARTED: 26.07.18	DATE FINISHED: 26.07.18

Depth (m)	SPT Blows (N)	USCS	% Core Recovery	Weathering	Description	Geological Unit
0.0			100		ASPHALT	FILL
0.0–0.5		SP	100		FILL: Gravelly silty SAND: Pale yellow brown, fine to coarse grained, medium dense, non-plastic, dry. Gravel comprises dolerite, rare charcoal fragments.	FILL
0.5–1.0		CL	100		FILL: Sandy gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is rounded and angular siltstone, brick and charcoal.	FILL
1.0–3.0	2, 3, 2 (N=5); 3, 4, 6 (N=10)	CI	100		FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occasional fragments of ceramic and brick.	FILL
3.0–3.7	6, 4, 4 (N=8)	CH	100		FILL: CLAY with gravel: Dark brown, stiff, moist, high plasticity. Contains gravels of dolerite, siltstone, brick, glass, charcoal fragments.	FILL
3.7–4.55	5 REF	CI	100		FILL: Gravelly sandy CLAY: Yellowish brown, stiff, medium plasticity, moist. Gravel comprises angular dolerite.	FILL
4.55–			8	CW	ZONE OF CORE LOSS (Blocked core barrel): Inferred as FILL: grey brown extremely low strength, completely weathered argillaceous sandstone.	FILL

Elevation (m AHD) scale: 56.0, 55.6, 55.2, 54.8, 54.4, 54.0, 53.6, 53.2, 52.8, 52.4, 52.0, 51.6, 51.2

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839

Page 1 of 3

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of GT02

PROJECT: 48-52 New Town Road			
CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525378.5	
LOCATION: New Town		NORTHING (GDA94): 5254126	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 56.38	TOTAL DEPTH (m): 13.2
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Not Encountered	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 9.25
METHOD/INTERVAL: Auger to 4.55 m	NQ coring below 4.55 m	DATE STARTED: 26.07.18	DATE FINISHED: 26.07.18

Column headings: DEPTH (m); STRENGTH INDEX – SOIL (V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD), ROCK (EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH); SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM Undrained Shear Strength (kPa), UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS (# DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM)); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

Depth interval (m)	Point Load Is(50)	Weathering	% Core Recovery	% RQD	Fractures spacing	Defects	Description
~5.6 – 6.8		SW	87			5 BD PR C 1.0 85 1 BD PR H2 15.0 80 CY 15.0 5 BD UR C 5.0 65 1 JT UR C 3.0 35 1 JT UR C 3.0 35	FILL/SANDSTONE BOULDER: Grey brown, fine to medium grained, low to medium strength, slightly weathered, thinly bedded. Bedding dipping ~85 degrees.
~6.8 – 9.25			21				FILL: recovered as clay and dolerite rounded gravels, occasional shards of metal. Clay is dark grey high plasticity.
9.25 – ~9.8		MW	82	0	2	11 BD PR H1 2.0 90 CY 2.0	MUDSTONE INTERBEDDED WITH SILTSTONE: Dark grey and black, interlaminated, fine grained, low strength, distinctly weathered.
~9.8 –	0.17 0.19					2 BD PR C 90	MUDSTONE INTERBEDDED WITH SILTSTONE: Dark grey and black, interlaminated, fine grained, low strength, slightly weathered. Carbonaceous/organic. Slump structures and swaley bedding present

Depth scale (m): 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5
Elevation scale (m AHD): 50.8, 50.4, 50.0, 49.6, 49.2, 48.8, 48.4, 48.0, 47.6, 47.2, 46.8, 46.4, 46.0

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road		Log of GT02	
CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525378.5	
LOCATION: New Town		NORTHING (GDA94): 5254126	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 56.38	TOTAL DEPTH (m): 13.2
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Not Encountered	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 9.25
METHOD/INTERVAL: Auger to 4.55 m	NQ coring below 4.55 m	DATE STARTED: 26.07.18	DATE FINISHED: 26.07.18

DEPTH (m)	Point Load Is(50)	WEATHERING	% CORE RECOVERY	% RQD	FRACTURES SPACING (CM)	# DEFECTS	DEFECT TYPE	ROUGHNESS	ALTERATION	ALPHA°	DESCRIPTION	GEOLOGICAL UNIT	ELEVATION (m AHD)
											throughout. Borehole terminated at 13.2 m depth on reaching target depth.		45.6
11.0													45.2
	0.16											Rv	
11.5		SW	100	78	40								44.8
	0.12												
12.0						3	BD	PR	C	85			44.4
						2	BD	PR	C	85			
12.5													44.0
													43.6
13.0	0.18												43.2

Other columns (no entries): STRENGTH INDEX — SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); SHEAR VANE Cu (FS 2); HAND PENOTROM Undrained Shear Strength (kPa); UCS (kPa); USCS / JOINT SET #; APPETURE (MM); BETA°; INFILL TYPE; INFILL THICKNESS (MM); STAND PIPE DETAILS.

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839 | Page 3 of 3

GES GEO-ENVIRONMENTAL SOLUTIONS

Log of GT03

PROJECT: 48-52 New Town Road			
CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525361.3	
LOCATION: New Town		NORTHING (GDA94): 5254078	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 57.58	TOTAL DEPTH (m): 10.45
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Not Encountered	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 6.83
METHOD/INTERVAL: Auger to 6.83 m	HQ coring below 6.83 m	DATE STARTED: 27.07.18	DATE FINISHED: 27.07.18

Column headings: DEPTH (m); STRENGTH INDEX – SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM: Undrained Shear Strength (kPa), UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

USCS	% CORE RECOVERY	DESCRIPTION	GEOLOGICAL UNIT
CI	100	TOPSOIL: CLAY: Dark brown, firm, medium plasticity, moist. Rootlets present.	FILL
CI	100	FILL: Sandy gravelly CLAY: Dark brown, firm to stiff, moist, medium plasticity. Gravel comprise, brick, ceramic, glass and dolerite fragments.	FILL
CI	100	FILL: Sandy gravelly CLAY: Dark brown, firm to stiff, moist, medium plasticity. Gravel comprises ceramic and siltstone.	FILL
CI	100	FILL: Gravelly sandy CLAY: Pale grey brown, stiff, medium plasticity, slightly moist. Gravel comprises fine to coarse angular dolerite and ceramic.	FILL
CH	100	Silty CLAY trace sand and gravels: Pale grey brown, stiff, moist, high plasticity. Gravels are fine to coarse angular dolerite.	

Depth scale (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0

Elevation scale (m AHD): 57.2, 56.8, 56.4, 56.0, 55.6, 55.2, 54.8, 54.4, 54.0, 53.6, 53.2, 52.8, 52.4

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road		**Log of GT03**
CLIENT: **JSA Consulting Engineers**		EASTING (GDA94): **525361.3**
LOCATION: **New Town**		NORTHING (GDA94): **5254078**
SAMPLING METHOD: **Rotary Drilling**	AZIMUTH: **0** INCLINATION: **-90**	ELEVATION (m ~AHD): **57.58** TOTAL DEPTH (m): **10.45**
CONTRACTOR: **Tasmanian Drilling Services**		WATER TABLE (m BGS): **Not Encountered**
DRILL RIG: **Drillmac 500 Explorer**		LOGGED BY: **MT** NATURAL GROUND (m): **6.83**
METHOD/INTERVAL: **Auger to 6.83 m**	**HQ coring below 6.83 m**	DATE STARTED: **27.07.18** DATE FINISHED: **27.07.18**

Column headings: DEPTH (m); STRENGTH INDEX — SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM Undrained Shear Strength (kPa); UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

Depth (m)	SPT (N)	Point Load Is(50)	Weathering	% Core Recovery	% RQD	Fractures	Defects (# / type / roughness / alteration / aperture / alpha / infill)	Description	Geological unit
~6.7	28								Rv
7.0		0.08	MW	85	39	6	2 JT PR C 1.0 40 FE	SANDTSONE AND MUDSTONE : Orangish brown and dark grey, interlaminated, fine grained, low strength, slightly weathered locally distinctly weathered. Bedding is sub-horizontal with occasional iron stained jointing throughout. Sandstone is argillaceous.	Rv
7.3							6 BD PR C 85		
7.6		0.09							
8.0							3 BD PR C 86		
8.2		0.11					4 bd PR C		
8.3							1 JT PR C 15		
8.5							2 JT PR C 16		
8.8							20BD PR C		
9.0			HW	76	0	12		Vertical fracture, core softened by drilling, non-intact.	
9.6		1.76	SW	100	94		3 BD PR C FE	SANDSTONE INTERBEDDED MUDSTONE: Fine to medium grained, pale grey brown, low to medium strength, slightly weathered. Borehole terminated at 10.45 m depth on reaching target depth.	
10.0							1 BD PR C FE		
10.4		0.05							

Depth scale: 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0
Elevation scale (m AHD): 52.0, 51.6, 51.2, 50.8, 50.4, 50.0, 49.6, 49.2, 48.8, 48.4, 48.0, 47.6, 47.2

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839 | Page 2 of 2

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of GT04

PROJECT:	48-52 New Town Road		
CLIENT:	JSA Consulting Engineers	EASTING (GDA94):	525340
LOCATION:	New Town	NORTHING (GDA94):	5254032
SAMPLING METHOD:	Rotary Drilling AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 57.69	TOTAL DEPTH (m): 9.96
CONTRACTOR:	Tasmanian Drilling Services	WATER TABLE (m BGS):	Not Encountered
DRILL RIG:	Drillmac 500 Explorer	LOGGED BY: MT	NATURAL GROUND (m): 1.2
METHOD/INTERVAL:	Auger to 2.75 m / HQ coring below 2.75 m	DATE STARTED: 30.07.18	DATE FINISHED: 30.07.18

Column headings: DEPTH (m); STRENGTH INDEX – SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM: Undrained Shear Strength (kPa), UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

Core / test data

Point Load Is(50)	Weathering	USCS	% Core Recovery	% RQD	Fractures
			100		
			100		
		CH	86		
0.19					
	SW		97	41	11
0.25					
	MW		100	0	10
0.09					
0.13					
	SW		100	35	9
0.16					
	MW		100		
0.28					

Defects

# Defects	Defect Type	Roughness	Alteration	Appeture (mm)	Alpha°	Beta°	Infill Type	Infill Thickness (mm)
5	BD	PR	C	1.0	90			
4	BD	PR	C	1.0	90			
4	BD	PR	C	1.0	90			
1	JT	PR	C	1.0	15		FE	
5	BD	PR	D	1.0	85		CY	
2	BD	PR	B	1.0	90			
10	BD	PR	C	1.0	80		CY	
2	BD	PR	B	1.0	90			
1	JT	PR	C	1.0	35		FE	1.0
1	JT	UR	C	1.0	15			
1	JT	PR	C	2.0	18		CY	2.0
2	BD	PR	B	1.0	85			
1	JT	UR	B	1.0	25		FE	2.0
1	BD	PR	H2	5.0	85		CY	5.0
3	BD	PR	C	1.0	60			1.0
1	JT	UR	B	20.0	45		CA	20.0
1	JT	UR	C		50			2.0

Description

CONCRETE

FILL: Gravelly sandy CLAY: Pale grey, firm, fine to medium grained, angular, moist to wet, high plasticity. Gravel comprises dolerite and siltstone.

FILL: Sandy CLAY with gravel: Dark brown, firm, moist, high plasticity. Contains fine to coarse angular gravels of brick, dolerite and siltstone.

SANDSTONE: Fine grained, pale yellow brown, low to medium strength, slightly weathered.

SANDSTONE: Fine grained, pale yellow brown, low strength, distinctly weathered.

SANDSTONE: Fine grained, pale yellow brown, very low to low strength, slightly weathered.

SILTSTONE: Fine grained, pale yellow brown, mottled red, low strength, distinctly weathered. Contains multiple healed bedding

Geological unit: FILL

Depth (m): 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0

Elevation (m AHD): 57.6, 57.2, 56.8, 56.4, 56.0, 55.6, 55.2, 54.8, 54.4, 54.0, 53.6, 53.2, 52.8, 52.4

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839 | Page 1 of 2

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	48-52 New Town Road	Log of	GT04
CLIENT:	**JSA Consulting Engineers**	EASTING (GDA94):	**525340**
LOCATION:	**New Town**	NORTHING (GDA94):	**5254032**
SAMPLING METHOD:	**Rotary Drilling** AZIMUTH: **0** INCLINATION: **-90**	ELEVATION (m ~AHD): **57.69**	TOTAL DEPTH (m): **9.96**
CONTRACTOR:	**Tasmanian Drilling Services**	WATER TABLE (m BGS):	**Not Encountered**
DRILL RIG:	**Drillmac 500 Explorer**	LOGGED BY: **MT**	NATURAL GROUND (m): **1.2**
METHOD/INTERVAL:	**Auger to 2.75 m** / **HQ coring below 2.75 m**	DATE STARTED: **30.07.18**	DATE FINISHED: **30.07.18**

Columns: DEPTH (m); STRENGTH INDEX – SOIL (V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD) – ROCK (EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH); SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM Undrained Shear Strength (kPa); UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS (# DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM)); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

Point Load Is(50): 0.37 (approx. 6.0 m), 0.42, 0.46, 0.22, 0.37

Weathering: SW

% Core Recovery / % RQD / Fracture spacing: 100 / 47 / 8; 100 / 83 / 50

# Defects	Defect Type	Roughness	Alteration	Appeture (mm)	Alpha°	Beta°	Infill Type	Infill Thickness (mm)
5	JT	PR	C		35		FE	2.0
1	JT	PR	C		35		FE	2.0
1	BD	UR	C		80			
2	JT	PR	C		26			2.0
1	BD	PR	B		90			
2	JT	PR	C		40		FE	1.0
1	BD	PR	B		10		FE	1.0
3	JT	PR	B		25		FE	1.0
1	BD	PS	B		90		FE	
1	BD	UR	B		80			
1	JT	PR	H2		50		CY	10.0
1	JT	PS			0			
1	JT	PS	B		10		FE	
2	JT	PS	B		10		FE	
1	JT	PS	B		30		FE	

DESCRIPTION:

...multiple healed bedding fractures and joints infilled with calcite.

SANDSTONE: Fine grained, pale yellow brown, low to medium strength, slightly weathered.

SILTSTONE: Fine grained, pale yellow brown and dark grey, medium strength, slightly weathered. Contains occasional sub-vertical joints throughout with iron stained surfaces. Thinly interlaminated, siliceous. Borehole terminated at 9.95 m depth on reaching target depth.

Geological Unit: Rw

Depth (m): 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5

Elevation (m AHD): 52.0, 51.6, 51.2, 50.8, 50.4, 50.0, 49.6, 49.2, 48.8, 48.4, 48.0

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839 | Page 2 of 2

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road

Log of GT05

CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525390.4	
LOCATION: New Town		NORTHING (GDA94): 5254041	
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 59.04	TOTAL DEPTH (m): 11.5
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Encountered at 4.8 m depth	
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT	NATURAL GROUND (m): 7.7
METHOD/INTERVAL: Auger to 6.5 m	HQ coring below 6.5 m	DATE STARTED: 31.07.18	DATE FINISHED: 31.07.18

DEPTH (m)	SPT BLOWS (N)	USCS / JOINT SET #	% CORE RECOVERY	DESCRIPTION	GEOLOGICAL UNIT	STAND PIPE DETAILS
0.0			100	CONCRETE	FILL	PLAIN
		GP	100	FILL: Silty sandy GRAVEL : Pale brown, medium dense, fine to coarse grained, sub-angular, moist, low plasticity. Gravels comprise brick, concrete and dolerite clasts.		
		GC	100	FILL: GRAVEL trace clay: Brown, medium dense, medium to coarse grained, sub-angular, dry, non-plastic.		
1.5	3, 6, 5 (11)	CI	100	FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite		
3.0		GP	100	FILL GRAVELS AND COBBLES comprising dolerite.		
3.2	5, 7, 6 (13)	CI	100	FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite.		
5.0	6			FILL: Gravelly sandy CLAY : Dark brown, stiff to very stiff, wet, medium plasticity. Gravel comprises dolerite		

Column headings: DEPTH (m); STRENGTH INDEX – SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) 0 10 20 30; DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM Undrained Shear Strength (kPa); UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) 0 50 100; DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD).

Depth scale: 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0. Elevation scale: 58.8, 58.4, 58.0, 57.6, 57.2, 56.8, 56.4, 56.0, 55.6, 55.2, 54.8, 54.4, 54.0.

GEO ENVIRONMENTAL SOLUTIONS - 29 KIRKSWAY PLACE, BATTERY POINT, TAS 7004 - T: 03 6223 1839 Page 1 of 3

GEO-ENVIRONMENTAL SOLUTIONS

Log of GT05

PROJECT:	48-52 New Town Road
CLIENT:	JSA Consulting Engineers
LOCATION:	New Town
EASTING (GDA94):	525390.4
NORTHING (GDA94):	5254041
SAMPLING METHOD:	Rotary Drilling
AZIMUTH:	0
INCLINATION:	-90
ELEVATION (m ~AHD):	59.04
TOTAL DEPTH (m):	11.5
CONTRACTOR:	Tasmanian Drilling Services
WATER TABLE (m BGS):	Encountered at 4.8 m depth
DRILL RIG:	Drillmac 500 Explorer
LOGGED BY:	MT
NATURAL GROUND (m):	7.7
METHOD/INTERVAL:	Auger to 6.5 m; HQ coring below 6.5 m
DATE STARTED:	31.07.18
DATE FINISHED:	31.07.18

Column headings: DEPTH (m); STRENGTH INDEX – SOIL: V LOOSE / V SOFT, LOOSE / SOFT, M DENSE / FIRM, DENSE / STIFF, V DENSE / V STIFF, HARD; ROCK: EXTREMELY LOW, VERY LOW, LOW, MEDIUM, HIGH, VERY HIGH, EXTREMELY HIGH; SPT BLOWS (N) (0, 10, 20, 30); DCP Bearing Cap. (FS 2); Point Load Is(50); SHEAR VANE Cu (FS 2); HAND PENOTROM: Undrained Shear Strength (kPa), UCS (kPa); WEATHERING; USCS / JOINT SET #; % CORE RECOVERY; % RQD; FRACTURES SPACING (CM) (0, 50, 100); DEFECTS: # DEFECTS, DEFECT TYPE, ROUGHNESS, ALTERATION, APPETURE (MM), ALPHA°, BETA°, INFILL TYPE, INFILL THICKNESS (MM); DESCRIPTION; DEPTH (m); GEOLOGICAL UNIT; STAND PIPE DETAILS; ELEVATION (m AHD)

Depth (m)	SPT / Point Load	Weathering	USCS	% Core Recovery	% RQD	Fractures	Defects	Description
~5.3–6.5	SPT 12, 5, N = 17			17				Gravel comprises dolerite.
6.5–7.75			GP	12				FILL: Dolerite GRAVEL, clay washed away.
7.75–9.75	0.06; 0.09	MW		100	72	35	7 BD PS B 85 FE; 1 JT PS B 65 FE; 6 BD PS B; 2 BD UR C 75; 1 JT PR B 25 FE; 20 BD	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered, carbonaceous, abundant healed fractures throughout. Core has been quenched and healed.
9.75–11.5	0.31	SW		100	72	25	1 CO PR B 15; 1 BD PR B 60	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and light grey, low to medium strength, slightly weathered, carbonaceous. Bedding is dipping 45 degrees. Borehole terminated at 11.5 m depth on reaching target depth.

Geological unit: RV. Stand pipe details: SLOTTED (water level ▼ at ~5.6 m).

Elevation scale (m AHD): 53.6, 53.2, 52.8, 52.4, 52.0, 51.6, 51.2, 50.8, 50.4, 50.0, 49.6, 49.2, 48.8

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road		Log of GT05
CLIENT: JSA Consulting Engineers		EASTING (GDA94): 525390.4
LOCATION: New Town		NORTHING (GDA94): 5254041
SAMPLING METHOD: Rotary Drilling	AZIMUTH: 0 INCLINATION: -90	ELEVATION (m ~AHD): 59.04 TOTAL DEPTH (m): 11.5
CONTRACTOR: Tasmanian Drilling Services		WATER TABLE (m BGS): Encountered at 4.8 m depth
DRILL RIG: Drillmac 500 Explorer		LOGGED BY: MT NATURAL GROUND (m): 7.7
METHOD/INTERVAL: Auger to 6.5 m	HQ coring below 6.5 m	DATE STARTED: 31.07.18 DATE FINISHED: 31.07.18

DEPTH (m)	Point Load Is(50)	# DEFECTS	DEFECT TYPE	ROUGHNESS	ALTERATION	APPETURE (MM)	ALPHA°	DESCRIPTION	DEPTH (m)	ELEVATION (m AHD)
										48.4
11.0		2	BD	PR	B		80		11.0	48.0
		1	BD	PR	B		80			
	0.08	1	JT	PR	B		45		11.5	47.6

APPENDIX B – Core Photographs

BOREHOLE ID: GT01

DEPTH: 0.0 to 3.9 m

BOREHOLE ID: GT01

DEPTH: 3.9 to 7.1 m EOH

BOREHOLE ID: GT02

DEPTH: 0.0 to 4.0 m

BOREHOLE ID: GT02
DEPTH: 4.0 to 10.55 m

BOREHOLE ID: GT02
DEPTH: 10.55 – 13.2 m EOH

BOREHOLE ID: GT03
DEPTH: 0.0 to 4.0 m

BOREHOLE ID: GT03

DEPTH: 4.0 to 9.82 m

BOREHOLE ID: GT03

DEPTH: 9.82 to 10.45 m EOH

BOREHOLE ID: GT04

DEPTH: 0.0 to 4.0 m

BOREHOLE ID: GT04
DEPTH: 4.0 to 7.45 m

BOREHOLE ID: GT04
DEPTH: 7.45 to 9.95 m EOH

BOREHOLE ID: GT05
DEPTH: 0.0 to 4.0 m

BOREHOLE ID: GT05

DEPTH: 4.0 m to 9.9 m

BOREHOLE ID: GT05

DEPTH: 9.9 m to 11.5 m EOH

APPENDIX C – Laboratory Test Results

TEST RESULTS

AS 1289.2.1.1 & AS 4133.4.3

CIVIL GEOTECHNICAL SERVICES
6 - 8 Rose Avenue, Croydon 3136

Job No 18076
Report No 18076/R016
Date of issue 14/08/18

Client GEO-ENVIRONMENTAL SOLUTIONS P/L (SANDY BAY)
Project UCS TESTING 48-52 NEW TOWN ROAD
Location TASMANIA

Tested by SK
Date tested 13/08/18
Checked by ANR

Sample Identification	Rock Description	Field Moisture Content %	Dry Density t/m³	Specimen Length mm	Specimen Diameter mm	Uniaxial Compressive Strength MPa	Young's Modulus GPa	Comments
18076017 GT01 6.44 - 6.66m	SILTSTONE, pale brown and brown.	9.4	2.13	123.7	60.2	17.51	1.82	Partial failure on joint 60 - 70 degrees
18076018 GT04 7.81 - 7.91m	SILTSTONE, grey.	7.2	2.27	140.8	60.4	18.84	1.50	No defects
1876018 GT05 9.90 - 10.16m	SILTSTONE, grey and dark grey.	7.0	2.27	153.4	60.1	4.16	0.35	Failed on bedding at 40-45 degrees.

Notes

A4133.4.3_MC_DD_UCS_E V1.0 APR 11

GES

GEO-ENVIRONMENTAL

SOLUTIONS

V2 CONTAMINATION MANAGEMENT PLAN (CMP)

48-52 NEW TOWN ROAD, NEW TOWN. APRIL 2019

For the Proposed *New Town Medical Centre*

For Swanbury Penglase Architects

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Point 7004. Ph 6223 1839 Email: office@geosolutions.net.au

DOCUMENT CONTROL

Title	Version	Date	Author	Reviewed
Draft Contamination Management Plan, 48 – 52 New Town Road, New Town	Version 1	20 March 2019	Sarah Joyce	Kris Taylor
Contamination Management Plan, 48 – 52 New Town Road, New Town	Version 2	16^{h} April 2019	Kris Taylor	JP Cumming
			Yours faithfully, Sarah Joyce BSc (Hons) *Environmental Geologist*	

1 Introduction

Geo-Environmental Solutions Pty. Ltd. (GES) of 29 Kirksway Place, Battery Point, Tasmania were engaged by Swanbury Penglase Architects (the 'Client') on behalf of their client to prepare a site Contamination Management Plan (CMP) for 48-52 New Town Road, New Town - hereby referred to as 'The Site' for the proposed *New Town Medical Centre* development.

1.1 Assessment Framework

The council contaminated site register suggests that potentially contaminating activities may have taken place at the site or on a neighbouring site. The proposed development has therefore flagged the Interim Planning Scheme (IPS) E2.0 Potentially Contaminated Land Code. The following potentially contaminating activities (IPS Table E2.2) have been identified in the phase 1 ESA:

- Fill material imported onto a site from a potentially contaminated source;
- Commercial engine and machinery repair; and
- Petroleum product or oil storage

As the EPA director, or a person approved by the Director has not certified that the land is suitable for the intended use and there is no approved plan to manage contamination and associated risk to human health or the environment, there are no acceptable solutions to the proposed development and therefore all E2.0 performance criteria relevant to the proposed development are to be addressed.

GES prepared an environmental site assessment in accordance with IPS E2.0 performance criteria. The ESA report was been prepared by suitably qualified person (see Appendix 1) and 'defines the nature, extent and levels of existing contamination and the actual or potential risk to human health or the environment, on or off the site, resulting from that contamination, prepared in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 16 May 2013.'

In accordance with IPS E2.0 performance criteria, it is concluded from the ESA that:

- There is evidence that the land is contaminated based on NEPM (2013) Tier 1 guideline limit exceedances;
- The ESA demonstrates that the level of contamination does present a risk to human health or the environment; and
- This Contamination Management Plan (CMP) has therefore been produced for the site.

In accordance with IPS E2.0 performance criteria, this CMP is to provide:

- Specific remediation and protection measures required to be implemented before any use and/or excavation commences;
- A statement that the land is suitable for the intended use; and
- A statement that the proposed excavation works will not adversely impact on human health or the environment.

1.2 Background

GES completed a Phase 1 Environmental Site Assessment (ESA) report for the site in January 2019 which included a Tier 1 health risk assessment to determine potential soil contamination risks which may arise from the proposed commercial building development and associated works.

It was identified through the Phase I ESA that 48 to 50 New Town Road hosted a service station prior to 1973. Dangerous Goods Records provided four (4) records relating to dangerous substances including a 2000 gallon underground super spirit tank with a S/E pump later referred to as a 5.4 KL tank plus a 1.15KL on-ground tank for Diesel.

The Phase II ESA identified that despite the presence of hydrocarbon infrastructure onsite, a petroleum vapour intrusion risk has not been identified to proposed site users based on soil and groundwater samples collected from the site. Tier 1 soil contamination was identified in fill material to depths of up to 6 m. Contamination in fill material has minor commercial guideline limits exceedances and presents the greatest dermal contact, dust inhalation and soil ingestion risk to low density residential land use for offsite receptors. Most of this impacted soil exceeds environmental guideline limits and is not classified as clean fill and therefore needs careful environmental management in terms of excavation, transport and disposal.

Given the contamination risks, as per the Hobart City Council Interim Planning Scheme (IPS), there is a requirement that this CMP document is implemented and followed to mitigate any adverse impact upon human health or the environment as a result of the proposed works.

1.3 Objectives

The objective of this CMP is to comply with HCC IPS requirements. The purpose of this CMP is to:

- Identify the site hazards associated with contaminated soil exposure;
- Minimise risks to site workers and the environment; and
- Provide advice on and advise of safety measures to be adopted during future excavation or construction works at the site.

1.4 Scope of Works

The scope of work for the CMP is to produce a guidance document that includes information in relation to identifying measures and outlining procedures to minimise human health hazards and potential environmental impacts during all phases of site works including demolition, additional soil testing, excavation, construction and post construction future trench works at the site. This report is intended to;

- Minimise potential adverse environmental consequences associated with exposing contaminated soils. The most significant and direct pathway is through soil erosion into stormwater drains which feed into the marine environment of the River Derwent.
- Minimise potential health risks from the exposure of contaminated soil during demolition and excavation works. Contaminated soil may be spread onsite and offsite through various mechanisms including foot traffic, vehicle movements, dust erosion as well as stormwater erosion.
- Provide guidance for management of soil for onsite reuse or off-site soil disposal in accordance with IB105 guidelines.

1.5 Environmental Regulatory Requirements

Key regulations, legislation and policies considered most applicable to soil and groundwater management during any intrusive site works (excavation, construction or maintenance) include:

- Environmental Management and Pollution Control Act (1994).
- Environmental Management and Pollution Control (Waste Management) Regulations 2010.
- Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010
- Information Bulletin 105: Classification and Management of Contaminated Soil for Disposal (Version 3 2018), EPA Tasmania.
- NEPM (2013) National Environment Protection (Assessment of Site Contamination) Measure, 1999 as amended 2013.
- CRC CARE (2011) – Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater, September 2010. Friebel, E., Nadebaum, P. & GHD Pty Ltd.
- ANZECC (2000) – Australian and New Zealand Environment & Conservation Council – National Water Quality Management Strategy. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- DPIWE (1997) – State Policy on Water Quality Management, 1997.
- Australian Standard: AS 4482.1-2005 Guide to the investigation and sampling of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds
- Australian Standard: AS 4482.2-1999 Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances

1.6 Responsibility of Implementation

It will be the responsibility of the owner(s) of the site to implement this CMP. The owner(s) of the site may at times expressly delegate responsibility for site management as appropriate. The site owner(s) retains overall responsibility for implementation of this CMP and any modifications required to this CMP should site conditions change.

The owner(s) of the site are responsible for the distribution of this CMP to any contractors working on site associated with the site redevelopment and these contractors must comply with the requirements of this CMP.

To manage potential health risks, the advice stipulated in this CMP should be followed by all persons involved in works or other activities at the site that may result in the disturbance and/or excavation of soil.

1.7 Site Details

Site details are presented in Table 1 and the site investigation areas are presented in Figure 1.

Table 1 Site Details

INVESTIGATION AREA LOCATED BETWEEN: 48-52 New Town Road, New Town, Tasmania
APPROXIMATE INVESTIGATION AREA approximately 7,400m^2
TITLE REFERENCES According to the Cadastral Parcels layer on the LIST; *48-50 New Town Road* Property ID 5517199, CT 198029/1 (Fromberg Super Co Pty Ltd) *52 New Town Road* is Property ID 5517180, CT 252465/1 (Fromvision Pty Ltd)
SITE OWNER Fromberg Super Co Pty Ltd & Fromvision Pty Ltd
SITE ELEVATION & GRADIENT Elevation at the range from 60.3m AHD in the south-east, 56.2m AHD in the north and 57.5m AHD in the west.
SITE SURFACING The surface of the site is a combination of grass, garden beds, asphalt and concrete plus a number of brick office buildings, lean to sheds and warehouses all with concrete floors.
PREVIOUS LANDUSE Commercial – carpark and commercial buildings plus former service station at 48-50 New Town Road.
SITE ZONING Urban Mixed Use *under the Tasmanian Interim Planning Scheme 2015*
SITE LAND USE Commercial premises
PROPOSED LAND USE Commercial – New Town Medical Centre
SURROUNDING LAND USE: *Inner Residential* consistent with zoning

Figure 1 Aerial Photograph of Current Site Conditions (The LIST Map).

2 Background Environmental Site Assessment Information

2.1 Conclusions from the ESA:

- The site hosted a former service station on the title *48-50 New Town Road*, until approximately 1970; a total of 4 bowsers were identified in the historical photographs. By 1973 a new building was constructed, and it remains to this day.
- A considerable amount of fill exists on the northern two thirds of the site, approximately 6m thick in some areas which is identified as being contaminated (exceeding ecological, commercial, public open space and residential guideline limits).
- As a result, from the previous land use and activities associated with reclamation of land, there is localised contamination around the former service station infrastructure

2.2 Assessment Criteria

2.2.1 Soil

The reported soil analytical results were compared to the following relevant investigation guidelines suitable for assessment of soil contamination:

NEPM (2013) Schedule B1, Guideline on Investigation Levels for Soil.

- Health Investigation Limit (HIL D) – Commercial Land Use (assessing dust inhalation & soil ingestion risk)
- Health Screening Limit (HSL D) – Commercial Land Use (assessing petroleum hydrocarbon vapour inhalation risk)
- Health Investigation Limit (HIL A) – Residential Land Use (assessing dust inhalation & soil ingestion risk to neighboring residence during the construction phase)
- Ecological Investigation Levels (EIL's) - have been developed for selected metal and organic substances in and commercial & industrial setting. Threshold limits are specific to select sample physical and chemical properties.
- Ecological Screening Levels (ESL's) - have been developed for organic petrochemical substances in commercial & industrial setting. Threshold limits are specific to select sample physical properties.

EPA Tasmania (2018) Information Bulletin 105 (IB105).

- Classification and Management of Contaminated Soil for Disposal, Version 3 (2018)

CRC CARE Technical Report No. 10 (Friebel & Nadebaum 2011)

- Health Screening Limit (HSL D) – Commercial Land Use (assessing petrochemical dermal contact risk in an industrial setting)
- Health Screening Limit (HSL A) – Residential Land Use (assessing petroleum hydrocarbon dermal contact to neighboring residence during the construction phase)

2.2.2 Groundwater

- ANZECC 2000 ecosystem protection guidelines for 95% protection of Freshwater Ecosystems
- ANZECC 2000 ecosystem protection guidelines for 95% protection of Marinewater Ecosystems
- NEPM (2013) HSL's
- CRC CARE - Technical Report No. 10

2.3 Invasive Site Investigations

A total of fifteen site visits were conducted to complete the ESA. Site investigation works comprised of soil bore drilling and groundwater sampling which is summarised in Table 2 and Figure 2.

Borehole drilling and soil sample collection was conducted over 9 days, a total of 142 primary soil samples were selected for analysis. Groundwater sampling took place over 2 days, a total of 4 groundwater samples were selected for analysis.

Table 2 Summary of Site Investigation Work Dates

Scope	Data	Details
Site Walkover	18 July 2018	Photographs taken, preliminary discussion of borehole location selection
Service location/ Drilling/ Sample collection	23 July 2018	Sampled BH01 – BH07; 17 Primary Soil Samples;
Drilling/ Sample collection	24 July 2018	Sampled BH08 – BH12; 16 Primary Soil Samples;
Drilling/ Sample collection	25 July 2018	Sampled BH13 – BH19; 12 Primary Soil Samples;
Installation of Groundwater well	26 July 2018	MW1 was installed in borehole GT05 which was drilled by Tasmanian Drilling.
Drilling/ Sample collection	30 July 2018	BH20; 2 primary Samples;
Sampling of Groundwater well	11 September 2018	Sampled MW1
PAH analysis – Geotech Soil	17 October 201	*GT02, GT01, GT03*
Drilling/ Sample collection	24 October 2018	BH21-BH25; 27 Primary Soil Samples;
Drilling/ Sample collection	29-31 October 2018	BH26-BH40. 40 Primary Soil Samples;
Drilling/ Sample collection	5 November 2018	BH41 – BH53; 28 Primary Soil Samples;
Installation of Groundwater well	14-15 November 2018	Drilled and installed MW2 and MW3.
Sampling of Groundwater well	26 November 2018	Sampled Groundwater in MW1, MW2 and MW3.

Note: BH#-Soil bores; MW# - groundwater bore and GT# - Geotechnical Hole

Figure 2 Borehole Plan

2.4 Soil Assessment Results

2.4.1 Environmental

Ecological Screening Level Guidelines

Benzo(a)pyrene exceeded ESL guideline limits in most samples. The exceedances were mostly in the fill material and there is no clear pattern to the distribution for the ESL exceedances.

There were many low-level detections of hydrocarbons, with guideline exceedances for TRH C^{16}-C^{34} in the following boreholes 8, 13, 14, 17, 23, 40, 42, 44; depths ranged from 0.5 to 2.5 m below ground surface (bgs). There is no clear pattern to the distribution; holes 14 and 17 are isolated on the southern and western boundary retrospectively and the remaining boreholes are on the eastern boundary, see Figure 2.

Ecological Investigation Level Guidelines

There were many elevated heavy metal detections but only 1 EIL guideline exceedance, which was for copper, in BH23 at 3.5-3.6m bgs.

Environmental Risks

There are no onsite ecological receptors identified. The following offsite ecological receptors have been identified:

- Maypole Creek which is 1.7 km to the north near Risdon Road; and
- The River Derwent at Cornelian Bay which is 2.12 km from the site.

Benzo(a)pyrene, TRH and copper levels are elevated across the site.

Once pavement is removed from the site, soil erosion into the stormwater system may result in environmental impact to the freshwaters of Maypole Creek and the marine waters of the River Derwent. This will need to be managed to ensure that soil is not washed into stormwater culverts and ultimately the marine environment. The potential for leaching has been determined to be LOW to MODERATE for benzo(a)pyrene, PAH's and metals. Soil leaching into groundwater is considered LOW risk and surface water monitoring will be required to ensure discharged water does not exceed nominated ANZECC guideline limits.

Mitigation measures relating to the identified risks are detailed in Section 4.

2.4.2 Human Health

Health Screening Levels – Dermal Contact

Although there were many detections of hydrocarbons, there were no HSL D guidelines for *commercial land use* for Dermal Contact in any of the samples, remaining onsite or proposed to be excavated.

There was one HSL A (limit of 4500 mg/kg) guideline exceedance for *Low density residential* for TRH C^{16}-C^{34} in BH23 at 2.5-2.6m bgs (not proposed to be excavated).

There was one HSL B (limit of 5800 mg/kg) guideline exceedance for *High density residential* for TRH C^{16}-C^{34} in BH40 at 0.5-0.6m bgs (proposed to be excavated).

Health Investigation Levels – Dust Inhalation and Soil Ingestion

There were ten exceedances for Benzo(a)pyrene for *dust inhalation and soil ingestion* for *commercial land use* HIL D (limit of 40 mg/kg) from the following boreholes: 13, 17, 23, 40, 42, 44. These sample locations appear to run parallel along New Town Road.

The HIL B *High density residential* guideline limit is 4mg/kg for Benzo(a)pyrene, this limit was exceeded in most samples across the site.

Lead detections exceeded HIL A *Low density residential,* guidelines, (limit of 300mg/kg) in the following samples: BH03 at 0.5-0.6m bgs, BH02 at 0.5-0.6m bgs, BH18 at 3.1-3.2m bgs, BH25 at 4.5-4.6m bgs and BH39 at 2.5-2.6m bgs. There is no clear pattern in this distribution.

Health Screening Levels – Vapour Intrusion/ Trench worker

There were no *HSL D* guideline exceedances for assessing petroleum vapour intrusion risks

Human Health Risks

Based on the proposed land-use and layout, the Tier 1 ESA concluded the following with respect to human health risks:

- There may be isolated occurrences of lead, benzo(a)pyrene in the fill and in some instances in the natural soil material where contaminants have been leached and mobilized by groundwater. An assumption needs to be made that any soil encountered at the site may be contaminated.
- There may be hydrocarbons around the former fuel storage infrastructure.

Once pavement is removed from the site, potential offsite human health receptors will need to be considered during the demolition, excavation and construction phases of the work. Consideration to wind dispersion of soil and water movement to neighbouring properties. Mitigation measures relating to the identified risks are detailed in Section 5.

2.4.3 IB105

Soil samples collected at the site were compared against EPA Tasmania (2018) Information Bulletin 105 (IB105) to assess disposal options. Findings from the assessment are presented in borehole logs (Appendix 3) and indicative JSA Consulting Engineers IB105 plans (Appendix 4). Please note that due to heterogeneity of the fill material, these findings are indicative only. The following findings were made during the invasive soil investigation in relation to the IB105 guidelines:

- The main contaminants were identified in the thick layer of imported fill at the site and include benzo(a)pyrene (a PAH), some heavy metals including barium, beryllium, copper, lead, manganese, mercury and zinc (Level 2) and petroleum hydrocarbons at limited locations; mostly in the area surrounding the former service station infrastructure.
- Benzo(a)pyrene was present in most boreholes across the site.
- Material tested at the site is classified in a range from Level 1 Material to Level 4 Material.
- Following leachate testing;
    - benzo(a)pyrene has been reduced from Level 3 Material and Level 4 Material to Level 2 Material.
    - Some heavy metals were also reduced to Level 2 Material.
    - This reduction means that although the benzo(a)pyrene and heavy metals are present, they have limited mobility in water and material can be disposed of as Level 2 Material.
    - The only contaminant that could not be reduced with leachate testing was total petroleum hydrocarbons, C^{10}-C^{36}. The majority of the detection were of Level 2 classification in the following boreholes 2, 4, 8, 9, 13, 14, 39 42, 44, 48. There were two detections of Level 3 classification in the following boreholes 23 and 40.
- Areas where access was limited due to the presence of existing buildings, the soil in these areas will require further testing at a rate of 1 sample per 25 m^3 to confirm these conditions.

2.5 *Groundwater Assessment Results*

A total of three groundwater monitoring wells were installed to capture any potential spills from the former service station infrastructure. Results indicate that the underground refuelling infrastructure has been compromised overtime onsite and possibly upgradient as there was a presence of elevated levels of hydrocarbons and some heavy metals are present in the groundwater. The following information was obtained:

- MW1 has detectable hydrocarbon levels;
- MW2 does not have any hydrocarbons but there are traces of heavy metals and
- MW3 has low level detections of hydrocarbons.
- No free phase hydrocarbons were observed during the groundwater sampling event.

2.5.1 Environmental

- Copper levels in MW2 exceeded nominated ANZECC (2000) marine and freshwater guideline limits.
- Cobalt exceeded nominated ANZECC (2000) marine water guideline limits in MW1
- Naphthalene exceeded nominated ANZECC (2000) marine and freshwater guideline limits in MW1.
- Although there were detections of TRH's in groundwater and particularly high concentrations of PAH's and benzo(a)pyrene (TEQ) in MW1 (between 267ug/L and 1250ug/L), there are no legislated ecological guideline limits for these analytes. Typically, benzo(a)pyrene is not particularly soluble in water, with high concentrations explained by the presence of naphthalene (potentially sourcing from the diesel) which increases the mobility of benzo(a)pyrene in water (CRC CARE Tech Report 39). Benzo(a)pyrene (TEQ) concentrations in MW1 exceed low reliability freshwater and marine ecosystem values of 0.2 ug/L by between 1335 to 6250 times in MW1 (CRC CARE Tech Report 39) illustrating the need to adequate environmental monitoring and management of the site.

2.5.2 Human Health

Although there were low level detections of hydrocarbons, no indoor risk or risk to trench workers to vapour exposure was confirmed.

Benzo(a)pyrene (TEQ) concentrations in MW1 (at between 267ug/L and 1250ug/L) exceed drinking water guidelines (ANZECC 2000) limit of 0.01ug/L by between 26,700 and 125,000 times the limit. A single millilitre of groundwater from MW1 is equivalent to up to 125 L of water at the drinking water guideline limit which is equivalent to 62 day of benzo(a)pyrene (TEQ) exposure based on consumption of 2 litres of water per day. This highlights the importance of adequate PPE when handling this groundwater. One small splash of water has the potential to exceed recommended drinking water limits for half a year of exposure illustrating the need for exercising precaution when working with groundwater and surface water at the site.

2.5.3 Water Management

Note the following guidelines will apply to any surface water or groundwater sampled during the site redevelopment:

- ANZECC 2000 ecosystem protection guidelines for 90% protection of Freshwater Ecosystems
- ANZECC 2000 ecosystem protection guidelines for 90% protection of Marinewater Ecosystems

Insitu water testing is recommended to monitor groundwater and surface water across the site, and to assist in pin pointing activities which have the potential to cause and environmental or human health disturbance. Although new development plans indicate there is a low likelihood that groundwater will surface in excavations at the site and surface waters are unlikely to exceed guideline limits given limited chance for leaching, precautions are recommended to gauge the effectiveness of this CMP in managing overall risks to workers and the environment.

3 Potential Receptors

3.1 Ecological Receptors & Environmental Considerations

No sensitive terrestrial or freshwater ecosystem receptors have been identified on or near the site. The closest ecological receptor is the water source of Maypole Creek which is 1.7 km to the north of the site near Risdon Road. As stormwater from the site will discharge into the marine environment, all water sampled from the site during site development is to be compared against ANZECC (2000) guidelines limits for marine ecosystems. If exceedances are reported, measures will need to be put in place to manage disposal of stormwater from the site.

3.2 Human Receptors and Exposure Routes

As a result, from the previous land use activities and reclamation of land, there is localised contamination around the former service station infrastructure and contamination throughout the fill material at the site. Potential health exposure risks may be associated with soil excavation and management as well as general movement of soil around the site caused by foot & vehicle traffic, mobile machinery, as well as natural elements including wind and rain. Onsite and offsite exposure pathways include dermal contact, ingestion of contaminated soil/water and inhalation of dust.

A SWMP will be put in place to minimise onsite erosion of contaminated soil to offsite human receptors which in this instance is residential users. Figure 3 presents the spatial relationship between the site and the potential human receptors. Note that the adjacent properties on Seymour Street plus the properties at 54 and 56 New Town Road are down gradient and most likely to be affected by potential soil or water runoff from the site. All adjacent properties may be impacted by dust and noise during the site redevelopment work.

4 Minimising of Potential Environmental Impacts

Potential environmental impacts during any subsurface works or excavations may be associated with:

- Soil excavation and management
- Movement of soil
- Off-site disposal of soil
- Where relevant, groundwater and surface water extraction, removal and disposal
- Importation of fill to the site
- Dust and odour
- Stormwater management and sedimentation

To minimise potential environmental impacts, all work must be conducted in accordance with the:

- The Environmental Management and Pollution Control Act (EMPCA, 1994)
- Environmental Management and Pollution Control (Waste Management) Regulations (2010),
- Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010, and
- The guidance set out in this plan.

4.1 Soil

4.1.1 Soil Excavation and Management

The relevant sections of the CMP should be referred to during the following phases of site work: prior to commencement, demolition, additional soil testing, excavation, construction and ongoing future trenchwork at the site.

Prior to Commencement

Contractors and workers must be made aware of the potential soil and groundwater contamination and be familiar with the requirements of the CMP and they should also know that there may be environmental or human health consequences that result from noncompliance which may incur a fine from the EPA Tasmania.

Contractors must prepare one or more of the following: a site-specific Health and Safety Plan, a Job Safety Analysis (JSA) or a Safe Work Methods Statement (SWMS) covering their workers at the site for any reasonably anticipated risks.

Work procedures conducted on the site must be in accordance with relevant Occupational Health and Safety (OH&S) Regulations. It is the responsibility of the principal contractor that site workers are made aware of the OH&S issues at the site.

A Soil and Water Management Plan (SWMP) should be written and implemented prior to the commencement of any site demolition or excavation work. The SWMP should be closely aligned with recommendations identified in this CMP and Fact Sheets presented in Appendix 2.

Demolition

The time between site demolition and site resurfacing is a period where there is a heightened risk of offsite spread of contaminated soil. During this time there is expected to be the greatest chance of offsite spread of contaminates through soil leaching, dust generation, as well as soil erosion from vehicle and foot traffic, precipitation and stormwater runoff.

Limiting the exposure of paved surfaces through keeping pavement in place for as long as possible, this includes limiting the length of time the service trenches and footing pads remain open.

Demolition site work will involve removal of all site buildings and decommissioning redundant service infrastructure. Due to the contamination risk the impermeable surfaces should remain onsite and intact during this process for as long as practically possible even if this means concrete coring to obtain additional soil samples (the next phase).

It should be noted that asphalt surfaces often have hydrocarbon contamination, so any asphalt surface material should be managed separately to other materials.

Asbestos may be present in the site buildings, this is beyond the scope of the ESA or this CMP and will not be addressed again in this document. Demolition contractors should refer to their own JSA's or standard operating procedures regarding asbestos management.

Additional Soil Testing

The following procedures must be carried out prior to, during and following the completion of any soil excavation and/or surface cover disturbance at the site.

In areas where access was limited due to the presence of existing buildings, additional soil testing will be required at a rate of 1 sample per 25 m^3 to confirm contaminant levels at these locations. Surface coverings of concrete and asphalt should remain intact during this phase of work as much as practically possible.

Note that many of the soil boreholes across the site and, the soil bores in the current building were unable to reach the depth of the fill/bedrock and resampling in these areas to depths below FFL of the of the *New Town Medical Centre* building will be required.

Soil Excavation & Stockpiling

The proposed finished floor levels (FFL) of the basement carpark will be at 55.8 m ASL. There will be the requirement to relocate underground services according to the new FFL and develop a new foundation system potentially involving bored piers and earth cuttings.

Soil exposed and excavated from the site must be managed so as not to cause environmental harm in accordance with the Environmental Management and Pollution Control (Waste Management) Regulations (2010) and the Environmental Management and Pollution Control Act (EMPCA, 1994). Harm can be caused from contaminated soils leaching further underground, leaving the site through wind (as dust), carried off site with rain (as runoff stormwater), or released into the atmosphere as vapour.

Stockpiles should be sampled by a suitably experienced and qualified environmental assessor and analysed using a NATA registered laboratory to determine their contamination status, consistent with the procedures described in Section 4.1.3.

In order to prevent soil leaving the site the following erosion control measures must be followed:

- Develop a stabilized site access (Fact Sheet 12 Appendix 2);
- Clean up any soil spilt on roads adjoining the site.
- Ensure vehicles and equipment are free from excess soil when leaving the site, to avoid tracking soil off-site.
- Establish an equipment wash down area if necessary (Fact Sheet 13 Appendix 2);

Soil stockpiles must be managed in accordance with the Environmental Management and Pollution Control (Waste Management) Regulations, 2010 and best practice guidelines. The following are recommended:

- It is recommended that separate stockpiles be constructed to separate varying levels of apparent soil contamination, if encountered. This will likely enable cost savings during disposal phases.
- The source area of stockpiled soil must be noted on a plan for reference to ensure the movement of potentially contaminated soil is tracked (see Section 4.1.2).
- Soil should be classified for disposal or reuse in accordance with EPA Tasmania (2018) Information Bulletin 105 (IB105) before being transported off site (see Section 4.1.3) unless being transported to a facility approved by the EPA;
- Always keep stockpiles covered and sealed if possible (refer Section 4.1.5 Dust and Odour Control & Fact Sheet 9 Appendix 2).
- If stockpiled for greater than 12 hours, should be covered with an impermeable layer (eg. PVC plastic 2mm thick) to prevent the contents being affected by wind or rain;

- All soil stockpiles must have sediment control devices (silt fencing) around any temporary or longer-term stockpiles (Fact Sheet 14 Appendix 2).

Construction

If there are any changes to the plans during the construction phase and additional excavations are required, the CMP should be revisited. Additional soil and water testing may be required, or current results may need to be reassessed against different criteria.

SWMP measures must remain in place as long as soil is exposed at surface or in excavations including footing exposures and service trenches.

Following Completion of Excavation Works

Equipment used for excavation of potentially contaminated soil must be cleaned of loose soil prior to use in another area. The loose soil must be contained within the stockpiles at the site.

Future Trench Work

It is anticipated that over time, future trench workers or contractors will visit the site from time to time as services require repairs or new infrastructure is required.

The anticipated that the site layout will vary greatly to the current conditions; the site will be sealed by a ground floor concrete carpark. It is expected that some fill will remain on the northern two thirds of the site. Therefore, future trench workers and contractors should be made aware of the potential contamination that may be encountered at the site and should be provided with a copy of this document.

4.1.2 Movement of Soil

If soil is going to be removed from site is to be assessed and sampled by an Environmental Consultant and results compared against Information Bulletin 105 (IB105) for Classification and Management of Contaminated Soil for Disposal. It is not necessary for undisturbed soil that remains on site to be classified against IB 105.

Movement of soil at the site must be tracked to ensure its origin, contamination status and fate is documented. An example soil tracking form is provided in Appendix 5. Soil tracking forms are to be completed by the Site Foreman/supervisor of the site.

The source and destination of any soil moved around the site or off-site can be identified using references to development features, or a site grid. The appearance of soils encountered during excavation must be noted and checked to confirm they are consistent with those materials noted in the preliminary assessment. Soil appearance checks must be conducted by the Site Foreman or delegated to a suitably experienced and trained person.

4.1.3 Off-site Disposal of Soil

Waste soil generated at the site must be managed, transported and disposed in accordance with the Environmental Management and Pollution Control (Waste Management) Regulations 2010 and the Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010.

Aspects of these regulations related to classification and disposal of contaminated soils are summarised in Information Bulletin 105: Classification and Management of Contaminated Soil for Disposal (November 2018), published by EPA Tasmania.

See Appendix 6 for the comparison of soil analytical results from the ESA against IB105 plus IB105 in full. It is anticipated benzo(a)pyrene, some heavy metals and some hydrocarbon contamination will be encountered across the site.

Given the elevated levels of contamination encountered at the site, GES recommends that all soil excavated at the site is stockpiled systematically. Unclassified material will require systematic sampling for contamination levels. Soil flagged for landfill disposal is to be assessed by an Environmental Consultant and results compared against *Information Bulletin 105 (IB105) for Classification and Management of Contaminated Soil for Disposal.*

Soil samples would need to be obtained from the excavated soil and must comply with the sampling frequency in the EPA guidelines for off-site soil disposal.

Where excavated soil requires off-site disposal, the following is required:

- Communicate with the environmental consultant as early as possible. This will enable classification to be undertaken and relevant documentation prepared, prior to the proposed disposal date.
- Ensure that excavated soil volumes and origins are documented, to assist with classification for off-site disposal.
- Separate soils based on appearance and location of excavation. This will minimise the volume of higher category waste for dispose, and in turn minimise costs associated with disposal.
- Soils must be classified in accordance with Information Bulletin 105: Classification and Management of Contaminated Soil for Disposal (November 2018), published by EPA Tasmania or as updated.
- Where applicable, an application to transport excavated soil to an approved intermediate soil waste transfer facility for offsite IN105 characterization as approved by the Director, EPA Tasmania for review in accordance with Environmental Management and Pollution Control (Waste Management) Regulations, 2010 and the Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010.
- An application for disposal to an approved waste facility must be submitted to the Director, EPA Tasmania for review in accordance with Environmental Management and Pollution Control (Waste Management) Regulations, 2010 and the Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010.
- If approved, waste soils must be transported to the approved facility by a Controlled Waste Handler approved by EPA Tasmania.
- The Controlled Waste Handler must meet requirements for waste collection as well as disclosure of tracking information.

4.1.4 Importation of Fill Material

Fill imported to the site must meet Tasmanian EPA (IB105) "Fill Material" and NEPM HIL 'A' criteria (NEPM, 2013). Fill must be adequately sampled and analysed to demonstrate it meets Tasmanian EPA (IB105) "Fill Material" criteria prior to import to the site, as set out in this plan. A suitably qualified environmental consultant must conduct sampling and analysis.

A qualified environmental consultant must assess that the contamination status of the fill is suitable for use at the site. The environmental consultant shall inspect the source location of the fill. The material must be sampled and analysed at a minimum rate of one sample per 25 m^3 bulk soil volume and a minimum of 3 samples.

4.1.5 Dust and odour control

Generation of dust can spread contaminated soil and pose a risk to human health risk onsite and offsite and off-site ecological receptors. Fact Sheet 18 in Appendix 2 should be used as a guide for managing dust onsite. Measures that can be undertaken to assist in minimising the generation of dust and limit the amount of soil leaving the site include:

- Minimise movement of equipment on the site.
- Minimise excavation and movement of soils.
- Use a water spray sparingly to dampen work areas if excess dust is generated.
- Use a water spray sparingly to dampen soil prior to and during excavation if excess dust is generated.
- Avoid soil excavations that create dust on windy days.

- Always keep soil stockpiles covered where possible, with an impermeable membrane (eg. plastic sheeting) to minimise generation of dust, release of odours and to limit runoff of sediment.
- Avoid extended stockpiling of soil.
- Consider the use of dust barriers such as hessian or cloth screening.

4.2 Groundwater & Stormwater Management

To minimise potential migration of contaminants into the marine environment, all work must be conducted in accordance with the State Policy on Water Quality Management 1997 and the guidance set out in this plan.

The groundwater is known to contain high concentrations of contaminants particularly benzo(a)pyrene around MW1 (the former service station infrastructure) and the southern end of the site. There is concern that during the site redevelopment potentially impacted surface and groundwater will drain either:

- Offsite as overland flow onto neighboring properties; or
- Into stormwater systems without appropriate silt traps being put in place; or
- Exceeds recommended ANZECC (2000) guidelines limits.

It is expected that surface waters will drain to the north towards 17 Seymour Street and 54 New Town Road and to less of an extent the rear of the properties to the west; 5, 7, 9 ,11 ,13 and 15 Seymour Street (Figure 3).

The following needs to be put in place to manage groundwater and surface water at the site:

- Surface water at the site will need to bypass a main primary surface water sample collection point which will be used to test water before it enters the stormwater system;
- Sampled by an Environmental Consultant and compared against ANZECC 2000 guidelines for 90% protection of marine water ecosystems and freshwater ecosystems and TasWater's disposal requirements.
- Sampling should occur when rainfall exceeds 5 mm within a 24 hours period for the Ellerslie Road gauging station (approximately 1.5 weather front passing per month based on 2018 Bureau of Meteorology records).
- In the event there is a trigger, management measures will need to be put in place to collect water existing the site to ensure compliance with identified ANZECC 2000 guidelines.

4.3 Surface Water and Sediment Control

Measures to minimise the potential for contamination of stormwater and migration of contaminants include:

- Silt fencing is required around the perimeter of the site to reduce the extent of soil erosion from wind and rain (Fact Sheet 14 Appendix 2).
- Where possible overland flow should be diverted away from excavation workings to reduce the risk of surface waters becoming impacted as a result of mixing with contaminated soil (Fact Sheet 7 Appendix 2);
- The site will need to be regularly inspected for signs of scour including around all earthen drains (Fact Sheet 11 Appendix 2) and site slopes. Where scour is identified, erosion should be controlled with the use of erosion control matts and blankets (Fact Sheet 8 Appendix 2)
- Collect stormwater on-site and allow suspended solids to settle before disposal in accordance with EMPCA and/or local Water Authority requirements (Fact Sheet 17 Appendix 2).
- Control measures such as cut-off drains/mounds and or sand bags will be required to prevent soil and water from existing the site boundary at locations which are not identified as a legal point of discharge (LPOD). Measures will need to be put in place to ensure that water does not exist on to neighbouring properties.

- Silt traps will be required around all drainage pits to prevent soil from entering the stormwater system (Fact Sheet 15 Appendix 2). Soil collected around the pits will need to be excavated and placed into skip bins for disposal with other excavated soil. The silt traps will need to be regularly maintained and checked to ensure they are not discharging sediments into the stormwater.
- Install drainage and/or grade soil surfaces to minimise pooling of water on exposed soils. Pooling surface water may be contaminated and can be managed through placement of aggregate.

4.4 Spill Avoidance

The following measures are recommended to manage preventable spills and contamination during site redevelopment works:

- Avoid conducting vehicle or machinery maintenance on-site.
- Ensure any fuel, oil or other chemicals are stored safely and securely in a temporary bunded area and that storage containers are absent from leaks and cracks.
- Repair or remove any leaking containers or machinery from the site immediately.
- Always have a complete spill kit onsite during site works.
- Clean up any spilt fuel, oil or other chemicals as soon as practically possible.
- Check sediment control measures regularly (at least daily) and clean and maintain as necessary.
- Inspect sediment control measures more frequently during rain periods, to check they are adequate for site conditions.

Figure 3 Adjacent Properties with Potential Human Receptors

5 Minimisation of Risk to Health of Site Workers

Work procedures conducted on the site must be in accordance with relevant Occupational Health and Safety (OH&S) Regulations. It is the responsibility of the principal contractor that site workers are made aware of the OH&S issues at the site.

Engaged companies/contractors must prepare a site-specific Health and Safety Plan covering their workers at the site. In terms of managing exposure risks, given the complexity in defining where soil and contamination risks are located onsite, workers need to assume that all soil and water encountered at the site is contaminated.

5.1 Exposure Routes

5.1.1 Soil

Potential hazards for site workers associated with the presence of contaminants primarily in fill material at the site may be encountered during excavation or construction works must be considered as part of the overall Health and Safety Plan for the site, including:

- Ingestion of contaminated soil.
- Inhalation of dust.
- Dermal (skin) contact
- Inhalation of petroleum hydrocarbon vapours (low risk)

5.1.2 Groundwater and Surface Water

Potential hazards for site workers associated with the presence of contaminants in groundwater that may be encountered during excavation works must be considered as part of the overall Health and Safety Plan for the site, including:

- Ingestion of contaminated water.
- Dermal (skin) contact.
- Inhalation of petroleum hydrocarbon vapours (low risk)

5.2 Control measures

Personnel working at or visiting the site during any construction (including demolition and excavation) works must be provided with an induction briefing, based on the example Site Induction Record and GES cover note is provided in Appendix 6. This induction record may be incorporated into the general site induction procedure. The principal contractor is responsible for ensuring that workers are aware of contamination issues at the site.

Measures that must be undertaken to manage exposure of site workers to contaminants include:

- It is identified that groundwater and potentially surface water at the site contains highly toxic concentrations of PAH's including benzo(a)pyrene (TEQ). It is recommended that PAH (includes benzo(a)pyrene) is monitored in surface waters across the site in areas where workers are likely to be in direct contact with pooling or flowing water. Outcomes of the testing will assist in making modifications to drainage around workings to reduce exposure to toxic chemicals. The source of any contamination may not be readily apparent, and testing will assist in mitigating health exposure risks.
- Avoid handling of potentially contaminated soil and/or water.
- Wash hands before eating, drinking or smoking.
- Avoid activities that may introduce soil and/or water to the mouth, such as nail biting.
- Store and consume food and drink in a designated clean area.

- Remove soiled clothing and footwear before entering a designated clean area and before leaving the site.
- Use personal protective equipment (PPE) as required. In addition to hard hats, safety boots, safety glasses and hearing protection, this equipment may include:
  - Impermeable (latex or nitrile) gloves, if handling potentially contaminated soil and/or water
  - Long sleeved shirt and long trousers
  - Dust masks
  - Vapour masks
- Store personal protective equipment in a clean place to avoid contamination.
- Replace gloves and masks regularly, and other equipment as required.
- The principal contractor must ensure that site workers and visitors are provided with:
  - Site safety induction briefing.
  - Adequate hand washing facilities.
  - A designated clean area for storage and consumption of food and drink.
  - Adequate personal protective equipment, as described above.

6 Mitigation measures for development

Based on the findings of the ESA (GES, 2018) it was concluded that risk mitigation measures would be required to control soil ingestion and dust inhalation risks to future users of the site.

6.1 Physical separation layers

In the areas of the site not covered by a permanent hardstand surface (such as bitumen, concrete or building slabs) capping measures for the various landscaping finishes are required to prevent contact with the underlying soil as a precautionary measure.

The physical cap must ensure that future site users do not meet the potentially contaminated soil. The construction of the cap can be tailored to the specific area use, considering the potential for incidental digging and the action of erosion or tree roots. Some examples of suitable capping layers are described in Table 3 below.

Table 3 Examples of Capping Layers

Surface Landscape Type	Area/ Land Use	Characteristic	Capping Requirements
Concrete Path	Footpaths and high wear areas	High traffic areas	Suitable in a range of areas due to the ability to provide a level surface. Provides effective barrier to underlying soils.
Asphalt / Bitumen	Carpark and driveway area	High traffic areas	Suitable in a range of areas due to the ability to provide a level surface. Provides effective barrier to underlying soils.
Re-instated Grass	Around footpaths and high wear areas	High traffic area for general public and dust/soil exposure risks from maintenance	At least 0.15m of clean soil and development and maintenance of good grass cover.
Garden Bed	Around footpaths and high wear areas	Maintenance/gardening is conducted. Covers small areas and includes plants and shrubs that stabilize soil movement.	In relatively flat areas, clean fill and topsoil should be placed to the depth of likely digging and root penetration (approximately 0.3 m). This should be increased to at least 0.5m in sloped areas. If contaminated soil remains beneath the garden beds (i.e. it is not all removed from the area) then a geotextile should be placed between the clean fill and contaminated soil. Tanbark / timber mulch would be placed over clean fill and topsoil mixture.

7 CMP review and reporting

7.1 Review

Following changes in the understanding of site contamination conditions, work requirements, legislation, or work scope (including excavation or construction), this CMP must be revised and reviewed by a competent person prior to use for the proposed works. In the event that no changes to the above-mentioned conditions occur, the CMP should be reviewed every 2 years. The CMP must be revised to reflect any changes and provide adequate procedures for ensuring continued worker, public and environmental safety and compliance with legislation.

7.2 Reporting

It is recommended that Site Management maintain documentation demonstrating that the requirements of this CMP have been met. Such documentation is likely to include:

- Site survey levels.
- Soil tracking records.
- Repair details to vapour barrier or venting system (if required).
- Volumes of fill removed and imported to the site.
- Records of complaints, notices or breaches of the CMP requirements and an outline of actions taken.
- Signed induction records to the site which demonstrate workers commitment to following the CMP.
- Evidence that imported fill meets Tasmanian EPA (IB105) "Fill Material" and HIL A' criteria (NEPM, 2013).
- Evidence that excavated fill was disposed of in accordance with EMPCA (1994) requirements.

8 Potential Impact Statement

8.1 Change of Use

There is a proposed change of use from a former fuel station site to a surgery and therefore IPS E2.5 P1 performance criteria are to be addressed. In accordance with IPS E2.5 P1 performance criteria, the land is suitable for the intended use provided the following specific remediation and protection measures are implemented (as outlined in this CMP) before excavation commences:

- Physical separation layers are put in place to restrict access to soil.

Given this recommendation, there is a low risk that users of the proposed medical facility will be affected by historical site activities.

8.2 Excavation Works

There is proposed excavation works at the site, and therefore E2.6.2 P1 performance criteria are to be addressed. In accordance with IPS E2.6.2 performance criteria, it is concluded from the ESA that the proposed excavation will not adversely impact on human health and the environment, proved the following specific remediation and protection measures are implemented before excavation commences:

- This CMP document is accessible to any workers at the site;
- All workers are to be made aware of contamination issues associated with the site before a CMP induction form is filled in;
- At all times, dust must be prevented from being generated at the site;
- Appropriate PPE are worn including gloves when handling soil;
- Measures must be put in place to prevent soil from eroding offsite;
- Water testing is conducted by GES following 5 mm of rainfall over a 24-hour period. A risk assessment report is to be subsequently prepared by GES to determine likely impacts on the waterways and measures which need to be put in place to mitigate any adverse environmental risks. Mitigation measures to be recommended may include stormwater capture.

Given these measures are put in place, there is a low risk of adverse impact on human health and the environment.

9 SUMMARY OF ROLES AND RESPONSIBILITY

Site Owner	The owner(s) of the site are responsible for the distribution of this CMP to any building or development contractors working on site and these contractors must also comply with the requirements of this CMP. There is a responsibility to ensure the soil and water management plan (SWMP) is put in place prior to site demolition works, and the plan is active as soon as site coverings are removed. The SWMP should not be removed until all surfaces have been paved. Post the site redevelopment, the site owner(s), who may delegate to a site operator is responsible and must inform future site contractors and trench workers of the CMP and the requirements to follow its contents.
Site Manager during site redevelopment (including following phases of site work: prior to commencement, demolition, additional soil testing, excavation, construction and future trenchwork)	Responsible for the preliminary assessment of potential contamination discovered and assessing whether further action is required. The Site Manager is responsible for ensuring the induction of Site Operatives, assessing the adequacy of quarantine measures and contacting the relevant Consultant and/or Contractors where appropriate. Potential offsite migration of surface water and soil needs to be assessed. The site manager is to contact the Environmental Consultant to arrange for surface water to be tested in accordance with ANZECC (2000) and Stockpiled soil to be tested in accordance with IB105. The site manager is to become familiar with IB105 and determine the appropriate actions for soil transport and disposal following receiving final laboratory testing results. All soil must remain onsite until fate of the soil material is determined.
Site Operatives	During the works, the Site Operative will be vigilant for potential contamination. Where potential contamination is identified, Site Operatives will quarantine the area and inform the Site Manager. An Environmental Consultant may be required to assess the site. Potential offsite migration of surface water and soil needs to be assessed during and after rain events. The site operator is to notify the site manager when soil is ready for testing to discern the appropriate disposal actions.
Environmental Consultant	The services of an Environmental Consultant will be required for additional drilling and soil testing in accordance with IB105. The Environmental Consultant may also be required to sample temporarily stored groundwater. If unexpected or gross soil contamination is encountered (not identified in the ESA), an Environmental Consultant will need to be engaged to assess the potential contamination find, undertaking any necessary sampling and delineation, if required, developing a remedial scope and validating remediation. The Environmental Consultant must have appropriate qualifications and expertise in environmental assessment (e.g. an experienced environmental scientist, environmental soil scientist, environmental geologist or environmental engineer). All findings and conclusions will be reported, as appropriate, to the satisfaction of the Site Manager and the Site Owner

LIMITATIONS STATEMENT

This Contamination Management Plan has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and Swanbury Penglase Architects (the 'Client') on behalf of their client. To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The conclusions described within this report are based the results of analysis from the Environmental Site Assessment by GES (2019) and an assessment of their contamination status. The scope of the ESA does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

REFERENCES

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Australian Standard: AS 4482.1-2005 Guide to the investigation and sampling of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds

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Appendix 1 GES Staff

Geo-Environmental Solutions (GES) is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

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- 12 years' experience in environmental contamination assessment and site remediation.

Ms Sarah Joyce BSc (Hons)

- Senior Environmental Scientist
- Honours in Geography and Environmental Science at the University of Tasmania in 2003;
- Undergraduate Degree Double Major in Geology and Geography & Environmental Science
- 15 years professional work experience and six years contaminated site assessment

Mr Kris Taylor Bsc (Hons)

- Senior Environmental & Engineering Geologist
- Honours in Environmental Geology at the University of Tasmania in 1998
- 22 years professional work experience and 15 years contaminated site assessment & hydrogeology

GES STAFF – CONTAMINATED SITES EXPERIENCE

Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 6 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Aaron Plummer(Cert. IV)

- Soil Technician
- 3 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Sam Rees B.Agr.Sc (Phd)

- Soil & Environmental Scientist
- 6 years' experience in hydrocarbon and heavy metal contamination assessment and reporting of soils and groundwater.

Mr Mark Downie B.Agr.Sc (Hons)

- Soil Scientist
- 3 Year experience in contamination assessment and reporting of soils and groundwater.

Mr Matthew Temlett

- Engineering Geologist
- Masters in Applied Environmental Geology
- 10 years working as an Engineer and two years experience in contaminated sites; soil, groundwater and conceptual site models.

Appendix 2 Soil and Water Management Guideline Fact Sheets

Soil & Water Management on Large Building & Construction Sites

What is this?

Sediment and erosion control measures are typically required for subdivisions and larger sites. The construction of subdivisions involves breaking land into smaller lots and installation of related services (roads, water, sewerage, power etc.). Due to the scale of land clearance and excavation, subdivision construction activities can cause excessive erosion and sediment loads in runoff, compared with the disturbance of building single house lots.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion and control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 1

WHAT DO I NEED TO DO?

All works undertaken during subdivision construction are normally 'controlled' through the principle contractor and site manager. This means the risks of erosion can be readily managed through appropriate guidance and supervision. Compared with the allotment building phase where there are different building contractors and subcontractors present on any given allotment it is easier to manage erosion and prevent sediment runoff at the subdivision construction phase.

Submit a Soil and Water Management Plan:

Subdivisions or activities that create greater than 250 m^2 of ground disturbance may need to submit a drawn Soil and Water Management Plan (SWMP) to council as a requirement of their planning permit **(see Fact Sheet 3).**

On the SWMP clearly define and document who is responsible for maintaining the sediment and erosion control measures (installed during the subdivision phase) that will be used in the allotment building phase.

When designing subdivision works:

1) Ensure that the subdivision conforms to the natural limitations presented by the topography and the soil so as to reduce the potential for soil erosion.
2) Make sure that land clearing is only being undertaken in conjunction with the development of each stage.
3) Develop the site in increments of workable size such that adequate sediment and erosion control measures can be provided as the subdivision progresses. The smallest practical area of land should be exposed at any one period of time.
4) Coordinate the sediment and erosion control measures with the different subdivision construction phases.
5) Limit soil exposure to the shortest feasible period of time.
6) Keep removed topsoil for respreading over the developed area.
7) Retain and protect natural vegetation wherever practical.
8) Install larger sediment controls i.e. sediment basins if site conditions are suitable.
9) Manage wind-borne erosion.

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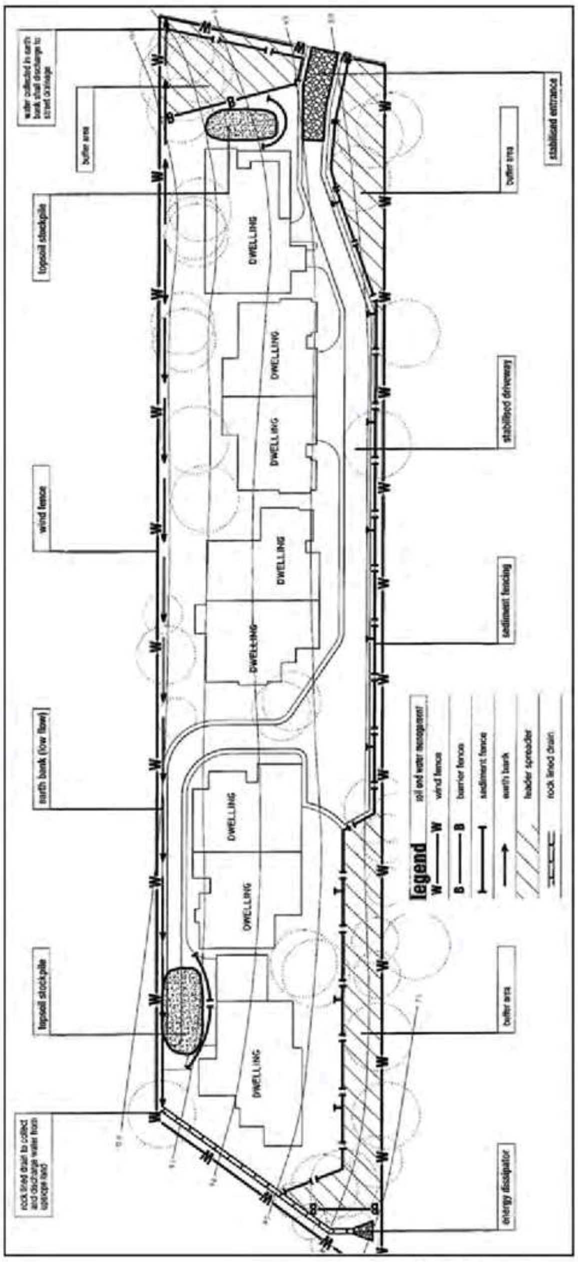

Figure 1A: SWMP for a subdivision.

List of fact sheets

1. **Soil & Water Management on Large Building & Construction Sites**
2. Soil & Water Management on Standard Building & Construction Sites
3. Soil & Water Management Plans
4. Dispersive Soils – High Risk of Tunnel Erosion
5. Minimise Soil Disturbance
6. Preserve Vegetation
7. Divert Up-slope Water
8. Erosion Control Mats & Blankets
9. Protect Service Trenches & Stockpiles
10. Early Roof Drainage Connection
11. Scour Protection – Stormwater Pipe Outfalls & Check Dams
12. Stabilised Site Access
13. Wheel Wash
14. Sediment Fences & Fibre Rolls
15. Protection of Stormwater Pits
16. Manage Concrete, Brick & Tile Cutting
17. Sediment Basins
18. Dust Control
19. Site Revegetation

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Figure 1A after Landcom 2004 *"Soils & Construction Volume 1 Managing Urban Stormwater (4th edition)"*. Some of the text in this brochure has been obtained and modified from the Brisbane City Council 2008 *"Subdivision and Development Guidelines"*.

Date of Issue: December 2008

Soil & Water Management on Standard Building & Construction Sites

What is this?

A general overview of sediment and erosion control measures that are typically required for single residential building lots including when certain control measures should be installed. Useful for planning and for determining what practices might be suitable for your site. For further details about each of the control measures mentioned go to the relevant fact sheet in the series.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion and control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 2

WHAT DO I NEED TO DO?

The timing of works and installation of control measures has a major influence on how effective soil and water management is in reducing on-site erosion and the amount of sediment that is carried off-site.

Before starting site works plan to:

1) Schedule earthworks in phases throughout the project so that the ground is disturbed for the shortest time possible **(see Fact Sheet 5).**
2) Avoid stripping and excavating until all necessary permits, licences and approvals have been obtained and you are ready to start work.
3) Install erosion and sediment control measures in accordance with an approved Soil and Water Management Plan (if required) **(see Fact Sheet 3).**

Install erosion and sediment control measures in sequence:

1) Choose a single, stabilised site access point **(see Fact Sheet 12).**
2) Install sediment fences or fibre rolls at the low end of the site to trap sediment **(see Fact Sheet 14).**
3) Divert up-slope catchment runoff around the site by installing a diversion drain and level spreader **(see Fact Sheet 7).**
4) Keep as much vegetation as possible to minimise soil erosion and reduce rainwater running across the site **(see Fact Sheet 6).**
5) Designate a location where topsoil and other excavation material will be stockpiled during building and construction. Provide suitable controls to prevent erosion **(see Fact Sheet 9).**
6) Stabilise areas of exposed soil with vegetation or erosion control blankets and mats **(see Fact Sheet 8).**
7) Protect the nearby stormwater system including any stormwater pits on and below the site from blocking up with sediment **(see Fact Sheet 15).**
8) Designate an appropriate location within the site where sediment-generating activities can be managed (e.g. wheel wash, brick cutting) **(see Fact Sheet 16).**

Once site works have commenced:

1) Monitor sediment and erosion control measures at least once a week and after each rainfall event.
2) Construct service trenches away from where water is likely to concentrate. Try not to have service trenches open any longer than necessary **(see Fact Sheet 9).**
3) Prevent clean rainwater running across the site by connecting downpipes to the stormwater system as soon as the roof is on the building frame **(see Fact Sheet 10).**

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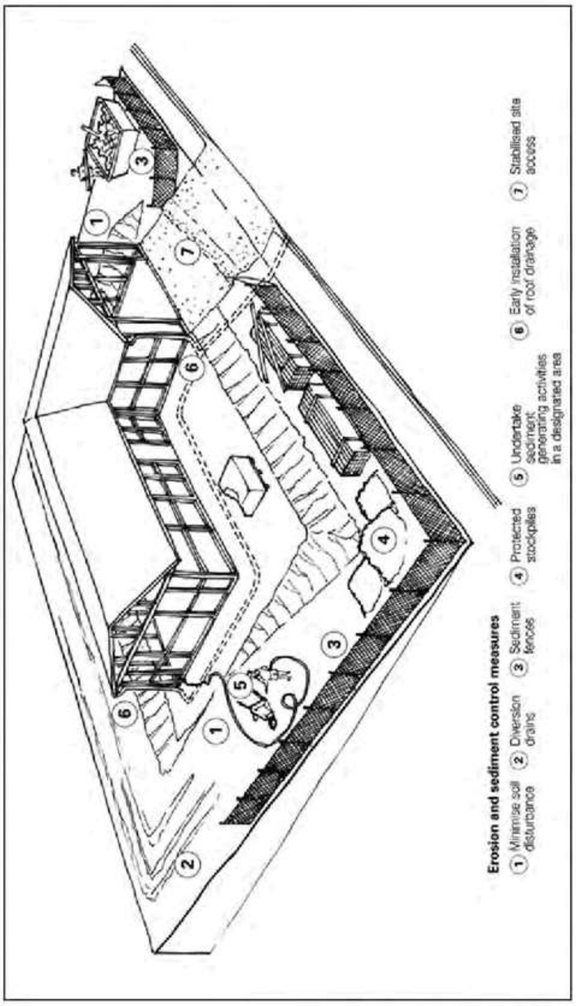

Figure 2A: *Appropriate sediment and erosion control measures for single residential building lots.*

List of fact sheets

1. Soil & Water Management on Large Building & Construction Sites
2. **Soil & Water Management on Standard Building & Construction Sites**
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4. Dispersive Soils – High Risk of Tunnel Erosion
5. Minimise Soil Disturbance
6. Preserve Vegetation
7. Divert Up-slope Water
8. Erosion Control Mats & Blankets
9. Protect Service Trenches & Stockpiles
10. Early Roof Drainage Connection
11. Scour Protection – Stormwater Pipe Outfalls & Check Dams
12. Stabilised Site Access
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Acknowledgement:

Figure 2A was kindly provided by South East Queensland Healthy Waterways Partnership and Brisbane City Council. Text in this brochure has been obtained and modified from the "*Do It Right On Site*" brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Soil & Water Management Plans

What are these?

Soil and water management plans are specific site plans or drawings that detail sediment and erosion control measures on building and construction sites. The Soil and Water Management Plan (SWMP) shows the type, location, design, installation and maintenance schedule for all these measures and should be considered as the blueprint for controlling all anticipated erosion and for preventing sediment from leaving a site.

Subdivisions or activities that create greater than 250 m^2 of ground disturbance typically need to submit a SWMP to council with their building or development proposals prior to any site disturbance. Once approved by council, all building and construction works need to be conducted in accordance with the SWMP.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion and control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 3

WHAT DO I NEED TO DO?

Prepare a SWMP (see Figure 3A):

A SWMP can easily be developed by overlaying information on a copy of the engineering site drawings. The plan must detail the site development and all the systems intended to minimise erosion and trap sediment. On the SWMP show the following:

1) Date and author.
2) North point and scale.
3) Property boundaries.
4) General soil description.
5) Location and amount of ground disturbance.
6) Initial and final contours, location of watercourses, surface drainage and existing stormwater infrastructure.
7) Stormwater discharge point, if proposed.
8) Location of all proposed temporary drainage control measures.
9) Construction details (e.g. building or subdivision layout).
10) Location of vegetation to be retained and removed.
11) Location of stabilised site access.
12) Location of soil, sand or other material stockpiles.
13) Location and details of all proposed erosion control measures.
14) Location and details of all proposed sediment control measures.
15) A statement of who is responsible for establishing and maintaining all erosion and sediment control measures.
16) The installation sequence of the different sediment and erosion controls.
17) The maintenance program of the sediment and erosion controls.
18) The revegetation and rehabilitation program.

Note: Other details may be required depending on the specific requirements of the site, scale of the development and level of ground disturbance. Contact your local council for what information you are required to submit on your SWMP.

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Submit the SWMP to council for approval:

A SWMP may be a requirement of your planning or building permit. Ensure that the council has approved your SWMP; otherwise you may be in breach of your permit.

Implement the SWMP and update as needed:

1) Keep a copy of the council-approved SWMP at the site at all times.
2) Ensure that all on-ground workers understand the SWMP.
3) Implement, update and maintain the control measures shown in the SWMP.

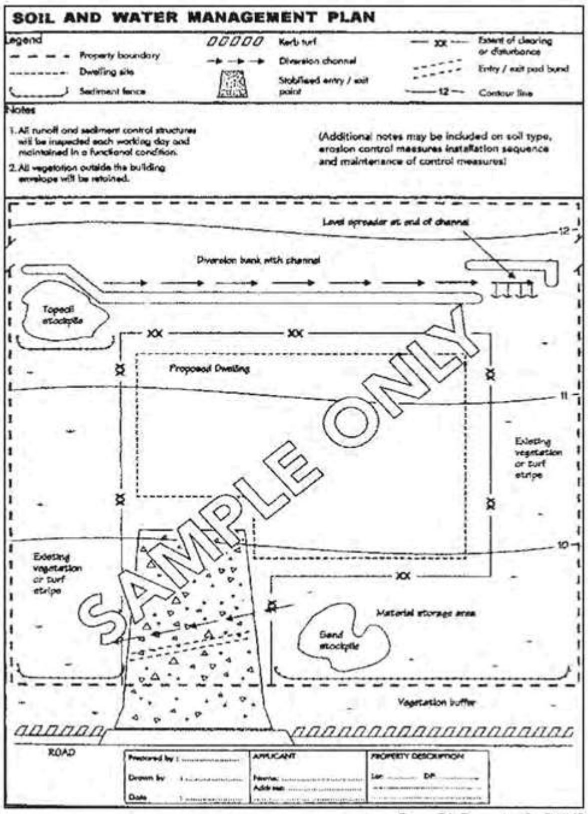

Figure 3A: Example of a SWMP

List of fact sheets

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Acknowledgement:

Figure 3A from Gold Coast City Council *"Best Practice Guidelines for the Control of Stormwater Pollution from Building Sites"*. Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Minimise Soil Disturbance

What is it?

Minimise soil disturbance to the greatest extent practicable. Earthworks should be kept to a minimum and should be closely linked with the commencement of building and construction work. To minimise risks, preserve native topsoil and natural vegetation and implement suitable sediment and erosion control measures (see other fact sheets in this series). Areas of soil disturbance on slopes should be roughened and terraced to reduce erosion.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 5

WHAT DO I NEED TO DO?

Design considerations:

1) Avoid the need for earthworks by working with the natural contours of the site. Limit building or construction on steep inclines. On slopes choose a subfloor method that will minimise excavation.
2) Limit the area of soil disturbance (the excavation envelope) to the minimum required, i.e. the house only.
3) Identify suitable sediment and erosion control measures for the excavation envelope.
4) Staging works. Consider scheduling earthworks in phases throughout the project to reduce erosion potential and rehabilitate exposed areas quickly to reduce the amount of soil exposed at one time.
5) Retain as much stripped topsoil as possible for reuse during landscaping and site rehabilitation.

Before starting site works:

1) Ensure approval has been granted by council.
2) Identify vegetation, including grass buffers, around the construction site to preserve throughout the development. Mark this as a **No Go Area (see Fact Sheet 6)** on all work plans, including the Soil and Water Management Plan (if required) **(see Fact Sheet 3).**
3) Install sediment and erosion control measures.
4) Ensure the operators of earthmoving equipment are aware of the excavation envelope and where stockpiles will be located.

Once site works have commenced:

1) Ensure vegetation buffers are protected.
2) Carry out staged excavation and stabilisation (if applicable).
3) Maintain sediment and erosion control measures.
4) Stabilise soil stockpiles by placing sediment fences around their lower edges, cover with fabric, plastic or vegetation.
5) Restrict vehicles and equipment to designated areas.

Soil roughening: when using heavy machinery (i.e. non-wheeled vehicles) on exposed slopes.

Don't smoothly grade slopes with compacted soils. This will increase runoff, is hard to revegetate and is highly susceptible to soil erosion.

Don't track heavy machinery across the slope. The track marks will create furrows that water will flow down when it rains.

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Do track machinery (e.g. excavators) up and down the slope to create grooves from the wheels/or tracks that will catch seeds, fertilizer, and rainfall. The grooves will roughen the surface in a way that will slow runoff over the slope *(see Figure 5A).*

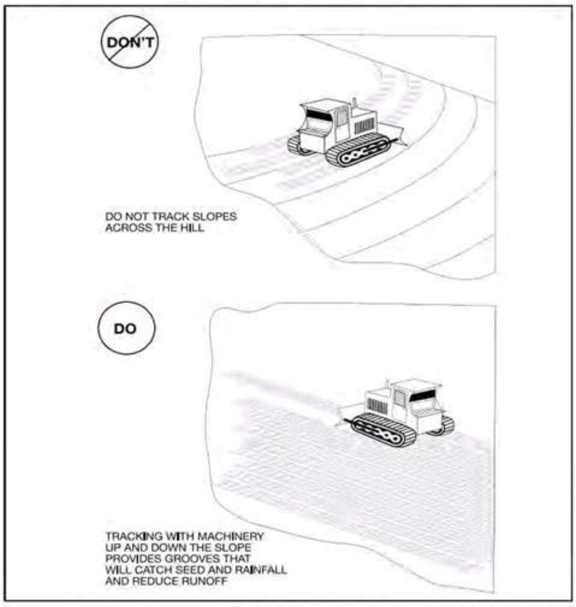

Figure 5A: *Avoid moving tracked vehicles across the slope, unless the final pass involves tracking up and down the slope.*

Maintaining control measures:

If topsoil has been removed it will need to be replaced *(see Figure 5B).*

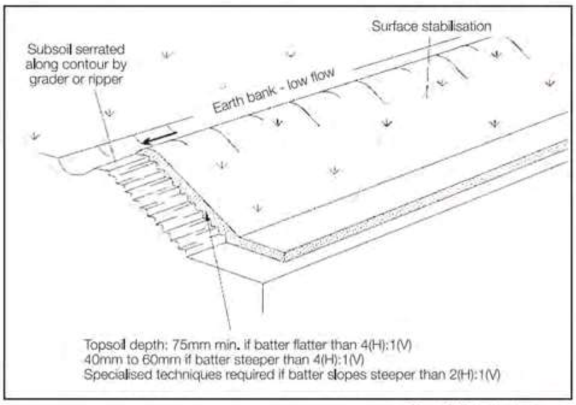

Figure 5B: *Replacing Topsoil.*

List of fact sheets

1. Soil & Water Management on Large Building & Construction Sites
2. Soil & Water Management on Standard Building & Construction Sites
3. Soil & Water Management Plans
4. Dispersive Soils – High Risk of Tunnel Erosion
5. **Minimise Soil Disturbance**
6. Preserve Vegetation
7. Divert Up-slope Water
8. Erosion Control Mats & Blankets
9. Protect Service Trenches & Stockpiles
10. Early Roof Drainage Connection
11. Scour Protection – Stormwater Pipe Outfalls & Check Dams
12. Stabilised Site Access
13. Wheel Wash
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Acknowledgement:

Figure 5A after California Regional Water Quality Control Board 1999 *"Erosion & Sediment Control Field Manual"*. Figure 5B from Landcom 2004 *"Soils & Construction Volume I Managing Urban Stormwater (4th edition)"*. Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Divert Up-slope Water

What is it?

Design surface drainage up-slope of building and construction sites to divert runoff away from the site. Where practical and particularly where stormwater runoff from more than 0.5 hectares feeds into the work site, divert up-slope water around the disturbed or active work area.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 7

WHAT DO I NEED TO DO?

Before starting site works:

Look at the site plans to identify site areas where stormwater can be diverted around the disturbed or active work area. Stormwater can be diverted with the use of small diversion drains. Note that the stormwater must not be diverted onto adjacent properties; instead it must discharge the work site at a legal point of discharge. Diversion drains need to be properly designed to ensure that they can convey water without overflowing or accumulating sediment. Document the diversion drains on your Soil and Water Management Plan (if required) **(see Fact Sheet 3).** Ensure workers on-site are aware of the need to maintain the diversion drains. Do not dig diversion drains on dispersive soils **(see Fact Sheet 4)**, instead build soil berms.

Installing the control measures:

Diversion drains: A diversion drain is a channel constructed on the high side of a site to divert surface runoff from rainwater that would otherwise flow down onto the disturbed or active work area.

1) The channel should be about 150 mm deep with a curved shape.
2) Place the excavated soil from the channel on the down-slope side to increase the diversion drain's capacity.

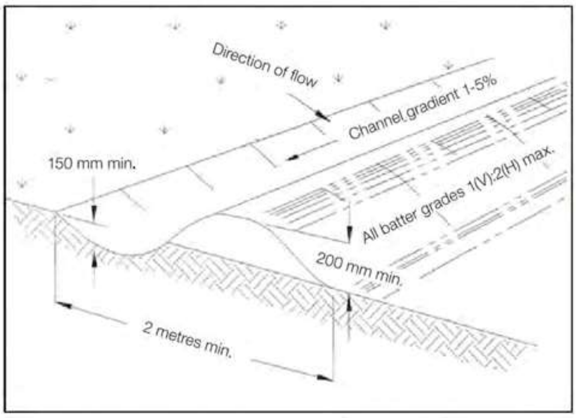

Figure 7A: *Example of a diversion drain.*

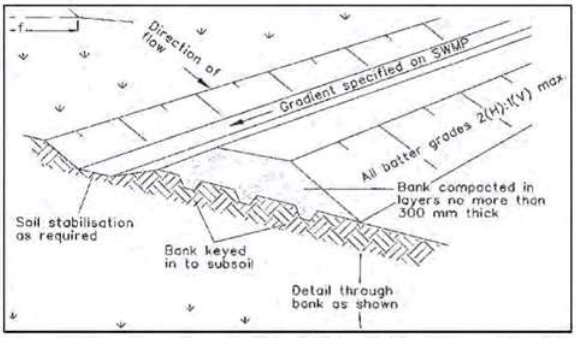

Figure 7B: Example of a diversion drain for high flow.

3) The diversion drain should divert flows to a stable drainage line to ensure that the channel does not itself cause erosion where it discharges.
4) The diversion drain should be kept clean and free of plantings and mulch as this will lead to the deposition of sediment that obstructs water flow and causes water to breach the channel and create unwanted erosion.

Level spreader: Level spreaders are generally used at the outlet of diversion channels. A level spreader is a wide, level overflow sill built across a slope. It allows even spread of water flow so velocities are reduced and soil erosion is avoided. This should only be constructed to release water to areas where the:

1) Water flow will not become concentrated.
2) Soil is stabilised and the site is not within the path of construction activities.
3) Ground remains well-vegetated.
4) Discharged water flow will be slow moving.

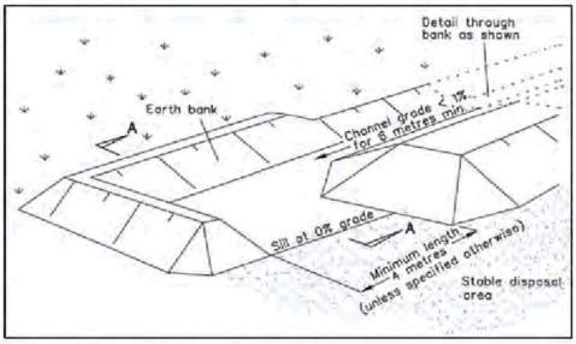

Figure 7C: Example of a level spreader used to release minor concentrated flows as sheet flow.

In some cases such as on steep slopes or where there are high flow velocities, a grass or geotextile fabric lined channel may be required to return the diverted flow to the stormwater system or a stable drainage line.

Maintaining the control measures:

Check diversion drains, level spreaders and discharge areas for signs of erosion.

List of fact sheets

Remember:

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Acknowledgement:

Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils. Figures 7A, 7B & 7C from Landcom 2004 *"Soils & Construction Volume I Managing Urban Stormwater (4th edition)"*.

Date of Issue: December 2008

Erosion Control Mats & Blankets

SOIL & WATER MANAGEMENT

What are these?

Erosion mats and blankets are used as a soil cover and a protective barrier for vegetation establishment. They are applied on soils with a high erosion risk, on steep sites or for site rehabilitation. When applied correctly, they are one of the most effective and practical means of controlling runoff and erosion on disturbed land prior to vegetation establishment.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 8

WHAT DO I NEED TO DO?

Before starting site works:

Identify where erosion is likely to occur i.e. areas of bare soil, especially on slopes steeper than 3:1 or when there is a delay in building and construction work or site rehabilitation. Select erosion control mats or erosion control blankets.

Erosion control mats: are heavier, synthetic and non-degradable, they are designed to add stability to soils and are often filled with topsoil, and vegetated when installed. Erosion control mats are suitable on slopes and in channel-lining applications.

Erosion control blankets: are light-weight and open-weave made from mulch, straw and wood fibre and held together by natural or synthetic netting. They are used for establishing and reinforcing vegetation. Their application depends on the blanket materials. Synthetic netting and wood fibre is stronger and can be used on steeper slopes compared to jute and straw blankets, which rapidly degrade and are more suitable for flatter areas. Check with suppliers of erosion control blankets about the applications of their different products.

Erosion control blankets can be used in conjunction with soil seeding, preventing the seed washing away and erosion of the prepared seedbed. Once established, the vegetation provides permanent erosion control.

Document erosion control mats and blankets on your Soil and Water Management Plan (if required) **(see Fact Sheet 3).**

Installing the control measures:

Erosion control mats should be installed immediately on exposed soils, while erosion control blankets should be fitted on newly seeded or landscaped areas. **See Figures 8A and 8B** for their installation guidelines.

Maintaining the control measures:

Close inspection after rainfall events and major runoff occurrences is essential. Check for damage due to water running under the mat or blanket or if it has been displaced by wind. Restabilise with anchor pins or wooden spikes. If significant erosion has occurred repair the fabric. Grading and reseeding may also be necessary. Continue inspections until vegetation is firmly established.

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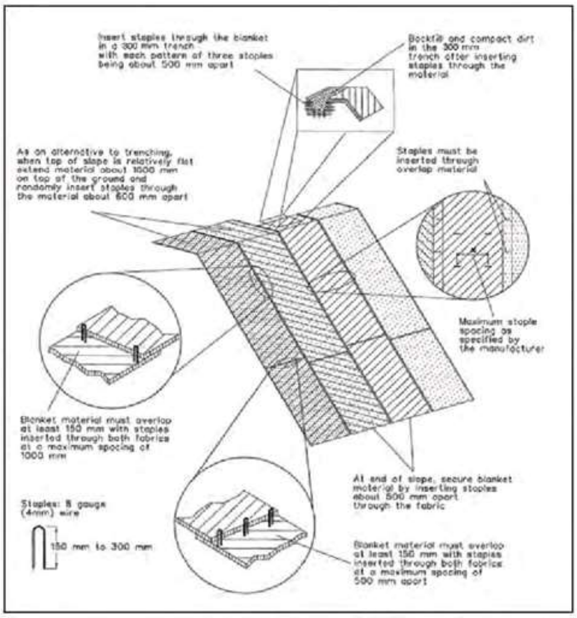

Figure 8A: *Installation of an erosion control blanket on a hillside.*

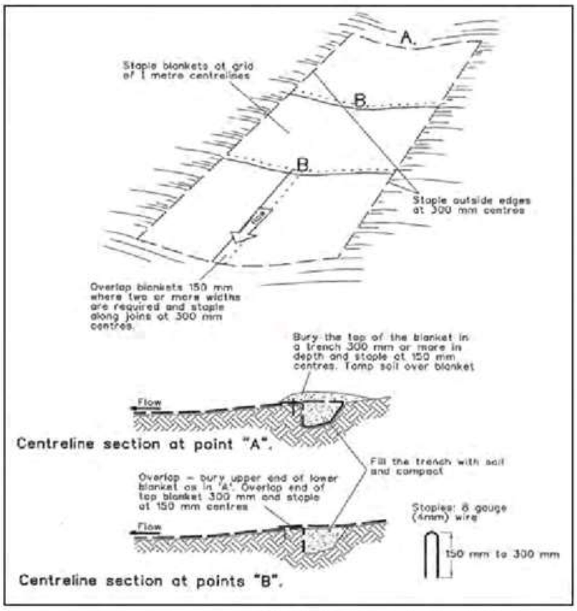

Figure 8B: *Erosion control mat used to line a channel.*

List of fact sheets

1. Soil & Water Management on Large Building & Construction Sites
2. Soil & Water Management on Standard Building & Construction Sites
3. Soil & Water Management Plans
4. Dispersive Soils – High Risk of Tunnel Erosion
5. Minimise Soil Disturbance
6. Preserve Vegetation
7. Divert Up-slope Water
8. **Erosion Control Mats & Blankets**
9. Protect Service Trenches & Stockpiles
10. Early Roof Drainage Connection
11. Scour Protection – Stormwater Pipe Outfalls & Check Dams
12. Stabilised Site Access
13. Wheel Wash
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Acknowledgement:

Figures 8A & 8B from Landcom 2004 *"Soils & Construction Volume I Managing Urban Stormwater (4th edition)".*

Date of Issue: December 2008

Protect Service Trenches & Stockpiles

What is it?

When excavated, service trenches can concentrate runoff and cause rapid soil erosion. This fact sheet discusses methods to install service trenches in a manner that does not cause soil erosion.

Temporary stockpiles are at risk of being washed or blown away. This fact sheet discusses proper on-site storage of materials such as sand, gravel, topsoil, mulch and woodchips.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 9

WHAT DO I NEED TO DO?

Before starting site works:

Service trenches: if your site has fine soil, protection measures may be needed. Decide where the service trenches will need to go and document them on your Soil and Water Management Plan (if required) **(see Fact Sheet 3)**. Ideally they should be away from areas where water flow is likely to concentrate. Where possible coordinate the various service connections so a single trench can be used and quickly backfilled. Also try scheduling the work when rainfall is low. Be aware if you have dispersive soil **(see Fact Sheet 4)**.

Stockpiles: avoid stockpile loss and stormwater pollution by limiting the amount of material on-site and remove all materials when work is complete.

Identify a protected storage area for building material stockpiles away from on-site drainage or stormwater flow paths. Place control measures such as diversion drains up-slope or sediment fences down-slope. Cover the stockpiles with fabric, plastic or a temporary grass cover. Drivers delivering stockpile material should always use the protected storage area as the drop-off. Document your storage area on the Soil and Water Management Plan (if required) **(see Fact Sheet 3)** and ensure staff are aware of its importance.

Note: Don't stockpile sediment or building materials (sand, gravel, mulch) on roadways or within drainage areas.

Installing the control measures:

Service trenches:

1) Remove and store vegetated topsoil so it can be replaced after works to provide immediate erosion protection.
2) Place the soil on the uphill side of trenches to divert water flow away from the trench line. Temporary bunds can be used.
3) The trench should be open for the shortest time practicable and avoid opening them when the risk of rainfall is high.
4) Once completed, backfill trench with subsoil and compact.
5) Replace top soil, level and top up to account for soil settling.
6) If trenches are on steep slopes, install earthbanks along the backfill surface at 6 metre intervals to divert flows and prevent erosion.
7) Excess soil should be used or disposed of in such a way that it does not create a wind or water erosion hazard.

Stockpiles:

1) Locate stockpiles at least 5 metres from stormwater flow paths, roads and hazard areas.
2) Place on gently sloping ground (not level areas which tend to be overland low paths) as a low, flat, elongated mound.

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3) Stockpiles should preferably be less than 1.5 metres high.
4) Construct an earth bank on the up-slope side to divert runoff around the stockpile and install a sediment fence 1–2 metres down-slope of the stockpile. The height of the sediment fence should be equal to the stockpile height and the length equal to the stockpile length at the base.
5) Stockpiled materials should be covered during windy conditions, rain or unattended periods. Topsoil stockpiles left for extended periods should be revegetated.

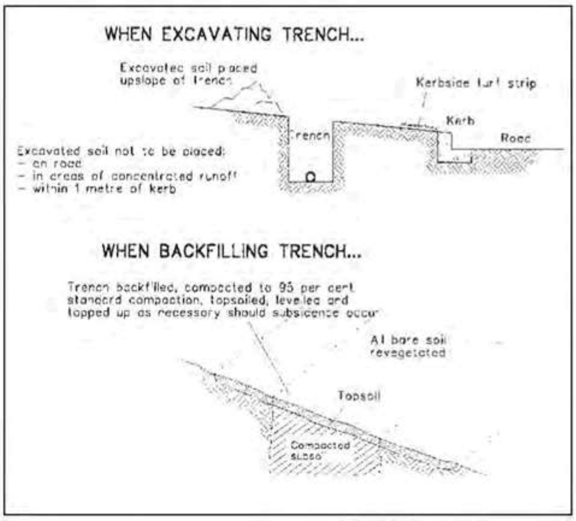

Figure 9A: Example of a service trench.

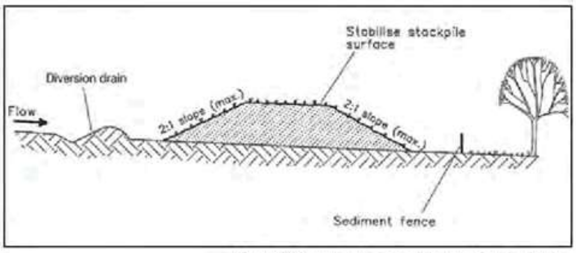

Figure 9B: Keep building materials in protected stockpiles.

Maintaining the control measures:

Service trenches: if they fill with water, pump water evenly over a stabilised vegetated area that will filter out the suspended clays. If this is not possible, add a small amount of gypsum to the water and allow the suspended clays to settle before pumping the water out.

Stockpiles: should be covered and checked regularly. Sediment and erosion controls (diversion drains and sediment fences) associated with stockpiles also need to be monitored and maintained.

List of fact sheets

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils. Figure 9A from the NSW Department of Housing as in Hobart Regional Councils *'Guidelines for Soil & Water Management 1999'*. Figure 9B from Landcom 2004 *"Soils & Construction Volume I Managing Urban Stormwater (4th edition)"*.

Date of Issue: December 2008

Scour Protection – Stormwater Pipe Outfalls & Check Dams

SOIL & WATER MANAGEMENT

What is this?

At stormwater pipe outfalls or along open drainage channels use rocks, vegetation, or other materials to break up concentrated flows, reduce the velocity of flows to non-erosive rates and to stabilise the outflow point.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 11

WHAT DO I NEED TO DO?

Before starting site works:

Stormwater pipe outfalls: should be located in areas where there is a low potential for soil erosion (e.g. areas of naturally occurring rock). If this is not possible, create a hard rock scour protector **(see Figure 11A).** If the pipe is highly visible (e.g. along a creek-side walking trail), natural rock and vegetation placement can conceal the outfall. If the outfall becomes council infrastructure, appropriate design approvals are required.

Check dams: are semi-pervious (typically loose rock) dam constructions that are placed in a series along open drainage channels to detain and reduce the velocity of stormwater runoff. They are particularly useful on gently sloping channels up to 10% (10:1) grade, but only effective for draining small areas of land (less than 4 hectares). If high flows are anticipated it may be necessary to line the entire base of the drainage channel with rocks.

Check dams can be temporarily used until a drainage channel has become revegetated. Alternatively, check dams can be a permanent feature if water detention is required. However, the drainage channel must still be able to effectively convey water.

Don't place check dams in channels that are already grass-lined, unless erosion is expected.

Don't construct check dams using sediment fences or straw bales.

Installing the control measures:

Stormwater pipe outfalls:

1) Fill material needs to be compacted to the density of the surrounding undisturbed material.
2) Place geotextile fabric over fill material.
3) Ensure that the rock work used for scour protection conforms to the required limits for water flow energy dissipation. (Ensure that the underlying geotextile does not sustain serious damage during the rock work phase.)
4) Repair any damage to geotextile areas with patches of geotextile (ensuring a 300 mm overlap with surrounding intact fabric).

Note: If low water flow has been determined for the stormwater pipe outfall, leave gaps in the rock work and plant into cuts in the geotextile.

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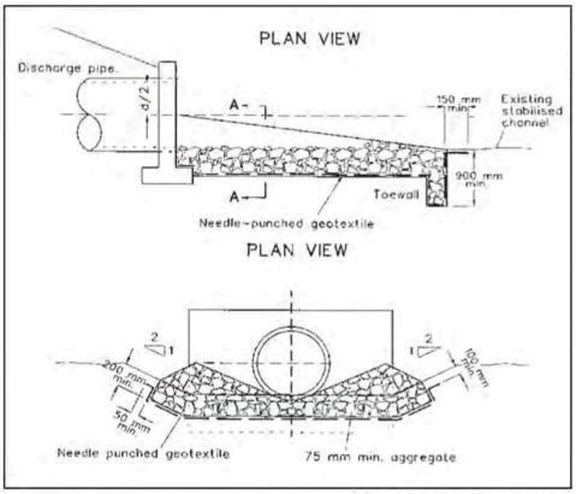

Figure 11A: Hard rock scour protector.

Check dams: these are appropriate for small channels with low flows that are susceptible to erosion (for larger channels or higher flows, specialist design may be required). A number of check dams will probably need to be built.

1) Excavate a shallow (200 mm) trench perpendicular to the drainage channel.
2) Construct the dam from aggregate (washed sand/gravel), placed in sandbags (for easy deconstruction). Place bags within the trench and build up the dam wall.
3) Ensure that the height of the dam spillway is less than 1 metre above the base of the drainage channel.
4) Ensure the dam height and spillway height does not dramatically impede water conveyance.
5) Space individual check dams so the toe of the upstream dam is level with the spillway of the next downstream dam. Otherwise extend downstream toe to provide erosion protection.
6) Check dams require regular maintenance as accumulated sediment needs to be removed, to prevent it becoming resuspended during subsequent storms.

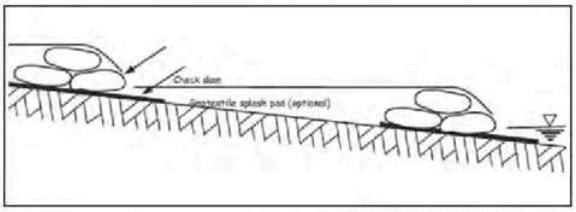

Figure 11B: Example of a check dam.

List of fact sheets

Remember:

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Acknowledgement:

Figure 11A from Landcom 2004 *"Soils and Construction Volume 1 Managing Urban Stormwater (4th edition)"*. Figure 11B from South East Queensland Healthy Waterways partnership 2006 *"Best Practice Guidelines for the Control of Stormwater Pollution from Building Sites"*. Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Stabilised Site Access

What is it?

A stabilised site access is a single entry/exit point for building and construction sites that is designed to reduce the tracking of sediment off-site. It provides a clean, dry surface for vehicles to enter and unload during all weather conditions without destroying vegetation or carrying large amounts of sediment onto paved road surfaces.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 12

WHAT DO I NEED TO DO?

Before starting site works:

Identify the best location to place the stabilised site access – ideally it should be in an elevated position with little or no water flowing to it from up-slope and away from any down-slope stormwater pits. All deliveries should be able to be made through this point. Document it on your Soil and Water Management Plan (if required) **(see Fact Sheet 3)** and ensure on-site staff are aware of its importance.

Installing the control measures:

The recommended construction method for the stabilised site access is laying down 200 mm of aggregate or recycled concrete greater than 40 mm in size (crushed sandstone is not suitable). Where the site access slopes toward the road, a diversion hump should be installed across the stabilised area to direct stormwater runoff to the side where it can be filtered by a sediment fence. If the construction process enables it, a permanent driveway can be laid and used as the access point.

Stabilised site access:

1) Strip at least 150 mm of topsoil, level area and stockpile in the space available.
2) Compact infill.
3) Cover the area with geotextile.
4) Construct a 200 mm thick pad over geotextile using aggregate at least 40 mm in size, ideally from kerb to building.
5) Construct a trafficable diversion hump immediately within the boundary to divert water to a sediment fence or other sediment control measure.

Note: On larger sites cattle grids or shaker grids can also be installed at the access point. These allow the wheels to turn a couple of times and shake off excess sediment. If sediment is still being tracked off-site then a wheel wash should be installed **(see Fact Sheet 13)**.

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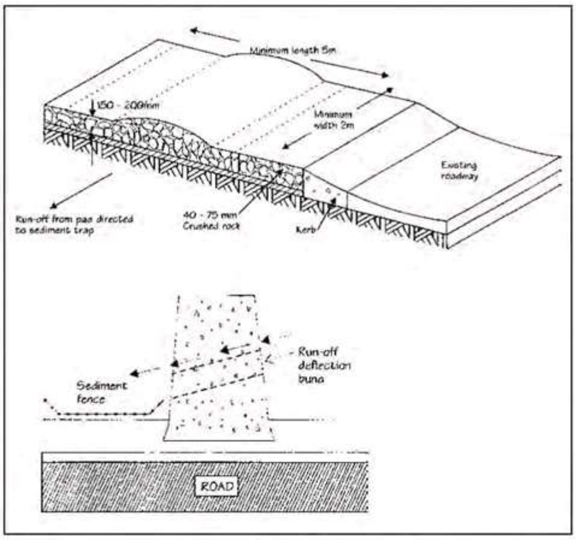

Figure 12A: *Stabilised site access for building sites only.*

Maintaining the control measures:

As vehicles use the stabilised site access they will slowly compact the gravel or rock. When it becomes too compacted the voids between the rock and gravel disappear and the stabilised site access will no longer trap mud and dirt.

Monitor the surface of the stabilised site access and ensure that it drains to the sediment fence or other sediment control measures. Add new gravel or rock as needed. Roads should be inspected for any sediment that has escaped the site at the end of each day and swept up if necessary. This should also be done whenever rain looks likely.

List of fact sheets

1. Soil & Water Management on Large Building & Construction Sites
2. Soil & Water Management on Standard Building & Construction Sites
3. Soil & Water Management Plans
4. Dispersive Soils – High Risk of Tunnel Erosion
5. Minimise Soil Disturbance
6. Preserve Vegetation
7. Divert Up-slope Water
8. Erosion Control Mats & Blankets
9. Protect Service Trenches & Stockpiles
10. Early Roof Drainage Connection
11. Scour Protection – Stormwater Pipe Outfalls & Check Dams
12. **Stabilised Site Access**
13. Wheel Wash
14. Sediment Fences & Fibre Rolls
15. Protection of Stormwater Pits
16. Manage Concrete, Brick & Tile Cutting
17. Sediment Basins
18. Dust Control
19. Site Revegetation

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Figure 12A and text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Wheel Wash

What is it?

A wheel wash reduces the amount of sediment transported onto paved roads by vehicles.

They should be installed on larger building and construction sites or when the stabilised site access is not preventing sediment from being tracked off the site.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 13

WHAT DO I NEED TO DO?

Installing the control measures:

1) Identify the best location to place the wheel wash. It should be incorporated with the stabilised site access **(see Fact Sheet 12).**
2) Construct a pad by evenly spreading a 200 mm layer of coarse aggregate or recycled concrete greater than 40 mm in size (crushed sandstone is not suitable) at a minimum depth of 300 mm.
3) Install a wash rack that is suitable for the anticipated traffic and weight loads.
4) The water used to wash the wheels of the vehicles shall not be discharged into stormwater system at any time. Provide a drainage channel that will convey the runoff from the wash area to a suitable on-site sediment control measure i.e. sediment basin **(see Fact Sheet 17)**, sediment settling tank, or a flat vegetated area.
5) Ensure that the drainage channel used to transport the sediment to the sediment control measure is of adequate size and proper gradient to carry the wash runoff.
6) Make sure that the sediment control measure is also of adequate size.
7) Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
8) Require all employees, subcontractors and others that leave the site with mud or dirt caked tyres and undercarriages to use the wash facilities.
9) If weeds and plant disease are an issue for your site refer to *"Tasmanian Washdown Guidelines for Weed and Disease Control 2004"* from the Tasmanian Department of Primary Industries and Water, Forestry Tasmania and the Agricultural Contractors Association of Tasmania.

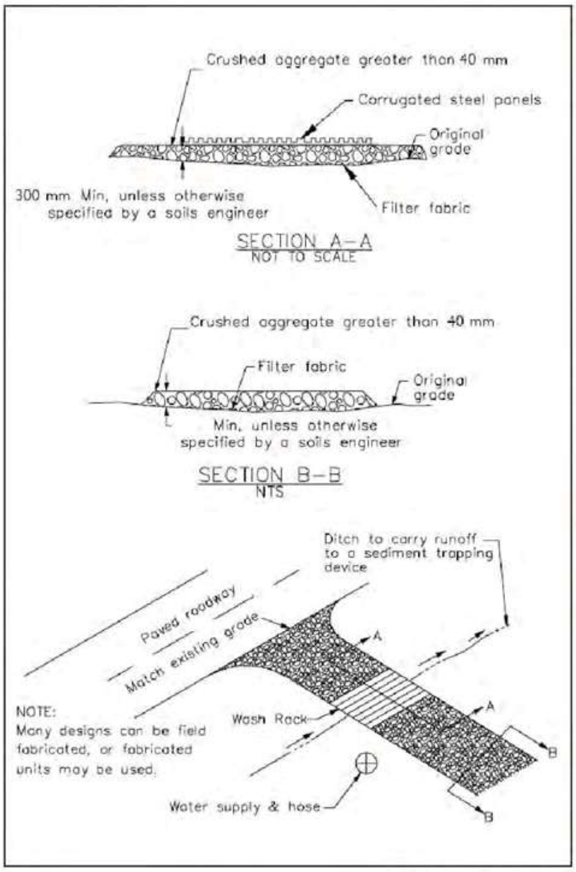

Figure 13 A: Wheel wash design.

Maintaining the control measures:

The wheel wash should be inspected weekly and after a major rainfall event. Remove accumulated sediment from the wash rack to maintain system performance. This sediment should be collected and may need to be disposed to landfill.

List of fact sheets

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Figure 13A after California Stormwater Quality Association 2003 *"California Stormwater BMP Handbook Construction"*.

Date of issue: December 2008

Sediment Fences & Fibre Rolls

What are these?

Sediment fences and fibre rolls are sediment control measures installed across slopes or along the parameter of building and construction sites. Fibre rolls are a range of organic products (coconut fibre, straw, flax) that are rolled into large diameter logs. Sediment fences are vertical barriers made from woven geotextile that are held in place by star pickets and a backfilled trench.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 14

WHAT DO I NEED TO DO?

Fibre Rolls: are log-like products commonly consisting of biodegradable fibres. They vary from biodegradable rolled coir (coconut fibre) and hessian socks filled with straw or mulch, to non-biodegradable geotextile tubes filled with mulch or straw. Biodegradable fibre rolls can be left permanently onsite to assist stabilisation and will support vegetative growth if left in place.

Sediment fences: are a commonly used sediment control measure constructed from heavy-duty geotextile. Although a sediment fence looks like shade cloth it is very different (shade cloth is not appropriate because it cannot slow water flow enough to adequately pond water up-slope of the fence and allow sediment to settle under gravity).

Before starting site works:

Identify drainage flow pathways that will intercept runoff from the site. Decide whether to use fibre rolls or sediment fences. Use fibre rolls at the base of an embankment, on slopes that are exposed, or on vegetated slopes where vegetation is failing to control erosion. Sediment fences should be used on small drainage areas and placed down-slope of potential areas of erosion. Document these measures on your Soil and Water Management Plan (if required) **(see Fact Sheet 3).**

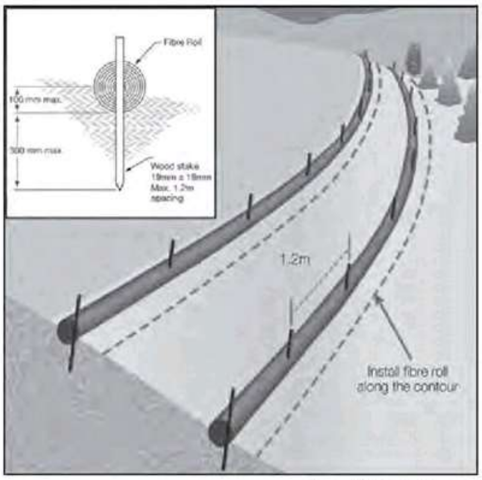

Figure 14A: Installation of fibre rolls

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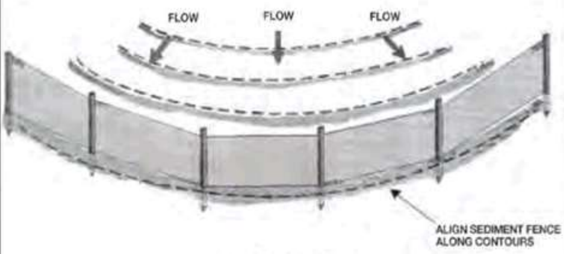
Installing the control measures:

Sediment control measures need to be in place prior to the start of site works. They can be altered after ground disturbance activities and if the site's drainage patterns change.

Installing fibre rolls:

1) Find a suitable installation site (if on a slope, place parallel to contours).
2) Remove large rocks and debris, and prepare a shallow concave trench (50–100 mm deep) to inset the fibre roll. (***Note:*** Place excavated material on the upside of the fibre roll to prevent undercutting.)
3) Place the fibre roll in a shallow trench and stake through the fibre roll every 30 cm.
4) Place further stakes on both sides of the fibre roll to within 2 m from the end of the roll.



SEDIMENT FENCE

Installing sediment fences:

1) Survey and mark out location of sediment fence, ensure it is parallel to the contours of the site.
2) Dig a 150 mm trench immediately above the proposed fence line.
3) Place the bottom of the fabric to the base of the trench and run fabric up the down-slope side of the trench.
4) Backfill the trench and compact to secure anchorage of the fabric.
5) Drive 1.5 m star pickets into ground, 2 m apart to support the sediment fence fabric. Tension and fasten fabric to pickets using UV stabilised zip ties or wire ties.
6) Join sections of fabric at a support post with a 2 m overlap.
7) Angle the ends of the sediment fence upslope to reduce scouring.

Don't place sediment fences across creeks or major drainage lines.

Maintaining the control measures:

Fibre rolls and sediment fences should be checked regularly, especially after every rain event and cleaned or repaired. For sediment fences check that all the pickets and the bottom of the fence are secure and that there are no tears in the fabric.

List of fact sheets

Remember:

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Acknowledgement:

Figures 14A and 14B after California Regional Water Quality Control Board 1999 *"Erosion & Sediment Control Field Manual"*.

Date of Issue: December 2008

Protection of Stormwater Pits

What is it?

Protect the stormwater system from blocking with sediment and building materials by placing control measures around or inside any stormwater pits on and below the site. Stormwater pit protection is an important last resort sediment control measure that should be used in conjunction with other on-site practices.

Why is it important?

Sediment generated from erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 15

WHAT DO I NEED TO DO?

Before starting site works:

Identify any stormwater pits and drains on and below the site. Plan the layout of the work site so that any wash-down areas and tile or brick cutting areas are not near them. Clearly mark all the stormwater pits and drains on the site plan and choose appropriate methods that will protect them. Install these sediment control measures before site work commences. Document them on your Soil and Water Management Plan (if required) **(see Fact Sheet 3)** and ensure staff are aware of its importance.

Note: the placement of sediment control measures on road reserves (i.e. off the work site) will normally require approval from the owner of the road, i.e. council or the Department of Infrastructure, Energy and Resources (DIER).

Installing the control measures:

There are a range of sediment control measures to protect stormwater pits including, sediment fence traps, filter socks and stormwater pit traps. Those that collect sediment above the stormwater pit are easier to clean but have low storage capacity compared to controls that are installed inside the stormwater pits. Place cones around controls in the gutters or on roads to prevent vehicles damaging them.

Sediment fence trap: these are sediment fences staked around the stormwater pit to trap sediment. Fabric must be partially buried so that water and sediment does not just flow underneath. The more space between the fence and the pit, the more chance of sediment settling and the greater the capacity of the trap **(see Figure 15A).**

Filter socks: are woven tubes filled with compost or bioremediation media that separate sediment, hydrocarbons, nutrients and heavy metals from site runoff. Filter socks are more effective than sandbags or geotextile sausages filled with gravel. Filter socks are able to treat runoff at higher flow rates with significantly less ponding.

Filter socks can be installed in the kerb and gutter below the work site, while longer socks can be used as a barrier around the stormwater pit **(see Figure 15B).**

Stormwater pit traps: are baskets, trays, bags or screens placed just below the entrance of the stormwater pit. They prevent sediment from entering the stormwater system. Fine mesh or fabric filters should be used to capture sediment **(see Figure 15C).**

Maintaining the control measures:

All sediment control measures should be inspected, especially after rainfall events and cleaned regularly to maintain effectiveness and prevent bypass. The built up material can be re-stockpiled and used on-site (if it is not contaminated), or otherwise disposed to landfill.

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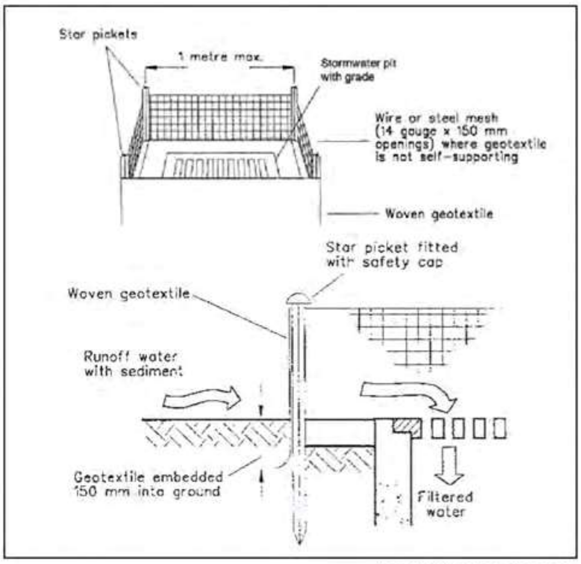

Figure 15A: A sediment fence trap.

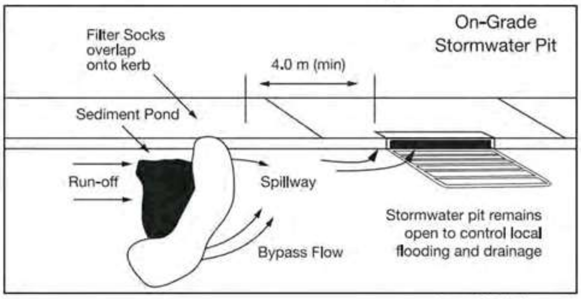

Figure 15B: A filter sock.

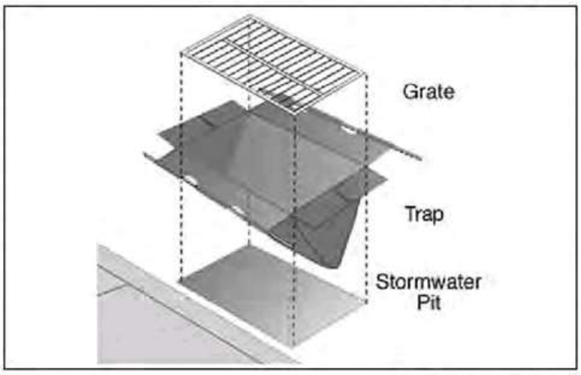

Figure 15C: Stormwater pit trap.

List of fact sheets

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Acknowledgement:

Figure 15A from Landcom 2004 *"Soils & Construction Volume I Managing Urban Stormwater (4th edition)"*. Figure 15B after South East Queensland Healthy Waterways Partnership 2006 *"Best Practice Guidelines for the Control of Stormwater Pollution from Building Sites"*. Figure 15C after California Regional Water Quality Board 1999 *"Erosion & Sediment Control Field Manual"*. Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Protected Concrete, Brick & Tile Cutting

What is this?

Concreting, bricklaying, brick and tile cutting must be conducted in such a way that ensures no waste products enter the stormwater system. If washed into the stormwater system, brick and tile cutting, concrete and mortar slurries will harden and block stormwater pipes and potentially cause flooding. Cement also raises the pH of waterways making it alkaline which is deadly to aquatic animals.

Why is it important?

Sediment generated from building and construction activities can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 16

WHAT DO I NEED TO DO?

Before starting site works:

Find a location on the site away from stormwater pits and drains to undertake these activities, including mixing cement and mortar. This area should be large enough to contain all excess water, residues and waste.

Designate where associated building materials should be stockpiled, as this typically determines where this activity will occur. If the nature of the job requires cutting in a location close to stormwater pits or drains such as cutting a footpath then controls need to be put in place to ensure that no material enters the stormwater system. Identify site requirements and list them on the Soil and Water Management Plan (if required) **(see Fact Sheet 3)** before starting site works.

Installing the control measures:

The designated brick or tile cutting area should have a diversion channel up-slope and sediment collection devices such as a sediment fence below it. If cutting in an area near a stormwater pit, use temporary collection devices such as filter socks, bunding or skirts suitably installed to direct the slurry onto a land area where it can soak into the earth. If this is not possible and the slurry is likely to flow to the stormwater system, filtering will be required. There are filtration systems available that work in the brick cutting machine with built in slurry containment systems, while for the kerb and gutter there are filter socks and for stormwater pits insert traps can be used **(see Fact Sheet 15)**. The filtered water must not be cloudy when discharged to the stormwater system. Install a series of filtration systems for best results.

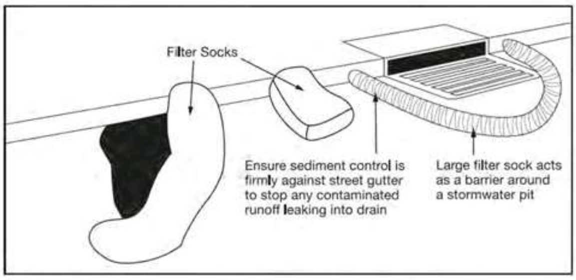

Figure 16A: *Installing a series of filtration systems.*

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When equipment is washed down, use a designated wash-down area on-site e.g. wheel wash **(see Fact Sheet 13)**. Waste concrete slurry can be safely disposed of by tipping small amounts into plastic or geotextile-lined ditches **(see Figure 16C)**. This will enable the water to evaporate or soak in to the earth and the solids can then be disposed to landfill or reused as clean fill in construction or as road base.

Maintaining the control measures:

All sediment control measures will require regular cleaning to maintain effectiveness and over time may need to be replaced. Remove the built up sediment and check for holes, other breaks, clogging and blockages in the control measures.

Shovel or vacuum concrete, brick or tile cutting slurry to an area well away from the stormwater system. **Do not** hose down. If there is no designated disposal area, place slurry into a 40 gallon drum that is half full of water. Solid materials will settle to the bottom of the drum for later disposal and the water can be reused when concreting.

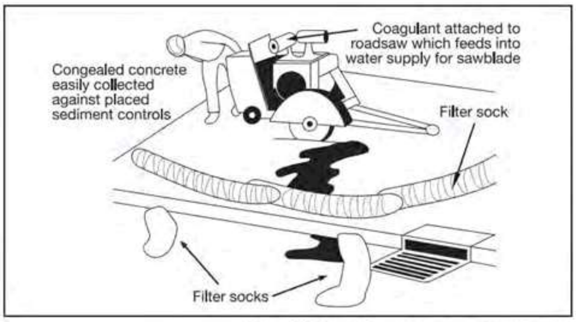

Figure 16B: Acceptable concrete slurry disposal method.

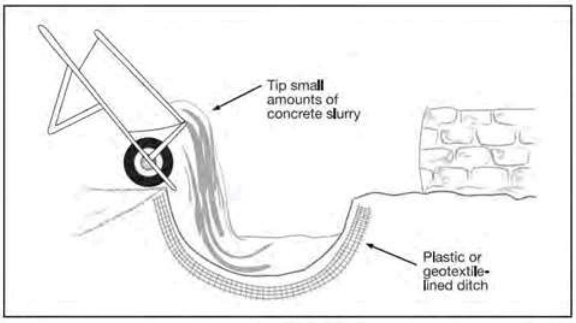

Figure 16C: Disposing concrete slurry into a lined ditch.

List of fact sheets

Remember:

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Acknowledgement:

Figures 16A, 16B and 16C after NSW Department of Conservation 2004 *"Environmental Best Management Practice Guideline for Concrete Contractors"*. Text in this brochure has been obtained and modified from the *"Do It Right On Site"* brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of Issue: December 2008

Sediment Basins

What is it?

Sediment basins are dams or ponds that capture sediment runoff from building and construction sites. They allow sediment to settle out and sink rather than be transported away with the runoff.

Sediment basins are formed by constructing an embankment of compacted soil at the lowest downstream point on the site and installing an outlet structure and overflow spillway. They are one of the most useful and cost-effective measures for treating sediment-laden runoff.

Why is it important?

Sediment generated from building and construction activities can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will control sediment run-off from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 17

WHAT DO I NEED TO DO?

Before starting site works:

Sediment basins are typically required on large construction sites and subdivisions, or in areas of high seasonal rainfall. Sediment basins by no means trap all the sediment from a site. Therefore, sediment basins should be used in conjunction with other sediment and erosion control measures. Sediment basins should be constructed as a first step in any land disturbing activity and remain functional for as long as possible, ideally until the area contributing sediment is stabilised. Document the sediment basin on the Soil and Water Management Plan (if required) **(see Fact Sheet 3)**. Detail on the plan how the basin will be maintained and decommissioned (if it is not a permanent on-site feature). Ensure that on-ground staff are aware of the need to maintain the sediment basin.

Design considerations:

Sediment basins require a considerable area to be effective. The two major factors determining the size of the basin are the settling velocity of the sediment and design flows in regards to rainfall. Sediment basins should be designed to cater for peak flow runoff from a design storm having an average reoccurrence interval of 10 years.

Sediment basins need to be positioned so if failure occurs they will not cause damage or nuisance to property, people or the environment. **Do not** install sediment basins on major drainage pathways. Locate sediment basins off-line and up-stream of the stormwater system, natural and constructed water bodies.

Preferably construct basins at the lowest downstream point to intercept most of the runoff from the site. Access for machinery to remove sediment is crucial, as is an area designated for stockpiling the removed sediment so it can dry out (preferably with this water seeping back into the basin). The dried sediment can eventually be reused or disposed to landfill.

Installing the control measures:

For suitable sediment basin design refer to the procedures in Chapter 4 of the *Water Sensitive Urban Design – Engineering Procedures for Stormwater Management in Southern Tasmania*, available from the Derwent Estuary Program web page:
http://www.derwentestuary.org.au/file.php?id=145

Note: For larger sediment basins a civil engineer can be used. They can provide detailed drawings to follow construction. It is essential that the engineer review/check the specifications of the proposed sediment basin to ensure it is correctly sized and down-stream risks are addressed in the event of basin failure. Sediment basins over one megalitre may require a dams permit.

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NRM North

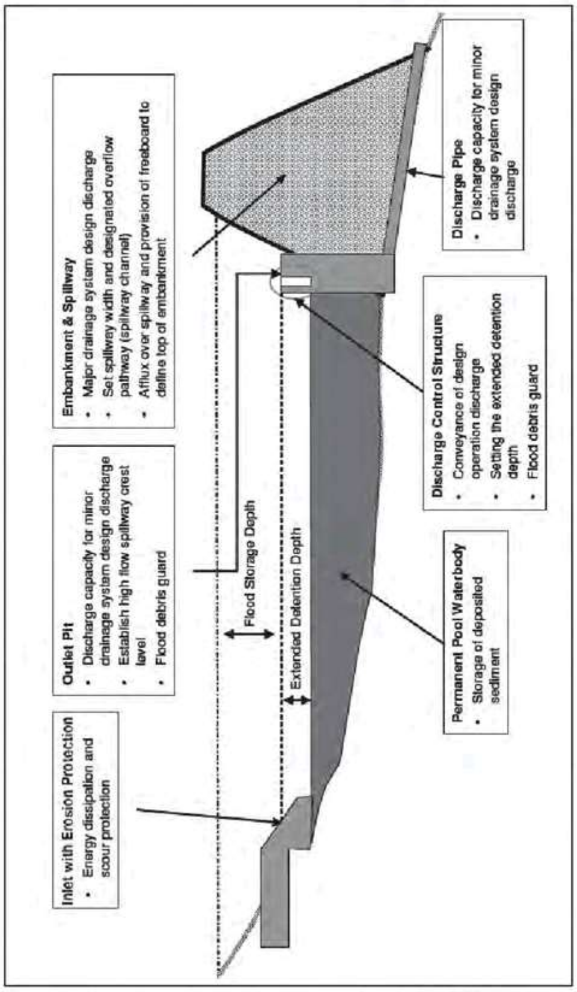

Figure 17A: *Sediment basin.*

Maintaining the control measures:

Sediment basins require regular inspection, especially after rain events and should be cleaned when more than half full of sediment. Litter and debris should be removed whenever observed in the sediment basin. If the water within the basin is cloudy and never clears, apply gypsum to allow the sediment to settle out.

List of fact sheets

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Figure 17A from Derwent Estuary Program 2006 *"Water Sensitive Urban Design – Engineering Procedures for Stormwater Management in Southern Tasmania"*.

Date of Issue: December 2008

Dust Control

SOIL & WATER MANAGEMENT

What is it?

Minimise the amount of dust (soil, building materials and residues) generated by wind erosion on building and construction sites. Research shows that average dust emission rates of over 2.5 tonnes per hectare per month occur on sites which have no dust control measures in place. The control measures discussed can be used on any building or construction site where dust may be generated and where dust may cause on or off-site damage.

Why is it important?

Sediment generated from wind erosion on building and construction sites can be a major source of pollution to local waterways. Follow the practices discussed in this fact sheet and you will minimise wind erosion from your site, meet your legal requirements and help protect our waterways.

Fact Sheet 18

WHAT DO I NEED TO DO?

Before starting site works:

Good site planning can eliminate dust being a problem.

1) Assess the dust potential of your site. Dust generating activities include major soil disturbances or heavy construction activity, such as clearing, excavation, demolition, cutting concrete or excessive vehicle traffic.
2) Decide upon dust control measures. A number of methods can be used to control dust from a site. The developer or builder will have to determine which practices are suitable based on specific site and weather conditions.
3) Document dust control measures on your Soil and Water Management Plan (if required) **(see Fact Sheet 3)** and ensure everyone working on the site understands them.

Installing the control measures:

These control measures will help to reduce the amount of soil and building materials loose on the site and therefore the dust that can be generated.

1) Stage works and disturb only small areas of the site at a time.
2) Maintain as much vegetation as possible. Existing trees and shrubs act as wind breaks, slowing wind velocities and provide coverage to surface soils.
3) Install constructed wind barriers if there is high risk of dust generation. Wind fences divert the wind up and over the site. Ensure that it is semi-permeable otherwise down-wind turbulence can make erosion worse.
4) Dampen the site slightly with a light application of water during excavation or when dust is being raised (be careful to only moisten ground surface, do not wet it to the point of creating mud).
5) Apply mulch to recently disturbed areas. Mulch can reduce wind erosion by 80%.
6) Where vegetative cover and mulching cannot be used (i.e. on site roads and entrances) apply rocks and stones.
7) For large open areas deep ploughing (tillage) brings soil clods to the surface where they rest on top of the dust, preventing it from becoming airborne.
8) Install a wheel wash where vehicles and/or equipment exit the site. Alternatively, a stabilised site access can be used **(see Fact Sheet 12)**.

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9) Cover sand and soil stockpiles with fabric, plastic or vegetation.
10) Ensure that relevant equipment and machinery have dust suppressors fitted.

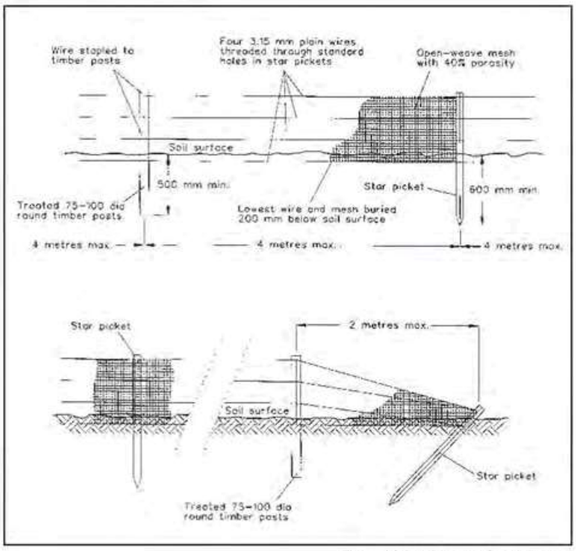


Figure 18A: Installation of a wind fence.

Maintaining the control measures:

Dust control measures involving the application of water require more monitoring than structural or vegetative controls to remain effective. If structural controls are used, they should be inspected for deterioration on a regular basis to ensure that they are still achieving their intended purpose.

List of fact sheets

Remember:

Everyone working on building and construction sites has a responsibility to prevent pollution. If you do have an accident and pollution occurs you are required by law to notify the site supervisor. If the site supervisor cannot be contacted, workers should immediately notify the local council so they can work with you to minimise any harm to the environment.

Acknowledgement:

Figure 18A from Landcom 2004 "*Soils & Construction Volume I Managing Urban Stormwater (4th edition)*". Text in this brochure has been obtained and modified from the "*Do It Right On Site*" brochure series, kindly provided by the Southern Sydney Regional Organisation of Councils.

Date of issue: December 2008

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

Appendix 3 IB105 Borehole Logs

GEO-ENVIRONMENTAL SOLUTIONS	PROJECT: 48-52 New Town Road ESA CLIENT: Swanbury Penglase Architects	Log of BH01
		EASTING: 5254124.978 GDA94
		NORTHING: 525375.976 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 56.754 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 4.5
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 23/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Asphalt	FILL			0.6
0.1–0.45	FILL: Gravelly silty SAND: Pale yellow brown, fine to coarse grained, medium dense, non-plastic, dry. Gravel comprises dolerite	FILL	SP		
0.45–0.8	FILL: Sandy gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is rounded and angular siltstone, brick and cha	FILL	CL		0.0
0.8–3.0	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occasional fragments of ceramic an	FILL	CI	BH01 1.0-1.1	0.1
				BH01 1.5-1.6	0.5
					0.1
				BH01 2.5-2.6	0.4
3.0–3.7	FILL: CLAY with gravel: Dark brown, stiff, moist, high plasticity. Contains gravels of dolerite, siltstone, brick, glass, charc	FILL	CH		0.0
				BH01 3.5-3.6	0.0
3.7–4.5	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, moist. Gravel comprises angular dolerite. Refusal on likely	FILL	CI		0.0
				BH01 4.4-4.5	0.1

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Berylium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH01 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH01 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH01 2.5-2.6	1	1	1	1	1		1	1	1	1	1		1	1			2			3		1	1	1		1	1	1	1		
BH01 3.5-3.6	1	1	1	1	1		1	1	1	1	1		1	1			1			3		1	1	1		1	1	1	1		
BH01 4.4-4.5	1	1	1	1	1		1	1	1	2	2		1	1			1			3		1	2	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0, 52.8, 52.6, 52.4

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH02**
CLIENT: Swanbury Penglase Architects	EASTING: 525367.355	GDA94
	NORTHING: 5254107.407	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.18	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4.1	
EQUIPMENT/METHOD: AMS 9110Ag Probe; LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 23/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Asphalt		
0.1–0.4	FILL: Sandy GRAVEL: Pale yellow brown, fine to coarse grained, medium dense, non-plastic, dry. Gravel comprises dolerite		SP
0.4–4.1	FILL: Sandy gravelly CLAY: Pale brown, moist, stiff, medium plasticity. Gravel is rounded and angular siltstone& dolerite, bric	FILL	CI

Approximate groundfloor level: 1.4 m depth (55.8 m elevation).

Depth (m)	Laboratory Sample	Field PID (ppm)
0.0		0.1
0.5	BH02 0.5-0.6	0.1
1.0	BH02 1.0-1.1	0.0
1.5		0.1
2.0	BH02 2.0-2.1	0.0
2.8	BH02 2.8-2.9	0.1
3.4		0.1
4.0	BH02 4.0-4.1	0.0

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH02 0.5-0.6	1	2	1	1	1		1	1	2	1	2		1	1			2			2		1	1	1		1	1	1	1		
BH02 1.0-1.1	1	2	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH02 2.0-2.1	1	2	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH02 2.8-2.9	1	2	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH02 4.0-4.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH03

EASTING: 5254105.348 GDA94

NORTHING: 525380.051 GDA94

BORING LOCATION: New Town

ELEVATION AND DATUM: 57.054 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions P/L

TOTAL DEPTH (m): 4

EQUIPMENT/METHOD: AMS 9110Ag Probe

LOGGED BY: S. Joyce

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 23/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Field PID (ppm)
0.0–0.1	FILL: Asphalt	FILL	P	0.0
0.1–1.0	FILL: Sandy gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is rounded and angular siltstone, brick and cha	FILL	CL	0.2 (0.5)
1.0–2.3	FILL: GRAVEL with Clay: brown/dark grey, slightly moist, dense. Contains fragments of Slate	FILL	GW	0.2 (1.0); 0.1 (2.0)
2.3–4.0	FILL: CLAY with gravel: Dark brown, stiff, moist, high plasticity. Contains gravels of dolerite, siltstone, brick, glass, charc	FILL		0.2 (2.5); 0.3 (3.0); 0.2 (3.6)

IB105 Analyte IL Exceedances

Laboratory Sample	Field PID (ppm)	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH03 0.5-0.6	0.2	1	1	1	1	1		1	1	2	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH03 1.0-1.1	0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH03 2.5-2.6	0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			3		1	1	1		1	1	1	1		
BH03 3.0-3.1	0.3	1	1	1	1	1		1	1	1	1	1		1	1			2			3		1	2	1		1	1	1	1		
BH03 3.9-4.0		1	1	1	1	1		1	1	1	1	1		1	1			1			3		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH04**
CLIENT: Swanbury Penglase Architects		EASTING: 5254104.766 GDA94
		NORTHING: 525361.385 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.233 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 4.6
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 23/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	ELEVATION (metres)
0.0–0.1	FILL: Asphalt	FILL	P	57.2
0.1–1.4	FILL: Gravelly sandy CLAY: brown/trace yellow, moist, stiff, medium plasticity, Gravel comprises angular dolerite & mudstone.	FILL	CI	
1.4–2.3	FILL: Clayey Sandy GRAVEL: grey/brown, dry, dense, brick fragments	FILL	GW	55.8
2.3–2.7	FILL: Sandy gravelly CLAY: Pale brown, moist, stiff, medium plasticity. Gravel is rounded and angular siltstone& dolerite, bric	FILL	CI	
2.7–4.6	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, moist. Gravel comprises angular dolerite. Refusal on likely	FILL	CI	

Depth (m)	Laboratory Sample	Field PID (ppm)
0.0		0.0
0.5	BH04 0.5-0.6	0.0
1.0		0.0
1.5	BH04 1.5-1.6	0.0
2.0		0.0
2.5	BH04 2.5-2.6	0.0
3.0	BH04 3.0-3.1	0.0
3.5	BH04 3.5-3.6	0.0
4.0		0.0
4.5	BH04 4.5-4.6	0.0

IB105 Analyte IL Exceedances

Laboratory Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
BH04 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1		
BH04 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1		
BH04 2.5-2.6	1	2	1	1	1		1	1	1	2	1		1	1		
BH04 3.0-3.1	1	1	1	1	1		1	1	1	1	1		1	1		
BH04 3.5-3.6	1	1	1	1	1		1	1	1	1	1		1	1		
BH04 4.5-4.6	1	1	1	1	1		1	1	1	2	1		1	1		

Laboratory Sample	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH04 0.5-0.6	2			3		1	1	1		1	1	1	1		
BH04 1.5-1.6	1			4		1	2	1		1	1	1	1		
BH04 2.5-2.6	1			1		1	1	1		1	1	1	1		
BH04 3.0-3.1	1			2		1	1	1		1	1	1	1		
BH04 3.5-3.6	1			2		1	1	1		1	1	1	1		
BH04 4.5-4.6	1			2		1	1	1		1	1	1	1		

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: 1 Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH05

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	525356.395 GDA94
NORTHING:	5254082.471 GDA94
BORING LOCATION:	New Town
ELEVATION AND DATUM:	57.58 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions P/L
TOTAL DEPTH (m):	4.6
EQUIPMENT/METHOD:	AMS 9110Ag Probe
LOGGED BY:	S. Joyce
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	23/07/2018

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		0.0	
0.2–1.2	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occational gravels of dolerite, si	FILL	CI		0.0	
1.0				BH05 1.0-1.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1
1.2–4.5	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite & sandston	FILL	CI		0.0	
2.0				BH05 2.0-2.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1
2.5					0.0	
3.0				BH05 3.0-3.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 1 1 1 1 1 1
3.5					0.0	
4.0				BH05 4.0-4.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 1 1 1 1 1 1
4.4					0.2	
4.5–4.6	FILL: Cobble - Sandstone: pale yellow-grey, dry, moderate rock	FILL	GP	BH05 4.5-4.6		1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1

MONITORING WELL

ELEVATION (metres): 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0

Approximate groundfloor level marked at 1.8 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH06**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254075.47	GDA94
	NORTHING: 525341.576	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.277 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.4	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 23/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		0.1		57.2
0.2–0.35	FILL: Sandy CLAY with gravels: Dark brown, firm, moist, medium plasticity. Contains gravels of dolerite.	FILL	CI	BH06 0.2-0.3			57.0
0.35–0.4	FILL: GRAVEL: blue-grey, moist, dense to Refusal	FILL	GP		0.2		

IB105 Analyte IL Exceedances (sample BH06 0.2-0.3)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✗ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH07**
CLIENT: Swanbury Penglase Architects		EASTING: 5254072.05 GDA94
		NORTHING: 525342.579 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.482 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 2.3
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 23/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		6.9		57.4
0.2–1.2	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occational gravels of dolerite	FILL	CI	BH07 1.0-1.1	0.0; 2.2		57.2 – 56.4
1.2–2.3	FILL: Clayey Sandy GRAVEL: grey, dry, dense to Refusal	FILL	GW	BH07 2.2-2.3	0.1; 0.2; 2.1		56.2 – 55.2

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7 ✖, 1.8, 1.9, 2.0, 2.1, 2.2

Elevation scale: 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✖, 55.6, 55.4, 55.2

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH07 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH07 2.2-2.3	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: 1 Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH08

EASTING:	525386.867	GDA94
NORTHING:	5254073.937	GDA94
ELEVATION AND DATUM:	57.78	m AHD
TOTAL DEPTH (m):	4.6	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
EQUIPMENT/METHOD: AMS 9110Ag Probe
LOGGED BY: S. Joyce
SAMPLING: Direct Push
DATE: 24/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC
0.2–4.6	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite	FILL	CI

Depth (m)	Field PID (ppm)
0.0	0.0
0.5	0.0
1.0	0.0
1.5	0.0
2.0	0.0
2.5	0.0
3.0	0.0
3.5	0.0
4.0	0.0
4.5	0.0

IB105 Analyte IL Exceedances

Laboratory Sample	Field PID (ppm)	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH08_1.0-1.1	0.0	1	1	1	1	1		1	1	1	1	1		1	1			1			4		1	2	1		1	1	1	1		
BH08_2.0-2.1	0.0	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH08_2.5-2.6	0.0	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH08_4.5-4.6	0.0	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2

Approximate groundfloor level marked at 2.0 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL
SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH09**
CLIENT: Swanbury Penglase Architects		EASTING: 5254043.755 GDA94
		NORTHING: 525388.559 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 58.83 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 6.4
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete slab	FILL	P
0.1–4.6	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite	FILL	CI
4.6–6.2	FILL: Gravelly sandy CLAY : Dark brown, moist to wet, stiff, medium plasticity. Gravel comprises dolerite.	FILL	CI
6.2–6.3	Sandy SILTY CLAY: pale brown, moist, stiff, medium to high plasticity	CI	CH
6.3–6.4	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered,	RW	

Field PID (ppm): 0.3, 0.0, 5.8, 0.2, 0.0, 0.0, 0.1, 0.1, 0.0, 0.5, 0.1, 0.2, 0.2

IB105 Analyte IL Exceedances

Laboratory Sample	Field PID (ppm)	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH09_1.0-1.1	5.8	1	1	1	1	1		1	1	1	1	1		1	1			1			3		1	2	1		1	1	1	1		
BH09_2.5-2.6	0.0	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH09_4.5-4.6	0.5	1	1	1	1	1		1	1	1	1	1		1	1			1			4		1	2	1		1	1	1	1		
BH09_6.0-6.1	0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0, 52.8, 52.6

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH10

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	525391.194 GDA94
NORTHING:	5254030.284 GDA94
BORING LOCATION:	New Town
ELEVATION AND DATUM:	59.53 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions P/L
TOTAL DEPTH (m):	5.5
EQUIPMENT/METHOD:	AMS 9110Ag Probe
LOGGED BY:	S. Joyce
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	24/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL
0.0–0.1	FILL: Asphalt	FILL	P			
0.1–0.2	FILL: Concrete slab	FILL				
0.2–1.4	FILL: Sandy Gravelly CLAY: Pale brown, moist, stiff, low to medium plasticity. Gravel is rounded and angular dolerite	FILL	CI	BH10_1.0-1.1	0.0 (0.5); 0.0 (1.0)	
1.4–2.0	FILL: Sandy SILTY CLAY: pale brown, moist, stiff, medium plasticity	FILL	CI		0.0 (1.5)	
2.0–3.4	FILL: Sandy CLAY trace gravels: Dark brown, moist, stiff, medium plasticity.	FILL	CI	BH10_3.0-3.1	0.0 (2.0); 0.0 (2.5); 0.1 (3.0)	
3.4–4.2	Silty SANDY CLAY: pale brown, moist, stiff, medium plasticity	Rv	CI		0.1 (3.5); 0.1 (4.0)	
4.2–5.3	Sandy CLAYEY SILT: pale brown, wet, loose, 'puggy' , fine grained sand	Rv	ML	BH10_5.0-5.1	0.0 (4.5); 0.9 (5.0)	
5.3–5.5	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered,	Rv				

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH10_1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH10_3.0-3.1	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH10_5.0-5.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

ELEVATION (metres): 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH11**
CLIENT: Swanbury Penglase Architects		EASTING: 5254019.694 GDA94
		NORTHING: 525386.54 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 59.837 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 3.4
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete slab		P
0.1–0.4	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC
0.4–3.2	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, slightly moist, stiff, medium plasticity. Contains gravels of siltstone, ch	FILL	CI
3.2–3.4	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,	Rv	

DEPTH (m)	Laboratory Sample	Field PID (ppm)
0.5		0.5
1.0	BH11_1.0-1.1	0.6
1.5		0.8
2.0	BH11_2.0-2.1	0.8
2.5	BH11_2.5-2.6	1.0
3.0		1.0
3.3	BH11_3.3-3.4	0.9

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
BH11_1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1		
BH11_2.0-2.1	1	1	2	1	1		1	1	1	1	1		1	1		
BH11_2.5-2.6	1	1	1	1	1		1	1	1	1	1		1	1		
BH11_3.3-3.4	1	1	2	1	1		1	1	1	2	1		1	1		

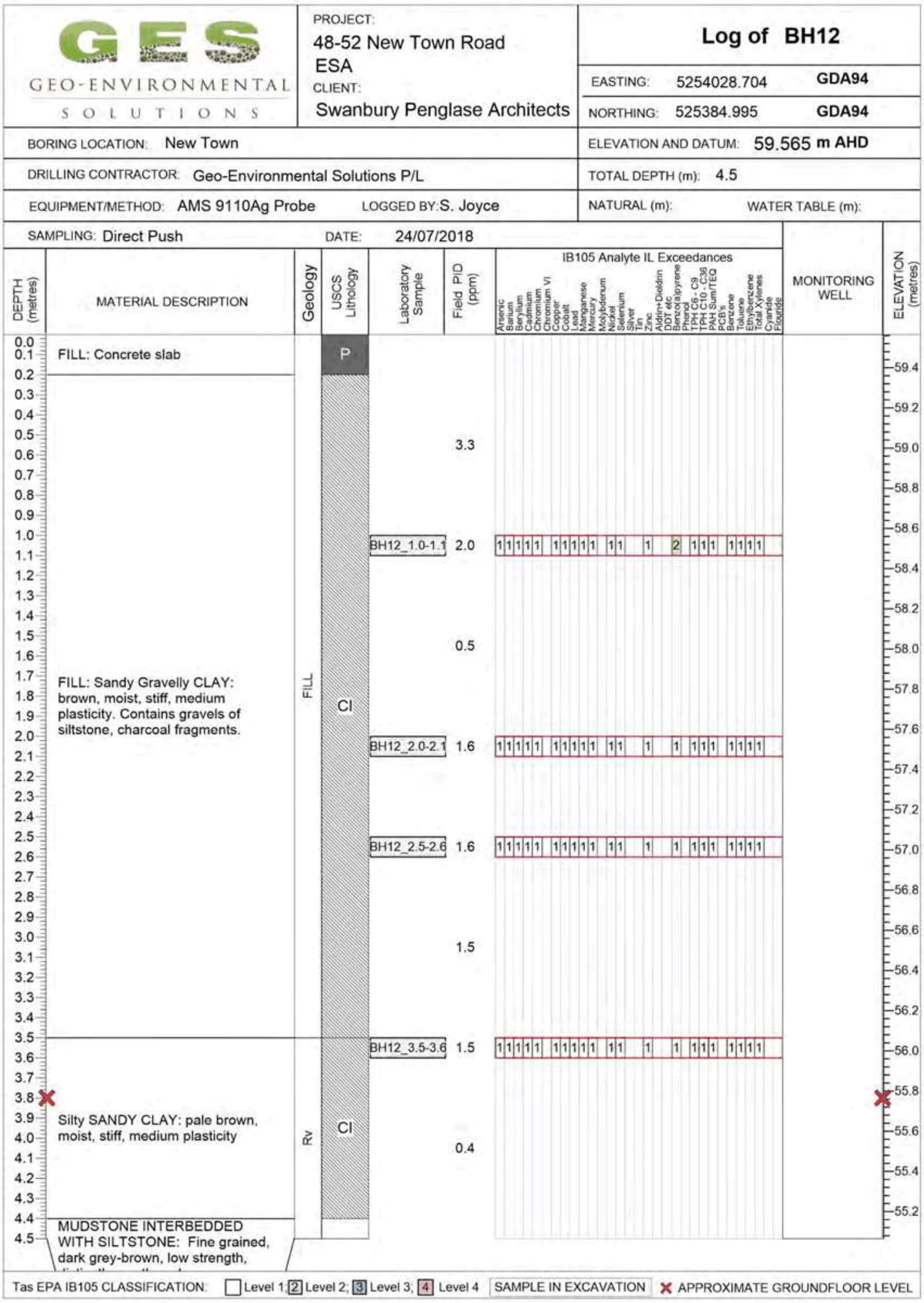
Sample	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH11_1.0-1.1	1			3		1	1	1		1	1	1	1		
BH11_2.0-2.1	1			3		1	1	1		1	1	1	1		
BH11_2.5-2.6	2			2		1	1	1		1	1	1	1		
BH11_3.3-3.4	1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 59.8, 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6

Tas EPA IB105 CLASSIFICATION: 1 Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)



GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH12

EASTING:	5254028.704	GDA94
NORTHING:	525384.995	GDA94

BORING LOCATION: New Town

ELEVATION AND DATUM: 59.565 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions P/L

TOTAL DEPTH (m): 4.5

EQUIPMENT/METHOD: AMS 9110Ag Probe

LOGGED BY: S. Joyce

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 24/07/2018

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium III, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
0.0–0.2	FILL: Concrete slab		P			
0.2–3.5	FILL: Sandy Gravelly CLAY: brown, moist, stiff, medium plasticity. Contains gravels of siltstone, charcoal fragments.	FILL	CI			
0.5					3.3	
1.0				BH12_1.0-1.1	2.0	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1
1.5					0.5	
2.0				BH12_2.0-2.1	1.6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2.5				BH12_2.5-2.6	1.6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
3.0					1.5	
3.5–4.4	Silty SANDY CLAY: pale brown, moist, stiff, medium plasticity	Rv	CI	BH12_3.5-3.6	1.5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
4.0					0.4	
4.4–4.5	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength,					

MONITORING WELL

ELEVATION (metres): 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH13

EASTING:	5254008.024	GDA94
NORTHING:	525398.145	GDA94

BORING LOCATION: New Town

ELEVATION AND DATUM: 60.436 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions P/L

TOTAL DEPTH (m): 3.2

EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce

NATURAL (m): WATER TABLE (m):

SAMPLING: Direct Push DATE: 25/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Asphalt	FILL	P		
0.1–0.2	FILL: Concrete slab	FILL	P		
0.2–0.8	FILL: Sandy clayey GRAVEL: Brown, medium dense, fine to coarse grained, moist, low plasticity.	FILL	GC		0.9
0.8–1.1	FILL: Layer of brick and concrete.	FILL		BH13 1.0-1.1	0.7
1.1–1.75	FILL: Sandy CLAY: Brown, firm becoming stiff, moist, high plasticity. Contains occasional fragments of brick.	FILL	CH	BH13 1.5-1.6	0.8
1.75–1.95	SILT: Pale brown, stiff, non-plastic, moist.	Rvv	ML		
1.95–2.5	Silty CLAY: Pale brown mottled orange, stiff, medium to high plasticity, moist.	Rvv	CH	BH13 2.0-2.1	0.1
2.5–3.2	SANDSTONE INTERBEDDED WITH MUDSTONE: Fine to medium grained, pale grey brown, medium strength, slightly weathered.	Rvv			

IB105 Analyte IL Exceedances

Analyte	BH13 1.0-1.1	BH13 1.5-1.6	BH13 2.0-2.1
Arsenic	1	1	1
Barium	1	1	1
Berylium	1	1	1
Cadmium	1	1	1
Chromium	1	1	1
Chromium VI			
Copper	1	1	1
Cobalt	1	1	1
Lead	2	1	1
Manganese	1	1	2
Mercury	1	1	1
Molybdenum			
Nickel	1	1	1
Selenium	1	1	1
Silver			
Tin			
Zinc	1	1	1
Aldrin+Dieldrin			
DDT etc			
Benzo(a)pyrene	4	2	2
Phenol			
TPH C6 - C9	1	1	1
TPH C10 - C36	2	1	1
PAH Sum/TEQ	1	1	1
PCB's			
Benzene	1	1	1
Toluene	1	1	1
Ethylbenzene	1	1	1
Total Xylenes	1	1	1
Cyanide			
Flouride			

MONITORING WELL

ELEVATION (metres): 60.4, 60.2, 60.0, 59.8, 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH14**
CLIENT: Swanbury Penglase Architects		EASTING: 5254002.799 **GDA94**
		NORTHING: 525363.871 **GDA94**
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.758 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 0.5
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 25/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P					
0.1–0.45	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC		1.3			57.6
0.45–0.5	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,	Rf		BH14 0.4-0.5	3.3	see below		57.4

IB105 Analyte IL Exceedances (BH14 0.4-0.5):

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1	1	1	1	1		1	1	1	2	1		1	1			1			1		1	2	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH15**
CLIENT: Swanbury Penglase Architects	EASTING: 5254012.204	GDA94
	NORTHING: 525357.875	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.707 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.65	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 25/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P					57.6
0.1–0.6	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC		1.8			57.4 / 57.2
0.6	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,	R		BH15 0.55-0.65	0.7	see below		

IB105 Analyte IL Exceedances (BH15 0.55-0.65):

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
1	1	1	1	1		1	1	1	2	1		1	1		

Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	Log of BH16	
CLIENT: Swanbury Penglase Architects	EASTING: 5254017.943	GDA94
	NORTHING: 525350.1	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.704 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.4	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 25/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab		P				57.6
0.1–0.3	FILL: GRAVEL: brown/grey, slightly moist, dense	FILL	GC		0.4		
0.3–0.4	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC	BH16 0.3-0.4	1.2		57.4

IB105 Analyte IL Exceedances (sample BH16 0.3-0.4)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH17**
CLIENT: Swanbury Penglase Architects		EASTING: 5254042.699 GDA94
		NORTHING: 525330.158 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.587 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 1.2
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 25/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P				
0.1–0.5	FILL: Gravelly sandy CLAY: brown/grey, slightly moist, stiff, medium plasticity.	FILL	CI		0.3		57.4
0.5–1.1	Sandy SILTY CLAY: pale brown, moist, stiff, medium to high plasticity	CI	CH	BH17 0.5-0.6	0.6		57.2
					0.9		57.0 / 56.8 / 56.6
1.1–1.2	SANDSTONE: Quartz rich, fine to medium grained, pale grey brown, medium strength, slightly weathered.	RW		BH17 1.1-1.2	1.0		56.4

IB105 Analyte IL Exceedances

Analyte	BH17 0.5-0.6	BH17 1.1-1.2
Arsenic	1	1
Barium	1	2
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI		
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	1
Mercury	1	1
Molybdenum		
Nickel	1	1
Selenium	1	1
Silver		
Tin		
Zinc	1	1
Aldrin+Dieldrin		
DDT etc		
Benzo(a)pyrene	4	1
Phenol		
TPH C6 - C9	1	1
TPH C10 - C36	2	1
PAH Sum/TEQ	1	1
PCB's		
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide		
Flouride		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH18**
CLIENT: Swanbury Penglase Architects	EASTING: 5254054.073	GDA94
	NORTHING: 525344.624	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.718 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 3.6	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 25/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.15	FILL: Concrete slab	FILL	P		
0.15–1.5	FILL: Sandy Gravelly CLAY: brown, moist, stiff, medium plasticity. Contains gravels of siltstone, brick & charcoal fragments.	FILL	CI	BH18 0.5-0.6	0.8
					0.8
1.5–3.6	FILL: Sandy CLAY trace gravels: Dark brown, moist (wet at 3.2m), stiff, medium plasticity. Refusal on likely cobble	FILL	CI	BH18 1.5-1.6	1.1
					0.8
				BH18 2.5-2.6	0.9
				BH18 2.7-2.8	1.2
				BH18 3.1-3.2	0.9
				BH18 3.5-3.6	0.8

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH18 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH18 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			2			3		1	1	1		1	1	1	1		
BH18 2.5-2.6	1	1	1	1	1		1	1	1	2	1		1	1			1			1		1	1	1		1	1	1	1		
BH18 2.7-2.8	1	2	1	1	1		1	1	2	1	2		1	1			2			2		1	1	1		1	1	1	1		
BH18 3.1-3.2	1	1	1	1	1		1	1	2	1	2		1	1			2			2		1	1	1		1	1	1	1		
BH18 3.5-3.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2

DEPTH (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 ✖, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5

Tas EPA IB105 CLASSIFICATION: ☐ Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH19**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254044.768	GDA94
	NORTHING: 525343.195	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.694 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 2.2	
EQUIPMENT/METHOD: AMS 9110Ag Probe; LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 25/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.2	FILL: Concrete slab		P			57.6
0.5					0.8	57.2
0.2–2.1	FILL: Sandy CLAY trace gravels: Dark brown, moist (perched water at 1.2m), stiff, medium plasticity	FILL	CI	BH19 1.0-1.1	0.8	56.6
1.5					0.8	56.2
1.9 ✕						55.8 ✕
2.1–2.2	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,	Rv		BH19 2.1-2.2	1.1	55.6

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1

Elevation scale: 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH19 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH19 2.1-2.2	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH20**
CLIENT: Swanbury Penglase Architects	EASTING: 5254035.024	**GDA94**
	NORTHING: 525338.362	**GDA94**
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.732 **m AHD**	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Tasmanian Drilling Services LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger	DATE: 30/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Concrete slab	FILL	P		
0.1–0.5	FILL: Gravelly sandy CLAY: Pale grey, firm, fine to medium grained, angular, moist to wet, high plasticity. Gravel comprises do	FILL	CH		
0.5–1.2	FILL: Sandy CLAY with gravel: Dark brown, firm, moist, high plasticity. Contains fine to coarse angular gravels of brick, dole	FILL	CH	BH20 0.5-0.6; BH20 1.0-1.1	
1.2–2.7	✕ SANDSTONE: Fine grained, pale yellow brown, low to medium strength, slightly weathered.	Rv			
2.7–3.0	SANDSTONE: Fine grained, pale yellow brown, low strength, distinctly weathered.	Rv			

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH20 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH20 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✕, 55.6, 55.4, 55.2, 55.0, 54.8

DEPTH (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 ✕, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9

Tas EPA IB105 CLASSIFICATION: ☐ Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH21**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254116.448	GDA94
	NORTHING: 525378.118	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 56.821 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 4.2	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 24/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	IB105 Analyte IL Exceedances
0.0–0.1	FILL: Asphalt	FILL			
0.1–0.8	FILL: Sandy Gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is angular siltstone & Dolerite, brick and char	FILL	CL	BH21 0.5-0.6	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1
0.8–4.2	FILL: Gravelly Sandy CLAY: dark brown, firm to stiff, moist, medium to high plasticity. Gravel is angular siltstone & Dolerite,	FILL	CI	BH21 1.5-1.6	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1
				BH21 2.5-2.6	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1
				BH21 3.5-3.6	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

Other columns: Field PID (ppm); MONITORING WELL; ELEVATION (metres) 56.8 to 52.8. Approximate groundfloor level marked at 1.0 m depth (55.8 m elevation).

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH22

EASTING: 525369.105 GDA94

NORTHING: 5254118.419 GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 56.94 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 3.7

EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer

NATURAL (m): WATER TABLE (m):

SAMPLING: Direct Push DATE: 24/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0	FILL: Asphalt				
0.1–1.0	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity. Gravel is angular siltstone & dolerite, brick fragments	FILL	CI	BH22 0.5-0.6	
1.0–1.3	FILL: Sandy GRAVEL; pale yellow-brown, slightly moist to dry, dense, fine to course angular Dolerite gravel		GC		
1.3–1.6	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm), lense of brick fragments at bas			BH22 1.5-1.6	
1.6–1.9	FILL: Sandy CLAY trace gravels; dark brown, moist, stiff, medium to high plasticity. Contains occational gravels of dolerite, s		CH		
1.9–3.7	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm). EOH	FILL	GC	BH22 2.5-2.6; BH22 3.4-3.5	

IB105 Analyte IL Exceedances

Analyte	BH22 0.5-0.6	BH22 1.5-1.6	BH22 2.5-2.6	BH22 3.4-3.5
Arsenic	1	1	1	1
Barium	1	1	1	1
Beryllium	1	1	1	1
Cadmium	1	1	1	1
Chromium	1	1	1	1
Chromium VI				
Copper	1	1	1	1
Cobalt	1	1	1	1
Lead	1	1	1	1
Manganese	1	1	1	1
Mercury	1	1	1	1
Molybdenum				
Nickel	1	1	1	1
Selenium	1	1	1	1
Silver				
Tin				
Zinc	1	1	1	1
Aldrin+Dieldrin				
DDT etc				
Benzo(a)pyrene	2	1	1	1
Phenol				
TPH C6 - C9	1	1	1	1
TPH C10 - C36	1	1	1	1
PAH Sum/TEQ	2	1	1	1
PCB's				
Benzene	1	1	1	1
Toluene	1	1	1	1
Ethylbenzene	1	1	1	1
Total Xylenes	1	1	1	1
Cyanide				
Flouride				

MONITORING WELL

ELEVATION (metres): 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	Log of BH23
CLIENT: Swanbury Penglase Architects	EASTING: 5254094.233 GDA94
	NORTHING: 525368.937 GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.361 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 5.3
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push DATE: 24/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Asphalt	FILL			
0.1–0.6	FILL: Gravelly Clayey SAND; brown, slightly moist, fine to coarse grained, medium dense, non-plastic, Gravel comprises dolerite	FILL	SW	BH23 0.5-0.6	
0.6–1.1	FILL: Sandy Clayey GRAVEL; red/grey/brown, dry, dense, fine to medium angular gravel (2-10mm), brick fragments	FILL	GC		
1.1–1.6	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity. Gravel is angular siltstone & dolerite, brick fragments	FILL	CI	BH23 1.5-1.6	
1.6–2.4	FILL: Sandy Clayey GRAVEL; red/grey/brown, dry, dense, fine to medium angular gravel (2-10mm), brick fragments	FILL	GC		
2.4–4.1	FILL: Gravelly Sandy CLAY: dark brown, firm to stiff, moist, medium to high plasticity. Gravel is angular siltstone & Dolerite,	FILL	CI	BH23 2.5-2.6; BH23 3.5-3.6	
4.1–5.3	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity. Gravel is angular siltstone & dolerite. EOH	FILL	CI	BH23 4.5-4.6	

IB105 Analyte IL Exceedances

Analyte	BH23 0.5-0.6	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6
Arsenic	1	1	1	1	1
Barium	1	1	1	2	1
Beryllium	1	1	1	1	1
Cadmium	1	1	1	1	1
Chromium	1	1	1	1	1
Chromium VI					
Copper	1	1	1	1	1
Cobalt	1	1	1	1	1
Lead	1	1	1	1	1
Manganese	1	1	1	1	2
Mercury	1	1	1	1	1
Molybdenum					
Nickel	1	1	1	1	1
Selenium	1	1	1	1	1
Silver					
Tin					
Zinc	1	2	1	2	1
Aldrin+Dieldrin					
DDT etc					
Benzo(a)pyrene	2	2	2	2	2
Phenol					
TPH C6 - C9	1	1	1	1	1
TPH C10 - C36	1	1	3	1	1
PAH Sum/TEQ	2	2	2	2	2
PCB's					
Benzene	1	1	1	1	1
Toluene	1	1	1	1	1
Ethylbenzene	1	1	1	1	1
Total Xylenes	1	1	1	1	1
Cyanide					
Flouride					

MONITORING WELL

ELEVATION (metres): 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0, 52.8, 52.6, 52.4, 52.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH24

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254096.239 GDA94
NORTHING:	525357.19 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	57.3 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	3.6
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	24/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.2	FILL: Silty SAND; dark brown, trace fine grave, dry, meidum dense	FILL	SM		
0.2–0.7	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm)	FILL	GC	BH24 0.5-0.6	
0.7–1.7	FILL: Gravelly Sandy CLAY: pale yellow-brown, slightly moist, very stiff, medium plasticity. Gravel is angular siltstone & Dole	FILL	CI	BH24 1.5-1.6	
1.7–3.6	FILL: Gravelly Sandy CLAY: grey/brown, slightly moist, very stiff, medium plasticity. Gravel is angular siltstone & Dolerite. E	FILL	CI	BH24 2.5-2.6; BH24 3.3-3.4	

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH24 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH24 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH24 2.5-2.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH24 3.3-3.4	1	1	1	1	1		1	1	1	2	1		1	1			2			2		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.2 – 53.8

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✘ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH25

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254080.711 GDA94
NORTHING:	525350.801 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	57.587 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	5.8
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	24/10/18

MATERIAL DESCRIPTION	Geology	USCS Lithology
FILL: Silty SAND; dark brown, trace fine grave, dry, meidum dense	FILL	SM
FILL: Sandy Clayey GRAVEL; grey/brown/'pink', dry, very dense, fine to coarse angular gravel (2-40mm), red brick fragments	FILL	GC
FILL: Gravelly Sandy CLAY: grey/brown, slightly moist, very stiff, medium plasticity overall. Gravel is angular siltstone & Dol	FILL	CI
FILL: Mixed Gravelly Sandy CLAY: red/grey/dark brown, slightly moist, very stiff, medium plasticity overall. Gravel is angular	FILL	CI

IB105 Analyte IL Exceedances

Laboratory Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH25 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH25 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH25 2.5-2.6	1	1	2	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH25 3.5-3.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH25 4.5-4.6	1	1	1	1	1		1	1	2	1	1		1	1			2			2		1	1	2		1	1	1	1		
BH25 5.5-5.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

DEPTH (metres) | Field PID (ppm) | MONITORING WELL | ELEVATION (metres)

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH26**
CLIENT: Swanbury Penglase Architects	EASTING: 5254037.771	GDA94
	NORTHING: 525329.284	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.605 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.7	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P				57.6
0.1–0.4	FILL: Clayey GRAVEL; dark orange-brown, slightly moist, very dense, fine to coarse angular Dolerite gravel	FILL	GC	BH26 0.1-0.2			57.4
0.4–0.6	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Q	CH	BH26 0.5-0.6			57.2
0.6–0.7	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rwl					57.0

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH26 0.1-0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH26 0.5-0.6	1	2	2	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH27**
CLIENT: Swanbury Penglase Architects		EASTING: 5254040.377 GDA94
		NORTHING: 525338.728 GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.729 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 2
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 30/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P			
0.1–0.9	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH27 0.1-0.2; BH27 0.5-0.6		
0.9–1.05	FILL: Sandy GRAVEL; orange, slightly moist, dense	FILL	GW			
1.05–1.3	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH27 1.0-1.1		
1.3–1.45	Gravelly SILT: low plasticity, dark grey/black, moist, stiff	Q	ML			
1.45–1.9	Gravelly Silty CLAY: medium plasticity, pale brown-grey, moist, very stiff, gradual transition to	Q	CI	BH27 1.5-1.6		
1.9–2.0	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rvt		BH27 1.9-2.0		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

Elevation scale: 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
BH27 0.1-0.2	1	1	1	1	1		1	1	1	1	1		1	1		
BH27 0.5-0.6	2	1	1	1	1		1	1	1	1	1		1	1		
BH27 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1		
BH27 1.5-1.6	1	1	2	1	1		1	1	1	1	1		1	1		
BH27 1.9-2.0	1	1	1	1	1		1	1	1	2	1		1	1		

Sample	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH27 0.1-0.2	1			2		1	1	1		1	1	1	1		
BH27 0.5-0.6	1			1		1	1	1		1	1	1	1		
BH27 1.0-1.1	1			2		1	1	2		1	1	1	1		
BH27 1.5-1.6	1			1		1	1	1		1	1	1	1		
BH27 1.9-2.0	1			1		1	1	1		1	1	1	1		

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH28

EASTING: 5254047.014 GDA94

NORTHING: 525333.614 GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 57.992 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 1.4

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P				
0.1–1.1	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH28 0.1-0.2; BH28 0.5-0.6; BH28 1.0-1.1			
1.1–1.2	FILL: Woodchips, black, moist, loose						
1.2–1.3	Gravelly SILT: low plasticity, dark grey/black, moist, stiff	Q	ML	BH28 1.2-1.3			
	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered						

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3

Elevation scale (metres): 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6

IB105 Analyte IL Exceedances

Laboratory Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH28 0.1-0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH28 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH28 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH28 1.2-1.3	1	1	1	1	1		1	1	1	1	1		1	1			2			2		1	1	2		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH29

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254003.063 GDA94
NORTHING:	525381.977 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	59.713 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	2.2
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Concrete	FILL	P		
0.1–1.3	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH29 0.5-0.6	
1.3–1.6	FILL: Sandy CLAY; medium plasticity, dark brown/black, slightly moist, very stiff	FILL	CI	BH29 1.5-1.6	
1.6–1.7	FILL: Brick fragments; red, dry, dense	FILL			
1.7–1.9	FILL: Sandy GRAVEL; orange, slightly moist, dense	FILL	GW		
1.9–2.1	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	σ	CH	BH29 2.1-2.2	
2.1–2.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered				

IB105 Analyte IL Exceedances

Analyte	BH29 0.5-0.6	BH29 1.5-1.6	BH29 2.1-2.2
Arsenic	1	1	1
Barium	1	1	1
Beryllium	1	1	1
Cadmium	1	1	1
Chromium	1	1	1
Chromium VI			
Copper	1	1	1
Cobalt	1	1	1
Lead	1	1	1
Manganese	1	1	1
Mercury	1	1	1
Molybdenum			
Nickel	1	1	1
Selenium	1	1	1
Silver			
Tin			
Zinc	1	1	1
Aldrin+Dieldrin			
DDT etc			
Benzo(a)pyrene	2	1	1
Phenol			
TPH C6 - C9	1	1	1
TPH C10 - C36	1	1	1
PAH Sum/TEQ	2	1	1
PCB's			
Benzene	1	1	1
Toluene	1	1	1
Ethylbenzene	1	1	1
Total Xylenes	1	1	1
Cyanide			
Flouride			

MONITORING WELL

ELEVATION (metres): 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH30**
CLIENT: Swanbury Penglase Architects	EASTING: 5254000.95	**GDA94**
	NORTHING: 525372.89	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 58.412 **m AHD**	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.4	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0	FILL: Concrete	FILL	P				58.4
0.1	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI				
0.2	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Q	CH				58.2
0.3	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	T		BH30 0.3-0.4			
0.4							

IB105 Analyte IL Exceedances (sample BH30 0.3-0.4)

Analyte	Level
Arsenic	1
Barium	1
Beryllium	1
Cadmium	1
Chromium	1
Chromium VI	
Copper	1
Cobalt	1
Lead	1
Manganese	1
Mercury	1
Molybdenum	
Nickel	1
Selenium	1
Silver	
Tin	
Zinc	1
Aldrin+Dieldrin	
DDT etc	
Benzo(a)pyrene	1
Phenol	
TPH C6 - C9	1
TPH C10 - C36	1
PAH Sum/TEQ	1
PCB's	
Benzene	1
Toluene	1
Ethylbenzene	1
Total Xylenes	1
Cyanide	
Flouride	

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH31**
CLIENT: Swanbury Penglase Architects	EASTING: 5254015.916	GDA94
	NORTHING: 525314.878	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 60.523 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.9	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen						
0.1–1.0	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH31 0.5-0.6			
1.0–1.8	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rvvi		BH31 1.5-1.6			

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8

Elevation scale: 60.4, 60.2, 60.0, 59.8, 59.6, 59.4, 59.2, 59.0, 58.8

IB105 Analyte IL Exceedances

Analyte	BH31 0.5-0.6	BH31 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI		
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	2
Mercury	1	1
Molybdenum		
Nickel	1	1
Selenium	1	1
Silver		
Tin		
Zinc	1	1
Aldrin+Dieldrin		
DDT etc		
Benzo(a)pyrene	1	1
Phenol		
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	1	1
PCB's		
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide		
Flouride		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH32**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254009.27	GDA94
	NORTHING: 525321.543	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 60.816 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen						60.8
0.1–1.0	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH32 0.5-0.6			60.6, 60.4, 60.2, 60.0
1.0–1.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rvl					59.8

IB105 Analyte IL Exceedances (sample BH32 0.5-0.6):

Analyte	Level
Arsenic	1
Barium	1
Beryllium	1
Cadmium	1
Chromium	1
Chromium VI	
Copper	1
Cobalt	1
Lead	1
Manganese	1
Mercury	1
Molybdenum	
Nickel	1
Selenium	1
Silver	
Tin	
Zinc	1
Aldrin+Dieldrin	
DDT etc	
Benzo(a)pyrene	2
Phenol	
TPH C6 - C9	1
TPH C10 - C36	1
PAH Sum/TEQ	1
PCB's	
Benzene	1
Toluene	1
Ethylbenzene	1
Total Xylenes	1
Cyanide	
Flouride	

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects

Log of BH33

EASTING:	5254025.94	GDA94
NORTHING:	525321.493	GDA94
ELEVATION AND DATUM:	59.262 m AHD	
TOTAL DEPTH (m):	1	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0	FILL: Bitumen						59.2
0.1–0.5	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI				59.0, 58.8
0.5–0.8	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Q	CH	BH33 0.5-0.6			58.6
0.8–1.0	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rvvl					58.4

IB105 Analyte IL Exceedances (sample BH33 0.5-0.6)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH34

EASTING:	525330.254	GDA94
NORTHING:	5254019.551	GDA94
ELEVATION AND DATUM:	59.42	m AHD
TOTAL DEPTH (m):	1.2	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania
DRILLING CONTRACTOR: Geo-Environmental Solutions
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer
SAMPLING: Direct Push DATE: 30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen							59.4
0.1–0.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH34 0.5-0.6		1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		59.2, 59.0, 58.8
0.6–1.15	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Cl	CH					58.6, 58.4
1.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH35**
CLIENT: Swanbury Penglase Architects	EASTING: 5254064.796	GDA94
	NORTHING: 525336.154	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.373 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 2	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–1.9	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH35 0.5-0.6; BH35 1.5-1.6			57.2 – 55.4

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 ✖, 1.7, 1.8, 1.9

Elevation scale: 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✖, 55.6, 55.4

IB105 Analyte IL Exceedances

Analyte	BH35 0.5-0.6	BH35 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI		
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	1
Mercury	1	1
Molybdenum		
Nickel	1	1
Selenium	1	1
Silver		
Tin		
Zinc	1	1
Aldrin+Dieldrin		
DDT etc		
Benzo(a)pyrene	2	2
Phenol		
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	2	1
PCB's		
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide		
Flouride		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH36**	
CLIENT: Swanbury Penglase Architects	EASTING: 525343.65	**GDA94**
	NORTHING: 5254033.037	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.72	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.3	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 31/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Bitumen	FILL	P				57.6
0.2–0.8	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH36 0.5-0.6			57.4, 57.2, 57.0
0.8–1.25	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Cl	CH				56.8, 56.6
1.3	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered						

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH36 0.5-0.6	1	1	1	1	1		1	1	1	2	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

Log of BH37

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	525355.025 GDA94
NORTHING:	5254034.878 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	57.77 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	3.6
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	31/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete		P
0.1–2.8	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI
2.8–3.6	Silty Sandy CLAY: low plasticity, orange/yellow/pale brown, moist, firm to stiff, extremely weathered	Cl	CL

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0 ✕, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✕, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2

MONITORING WELL

Field PID (ppm)

IB105 Analyte IL Exceedances

Laboratory Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH37 0.5-0.6	1	1	1	1	1		1	1	1	1	2		1	1			2			2		1	1	2		1	1	1	1		
BH37 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH37 2.5-2.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH37 3.5-3.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH38

EASTING: 525366.493 GDA94

NORTHING: 5254034.512 GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 57.78 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 2.7

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 31/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Concrete		P		
0.1–2.4	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH38 0.5-0.6; BH38 1.5-1.6	
2.4–2.5	Sandy Clayey SILT: low plasticity, dark grey, moist, soft	CI	ML		
2.5–2.6	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff		CH	BH38 2.5-2.6	
2.6–2.7	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered				

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH38 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH38 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH38 2.5-2.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

MONITORING WELL

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH39

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254035.33 GDA94
NORTHING:	525378.498 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	58.426 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	3.1
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	31/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P			58.4
0.1–0.7	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH39 0.5-0.6		
0.7–3.1	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH39 1.5-1.6; BH39 2.5-2.6		55.4

Approximate groundfloor level: 2.6 m depth.

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH39 0.5-0.6	1	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH39 1.5-1.6	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH39 2.5-2.6	1	1	1	1	1		1	1	2	1	1		1	1			2			2		1	2	2		1	1	1	1		

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH40**
CLIENT: Swanbury Penglase Architects	EASTING: 5254036.898 **GDA94**
	NORTHING: 525385.824 **GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 59.048 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 4
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push DATE: 31/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P				59.0
0.1–4.0	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH40 0.5-0.6; BH40 1.5-1.6; BH40 2.5-2.6; BH40 3.5-3.6			58.8 – 55.2

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2 ✕, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9

Elevation scale: 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, ✕ 55.8, 55.6, 55.4, 55.2

IB105 Analyte IL Exceedances

Analyte	BH40 0.5-0.6	BH40 1.5-1.6	BH40 2.5-2.6	BH40 3.5-3.6
Arsenic	1	1	1	1
Barium	1	1	1	1
Beryllium	1	1	1	1
Cadmium	1	1	1	1
Chromium	1	1	1	1
Chromium VI				
Copper	1	1	1	1
Cobalt	1	1	1	1
Lead	1	1	1	1
Manganese	1	1	1	1
Mercury	1	1	1	1
Molybdenum				
Nickel	1	1	1	1
Selenium	1	1	1	1
Silver				
Tin				
Zinc	1	1	1	1
Aldrin+Dieldrin				
DDT etc				
Benzo(a)pyrene	2	2	2	2
Phenol				
TPH C6 - C9	1	1	1	1
TPH C10 - C36	3	2	1	2
PAH Sum/TEQ	2	2	1	2
PCB's				
Benzene	1	1	1	1
Toluene	1	1	1	1
Ethylbenzene	1	1	1	1
Total Xylenes	1	1	1	1
Cyanide				
Flouride				

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH41**	
CLIENT: Swanbury Penglase Architects	EASTING: 525359.526	GDA94
	NORTHING: 5254017.36	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.75	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.8	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 1/11/18		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Cobalt, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P					
0.1–0.8	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH41 0.5-0.6		1 (all analytes)		57.6, 57.4, 57.2, 57.0
0.8	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

Log of BH42

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254020.873 GDA94
NORTHING:	525393.432 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	59.976 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	3.1
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL
0.0–0.1	FILL: Bitumen	FILL	F			
0.1–0.2	FILL: Concrete	FILL	P			
0.2–0.3	FILL: SAND; pale grey, slightly moist, loose	FILL	SP			
0.3–2.8	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH42 0.5-0.6; BH42 1.5-1.6; BH42 2.5-2.6		
2.8–3.0	Silty Sandy CLAY: medium to high plasticity, grey/brown, moist, stiff	Q	CH			
3.0–3.1	SANDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rvl				

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0

ELEVATION (metres): 59.8, 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0

IB105 Analyte IL Exceedances

Analyte	BH42 0.5-0.6	BH42 1.5-1.6	BH42 2.5-2.6
Arsenic	1	1	1
Barium	1	1	1
Beryllium	1	1	1
Cadmium	1	1	1
Chromium	1	1	1
Chromium VI	1	1	1
Copper	1	1	1
Cobalt	1	1	1
Lead	1	1	1
Manganese	1	1	1
Mercury	1	1	2
Molybdenum	1	1	1
Nickel	1	1	1
Selenium	1	1	1
Silver	1	1	1
Tin	1	1	1
Zinc	1	1	1
Aldrin+Dieldrin	1	1	1
DDT etc	1	1	1
Benzo(a)pyrene	2	2	1
Phenol	1	1	1
TPH C6 - C9	1	1	1
TPH C10 - C36	2	2	1
PAH Sum/TEQ	2	2	1
PCB's	1	1	1
Benzene	1	1	1
Toluene	1	1	1
Ethylbenzene	1	1	1
Total Xylenes	1	1	1
Cyanide	1	1	1
Flouride	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH43

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	5254061.419 GDA94
NORTHING:	525385.491 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	58.43 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	4.1
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0 – 0.1	FILL: Concrete	FILL	P				58.4
0.1 – 0.25	FILL: SAND; pale grey, slightly moist, loose	FILL	SP				58.2
0.25 – 4.1	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH43 0.5-0.6; BH43 1.5-1.6; BH43 2.5-2.6; BH43 3.5-3.6			58.0 – 54.4

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0

Elevation scale (metres): 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4

Approximate groundfloor level: 2.6 m depth (55.8 m elevation)

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
BH43 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH43 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH43 2.5-2.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH43 3.5-3.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Sample	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH43 0.5-0.6	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH43 1.5-1.6	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH43 2.5-2.6	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH43 3.5-3.6	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH44

EASTING:	5254075.885	GDA94
NORTHING:	525383.3	GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 58.908 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 3.9

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete	FILL	P
0.1–0.7	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI
0.7–3.9	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1 ✕, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8

Elevation scale (metres): 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✕, 55.6, 55.4, 55.2

Field PID (ppm)

MONITORING WELL

IB105 Analyte IL Exceedances

Laboratory Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH44 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH44 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH44 2.5-2.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH44 3.5-3.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH45**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254068.651	GDA94
	NORTHING: 525353.053	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.763 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.6	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 1/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Gravelly Sandy SILT; low plasticity, dark grey/brown, dry to slightly moist, stiff	FILL	ML				57.6
0.2–0.5	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI				57.4
0.5–0.6				BH45 0.5-0.6			57.2

IB105 Analyte IL Exceedances (sample BH45 0.5-0.6)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH46**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254071.27	**GDA94**
	NORTHING: 525364.124	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.763 **m AHD**	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 1/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.3	FILL: Gravelly Sandy SILT; low plasticity, dark grey/brown, dry to slightly moist, stiff	FILL	ML				57.6
0.3–0.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH46 0.5-0.6			57.4, 57.2
0.6–1.0							57.0, 56.8

IB105 Analyte IL Exceedances (sample BH46 0.5-0.6):

Analyte	Level
Arsenic	1
Barium	1
Beryllium	1
Cadmium	1
Chromium	1
Chromium VI	1
Copper	1
Cobalt	1
Lead	1
Manganese	1
Mercury	1
Molybdenum	1
Nickel	1
Selenium	1
Silver	1
Tin	1
Zinc	2
Aldrin+Dieldrin	1
DDT etc	1
Benzo(a)pyrene	2
Phenol	1
TPH C6 - C9	1
TPH C10 - C36	1
PAH Sum/TEQ	2
PCB's	1
Benzene	1
Toluene	1
Ethylbenzene	1
Total Xylenes	1
Cyanide	1
Flouride	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH47

PROJECT: 48-52 New Town Road ESA		EASTING: 525348.989	GDA94
CLIENT: Swanbury Penglase Architects		NORTHING: 5254050.965	GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.87	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1.6	
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push	DATE: 5/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P				57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH47 0.5-0.6; BH47 1.5-1.6			57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Analyte	BH47 0.5-0.6	BH47 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	2
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	2	1
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	2	2
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	2	2
PCB's	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Flouride	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH48

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
EASTING:	525350.219 GDA94
NORTHING:	5254044.577 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	57.87 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	1.6
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete	FILL	P				57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH48 0.5-0.6; BH48 1.5-1.6			57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5

IB105 Analyte IL Exceedances

Analyte	BH48 0.5-0.6	BH48 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	1
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	2	2
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	2	2
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	2
PAH Sum/TEQ	2	2
PCB's	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Flouride	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH49

EASTING: 525354.935 GDA94
NORTHING: 5254047.511 GDA94

BORING LOCATION: New Town, Tasmania
ELEVATION AND DATUM: 57.87 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions
TOTAL DEPTH (m): 1.6

EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
NATURAL (m):
WATER TABLE (m):

SAMPLING: Direct Push
DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P				57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH49 0.5-0.6; BH49 1.5-1.6			57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH49 0.5-0.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
BH49 1.5-1.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH50

EASTING: 525360.123 GDA94
NORTHING: 5254046.508 GDA94

BORING LOCATION: New Town, Tasmania
ELEVATION AND DATUM: 57.87 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions
TOTAL DEPTH (m): 1.6
EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P				
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH50 0.5-0.6; BH50 1.5-1.6			

Depth scale (m): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5

Elevation scale (m): 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin
BH50 0.5-0.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
BH50 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Sample	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCB's	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Flouride
BH50 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH50 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✘ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH51**
CLIENT: Swanbury Penglase Architects		EASTING: 525358.911 **GDA94**
		NORTHING: 5254052.724 **GDA94**
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.87 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1.6
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 5/11/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL
0.0–0.2	FILL: Concrete		P			
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH51 0.5-0.6; BH51 1.5-1.6		

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5

Elevation scale (metres): 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Analyte	BH51 0.5-0.6	BH51 1.5-1.6
Arsenic	1	1
Barium	2	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	1	1
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	1	1
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	2	2
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	1	2
PCB's	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Flouride	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH52

EASTING:	525358.911	GDA94
NORTHING:	5254052.724	GDA94
ELEVATION AND DATUM:	57.87	m AHD
TOTAL DEPTH (m):	1.6	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania
DRILLING CONTRACTOR: Geo-Environmental Solutions
EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
SAMPLING: Direct Push
DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P				57.8
0.1–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH52 0.5-0.6; BH52 1.5-1.6			57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Analyte	BH52 0.5-0.6	BH52 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	1	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	2	1
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	1	1
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	1	1
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	1	1
PCB's	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Flouride	1	1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✗ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	48-52 New Town Road ESA
CLIENT:	Swanbury Penglase Architects
Log of BH53	
EASTING:	525360.123 GDA94
NORTHING:	5254046.508 GDA94
BORING LOCATION:	New Town, Tasmania
ELEVATION AND DATUM:	57.87 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	1.6
EQUIPMENT/METHOD:	AMS 9110Ag
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P			57.8
0.1–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH53 0.5-0.6; BH53 1.5-1.6		57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Analyte	BH53 0.5-0.6	BH53 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	2	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	2	1
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	1	1
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	1	1
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum/TEQ	1	1
PCB's	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Flouride	1	1

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: ☐ Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of MW1

EASTING:	525389.311	GDA94
NORTHING:	5254037.766	GDA94
ELEVATION AND DATUM:	59.15	m AHD
TOTAL DEPTH (m):	11.5	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town

DRILLING CONTRACTOR: Tasmanian Drilling Services

EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY: S. Joyce

SAMPLING: Hollow Stem Auger DATE: 30/07/2018

MATERIAL DESCRIPTION	Geology	USCS Lithology
CONCRETE	FILL	
FILL: Silty sandy GRAVEL : Pale brown, medium dense, fine to coarse grained, sub-angular, moist, low plasticity. Gravels compri	FILL	GP
FILL: GRAVEL trace clay: Brown, medium dense, medium to coarse grained, sub-angular, dry, non-plastic.	FILL	GC
FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite	FILL	CI
FILL GRAVELS AND COBBLES comprising dolerite.	FILL	GP
FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite.	FILL	CI
FILL: Gravelly sandy CLAY : Dark brown, stiff to very stiff, wet, medium plasticity. Gravel comprises dolerite.	FILL	CI
FILL: Dolerite GRAVEL, clay washed away.	FILL	GP
MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered, carbon	Rv	
MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and light grey, low to medium strength, slightly weathered, carbo	Rv	

Columns: DEPTH (metres); Laboratory Sample; Field PID (ppm); IB105 Analyte IL Exceedances (Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride); MONITORING WELL (Casingniteoutm, ScreenSand, End Cap; water level 3.4); ELEVATION (metres) 59.0 to 47.8.

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of MW2**
CLIENT: Swanbury Penglase Architects	EASTING: 525344.9	GDA94
	NORTHING: 5254055	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.68	m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 3.2	
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 14/11/18		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL
0.0–0.1	CONCRETE		P			Cement
0.1–0.5	FILL: Sandy Gravelly CLAY: brown, moist, stiff, medium plasticity. Contains gravels of siltstone, brick & charcoal fragments.	FILL	GP			Grout
0.5–2.8	FILL: Sandy CLAY trace gravels: Dark brown, moist (wet at 3.2m), stiff, medium plasticity. Refusal on likely cobble	FILL	GC			BCasinge; Screen Sand; 2.8
2.8–3.2	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered, carbon	Rv				Screen Sand; End Cap

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	Log of MW3
CLIENT: Swanbury Penglase Architects	EASTING: 525370.9 GDA94
	NORTHING: 5254002 GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 58.6 m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 15
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 14/11/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances (Arsenic, Barium, Berylium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride)	MONITORING WELL	ELEVATION (metres)
0.0	CONCRETE	FILL	P				Groutme	
0.1–0.7	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occasional gravels of dolerite, siltstone, charcoal fragments.	FILL	GC				Groutme; water level ▶0.5	58.4, 58.2, 58.0
0.8–7.7							Casing Bentonite	57.8 … 50.8
7.8–8.3	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,	Rv					and	50.6, 50.4

Tas EPA IB105 CLASSIFICATION: ☐ Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

IB105 Borehole Logs (PAH leach testing on all soil after borehole BH20)

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of MW3**
CLIENT: Swanbury Penglase Architects	EASTING: 525370.9 GDA94
	NORTHING: 5254002 GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 58.6 m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 15
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 14/11/18	

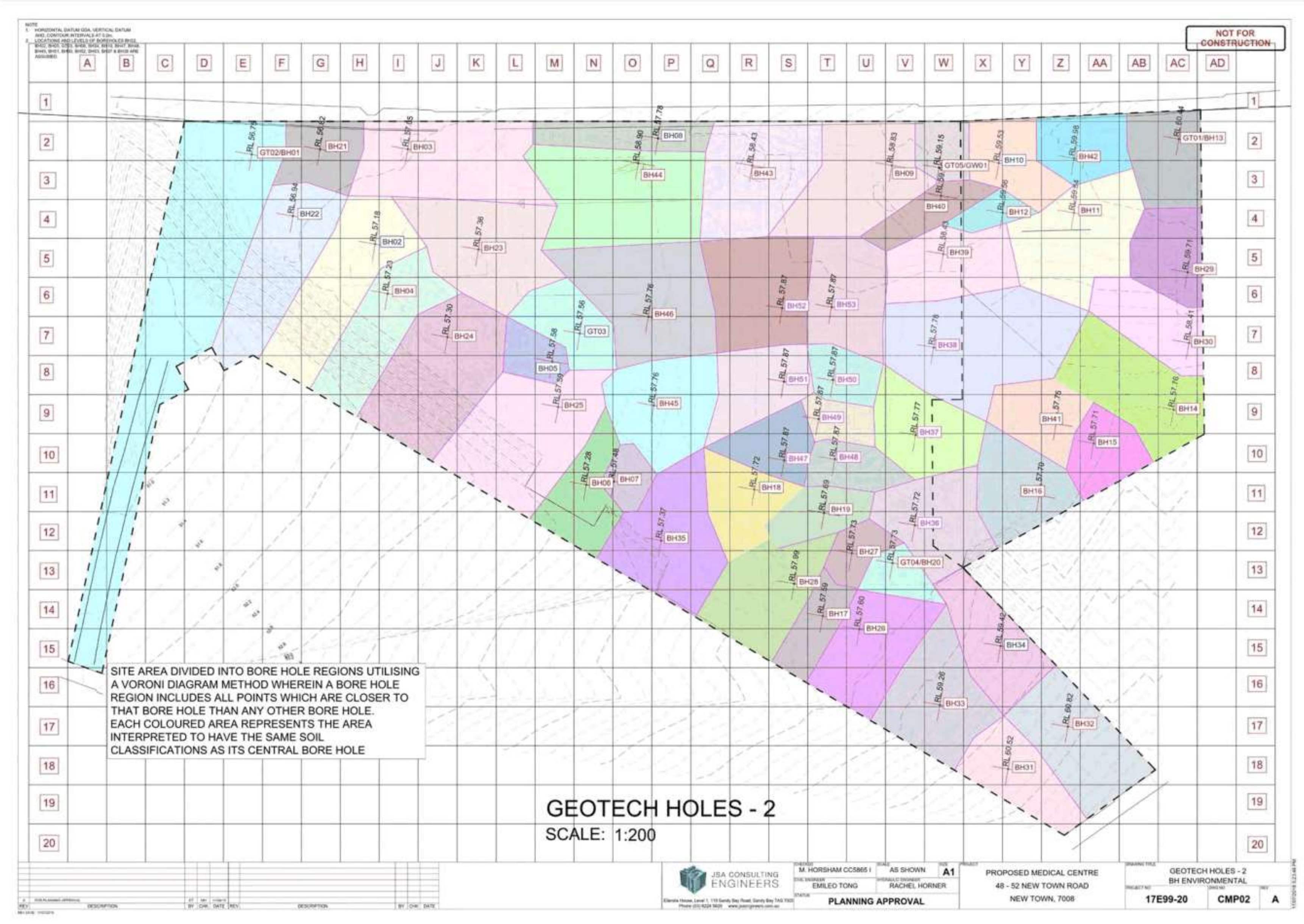
DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Flouride	MONITORING WELL	ELEVATION (metres)
8.4–15.0							Screen; End Cap	50.2–43.6

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

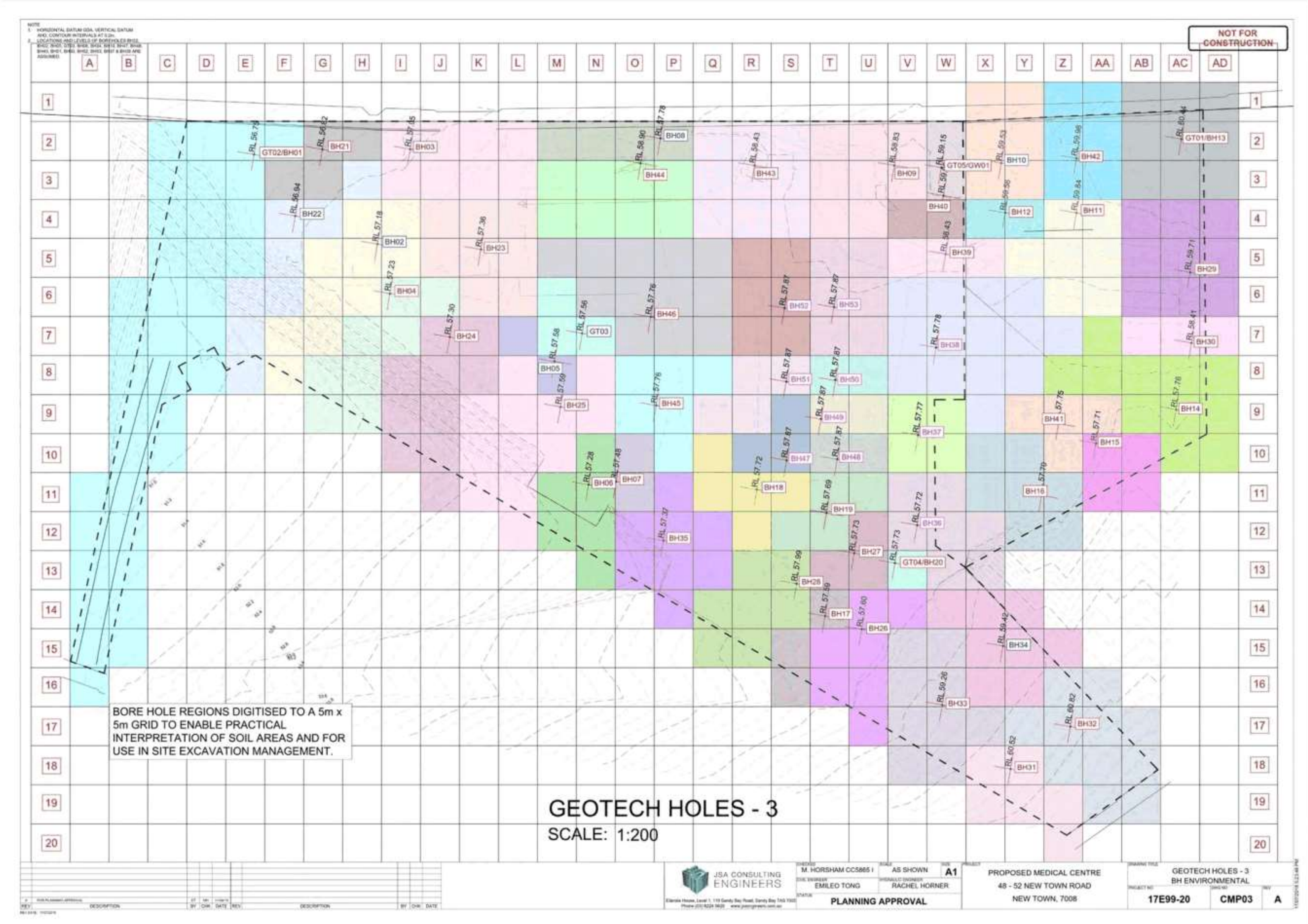
Appendix 4 JSA Consulting Engineers Inferred Site IB105 Soil Classification Grid

JSA Consulting Engineers Inferred Site IB105 Classification Grid

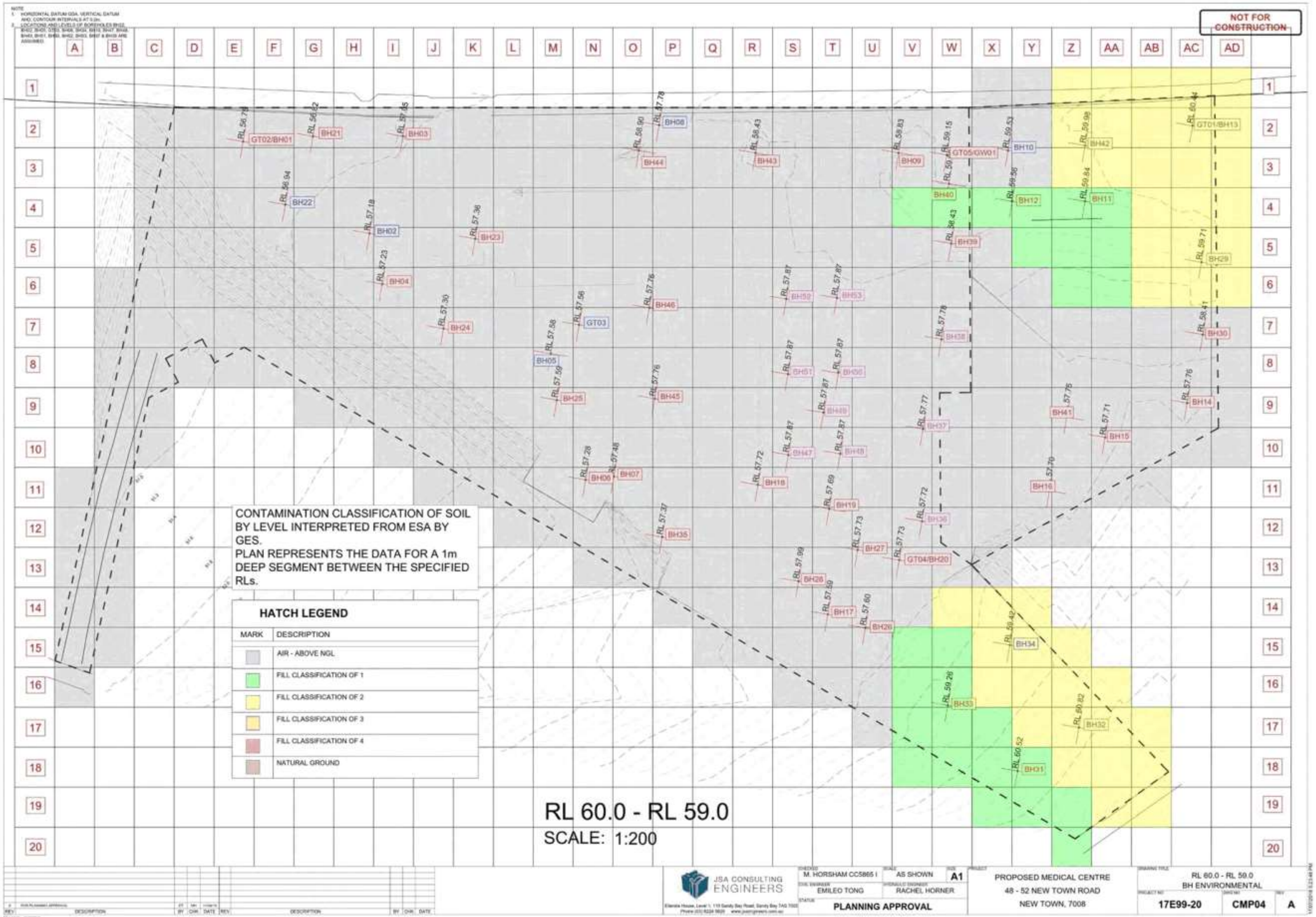
JSA Consulting Engineers Inferred Site IB105 Classification Grid



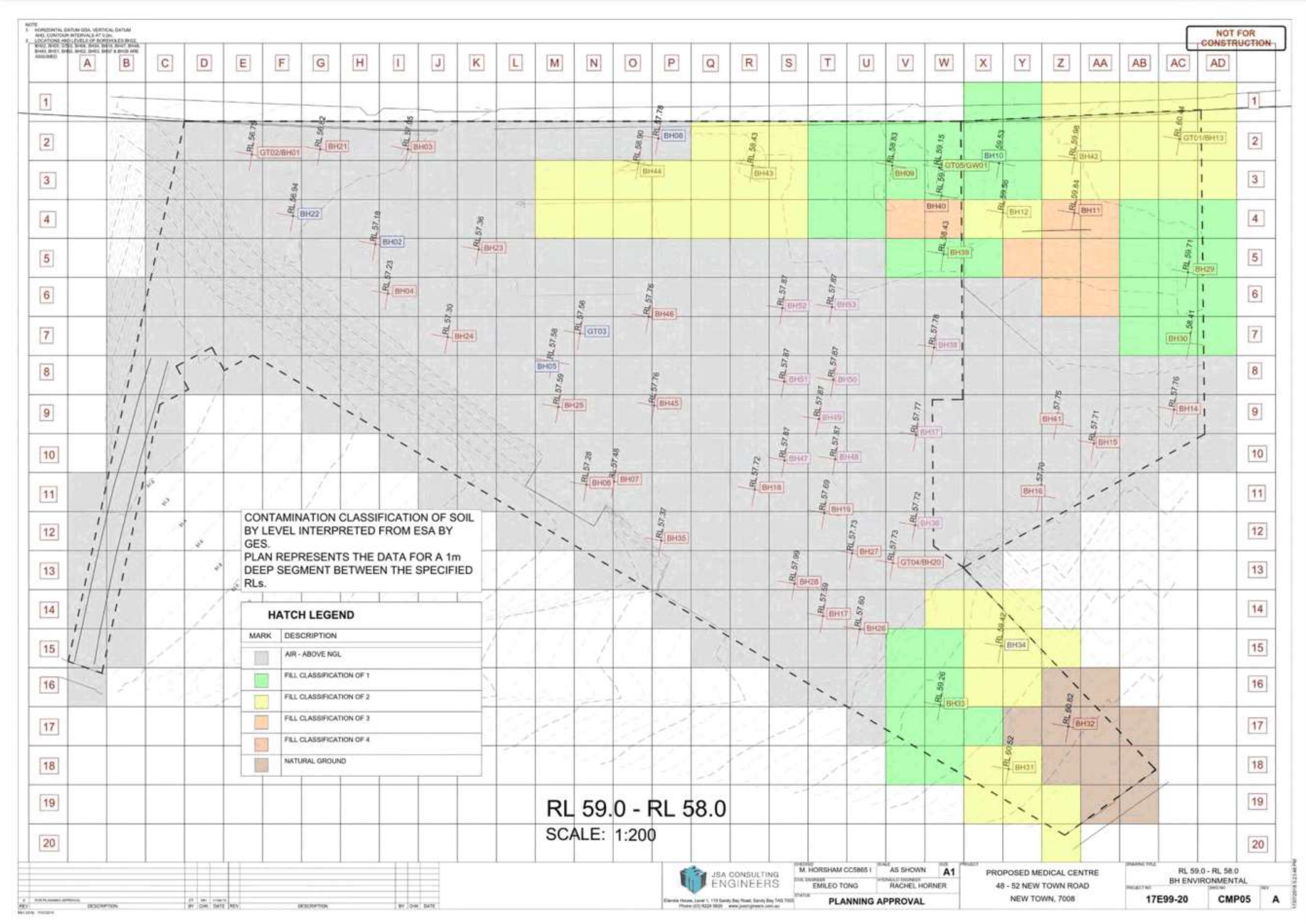
JSA Consulting Engineers Inferred Site IB105 Classification Grid



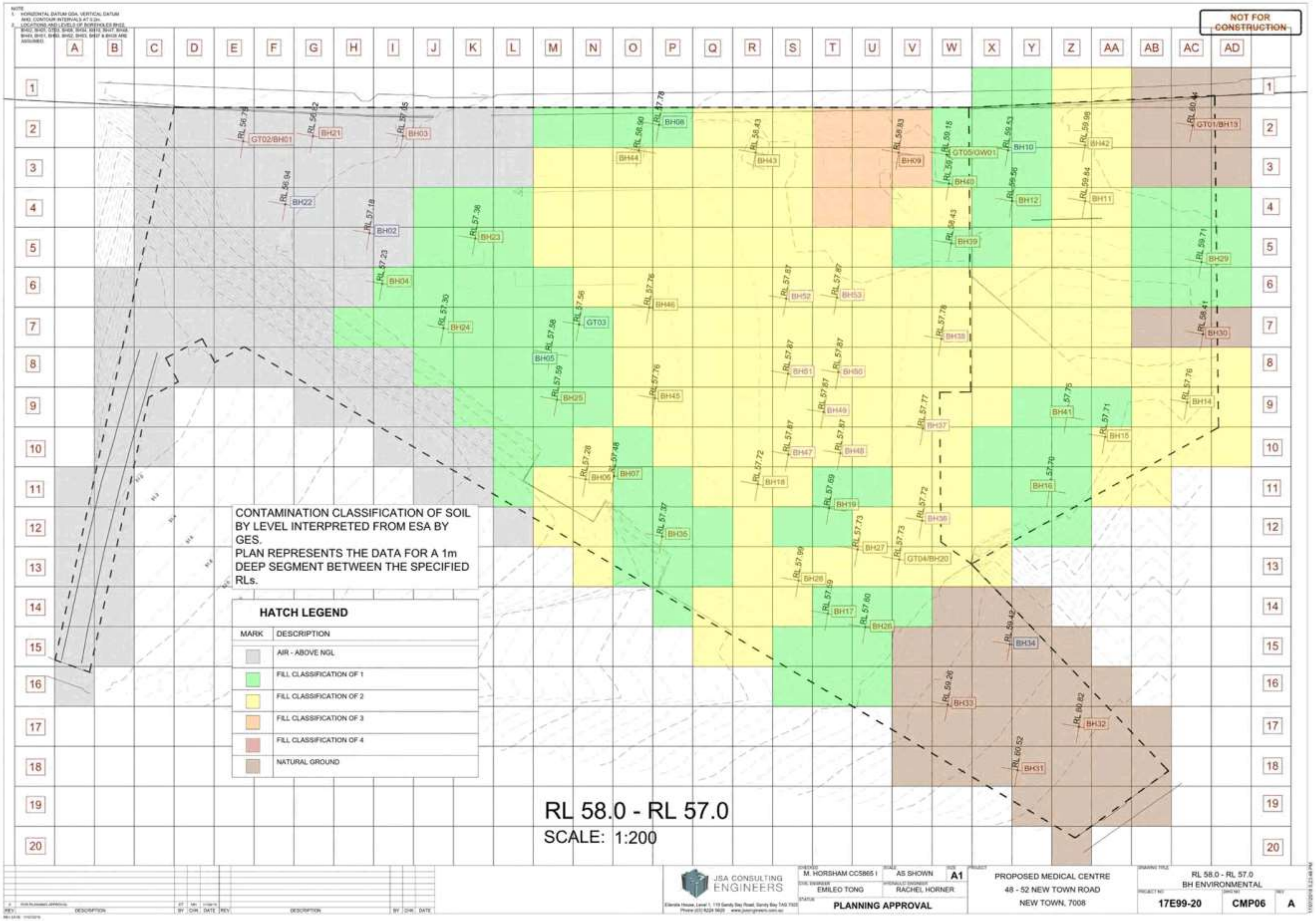
JSA Consulting Engineers Inferred Site IB105 Classification Grid



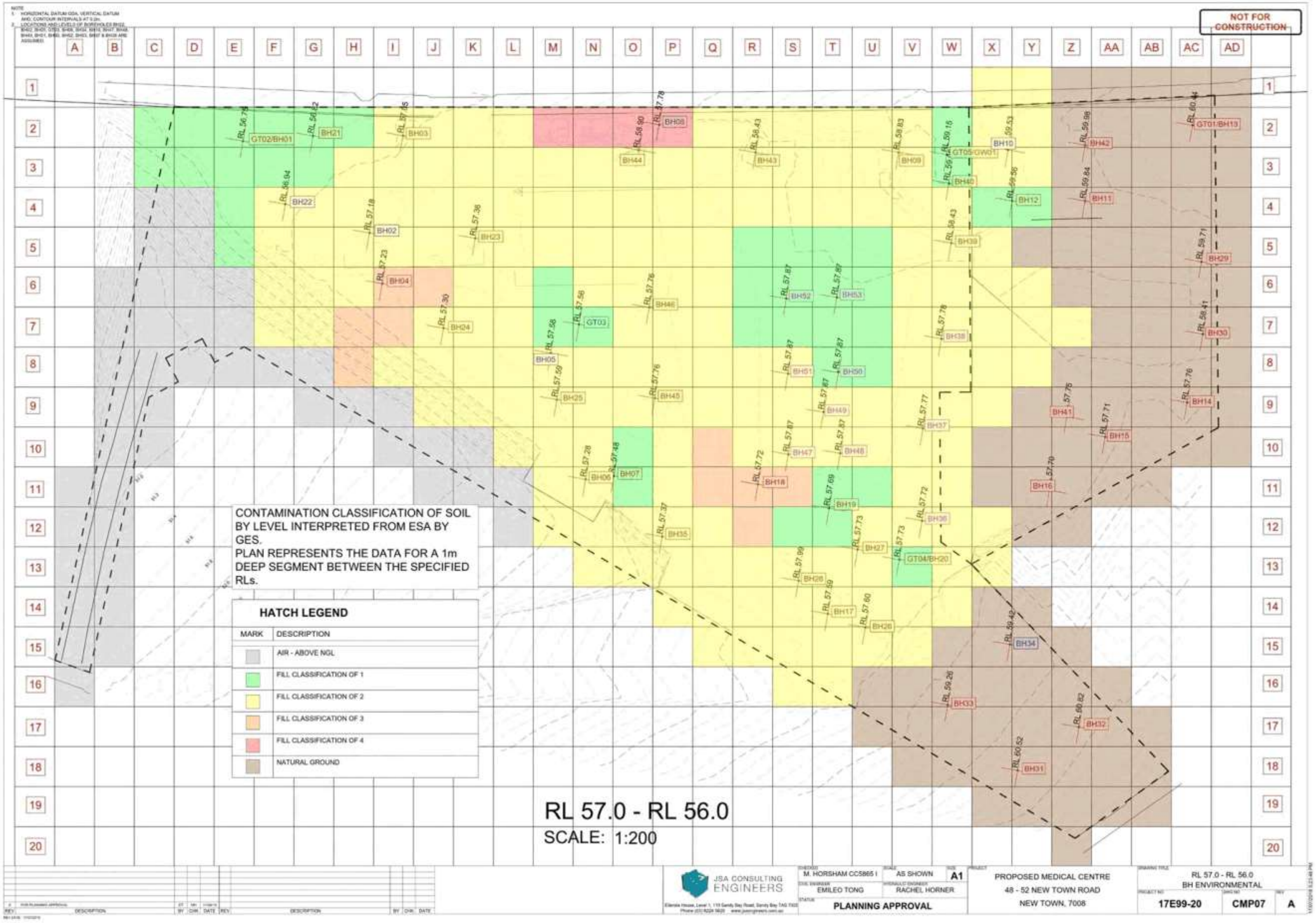
JSA Consulting Engineers Inferred Site IB105 Classification Grid



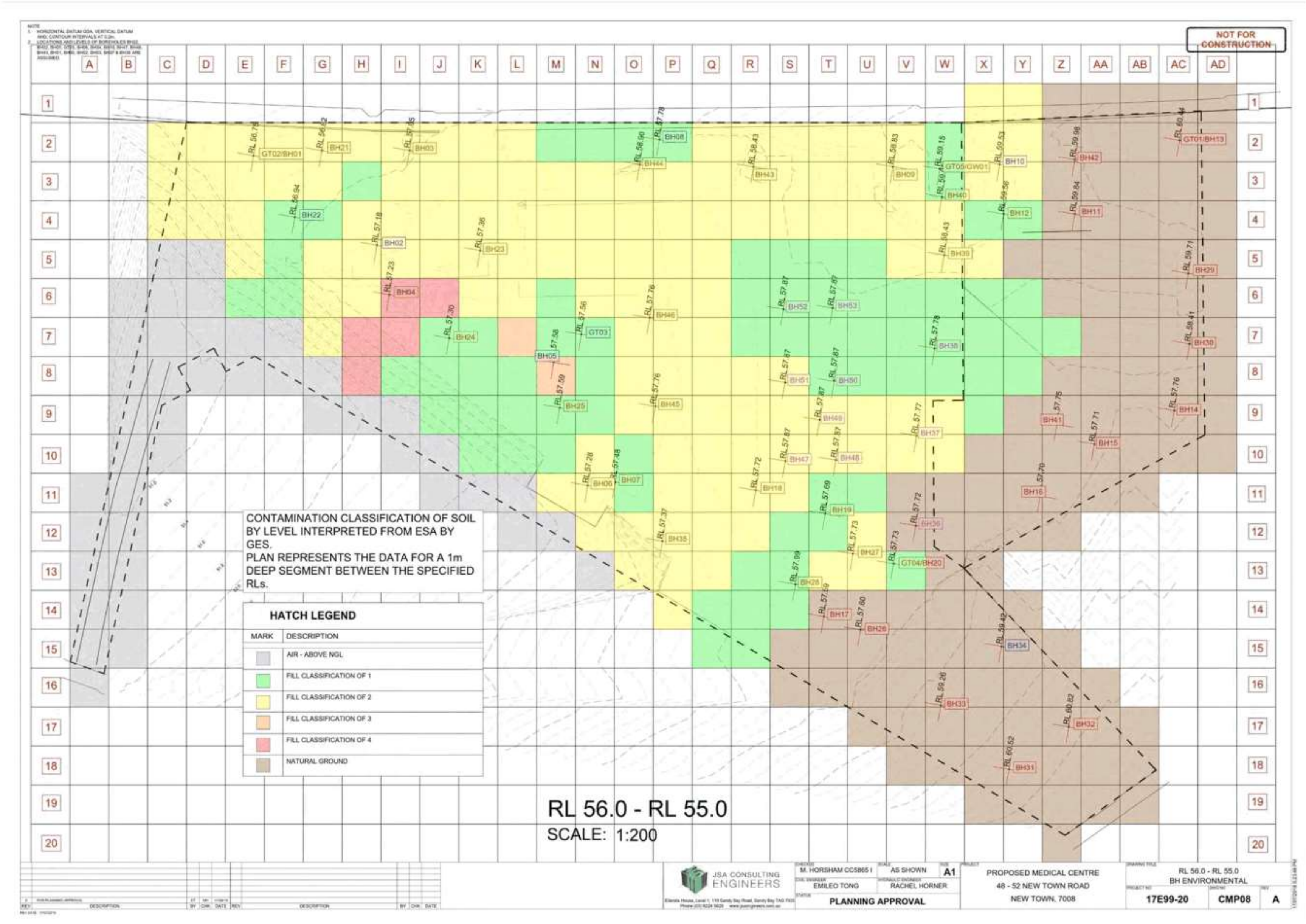
JSA Consulting Engineers Inferred Site IB105 Classification Grid



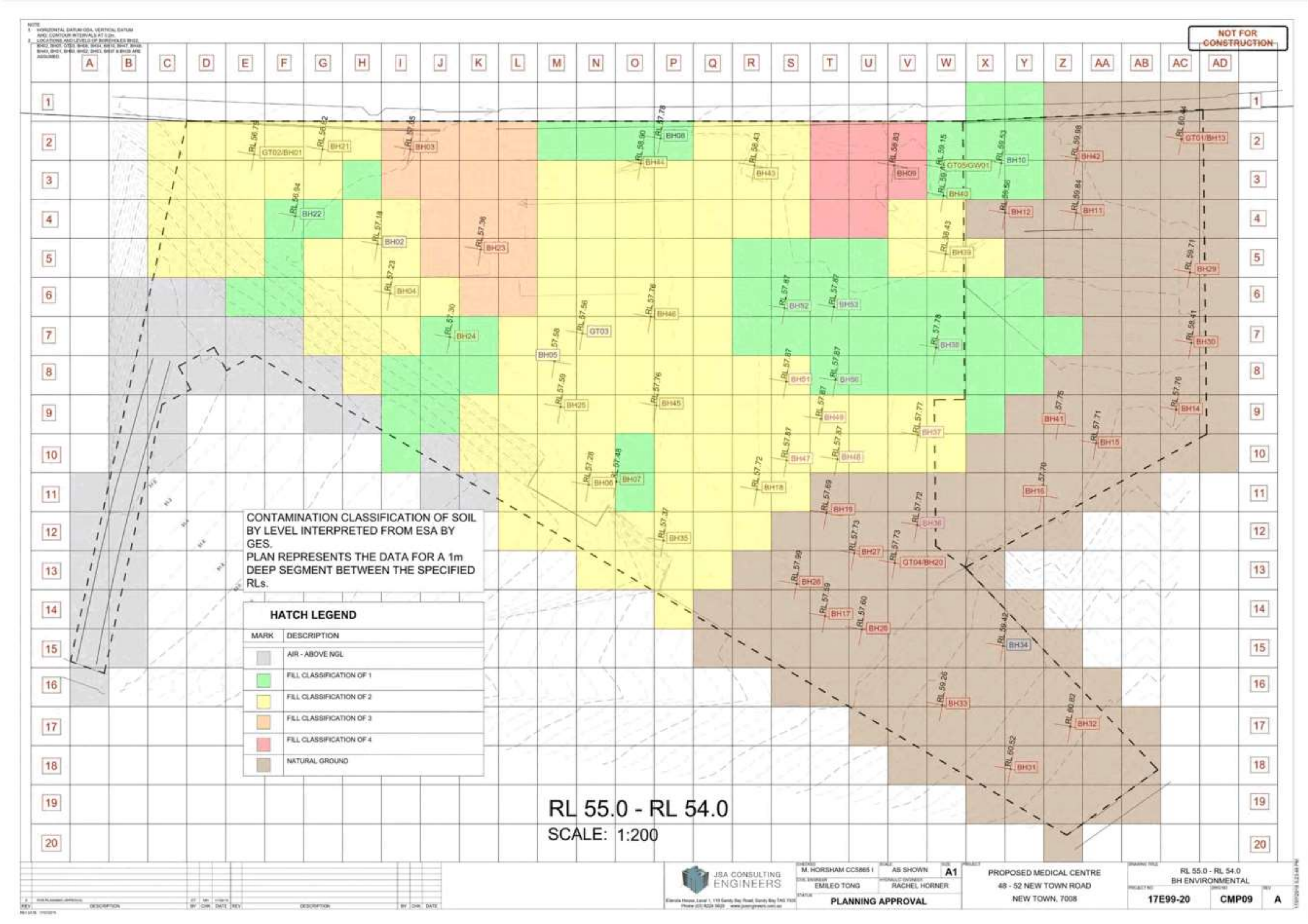
JSA Consulting Engineers Inferred Site IB105 Classification Grid



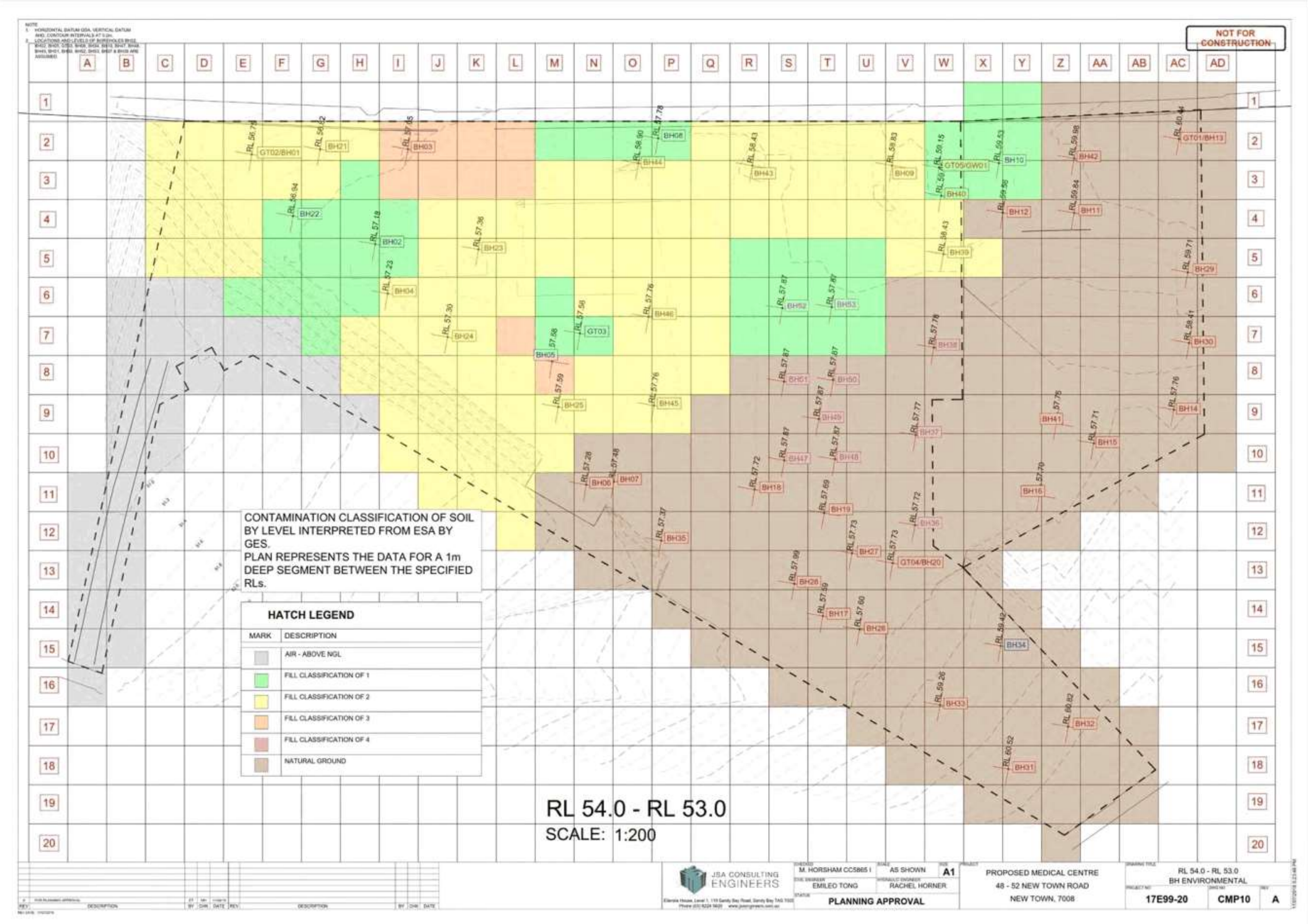
JSA Consulting Engineers Inferred Site IB105 Classification Grid



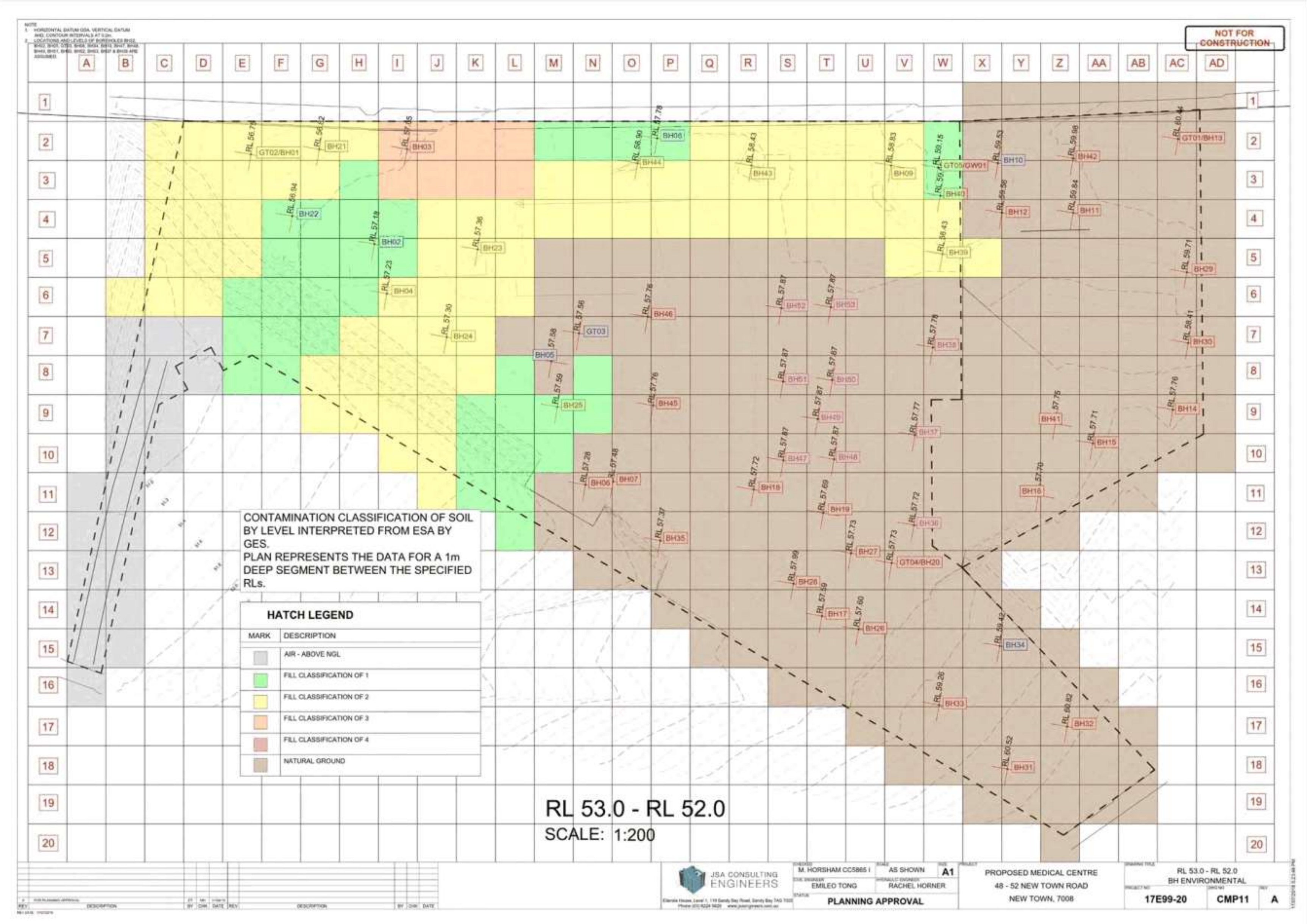
JSA Consulting Engineers Inferred Site IB105 Classification Grid



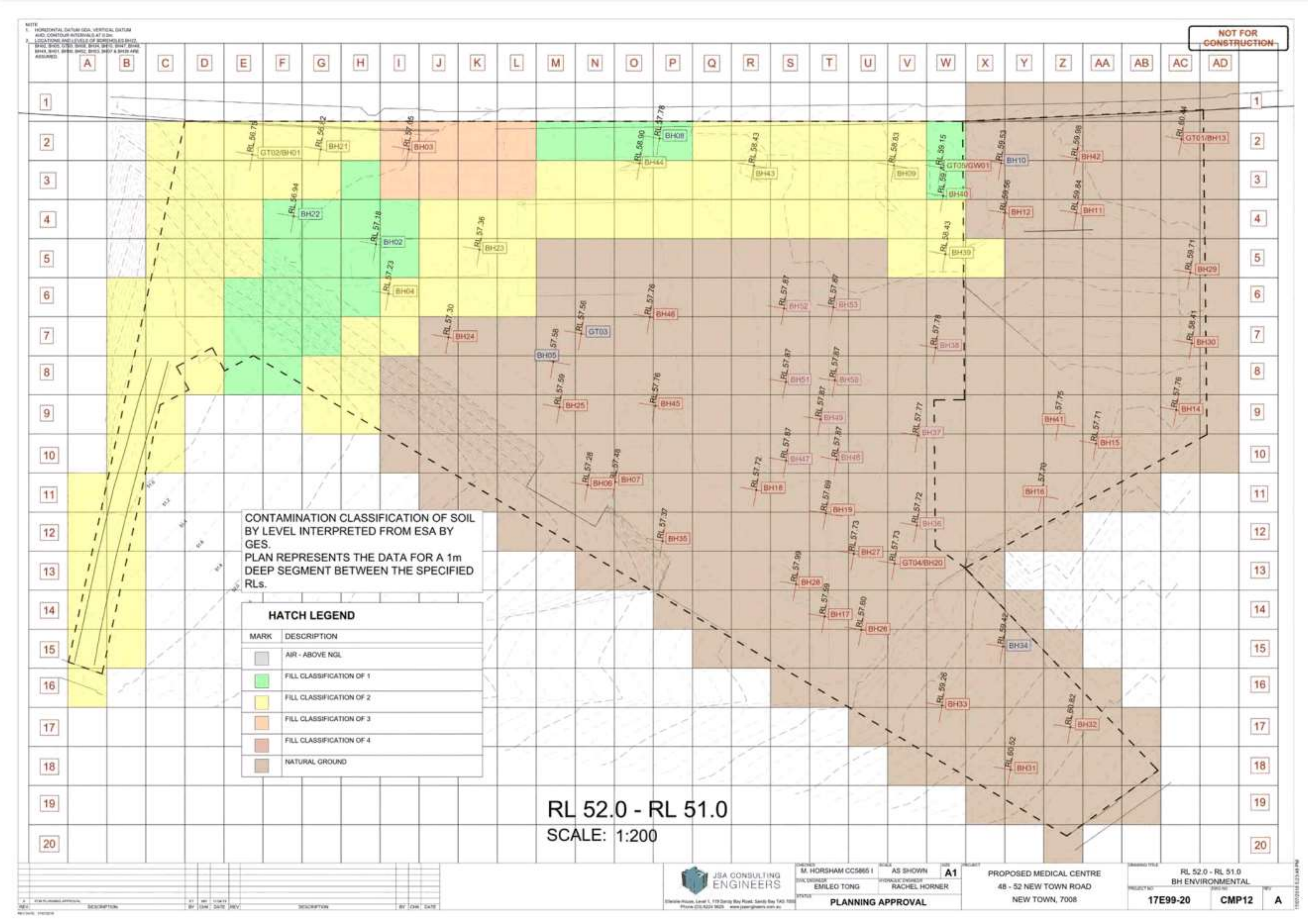
JSA Consulting Engineers Inferred Site IB105 Classification Grid



JSA Consulting Engineers Inferred Site IB105 Classification Grid



JSA Consulting Engineers Inferred Site IB105 Classification Grid



SOIL TRACKING FORM

Appendix 5 Soil Tracking From

48-52 New Town Road, New Town, Tasmania

Date excavated	Soil origin (grid block)	Stockpile ID	Stockpile location (grid block)	Soil description (colour, texture, moisture, odour, staining)	Samples collected	Laboratory analysis (list lab tests)	Final soil classification Fill, Level 1, Level 2, Level 3, Level 4	Final destination	Notes	Logged by

Appendix 6 Soil Results compared against IB105

The soil samples have been compared against IB105 guidelines for soil disposal, refer to Table 4 to Table 8

IB105

Table 4 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH01-BH20

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
23/07/2018	BH01 1.0-1.1 X	<5	50	<1	<1	8	8	5	35	82	<0.1	7	<5	45	0.6	<10	<50	6.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 2.5-2.6	<5	30	<1	<1	10	15	5	25	25	<0.1	8	<5	1100	5.1	<10	420	77.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 4.4-4.5	6	50	<1	<1	6	54	11	52	846	1	12	<5	66	17.4	<10	1170	152	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 1.0-1.1 X	<5	440	<1	<1	10	46	13	162	236	0.4	13	<5	132	0.6	<10	<50	6.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 2.8-2.9	<5	730	1	<1	16	12	13	56	63	<0.1	12	<5	71	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 4.0-4.1	<5	220	1	<1	22	54	26	7	99	<0.1	22	<5	35	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 0.5-0.6 X	5	140	<1	<1	13	24	14	502	378	0.1	16	<5	118	1.4	<10	<50	17	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 2.5-2.6	<5	260	<1	<1	3	28	10	12	105	<0.1	7	<5	40	7.8	<10	540	83.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 3.9-4.0	<5	70	<1	<1	12	25	11	14	261	<0.1	16	<5	44	8.9	<10	780	119	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 1.5-1.6 X	<5	130	<1	<1	14	35	10	128	301	0.2	14	<5	113	25.6	<10	1360	306	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 3.0-3.1	<5	170	<1	<1	14	35	11	217	224	0.1	14	<5	127	1.7	<10	<50	20.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 4.5-4.6	<5	180	<1	<1	12	28	14	136	1040	0.1	27	<5	184	1.5	<10	<50	16.1	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 1.0-1.1 X	<5	60	<1	<1	8	7	7	21	78	<0.1	11	<5	244	<0.5	<10	<50	3.1	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 3.0-3.1	<5	120	<1	2	15	44	21	94	179	0.1	22	<5	322	1.9	<10	<50	22	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 4.5-4.6	<5	100	<1	<1	8	32	17	122	199	0.2	14	<5	102	3.9	<10	110	58.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH06 0.2-0.3 X	<5	150	<1	<1	10	30	10	174	253	0.4	12	<5	168	1.7	<10	<50	22.4	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH07 1.0-1.1 X	<5	230	<1	<1	11	20	11	80	173	0.1	13	<5	161	<0.5	<10	<50	3.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH07 2.2-2.3 X	<5	260	<1	<1	8	17	9	120	309	0.4	7	<5	70	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 1.5-1.6 X	5	40	<1	<1	15	8	9	28	223	<0.1	12	<5	64	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 3.5-3.6	<5	20	<1	<1	8	29	14	23	277	<0.1	12	<5	60	12.7	<10	820	131	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 0.5-0.6 X	5	1880	<1	<1	24	37	10	349	297	1.2	12	<5	221	1.8	<10	<50	15.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 2.0-2.1 X	<5	340	1	<1	12	11	16	82	125	0.2	13	<5	62	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 1.0-1.1 X	6	140	<1	<1	19	44	16	93	308	0.1	17	<5	176	0.9	<10	<50	8.6	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 3.0-3.1	<5	80	<1	<1	5	52	10	218	263	<0.1	9	<5	573	17.5	<10	1230	205	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 0.5-0.6 X	<5	110	<1	<1	14	35	18	56	276	0.1	17	<5	236	4.7	<10	310	60.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 2.5-2.6	<5	320	<1	<1	12	25	24	37	576	<0.1	50	<5	74	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 3.5-3.6	<5	140	<1	<1	10	26	17	76	441	<0.1	23	<5	130	1	<10	<50	9	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 2.0-2.1 X	<5	140	<1	<1	12	36	19	120	206	0.3	14	<5	111	4.3	<10	270	57.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 4.0-4.1	<5	150	<1	<1	9	40	12	221	269	0.3	13	<5	280	4.9	<10	490	54.7	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_1.0-1.1 X	<5	50	<1	<1	6	40	8	25	211	<0.1	9	<5	42	25.5	<10	2080	301	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_2.0-2.1 X	<5	60	<1	<1	10	18	6	7	69	<0.1	7	<5	12	1.5	<10	<50	13.8	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_2.5-2.6 X	<5	80	<1	<1	13	30	13	29	210	<0.1	12	<5	20	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_4.5-4.6	5	90	<1	<1	11	<5	39	13	171	<0.1	14	<5	31	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_1.0-1.1 X	<5	50	<1	<1	7	33	8	16	257	<0.1	10	<5	40	16.6	<10	1610	161	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_2.5-2.6 X	<5	50	<1	<1	7	20	7	24	377	<0.1	10	<5	30	1	<10	<50	10.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_4.5-4.6	<5	40	<1	<1	4	31	7	15	92	<0.1	5	<5	23	22.8	<10	1470	268	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_6.0-6.1	6	120	<1	<1	13	29	11	289	120	0.7	15	<5	170	0.7	<10	<50	8.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_1.0-1.1 X	<5	140	<1	<1	<2	56	30	37	408	<0.1	13	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_3.0-3.1 X	<5	140	<1	<1	9	90	9	114	462	0.6	11	<5	123	1	<10	<50	8.8	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_5.0-5.1	<5	70	<1	<1	8	7	16	14	325	<0.1	12	<5	34	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_1.0-1.1 X	7	120	<1	<1	8	55	12	60	202	0.1	11	<5	105	4	<10	560	42.2	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_2.0-2.1 X	<5	100	2	<1	8	17	27	14	294	<0.1	20	<5	61	5.5	<10	520	62	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_2.5-2.6 X	<5	180	<1	<1	11	84	7	256	310	0.8	10	<5	321	1.9	<10	<50	16.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_3.3-3.4 X	13	160	2	<1	17	7	42	15	1630	<0.1	47	<5	44	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_1.0-1.1 X	<5	110	<1	<1	9	26	9	49	116	<0.1	9	<5	125	1.2	<10	<50	14.7	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_2.0-2.1 X	<5	100	<1	<1	11	24	12	24	448	<0.1	13	<5	50	<0.5	<10	<50	3.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_2.5-2.6 X	<5	120	<1	<1	3	77	43	9	281	<0.1	7	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_3.5-3.6 X	<5	90	<1	<1	7	33	8	72	236	0.5	9	<5	50	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 1.0-1.1 X	5	80	<1	<1	11	51	10	779	296	0.4	11	<5	44	29.8	<10	3260	496	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 1.5-1.6 X	<5	90	<1	<1	8	44	10	128	252	0.2	12	<5	41	0.8	<10	<50	9.2	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 2.0-2.1 X	11	100	1	<1	22	9	16	30	552	<0.1	13	<5	33	0.8	<10	<50	10.3	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH14 0.4-0.5 X	5	100	<1	<1	8	10	11	16	1030	<0.1	11	<5	32	<0.5	<10	3220	0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH15 0.55-0.65 X	6	20	1	<1	14	17	28	14	830	<0.1	42	<5	82	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH16 0.3-0.4 X	<5	20	<1	<1	7	69	11	7	381	<0.1	10	<5	42	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH17 0.5-0.6 X	<5	100	<1	<1	12	40	9	62	167	<0.1	14	<5	107	89.1	<10	4870	1290	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH17 1.1-1.2 X	12	1620	1	<1	12	9	18	17	111	<0.1	33	<5	57	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 0.5-0.6 X	<5	120	<1	<1	14	22	13	46	239	<0.1	14	<5	72	0.5	<10	<50	3.6	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 1.5-1.6 X	5	170	<1	<1	15	35	18	123	242	0.4	22	<5	242	3.4	<10	460	34.4	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 2.5-2.6 X	<5	80	<1	<1	34	60	29	7	517	<0.1	28	<5	103	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 2.7-2.8 X	<5	310	<1	<1	17	136	12	1160	199	4.5	23	<5	593	1.6	<10	210	14.8	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 3.1-3.2	5	180	<1	<1	16	96	10	479	194	1.5	15	<5	293	1.3	<10	<50	11.1	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 3.5-3.6	6	130	1	<1	11	<5	18	11	256	<0.1	19	<5	27	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH19 1.0-1.1 X	<5	150	<1	<1	4	58	11	56	179	<0.1	5	<5	66	<0.5	<10	<50	1.3	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH19 2.1-2.2 X	6	80	1	<1	15	10	14	10	109	<0.1	19	<5	33	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/07/2018	BH20 0.5-0.6 X	<5	40	<1	<1	9	23	4	18	91	<0.1	7	<5	40	1.1	<10	<50	10.2	<0.2	<0.5	<0.5	<0.5
30/07/2018	BH20 1.0-1.1 X	<5	120	<1	<1	13	25	9	114	212	0.5	11	<5	117	<0.5	<10	<50	1.6	<0.2	<0.5	<0.5	<0.5
Averaging		<5	180	<1	<1	12	35	14	105	300	0.2	14	<5	135	5.5	<10	450	70	<0.2	<0.5	<0.5	<0.5

- Note no Leachate testing.
- It is likely that if testing had been conducted the metals would come down to Level 1. And Benzo(a)pyrene would come down to Level 2.
- Level 1 is not achievable for Benzo(a)pyrene as no test exist to meet the conservative guideline.
- C^{10}-C^{36} Total Recoverable Hydrocarbon results will not change with leachate testing either.

Table 5 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH21-BH40 plus GT01-BT03

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
24/10/2018	BH21 0.5-0.6 X	<5	50	<1	<1	15	172	11	27	168	<0.1	16	<5	41	14.3	<10	880	150	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 1.5-1.6 X	<5	70	<1	<1	8	11	6	77	128	<0.1	7	<5	57	0.8	<10	190	6.1	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 2.5-2.6	<5	50	<1	<1	<2	94	19	11	465	<0.1	6	<5	42	1.9	<10	<50	14.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 3.5-3.6	<5	40	<1	<1	4	78	19	5	436	0.1	12	<5	32	0.6	<10	<50	2.7	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 4.5-4.6	<5	70	<1	<1	9	82	26	17	478	<0.1	15	<5	46	6.1	<10	<50	43.4	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 5.5-5.6	<5	60	<1	<1	6	70	17	32	355	<0.1	10	<5	81	4.6	<10	<50	42.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 0.5-0.6 X	<5	150	<1	<1	12	30	20	90	243	0.2	20	<5	122	4.1	<10	120	44.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 1.5-1.6 X	<5	90	<1	<1	14	48	24	32	256	0.2	16	<5	48	<0.5	<10	<50	0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 2.5-2.6	<5	90	<1	<1	25	58	23	<5	358	<0.1	24	<5	37	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 3.4-3.5	<5	80	<1	<1	24	57	18	12	428	<0.1	25	<5	44	<0.5	<10	<50	1.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 0.5-0.6 X	6	130	<1	<1	16	56	12	141	298	0.2	24	<5	116	6.7	<10	630	77.7	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 1.5-1.6 X	<5	150	<1	<1	17	41	12	175	310	0.2	22	<5	302	3.8	<10	<50	45	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 2.5-2.6	<5	100	<1	<1	10	39	10	220	180	0.1	11	<5	123	166	<10	5790	2080	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 3.5-3.6	<5	3730	<1	<1	10	2410	21	186	405	0.1	13	<5	208	2.5	<10	530	27	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 4.5-4.6	5	140	1	<1	11	18	18	16	1090	<0.1	21	<5	63	2.2	<10	<50	22.2	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 5.5-5.6	9	80	<1	<1	11	39	13	42	630	0.1	16	<5	134	45.2	<10	2510	472	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 0.5-0.6 X	<5	100	<1	<1	12	21	11	70	227	0.1	16	<5	120	4.8	<10	260	52.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 1.5-1.6 X	<5	160	<1	<1	19	15	9	31	222	<0.1	13	<5	51	<0.5	<10	<50	0.6	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 2.5-2.6	<5	170	<1	<1	24	16	14	22	455	<0.1	20	<5	56	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 3.3-3.4	<5	200	1	<1	17	42	19	212	518	0.6	22	<5	220	0.7	<10	<50	5.1	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 0.5-0.6 X	<5	210	<1	<1	8	25	16	49	305	<0.1	15	<5	114	0.9	<10	<50	15.3	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 1.5-1.6 X	<5	80	<1	<1	16	40	25	8	142	<0.1	20	<5	33	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 2.5-2.6 X	<5	160	2	<1	8	29	57	50	165	0.1	12	<5	38	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 3.5-3.6	<5	160	<1	<1	12	26	20	138	210	0.4	18	<5	134	2.2	<10	280	24.8	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 4.5-4.6	<5	170	<1	<1	12	43	17	460	372	0.3	19	<5	215	14.9	<10	770	153	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 5.5-5.6	<5	20	<1	<1	4	<5	<2	6	28	<0.1	<2	<5	<5	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH26 0.1-0.2 X	<5	30	<1	<1	6	23	4	14	56	<0.1	4	<5	30	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH26 0.5-0.6 X	16	310	2	<1	16	11	31	17	221	<0.1	42	<5	52	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 0.1-0.2 X	<5	90	<1	<1	6	46	10	28	255	<0.1	6	<5	59	1.1	<10	<50	12.7	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 0.5-0.6 X	21	100	1	<1	17	21	16	43	194	<0.1	15	<5	80	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.0-1.1 X	<5	120	<1	<1	9	38	16	278	215	0.2	18	<5	75	5.6	<10	320	35.4	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.5-1.6 X	14	30	2	<1	14	6	23	10	422	<0.1	34	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.9-2.0 X	14	40	<1	<1	20	7	22	12	1500	<0.1	38	<5	53	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 0.1-0.2 X	<5	30	<1	<1	8	<5	<2	6	30	<0.1	3	<5	12	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 0.5-0.6 X	<5	80	<1	<1	18	21	16	34	314	<0.1	20	<5	72	1.2	<10	<50	11.2	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 1.0-1.1 X	<5	30	<1	<1	12	<5	2	12	124	<0.1	6	<5	43	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 1.2-1.3 X	<5	80	<1	<1	8	18	11	81	190	0.4	9	<5	456	7.3	<10	550	88.4	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 0.5-0.6 X	<5	100	<1	<1	8	43	13	70	345	<0.1	14	<5	112	4.6	<10	440	51.3	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 1.5-1.6 X	<5	110	<1	<1	11	25	9	78	249	0.3	10	<5	86	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 2.1-2.2 X	<5	70	<1	<1	10	6	12	10	150	<0.1	11	<5	23	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH30 0.3-0.4 X	<5	100	<1	<1	12	23	12	53	316	0.1	16	<5	100	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH31 0.5-0.6 X	7	70	<1	<1	12	9	12	19	134	<0.1	13	<5	61	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH31 1.5-1.6 X	6	100	<1	<1	13	7	17	12	584	<0.1	28	<5	58	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH32 0.5-0.6 X	<5	90	<1	<1	14	13	6	21	136	<0.1	13	<5	36	1.1	<10	<50	8.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH33 0.5-0.6 X	<5	80	<1	<1	9	6	4	15	80	<0.1	6	<5	20	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH34 0.5-0.6 X	<5	380	<1	<1	15	6	8	10	45	<0.1	10	<5	16	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH35 0.5-0.6 X	<5	140	<1	<1	12	32	11	152	267	0.2	12	<5	163	2.7	<10	270	29.1	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH35 1.5-1.6 X	<5	180	<1	<1	11	44	15	82	346	0.2	17	<5	130	1.6	<10	<50	19	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH36 0.5-0.6 X	<5	100	<1	<1	17	40	19	10	624	<0.1	17	<5	40	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 0.5-0.6 X	13	160	<1	<1	13	67	12	231	295	1	14	<5	367	6.8	<10	470	63.8	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 1.5-1.6 X	<5	40	<1	<1	14	30	12	42	112	<0.1	11	<5	73	7.4	<10	430	105	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 2.5-2.6 X	9	240	1	1	25	9	11	53	350	<0.1	16	<5	40	2	<10	110	29.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 3.5-3.6	<5	20	<1	<1	15	11	12	18	238	<0.1	15	<5	44	3	<10	120	42.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 0.5-0.6 X	<5	70	<1	<1	14	13	15	57	356	0.2	13	<5	45	1.3	<10	<50	11.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 1.5-1.6 X	<5	170	<1	<1	9	14	17	89	174	<0.1	13	<5	108	0.7	<10	<50	5.2	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 2.5-2.6 X	<5	70	<1	<1	14	14	11	14	165	<0.1	14	<5	40	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 0.5-0.6 X	<5	60	<1	<1	13	18	10	42	301	0.1	16	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 1.5-1.6 X	<5	80	<1	<1	15	24	7	36	146	<0.1	9	<5	71	2.2	<10	<50	28.2	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 2.5-2.6 X	<5	50	<1	1	8	198	8	359	176	<0.1	10	<5	227	19	<10	1120	229	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 0.5-0.6 X	<5	30	<1	<1	6	60	10	12	267	<0.1	12	<5	34	76.6	<10	7370	1060	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 1.5-1.6 X	<5	50	<1	<1	6	70	18	46	353	<0.1	14	<5	62	37.4	<10	2470	371	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 2.5-2.6 X	<5	60	<1	<1	9	14	13	15	183	<0.1	17	<5	60	1.6	<10	<50	14.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 3.5-3.6 X	<5	40	<1	<1	9	51	14	22	272	<0.1	14	<5	51	59.6	<10	4280	621	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 0.5-0.6 X	<5	640	1	<1	12	10	19	31	112	<0.1	15	<5	51	1.3	<10	<50	14	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 1.5-1.6 X	<5	100	<1	<1	9	20	9	101	167	0.4	11	<5	76	9.4	<10	410	80.9	<0.2	<0.5	<0.5	<0.5
17/10/2018	GT01	----	----	----	----	----	----	----	----	----	----	----	----	----	6.7	----	----	101	----	----	----	----
17/10/2018	GT02	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	12.5	----	----	----	----
17/10/2018	GT03	----	----	----	----	----	----	----	----	----	----	----	----	----	9.1	----	----	136	----	----	----	----
Averaging		<5	150	<1	<1	12	65	14	65	285	0.1	14	<5	85	8.5	<10	500	100	<0.2	<0.5	<0.5	<0.5

IB105

Table 6 Soil Analytical Results Compared Against IB105 Leachate Investigation Limits for soil Disposal – BH21-BH40

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal Leachable Fraction *Italic*/* - Based On Soil (Total) Limit **Bold** - Based On Leach Limit		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Hexavalent Chromium	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin + Dieldrin	DDT + DDD + DDE	Benzo(a)pyrene	Phenol	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Benzo(a)pyrene (TEQ)	Polychlorinated biphenyls (PCB's)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Cyanide	Fluoride
Unit		mg/L	mg/L	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	µg/L	µg/L	µg/L	µg/L			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
LOR		0.1	0.1	0.1	0.1	0.1		0.1		0.1	0.1	0.001	0.1	0.1	0.1	0.1		0.1	0.5	0.5	0.5	1			0.5	1	1	2	2	2	0	0.1
Investigation Level Selected																																
IB105 Level 1																																
IB105 Level 2		<0.5	<35	<1	<0.1	<0.5		<10		<0.5	<25	<0.01	<2.5	<1	<0.1	<0.5		<25	<3	<200	<0.5	<14000			<0.5	<1	<50	<1400	<3000	<5000	<1	<15
IB105 Level 3		0.5	35	1	0.1	0.5		10		0.5	25	0.01	2.5	1	0.1	0.5		25	3	200	0.5	14000			0.5	1	50	1400	3000	5000	1	15
IB105 Level 4		5	350	4	0.5	5		100		5	250	0.1	20	8	1	5		250	30	2000	5	50000				2	500	14000	30000	50000	10	150
24/10/2018	BH21 0.5-0.6 X							*													<0.5				<0.5							
24/10/2018	BH21 1.5-1.6 X																				*											
24/10/2018	BH21 2.5-2.6																				*											
24/10/2018	BH21 3.5-3.6																				*											
24/10/2018	BH21 4.5-4.6																				<0.5				<0.5							
24/10/2018	BH21 5.5-5.6																				<0.5				<0.5							
24/10/2018	BH22 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH22 1.5-1.6 X																															
24/10/2018	BH22 2.5-2.6																															
24/10/2018	BH22 3.4-3.5																															
24/10/2018	BH23 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH23 1.5-1.6 X																	*			<0.5				<0.5							
24/10/2018	BH23 2.5-2.6																				<0.5			*	<0.5							
24/10/2018	BH23 3.5-3.6		0.8					2.9										*			<0.5				<0.5							
24/10/2018	BH23 4.5-4.6										*										<0.5				<0.5							
24/10/2018	BH23 5.5-5.6										*										<0.5			*	<0.5							
24/10/2018	BH24 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH24 1.5-1.6 X																															
24/10/2018	BH24 2.5-2.6																															
24/10/2018	BH24 3.3-3.4										*							*			*											
24/10/2018	BH25 0.5-0.6 X																				*											
24/10/2018	BH25 1.5-1.6 X																															
24/10/2018	BH25 2.5-2.6 X			*																												
24/10/2018	BH25 3.5-3.6																				<0.5				<0.5							
24/10/2018	BH25 4.5-4.6									*								*			<0.5				<0.5							
24/10/2018	BH25 5.5-5.6																															
29/10/2018	BH26 0.1-0.2 X																															
29/10/2018	BH26 0.5-0.6 X		*	*																												
29/10/2018	BH27 0.1-0.2 X																				*											
29/10/2018	BH27 0.5-0.6 X	*																														
29/10/2018	BH27 1.0-1.1 X																				<0.5				<0.5							
29/10/2018	BH27 1.5-1.6 X			*																												
29/10/2018	BH27 1.9-2.0 X										*																					
29/10/2018	BH28 0.1-0.2 X																															
29/10/2018	BH28 0.5-0.6 X																				*											
29/10/2018	BH28 1.0-1.1 X																															
29/10/2018	BH28 1.2-1.3 X																	*			<0.5				<0.5							
30/10/2018	BH29 0.5-0.6 X																				<0.5				<0.5							
30/10/2018	BH29 1.5-1.6 X																															
30/10/2018	BH29 2.1-2.2 X																															
30/10/2018	BH30 0.3-0.4 X																															
30/10/2018	BH31 0.5-0.6 X																															
30/10/2018	BH31 1.5-1.6 X										*																					
30/10/2018	BH32 0.5-0.6 X																				*											
30/10/2018	BH33 0.5-0.6 X																															
30/10/2018	BH34 0.5-0.6 X		*																													
30/10/2018	BH35 0.5-0.6 X																				<0.5				<0.5							
30/10/2018	BH35 1.5-1.6 X																				*											
31/10/2018	BH36 0.5-0.6 X										*																					
31/10/2018	BH37 0.5-0.6 X											*						*			<0.5				<0.5							
31/10/2018	BH37 1.5-1.6 X																				<0.5				<0.5							
31/10/2018	BH37 2.5-2.6 X																				<0.5				<0.5							
31/10/2018	BH37 3.5-3.6																				<0.5				<0.5							
31/10/2018	BH38 0.5-0.6 X																				*											
31/10/2018	BH38 1.5-1.6 X																				*											
31/10/2018	BH38 2.5-2.6 X																															
31/10/2018	BH39 0.5-0.6 X																															
31/10/2018	BH39 1.5-1.6 X																				<0.5				<0.5							
31/10/2018	BH39 2.5-2.6 X							*		*								*			<0.5			*	<0.5							
31/10/2018	BH40 0.5-0.6 X																				<0.5			*	<0.5							
31/10/2018	BH40 1.5-1.6 X																				<0.5			*	<0.5							
31/10/2018	BH40 2.5-2.6 X																				*											
31/10/2018	BH40 3.5-3.6 X																				<0.5			*	<0.5							
5/11/2018	BH51 0.5-0.6 X		*																		*											
17/10/2018	GT01																				<0.5				<0.5							
17/10/2018	GT02																				*<0.5**				<0.5							
17/10/2018	GT03																				<0.5				<0.5							

Note:
Leachable fraction analysis will take precedence over soil analysis when calculating IB105 Limits.
There are no leachable fraction investigation limits for certain compounds eg. Cobalt, and therefore the solids limit is applied. Where solid Level 2 or greater exceedances are present, these are represented with a * in the sheet. Leachable fraction limits are not available for Level 1 classification, and therefore a minimum leachable fraction Level 2 limit is applied if the solid results exceed Level 1 guideline limits for solids, alternatively Level 1 is applied
Leachable fraction exceedances are represented with a bold and highlighted cell and Level 2 solid exceedances are defined with italics and bold highlighting
Where the benzo(a)pyrene (TEQ) limit is exceeded, the assessment is based on soil total limits

IB105

Table 7 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH41-BH53

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
5/11/2018	BH41 0.5-0.6 X	<5	30	<1	<1	6	75	20	9	319	<0.1	15	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 0.5-0.6 X	<5	50	<1	<1	7	38	11	17	188	<0.1	13	<5	39	18.9	<10	1300	185	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 1.5-1.6 X	<5	30	<1	<1	6	45	25	13	354	<0.1	18	<5	62	66.4	<10	3430	648	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 2.5-2.6 X	<5	120	<1	<1	8	30	6	84	379	1	12	<5	45	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 0.5-0.6 X	<5	90	<1	<1	6	35	10	67	196	0.1	7	<5	95	3.8	<10	110	42.1	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 1.5-1.6 X	<5	110	<1	<1	9	21	11	11	291	<0.1	13	<5	36	13.4	<10	650	114	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 2.5-2.6 X	<5	90	<1	<1	9	21	12	110	239	<0.1	12	<5	37	4.1	<10	140	45.2	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 3.5-3.6 X	<5	50	<1	<1	4	78	15	23	351	<0.1	10	<5	53	12	<10	520	112	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 0.5-0.6 X	<5	80	<1	<1	12	6	10	16	62	<0.1	12	<5	41	5.1	<10	370	63.1	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 1.5-1.6 X	<5	40	<1	<1	5	68	12	18	263	<0.1	11	<5	39	33	<10	1710	284	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 2.5-2.6 X	<5	40	<1	<1	5	61	11	29	218	<0.1	10	<5	33	21.6	<10	1680	173	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 3.5-3.6 X	<5	50	<1	<1	6	52	12	34	230	<0.1	10	<5	43	60.3	<10	3400	639	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH45 0.5-0.6 X	<5	100	<1	<1	11	66	9	83	216	0.2	13	<5	134	8.2	<10	400	98.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH46 0.5-0.6 X	7	170	<1	<1	17	187	13	223	294	0.3	20	<5	221	3.7	<10	240	37.8	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH47 0.5-0.6 X	<5	200	<1	<1	9	41	35	179	242	0.5	18	<5	373	6	<10	400	51.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH47 1.5-1.6 X	<5	80	<1	<1	16	50	16	24	540	<0.1	20	<5	77	8.3	<10	680	97.2	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH48 0.5-0.6 X	<5	140	<1	<1	7	95	26	154	344	0.2	17	<5	265	7.7	<10	520	66.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH48 1.5-1.6 X	<5	130	<1	<1	10	59	9	180	232	0.4	12	<5	254	14.3	<10	1370	107	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH49 0.5-0.6 X	8	60	<1	<1	38	39	13	26	923	<0.1	23	<5	65	1.1	<10	<50	5.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH49 1.5-1.6 X	<5	220	1	<1	12	11	28	22	1070	<0.1	25	<5	77	0.9	<10	<50	6.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH50 0.5-0.6 X	<5	60	<1	<1	19	20	23	25	591	<0.1	22	<5	67	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH50 1.5-1.6 X	5	80	<1	<1	10	13	13	17	350	<0.1	16	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 0.5-0.6 X	<5	640	1	<1	12	10	19	31	112	<0.1	15	<5	51	1.3	<10	<50	14	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 1.5-1.6 X	<5	100	<1	<1	9	20	9	101	167	0.4	11	<5	76	9.4	<10	410	80.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH52 0.5-0.6 X	6	140	<1	<1	32	21	12	18	868	<0.1	26	<5	61	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH52 1.5-1.6 X	6	120	<1	<1	15	17	11	18	406	<0.1	17	<5	57	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH53 0.5-0.6 X	<5	200	2	<1	16	28	24	25	510	<0.1	32	<5	70	<0.5	<10	<50	1.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH53 1.5-1.6 X	<5	30	<1	<1	12	16	5	49	122	<0.1	7	<5	30	<0.5	<10	<50	2.2	<0.2	<0.5	<0.5	<0.5
Averaging		<5	120	<1	<1	12	45	16	55	360	0.1	16	<5	90	11	<10	650	103	<0.2	<0.5	<0.5	<0.5

Table 8 Soil Analytical Results Compared Against IB105 Leachate Investigation Limits for soil Disposal – BH41-BH53

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal Leachable Fraction *Italic/** - Based On Soil (Total) Limit **Bold** - Based On Leach Limit		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Hexavalent Chromium	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin + Dieldrin	DDT + DDD + DDE	Benzo(a)pyrene	Phenol	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Benzo(a)pyrene (TEQ)	Polychlorinated biphenyls (PCB's)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Cyanide	Fluoride
Unit		mg/L	mg/L	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	µg/L	µg/L	µg/L	µg/L			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
LOR		0.1	0.1	0.1	0.1	0.1		0.1		0.1	0.1	0.001	0.1	0.1	0.1	0.1		0.1	0.5	0.5	0.5	1			0.5	1	1	2	2	2	0	0.1
Investigation Level Selected																																
IB105 Level 1																																
IB105 Level 2		<0.5	<35	<1	<0.1	<0.5		<10		<0.5	<25	<0.01	<2.5	<1	<0.1	<0.5		<25	<3	<200	<0.5	<14000			<0.5	<1	<50	<1400	<3000	<5000	<1	<15
IB105 Level 3		0.5	35	1	0.1	0.5		10		0.5	25	0.01	2.5	1	0.1	0.5		25	3	200	0.5	14000			0.5	1	50	1400	3000	5000	1	15
IB105 Level 4		5	350	4	0.5	5		100		5	250	0.1	20	8	1	5		250	30	2000	5	50000				2	500	14000	30000	50000	10	150
5/11/2018	BH41 0.5-0.6 X																															
5/11/2018	BH42 0.5-0.6 X																				**<0.5**			*	**<0.5**							
5/11/2018	BH42 1.5-1.6 X																				**<0.5**			*	**<0.5**							
5/11/2018	BH42 2.5-2.6 X											*																				
5/11/2018	BH43 0.5-0.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH43 1.5-1.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH43 2.5-2.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH43 3.5-3.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH44 0.5-0.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH44 1.5-1.6 X																				**<0.5**			*	**<0.5**							
5/11/2018	BH44 2.5-2.6 X																				**<0.5**			*	**<0.5**							
5/11/2018	BH44 3.5-3.6 X																				**<0.5**			*	**<0.5**							
5/11/2018	BH45 0.5-0.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH46 0.5-0.6 X							*										*			**<0.5**				**<0.5**							
5/11/2018	BH47 0.5-0.6 X																	*			**<0.5**				**<0.5**							
5/11/2018	BH47 1.5-1.6 X										*										**<0.5**				**<0.5**							
5/11/2018	BH48 0.5-0.6 X																	*			**<0.5**				**<0.5**							
5/11/2018	BH48 1.5-1.6 X																	*			**<0.5**			*	**<0.5**							
5/11/2018	BH49 0.5-0.6 X										*										*											
5/11/2018	BH49 1.5-1.6 X										*										*											
5/11/2018	BH50 0.5-0.6 X										*																					
5/11/2018	BH50 1.5-1.6 X																															
5/11/2018	BH51 0.5-0.6 X		*																		*											
5/11/2018	BH51 1.5-1.6 X																				**<0.5**				**<0.5**							
5/11/2018	BH52 0.5-0.6 X										*																					
5/11/2018	BH52 1.5-1.6 X																															
5/11/2018	BH53 0.5-0.6 X			*							*																					
5/11/2018	BH53 1.5-1.6 X																															

Note:
Leachable fraction analysis will take precedence over soil analysis when calculating IB105 Limits.
There are no leachable fraction investigation limits for certain compounds eg. Cobalt, and therefore the solids limit is applied. Where solid Level 2 or greater exceedances are present, these are represented with a * in the sheet. Leachable fraction limits are not available for Level 1 classification, and therefore a minimum leachable fraction Level 2 limit is applied if the solid results exceed Level 1 guideline limits for solids, alternatively Level 1 is applied
Leachable fraction exceedances are represented with a bold and highlighted cell and Level 2 solid exceedances are defined with italics and bold highlighting
Where the benzo(a)pyrene (TEQ) limit is exceeded, the assessment is based on soil total limits

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epa TASMANIA
ENVIRONMENT PROTECTION AUTHORITY

INFORMATION BULLETIN No. 105

Environmental Management and Pollution Control (Waste Management) Regulations 2010

CLASSIFICATION AND MANAGEMENT OF CONTAMINATED SOIL FOR DISPOSAL

1. Introduction

This bulletin defines the criteria used by the Environment Protection Authority (EPA) for the classification of contaminated soil that requires treatment and/or off-site disposal, and outlines the management of each classification in accordance with the *Environmental Management and Pollution Control (Waste Management) Regulations 2010* (the 'Regulations'). Although criteria set out in this bulletin have been determined for soil, they may be applicable to the classification of other solid waste material on an 'as needs basis' (see section 2.2.3). Please note, for the purposes of this Bulletin soil also includes dredge spoil (refer Section 2.2.5).

This bulletin is designed to be used by waste producers, consultants, local government, waste transporters and landfill operators that are responsible for determining whether potentially contaminated soil is suitable to be disposed of at a landfill, in assessing alternative options for contaminated soil management and how to make an application for disposal approval to the EPA.

The EPA encourages effective waste management by promoting on-site remediation, treatment and/or re-use, where appropriate, as the preferred options for dealing with contaminated soil. In accordance with the hierarchy of waste management options, direct disposal of soil to landfills should be used only when no other approved method of dealing with the contaminated soil is available. For further details on these waste management principles, see Section 1.2 of the *Landfill Sustainability Guide 2004* (DPIWE, 2004).

Treatment, re-use options and disposal of soil will be assessed and approved on a case by case basis by the Director, EPA ('the Director') or the Director's delegate.

2. Classification

The EPA uses 4 categories to classify contaminated soil: (Level 1) *Fill Material*; (Level 2) *Low Level Contaminated Soil*; (Level 3) *Contaminated Soil*; and (Level 4) *Contaminated Soil for Remediation*, Table 1 below summarises each classification.

Criteria in Table 2 below shows the maximum total concentration, and the maximum leachable concentration values for specific pollutants that are used to classify soil for off-site disposal. For soils classified as potentially acid sulfate soils (PASS), the criteria in Table 2 do not apply. Determination of risk associated with these soils should be conducted in line with the *Tasmanian Acid Sulfate Soil Management Guidelines* published by Department of Primary Industries, Parks, Water and Environment (refer Section 2.2.5).

For potential per and poly – fluoroalkyl substances (PFAS) contaminated soils, the criteria as detailed in the National Environmental Management Plan (NEMP 2018), section 14.6, should be used for the classification and determination of risk associated with soils containing PFAS for disposal (refer to section 2.2.6 of this bulletin for further detail).

Potentially contaminated soils are classified by analysis of representative samples of the soil and comparison of the results to the chemical concentrations given in Table 2.

It is not necessary to sample for all contaminants listed in Table 2 for soil classification. However, all contaminants that are reasonably likely to be present in the soil above background levels should be included in the sample analysis.

Generally, where a leachable concentration is prescribed in Table 2 that value takes precedence over the total concentration and is used as the sole determinant of final classification for disposal (see section 2.2.4 for further information).

Please note that these values in Table 2 are ***not*** to be interpreted as clean up target levels for certain land uses.

Table 1. Summary of the classification process

	Classification (with reference to Table 2)	**Controlled Waste**[1]	**Comments**
Fill Material[2] **(Level 1)**	Soil that exhibits levels of contaminants below the limits defined under *Fill Material* in Table 2.	Unlikely	Soil classified as *Fill Material* can still be a 'pollutant' under the *Environmental Management and Pollution Control Act 1994* and needs to be responsibly managed.
Low Level Contaminated Soil (Level 2)	Soil that exhibits levels of contaminants above the limits defined under *Fill Material* but below the limits defined under *Low Level Contaminated Soil* in Table 2.	Likely	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil (Level 3)	Soil that exhibits levels of contaminants above the limits defined under *Low Level Contaminated Soil* but below the limits defined under *Contaminated Soil* in Table 2.	Yes	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil for Remediation (Level 4)	Soil that exhibits levels of contaminants above the limits defined under *Contaminated Soil* in Table 2 (regardless of the maximum total concentrations) is generally ***not*** considered acceptable for off-site disposal without prior treatment.	Yes	Soil that contains contaminants that do not have criteria for leachable concentrations (*e.g.* petroleum hydrocarbons), and the levels of contaminants exceed the maximum total concentrations listed in *Contaminated Soil*, are generally classified as *Contaminated Soil for Remediation*.

[1] Controlled Waste is defined in the *Environmental Management and Pollution Control Act 1994*.
[2] Criteria for *Fill Material* are the limits set by the Director for the purposes of R.9(2)(a)(ii) in the *Regulations*.

IB105

Table 2. Maximum total concentration and leachable concentration values permitted for waste classification (Note, does not apply for material classified as PASS (refer section 2.2.5) or PFAS (refer section 2.2.6))

	FILL MATERIAL Level 1	LOW LEVEL CONTAMINATED SOIL Level 2		CONTAMINATED SOIL Level 3	
CONTAMINANT	Maximum total concentration mg/kg dry weight	Maximum total concentration mg/kg dry weight	Maximum (TCLP) leachable concentration (pH 5.0 extract) mg/L	Maximum total concentration mg/kg dry weight	Maximum (TCLP) leachable concentration (pH 5.0 extract) mg/L
Arsenic	20	200	0.5	750	5
Barium	300	3,000	35	30,000	350
Beryllium	2	40	1	400	4
Cadmium	3	40	0.1	400	0.5
Chromium (total)	50	500	0.5	5,000	5
Chromium (VI)	1	200	NA*	2,000	NA
Copper	100	2,000	10	7,500	100
Cobalt	100	200	NA	1,000	NA
Lead	300	1,200	0.5	3,000	5
Manganese	500	5,000	25	25,000	250
Mercury (total)	1	30	0.01	110	0.1
Molybdenum	10	1,000	2.5	4,000	20
Nickel	60	600	1	3,000	8
Selenium	10	50	0.1	200	1
Silver	10	180	0.5	720	5
Tin (total)	50	500	NA	900	NA
Zinc	200	14,000	25	50,000	250
Tributyltin (reported as Sn)	0.005	0.07	0.05	0.7	0.5
Aldrin + Dieldrin	2	20	0.003	50	0.03
DDT + DDD + DDE	2	200	0.2	1,000	2
Benzo(a)pyrene	0.08	2	0.0005	20	0.005
Phenols	25	500	14	2,000	50
C_6-C_9 petroleum hydrocarbons	65	650	NA	1,000	NA
C_{10}-C_{36} petroleum hydrocarbons	1,000	5,000	NA	10,000	NA
Polycyclic aromatic hydrocarbons (total)	20	40	0.0005 TEQ**	200	NA
Polychlorinated biphenyls (PCBs)	2	20	0.001	50	0.002
Benzene	1	5	0.05	50	0.5
Toluene	1	100	1.4	1,000	14
Ethylbenzene	3	100	3	1,080	30
Xylene (total)	14	180	5	1,800	50
Cyanide (total)	32	1,000	1	2,500	10
Fluoride	300	3,000	15	10,000	150

*NA – a leachable concentration has not been prescribed (refer Table 1 above)
** For guidance refer to http://epa.tas.gov.au/Documents/Advisory_Note_for_classification_of_PAHs.pdf

2.1 Controlled waste

Contaminated soil may or may not be a controlled waste as defined in the *National Environment Protection Measure for the Movement of Controlled Waste between States and Territories* (NEPC, 1998) and the *Environmental Management and Pollution Control Act 1994* (EMPCA) and as further prescribed in the Regulations.

Soil and other material reasonably suspected to be a controlled waste must be sampled and analysed to determine whether it is a controlled waste before that waste can be removed from the site (R.6(3) of the Regulations). This generally includes, but is not limited to soil that is from a site that is used, or has been used, for an activity listed in Table 3 and is likely to be contaminated.

Special provisions apply to the management of controlled waste, as detailed in section 3 of this bulletin. As a general rule all *Low Level Contaminated Soil*, *Contaminated Soil* and *Contaminated Soil for Remediation* that is intended for treatment, re-use or disposal should be managed as controlled waste unless sampling proves otherwise.

2.2 Sampling and analysis

The waste producer is responsible for organising the sampling and analysis of potentially contaminated soil. It is recommended that a suitably qualified person perform all sampling. Additionally, all soil sampling should be conducted in accordance with the relevant Australian Standards, which include:

- AS 4482.1-2005 Guide to the investigation and sampling of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds (and any subsequent editions)
- AS 4482.2-1999 Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances (and any subsequent editions)
- In the case of potentially Acid Sulfate Soils, the *Tasmanian Acid Sulfate Soil Management Guidelines* published by Department of Primary Industries, Parks, Water and Environment should be consulted.

In-situ sampling is generally not recommended for classification of soils that are to be excavated later for disposal. However, if this method of classification is unavoidable, then the Australian Standards listed above should be adhered to in order to obtain a representative number of samples.

All sample analyses must be conducted by a laboratory registered with the National Association of Testing Authorities, accredited for the testing procedures undertaken ('NATA accredited'), or by a laboratory approved by the Director for the test.

2.2.1 Sampling density

The number of samples required for adequate classification of soil is dependent on the volume of material, the estimated standard deviation of contamination concentrations, and the estimated average concentration. However, as a general rule for homogeneous stockpiled soil one sample should be taken every 25 m^3.

2.2.2 Composite sampling

Generally, composite samples are not recommended for classification of soil for disposal. However, composite sampling may assist an environmental program by reducing sampling costs that could be spent elsewhere in the program. Composite sampling is only acceptable for stockpiled soil containing non-volatile contaminants and is **not** an acceptable method for sampling of volatiles such as some hydrocarbon-contaminated soil.

All composite sampling should be undertaken by a suitably qualified person and in accordance with the Australian Standards AS 4482.1-2005 and the National Environmental Health Forum Monograph, Soil Series No. 3 – *Composite Sampling*, 1996.

2.2.3 Sampling materials other than soil

For materials such as contaminated construction materials there are no guidelines available for determining the representative number of samples for testing. Surface scrapings or bored samples may be required to classify the material. The person undertaking the sampling, preferably an environmental consultant should develop a sampling strategy and density that adequately classifies the material.

2.2.4 Leachable fraction

In order to classify soil for disposal, the leachable concentrations of metals and some organics should be undertaken. Where a leachable concentration is prescribed in Table 2, generally that value will take precedence over the total concentration value and will be used as the sole determinant of final classification for disposal.

The most appropriate procedure for determining the leachable fraction should be determined in consultation with an environmental consultant, the EPA and the analytical laboratory performing the procedures and with consideration of the waste management goals that are to be achieved. Accepted methods for determining leachable fractions are detailed below:

The Toxicity Characteristic Leaching Procedure (TCLP), in accordance with USEPA Method 1311 – SW 846, is used to simulate the leaching of contaminants into groundwater under conditions found in solid waste landfills.

The Multiple Extraction Procedure (MEP), in accordance with USEPA MEP Method 1320 – SW 846, is used to simulate leaching from repetitive acid washings and is a more rigorous test of the buffering capacity of the soil than the TCLP. In some circumstances (*e.g.* for remediation technologies that involve solidification with lime based agents), the MEP would be a more suitable test to determine the long-term stability of soil.

There is also an Australian Standard for the preparation of leachates: AS 4439-1997 (parts 1 to 3), *Wastes, Sediments and Contaminated Soils: Preparation of Leachates.*

2.2.5 Acid sulfate soils

Potentially Acid Sulfate Soils (PASS) underlie parts of Tasmania's coastline and may also underlie inland areas such as peat bogs, salt lakes and wetlands. They are natural soils that contain sulfides (mostly iron sulfides). In an undisturbed and waterlogged state these soils are harmless, but when disturbed (such as dredging estuaries etc), a process of oxidation can produce sulfuric acid in large quantities. As the acid moves through the soil profile it may 'mobilise' or cause the release of metals and other toxins from the soil, which eventually flow into surrounding waterways. Acid Sulfate Soil (ASS) runoff therefore has significant environmental, economic and social impacts. The *Tasmanian Acid Sulfate Soil Management Guidelines* provide guidance on the level of management required to minimise the risk associated with ASS. The *Guidelines* also provide criteria to characterise acid sulfate soils. The criteria in Table 2 of this Bulletin do not apply to any soils classified as PASS. Such soils should be managed as potentially acid sulfate soils. Acid Sulfate Soil predictive mapping is available for Tasmania at www.thelist.tas.gov.au. For further information regarding ASS, instructions on how to utilise the predictive mapping, or obtain a copy of the *Guidelines*, refer to:

http://www.dpiw.tas.gov.au/inter/nsf/WebPages/SWEN-83NVBG?open

2.2.6 Per and poly – fluoroalkyl substances (PFAS)

PFAS are a group of chemicals that have been used in applications such as fire-fighting foams, textile treatments for upholstery and clothing, paper products and electroplating. There are many types of PFAS, with the best known being Perfluorooctane sulfonate (PFOS), Perfluorooctane acid (PFOA) and perfluorohexane sulfonate (PFHxS). Some PFAS have been globally identified as chemicals of high concern, particularly due to their environmental persistence and bioaccumulation. Therefore, in addition to classifying soils using Table 2 of EPA Bulletin 105, the EPA has adopted the PFAS National Environmental Management Plan 2018 (NEMP). Section 14.6 of the NEMP is applicable to PFAS in soils and guides classification and determination of risk associated with disposal to landfill. Both total and leachable PFAS concentrations should be analysed.

Disposal of soils contaminated with PFAS requires the Director's approval. Applications for approval are assessed on a case by case basis in line with the NEMP (2018). To use or obtain a copy of the *NEMP*, refer to:

https://www.epa.vic.gov.au/your-environment/land-and-groundwater/pfas-in-victoria/pfas-national-environmental-management-plan

3. Re-use or disposal - waste management plan

A Waste Management Plan should be developed following the classification of soil to determine whether the soil can be remediated or re-used instead of, or prior to, disposal (see Figure 1, which summaries this process, and section 5 which details the information required).

It should be noted that a controlled waste will not be suitable for re-use in sensitive environments such as wetlands, agricultural areas or residential sites.

4. Disposal of contaminated material

Classification of soil (as defined in Table 2) will determine the category of landfill to which the soil can be disposed of in accordance with the landfill operator's permit conditions.

If disposal is the only viable management option, all possible efforts should be made to reduce the volume of material requiring disposal by minimising excavated volumes and segregating and sorting of wastes prior to disposal.

Waste Type	Category A landfill - **Solid Inert Landfill**	Category B landfill - **Putrescible Landfill**	Category C landfill - **Secure landfill**
Level 1 – *Fill Material*	✔	✔	✔
Level 2 – *Low Level Contaminated Soil*	✕	✔ (refer to Section 4.2.2)	✔
Level 3 - *Contaminated Soil*	✕	✕	✔
Level 4 - *Contaminated Soil for Remediation*	✕	✕	✕

See the *Landfill Sustainability Guide 2004* (DPIWE, 2004) for further details.

4.1 Disposal of fill material (Level 1)

4.1.1 The off-site disposal of *Fill Material* is not restricted and may be used as cover in landfills.

4.1.2 The definition of *Fill Material* includes inert construction material, soils and rocks, which have not been contaminated with any substance, and stable asphalt or bituminous pavement material, all of which are generally considered inert for use as 'fill'. However, soil and other material classified as *Fill Material* can still be a 'pollutant' under EMPCA and must be responsibly managed.

Re-use of fill material

4.1.3 The re-use of *Fill Material* must not result in environmental harm. *Fill Material* might contain contaminants above background levels and therefore may not be suitable for all uses, *e.g.* for sensitive uses such as child play areas, residential uses, or in protected nature reserves

4.1.4 In some cases, unwanted 'waste' soils or rock imported from another site to be used as fill may naturally contain contaminants at levels that are higher than *Fill Material* criteria due to regional geological characteristics. This material would be regarded as unsuitable for re-use if it posed a risk to human health or the environment in its new location.

The risk posed by importation of materials with naturally elevated levels of certain contaminants should be assessed by an environmental consultant and the evaluation and supporting information submitted to the Director for approval.

4.2 Disposal of low level contaminated soil (Level 2)*Low Level Contaminated Soil* may, in some cases, be suitable for disposal as intermediate landfill cover at nominated municipal landfills. Please note that the landfill operator should refuse soil that has not been classified and approved if there is likelihood that acceptance of the material may result in a breach of the landfill operator's permit conditions.

4.2.2 Approval for the disposal of *Low Level Contaminated Soil* must be sought from the landfill operator and the EPA. The information detailed in section 5 of this bulletin must be supplied to the EPA when making an application for approval to dispose of a waste.

Landfills at which *Low Level Contaminated Soil* (Level 2) may be accepted:

Council / Authority	Landfill
Circular Head Council	Port Latta Waste Depot
Dulverton Regional Waste Management Authority (DRWMA)	Dulverton Regional Waste Depot
Launceston City Council	Remount Rd Waste Depot
Copping Refuse Disposal Site Joint Authority	Copping Waste Depot

Re-use of low level contaminated soil

4.2.3 *Low Level Contaminated Soil* might be suitable for re-use as fill or levelling material on an industrial or commercial site, but will be judged on a case by case basis. In determining whether *Low Level Contaminated Soil* may be used as fill, an assessment of the environmental and human health hazards associated with the disposal option must be conducted by a suitably qualified environmental consultant. If the soil is classified as a controlled waste, approval must be sought from the Director as detailed in section 5.

4.3 Disposal of contaminated soil (Level 3)*Contaminated Soil* can only be disposed of at landfills that have the appropriate permit conditions and within a separate lined and contained cell.

4.3.2 Approval for the disposal of *Contaminated Soil* must be sought from the landfill operator and the EPA. The information detailed in section 5 of this bulletin must be supplied to the EPA in making an application for approval.

4.3.3 Only permitted landfills are allowed to accept Level 3 waste. Furthermore, it is at the landfill operator's discretion as to whether or not they will accept the waste. At the date of publication, no Tasmanian landfill is receiving level 3 waste for disposal.

4.4 Contaminated soil for remediation (Level 4)

4.4.1 *Contaminated Soil for Remediation* requires remediation or treatment prior to disposal to reduce total concentrations and/or leachable concentrations to levels acceptable for landfill disposal or re-use.

4.4.2 The producer (defined in the Regulations) of the *Contaminated Soil for Remediation* is responsible for identification of the treatment options, which will depend on the waste and pollutant type, waste volumes and the availability of suitable facilities in which to manage the remediation. Typical forms of treatment currently being used for remediation of contaminated soil include bioremediation, thermal treatment/desorption, soil washing, soil vapour extraction, red mud, chemical treatments and stabilisation. Specific treatment of hydrocarbon contaminated soil by bioremediation is encouraged under appropriate circumstances, as detailed in the EPA's *Information Bulletin 108: Landfarming of Petroleum Contaminated Soils.*

4.4.3 The suitable technologies for waste treatment may not be available in Tasmania and thus treatment may require transport to an interstate facility. Advice on interstate treatment options should be sought from the Controlled Waste Management Officer.

4.4.4 If the soil is to be disposed of after treatment, the EPA encourages treatment methods that minimise soil volumes prior to disposal to conserve landfill space.

4.4.5 If the remediation method has the potential to cause environmental harm, as defined in EMPCA, advice from the Director should be sought.

4.4.6 *Regulation 6 - General Responsibilities* of the Regulations requires that a person must not remove, receive, store, reuse, recycle, reprocess, salvage, incinerate, treat or use for energy recovery a controlled waste as defined within the Regulations unless approved to do so.

5. Approvals

5.1 Approval process

The waste producer, or consultant/contractor acting on behalf of the waste producer, is responsible for applying for approval for soil disposal, re-use options or remediation.

Applications are to be sent to the Director, EPA. Please allow up to ten working days for the Director to respond to an application. Please note that where it is intended to dispose of material to a landfill, an 'in principle' agreement from the landfill should be gained by the applicant prior to disposal.

Upon approval of the application, the Director, or a person authorised by the Director will provide written notification to the applicant of the approved classification of the waste where appropriate. The landfill authority will also be forwarded a copy of the approval, along with a copy of the analytical results and any other relevant information so that they can monitor waste entering the landfill.

5.2 Information required

An application for approval to dispose of, re-use, treat, remediate, *etc*, soil must contain the following information:

Introduction:

- Details of the site(s) from which the soil is to be removed, including a brief site history and why the soil is thought to be contaminated, or likely to cause environmental harm;
- Description of the soil;
- Estimate of the volume of soil to be managed.

Sampling details:

- Sampling density and analytical suite to classify the soil;
- Sampling protocols followed;
- Scaled sampling plan showing, for example, soil stockpiles and sample locations and contamination sources;
- NATA endorsed laboratory reports.

Waste management plan:

- Proposal for the management of the soil that is in accordance with relevant guidelines and standards;
- If the soil is to be disposed of, provide justification for why re-use, on-site treatment, *etc* is not proposed;
- Details of the proposed management method, for example the name of the landfill facility that you wish to dispose of the soil at, or details of the treatment or re-use *etc*;
- The name of the waste transporter that you will be utilising (see Section 6 for further details); and
- If the soil is to be re-used, recycled, treated, *etc*, and is a controlled waste, the waste producer must apply for an environmental approval from the Director (R.12 of the Regulations). Relevant information required by the EPA to consider an application for an environmental approval is detailed in R.12(3) of the Regulations. A R12 application form can be accessed at:
- http://epa.tas.gov.au/regulation/required-approvals-and-authorisations

In situations where a site investigation report has already been lodged with the EPA, duplication of information provided in that report is not required. However, in all cases, the application will need to make reference to the specific sample numbers used for soil classification.

6. Transport of contaminated material

If a controlled waste is to be transported, a waste transport business holding a current relevant approval for that particular waste type and issued under EMPCA is required. For information regarding currently approved Waste Transporters, either contact the Controlled Waste Transport Officer (see below) or a list can be accessed at:

http://epa.tas.gov.au/regulation/document?docid=1063

Caution should be taken when transporting any material to ensure its safe transportation and prevention of secondary impacts (*e.g.* dust).

7. Further information

For further information relating to this bulletin or to make a contaminated soil or controlled waste disposal application contact:

Waste Management Section
GPO Box 1550
HOBART TASMANIA 7001

Controlled Waste Management Officer...................... **Contaminated Sites Officer.......................................** **Controlled Waste Transport Officer ....** **Landfill Officer...**	**EPA Division** **Telephone: (03) 6165 4599**

Legislation may be viewed on the Internet at http://www.thelaw.tas.gov.au.
General information can be viewed either on the EPA's website at http://www.epa.tas.gov.au

8. Currency of this bulletin

This bulletin may be subject to amendment and persons relying on this bulletin should check with an officer of the Waste Management Section or on the above EPA Division and EPA websites to ensure that it is current at any given time.

Disclaimer
The Crown gives no warranty, express or implied, as to the accuracy or completeness of the information provided in this Bulletin. The contents are based on the best information available to the Environment Protection Authority (EPA) at the time of publication and are subject to revision based upon further advice received by the EPA.

Please note that other national or state agencies may have additional requirements relating to the import/export and/or disposal of controlled wastes.

Table 3. Potentially Contaminating Activities

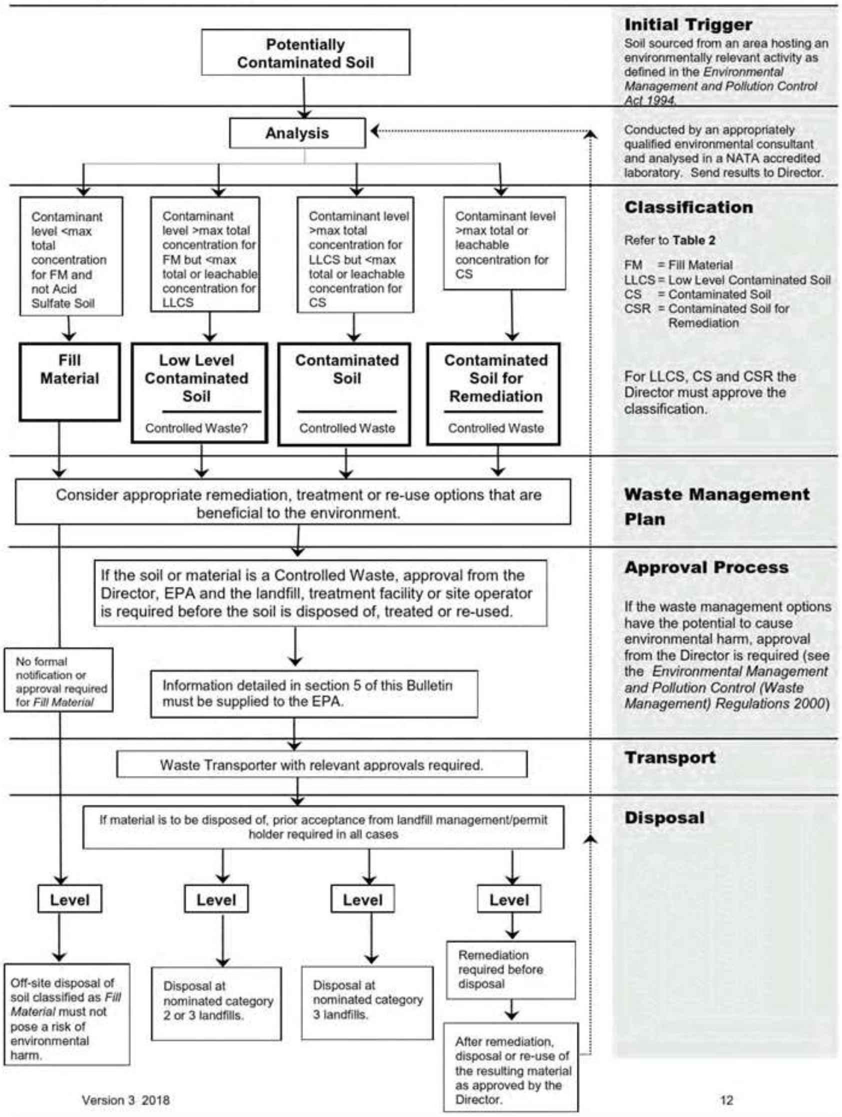
Potentially Contaminating Activities	
Acid / alkali plant and formulation	Landfill sites, including on-site waste disposal and refuse pits
Ammunition manufacture and usage (e.g. shooting ranges)	Lime burner
Asbestos production, handling or disposal	Metal treatments (e.g. electroplating) and abrasive blasting
Asphalt/bitumen manufacturing	Metal smelting, refining or finishing
Battery manufacturing or recycling	Mining and extractive industries
Boat/ship building, marinas, slip ways and associated boat yards	Oil or gas production or refining
Boiler or kiln usage	Paint formulation and manufacture

IB105

Chemical manufacture and formulation (e.g. fertilisers, paints, pesticides, photography, plastics, solvents)	Pesticide manufacture and formulation sites
Dewatering of sediments	Petroleum product or oil storage
Disturbance of potential acid sulfate soils	Pharmaceutical manufacture and formulation
Drum conditioning works	Power stations
Dry cleaning establishments	Printing
Electrical transformers	Radio-active material usage (e.g. hospitals)
Ethanol production plant	Railway yards
Engine works	Scrap yards and recycling facilities
Explosives industries and usage sites	Sewage treatment plant
Fertiliser manufacturing plants	Sheep and cattle dips
Fill material imported onto a site from a potentially contaminated source (includes dredge spoil)	Sites of fires involving hazardous materials, including fire fighting foam use
Foundry Operations	Spray mixing sites (e.g. for orchards)
Gas works	Spray painting industries
Herbicide manufacture	Tanning and associated trades
Hospitals	Textile operations
Sites of incidents involving release of hazardous materials	Tyre manufacturing and retreading works
Industrial activities involving chemicals that may have spilt	Wood preservation and storage or cutting of treated timber
Iron and steel works	Wool scouring
Laboratories	

IB105

Figure 1 **Summary of Waste Management for Contaminated Soil.**



Appendix 7 Site Induction Form & Cover Letter

Site Induction Form

GEO-ENVIRONMENTAL SOLUTIONS

48-52 New Town Road, New Town
Tasmania

An Environmental Site Assessment (ESA) report has been produced by Geo-Environmental Solutions for 48-52 New Town Road, New Town Tasmania, hereby referred to as 'The Site'.
Reporting identified the following risks at the site:

- A dust inhalation and soil ingestion risk to workers at the site
- High concentrations of contaminants including benzo(a)pyrene in groundwater at the site
- Potentially high concentrations of contaminants in surface waters at the site

Workers are to exercise caution when handling soil and water at the site and ensure that measures are put in place as identified with the Contamination Management Plan (CPM) which include and are not limited to:

- Ensuring that any dust occurrences are reported to the site supervisor and where necessary wearing dust masks to manage the risks;
- Wearing appropriate gloves when handling soil and water at the site;
- Ensuring that soil erosion at the site is managed in accordance with the site soil and water management plan (SWMP) which includes ensuring water and soil does not exit the site onto neighbouring properties

Site Induction Form

48-52 New Town Road, New Town
Tasmania

I ………………………………………………….. of …………………………………………..…. have been inducted to 48-52 New Town Road, New Town, Tasmania and have been informed of the CMP and its contents on …………………………………..(date)

I have been informed of the contents of the CMP and the responsibilities I have in ensuring that the CMP is adhered to relating to the following issues:

- Understanding the site contamination status
- Understanding the potential health impacts for site workers associated with site contamination
- Understanding the potential environmental impacts associated with site contamination
- Understanding how to reduce the risks to human health and the environment
- Maintaining documentation related to upholding the CMP

SOIL MANAGEMENT

- Excavation and stockpiling of soil at the site
- Movement of soil around the site
- Off-site disposal of soil
- Import of fill to the site
- Dust and sediment control

WATER MANAGEMENT

- Stormwater management and sediment control as outlined in the SWMP

I HEREBY ACCEPT THESE RESPONSIBILITIES.

NAME: ……………………………………………COMPANY:……………..……………….

SIGNED …………………………………..……….DATE …………………………

INDUCTED BY: …………………………………DATE …………………………

GEO-ENVIRONMENTAL SOLUTIONS

ENVIRONMENTAL SITE ASSESSMENT - Version 3

48-52 New Town Road, New Town

April 2019

Report for Swanbury Penglase Architects

Geo-Environmental Solutions P/L 29 Kirskway Place, Battery Point, 7004. Ph 6223 1839 E: Office@geosolutions.net.au

DOCUMENT CONTROL

Title	Version	Date	Author	Comments	Reviewed By
Environmental Site Assessment: 48-52 New Town Road, New Town.	Version 1	26 September 2018	S. Joyce	Contained details from the July-August investigation	JP Cumming
Environmental Site Assessment: 48-52 New Town Road, New Town.	Version 2	16 January 2019	S. Joyce	Additional soil & groundwater investigation information from October-November 2018.	JP Cumming
Environmental Site Assessment: 48-52 New Town Road, New Town.	Version 3	18 April 2019	K Taylor	Amendments to the building design and planning information	JP Cumming

EXECUTIVE SUMMARY

This report presents the findings from an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) at 48-52 New Town Road, New Town, Tasmania, hereby referred to as 'The Site'. GES was engaged by Swanbury Penglase Architects (the 'Client') on behalf of their client, to conduct the investigation in line with the anticipated Hobart City Councils *Contaminated Land Assessment and Planning* requirements plus the EPA Tasmanian's soil disposal and waste transport guidelines. The Client has designed a proposed commercial building which will be the Nexus Hobart Hospital; a day surgery and eye clinic.

The Environmental Site Assessment has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection (Assessment of Site Contamination) Measure (NEPM ASC 2013) guidelines.

The objectives of this ESA were to determine:

- In accordance with the Hobart City Council Interim Planning Scheme, if there is there is evidence the land is contaminated;
- Whether any site contamination presents an occupational health and safety risk to workers involved in redevelopment of the site or future site users;
- Whether any site contamination is likely to present an environmental risk from excavation conducted during development at the site;
- If the site is deemed to be contaminated:
    - Determine whether the site is suitable for the proposed use/development;
    - Make recommendations to prepare a contamination management plan (CMP) to manage any contamination risks, provide specific remediation and/or protection measures are required to be implemented before use or excavation commences

The scope of works of this ESA was to:

- Conduct a Desktop Assessment including records searches from the Environmental Protection Authority (EPA) Tasmania, WorkSafe Tasmania (WST) and Hobart City Council (HCC) as well as reviewing the relevant Historical Aerial Photographs.
- Conduct an invasive soil investigation across the entire site.
- A total of 53 bore holes were drilled to collect 183 primary soil samples, 142 of which was analysised for total recoverable hydrocarbons (TRH), Benzene Toluene Ethylbenzene Xylene Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAHs) plus leachate and a suite 15 Metals to a National Association of Testing Authorities (NATA) accredited laboratory to determine the presence/ absence of contamination and at what level;
- Conducted two limited groundwater monitoring events to obtain a snapshot of current groundwater conditions down gradient of the former service station site at *48-50 New Town Road*.
- All samples were sent with quality assurance/ quality control samples for analysis.
- All analytical results against were compared against NEPM ASC 2013 and any other relevant guidelines; and
- A Report presenting the findings of the site investigation, a conceptual site model (CSM) was developed, and future contamination management recommendations have been made.

From the desktop assessment, it is concluded that:

- The geology of the site is Triassic sediments of interbedded sandstone and mudstone.
- All surface waters from the site discharge into the street stormwater drains. The hydrogeology of the area is likely to consist of groundwater moving parallel with slope to the north towards the Maypole Creek which is approximately 1.7 km away. It is unlikely that any potential impact from the site would impact downgradient ecosystem receptors, given the spatial separation.
- The EPA Tasmania identified one property as a host to potentially contaminating activity, it is located 100m south of the site, at 30-36 New Town Road which hosted a former Caltex Service Station.

- The following information was apparent from the listed the historical aerial photographs;
    - '*48-50 New Town Road*' hosted a service station from prior to 1957 to approximately 1970; by 1973 a new building was constructed, and it remains to this day; a total of 4 bowsers were identified in the photographs.
    - *'52 New Town Road'* was a vacant block in 1957. By 1965 the current building plus attached warehouse buildings were constructed. There is a potential refueling bowser in the rear carpark, but it is unclear from the aerial photograph alone.
    - *30-36 New Town Road* hosted a service station between 1965-2000.
    - 466 Elizabeth Street hosted a service station between 1965-2000.
- WorkSafe Tasmania, provided four (4) records relating to dangerous substances held at *'52 New Town Road'* for 2000 gallon underground super spirit tank with a S/E pump later referred to as a 5.4 k/l tank plus a 1150 L on-ground tank for Diesel (situated above the generator building). WorkSafe Tasmania provided a site plan for '*48-52 New Town Road'*. BP Australia was mentioned in several of the documents.
- The HCC was contacted on the 9 July 2018. The councils register of potentially contaminated sites confirmed the following: '*48 New Town Road, operated as a "retail activity" from 1975-1989 as Tasmanian Television Ltd and COR/BP with the potential contaminant listed as Hydrocarbons.'*
- Given urban setting and absence of any native vegetation, there is a distinct lack of sensitive ecological receptors in the vicinity of the site.
- Registered water bores are a substantial distance from the site and are not considered to be impacted by any contamination at the site.
- The following areas of potential concern have been identified at the site:
    - All imported fill at the site, mostly at *52 New Town Road*;
    - The entire title of *48-50 New Town Road* was a former service station; and
    - The two service stations upgradient to the site at *30-36 New Town Road* and *466 Elizabeth Street*. It is likely that there was vehicle servicing and maintenance workshops associated with all of these service stations.
- COPC encountered at the site relate to the activities mentioned above and include the following: TPH/TRH, BTEXN, PAHs and Up to 15 Metals, PCB's.

The following investigation limits of Commercial/ Industrial guidelines were adopted for the site:

- Ecosystem – commercial/ Industrial use;
- Future land users access to soil – limited as the footprint of the proposed development will cover the entire site including the two lowest levels will be a concrete paved carpark therefore:
    - HIL D for soil ingestion and inhalation and
    - HSL D for dermal contact;
- Future land users vapour inhalation risk – HSL D;
- Site development works:
    - HSL D for vapour intrusion risk based on commercial land use;
    - Standard guidelines for assessing dermal contact risk; and
    - HIL D for assessing dust inhalation and soil ingestion risk
    - HIL A for assessing dermal contact and dust inhalation and soil ingestion risk to neighboring residential receptors
- Contamination exposure to trench workers:
    - HSL D for vapour intrusion risk based on commercial land use;
    - Standard guidelines for assessing dermal contact risk; and
    - HIL D for assessing dust inhalation and soil ingestion risk

From the soil assessment, it is concluded that:

- Many of the soil samples collected from the site had elevated levels of Polynuclear Aromatic Hydrocarbons in the form of Benzo(a)pyrene (Ecological Screening Levels) plus 1 exceedance for copper (Ecological Investigation Levels).
- Given the Health Screening Levels for *dermal contact* risk are not exceeded in any of the soil samples, there is a low risk to all current commercial workers, construction workers and trench workers during construction or future onsite inhabitants or trench workers in terms of dermal contact;
- There were commercial Health Investigation Level D guideline exceedance for assessing *soil ingestion and dust inhalation* risk in ten soil samples for benzo(a)pyrene and PAH's. 43% of soil samples collected at the site exceeded HIL A guidelines for assessing risk to neighboring residents as a result of exceedances from benzo(a)pyrene, PAH's and lead.
- There were no petroleum vapour intrusion risks identified in soil samples (*PVI* Health Screening Levels) which may indicate a risk to site development workers, future onsite inhabitants and future trench workers.
- Material tested at the site is classified under the *Information Bulletin 105* in a range from Level 1 to Level 4 Material with an overall average of Level 2. To accurately manage the excavated material for appropriate disposal, additional soil sampling may be required to be conducted by a suitably experienced environmental consultant.

The following conclusions have been made from the groundwater investigation:

- The results indicate that the underground refueling infrastructure relating to the former service station has been compromised overtime probably onsite and possibly upgradient as well;
- No free phase hydrocarbons was identified which suggests that the groundwater contamination is historic;
- Although there were low level detections of hydrocarbons there was no indoor vapour risk identified. Future investigations may be required once the new building is completed;
- Small amounts of trace metals are present in the groundwater and naphthalene exceeded freshwater and marine guideline limits; and
- Although high concentrations of benzo(a)pyrene are present, in accordance with the State Policy on Water Quality Management 1997 and ANZECC (2000) guidelines, an environmental or human health risk is not identified.

The following conclusions have been made from the current investigation:

- In accordance with the Interim Planning Scheme, it is identified from the site assessment that the site is considered a contaminated site and therefore will require a Contamination Management Plan (CMP) prior to the commencement of excavation works to address specific protection measures for human health and the environment;
- Without adequate management (through a CMP), elevated levels of lead and benzo(a)pyrene are present in the fill at the site may pose a risk to:
  - Human health both onsite and offsite during development works through dust inhalation and soil ingestion; and
  - The environment as a result of sediment erosion into the waterways
- It is quite plausible that there is secondary groundwater contamination sourcing from the upgradient former service stations, given 30-36 New Town Road is closer to the site, approximately 100m it is most probably source.
- Elevated levels of naphthalene, benzo(a)pyrene and some other metals are present in the groundwater which may pose a risk human health and the environment without adequate management (through a CMP)
- Given the CMP is put in place and recommendations are adhered to, the site will be suitable for the proposed use/development as a Medical Centre and commercial tenancy.
- In terms of soil disposal; elevated levels of barium, beryllium, lead, manganese, mercury, zinc, copper and benzo(a)pyrene and hydrocarbons have been identified and will require careful consideration when managing.
- The remaining UPSS infrastructure on site is currently a potential ongoing source for hydrocarbon contamination; and
- The proposed site redevelopment will involve the excavation of large volumes of fill from the site at the site which will remove most of the contaminated material at site.

GES recommends the following work should be undertaken at the site in relation to contamination investigations mitigation and remediation measures;

- Additional desktop investigations should be undertaken to review decommissioning and potential contamination reports at 30-36 New Town Road and 466 Elizabeth Street.
- All current construction workers and trench workers should be informed of the site contamination during their site induction as identified within the Contamination Management Plan (CMP)
- A CMP should be made available to all contractors prior to the commencement of excavation works. The CMP should include but not be limited to the following:
    - Soil management considerations including dust, wind, and water erosion in terms of human health and the environment;
    - Consideration to the duration of stockpile exposure and physical barriers to stockpiles plus standard building site security fencing
    - Classification and management advice in accordance with EPA IB105.
- The known source of hydrocarbon contamination; the underground fuel tank and associated infrastructure at *48-50 New Town Road*, should be removed as soon as practically possible. A Tank Decommissioning Assessment Report will be required according the EPA Tasmanian's underground petroleum storage systems decommissioning guidelines.
- During construction as a precaution, construction workers working around the former tank and on the section of the site that has the street address 48-50 New Town Road, should consider using personal air monitoring devices.
- Vapour risk to future site users has not been eliminated; once the new building is complete the following should be undertaken:
    - Shallow sub-vapour probes; and potentially
    - Indoor air monitoring

Limitations to this investigation were that the borehole locations and depths were restricted due to existing buildings and underground infrastructure on the site. All findings within the report are based on the proposed site development layout presented in Section 2.3. If the site layout is to change, this report will need to be amended to reflect these changes.

Table of Contents

Plates

Figures

Tables

ABREVIATIONS

ADWG	Australian Drinking Water Guidelines
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ALS	Analytical Laboratory Services
ANZECC	Australia and New Zealand Environment and Conservation Council
AWQG	Australian Water Quality Guidelines
BGS	Below Ground Surface
BH	Borehole
BTEX	Benzene Toluene Ethylbenzene Xylene
CMP	Construction Environmental Management Plan
COA	Certificate of Analysis
COC	Chain of Custody
COPC	Contaminant of Potential Concern
CRC CARE	Corporative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DQO	Data Quality Objectives
DWS	Depth Water Struck
EC	Electrical Conductivity
EOH	End Of Hole
EIL	Ecological Investigation Levels
ESL	Ecological Screening Levels
EPA	Environmental Protection Authority
EPN	Environmental Protection Notice
ESA	Environmental Site Assessment
GDA94	Geocentric Datum of Australia 1994
GES	Geo-Environmental Solutions Pty. Ltd.
GME	Groundwater Monitoring Event
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
IN	Investigation Notice
IP	Interface Probe
LiDAR	Light Detection And Ranging
LOR	Limits of Reporting
MCRWBA	Minimum Construction Requirements for Water Bores in Australia
MDL	Mean Detection Limit
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPM ASC	National Environmental Protection (Assessment of Site Contamination) Measure
NHMRC	National Health and Medical Research Council

NRMMC	Natural Resource Management Ministerial Council
NL	Non Limiting
NRMMC	Natural Resource Management Ministerial Council
PAH	Polynuclear Aromatic Hydrocarbons
PCP	Physico-Chemical Parameters
PEV	Protected Environmental Values
PHC	Petroleum Hydrocarbons
PID	Photo-Ionisation Detector
PPA	Preferential (PVI) Pathways Assessment
PSH	Phase Separated Hydrocarbons
PVI	Petroleum Vapour Intrusion
Redox	Reduction / Oxidation Potential
RN	Remediation Notice
SCA	Site Contamination Assessment
SCM	Site Contamination Model
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
USCS	Unified Soil Classification System
VME	Vapour Monitoring Event
VP	Vapour Probe
WRG	Water Resource Group

1 INTRODUCTION

1.1 General

This report presents the findings from an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) at 48-52 New Town Road, New Town, Tasmania, hereby referred to as 'The Site'. GES was engaged by Swanbury Penglase Architects (the 'Client') on behalf of their client, to conduct the investigation in line with the anticipated Hobart City Councils *Contaminated Land Assessment and Planning* requirements plus the EPA Tasmanian's soil disposal and waste transport guidelines. The Client has designed a proposed commercial building which will be the Nexus Hobart Hospital; a surgery and eye clinic.

The site location is presented in Figure 1, an image of the existing building on the south portion of the site is presented in Plate 1 and the current site aerial photograph is presented in Figure 2. Version 1 of this report contained details from the July-August investigation. The revision, Version 2 contains additional soil & groundwater information from October-November 2018 investigation. It should be noted that the investigation was limited by the footprint of the existing buildings onsite thus access was restricted in these areas. This revision, version 3 contains amended design plans and planning information.

The ESA has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection (Assessment of Site Contamination) Measure (NEPM ASC 2013) guidelines and key regulations and policies identified in the References section of this document. Personnel engaged in preparing this ESA are listed in Appendix 1 along with their relevant qualifications and years of experience.

Figure 1 Site Location 48-52 New Town Road, the site and surrounding area (LIST Image, 2018).

Plate 1 Image existing building at 48-50 New Town Road (Google Earth Image).

Figure 2 Current Site Plan (Aerial photograph LIST Image, 2018), currently two Titles.

1.2 Site Details

Site details are presented in Table 1.

Table 1 Site Details

Site Address
48-52 New Town Road, New Town, Tasmania
Current Title identification details
According to the Cadastral Parcels layer on the list;
48-50 New Town Road Property ID 5517199, CT 198029/1 (Fromberg Super Co Pty Ltd)
52 New Town Road is Property ID 5517180, CT 252465/1 (Fromvision Pty Ltd)
Current land use
This site consists of two office buildings with a number of shed and ancillary warehouse buildings currently occupied by Contact Group a provider of commercial and residential electrical services.
Site Total Area
The total area of the site redevelopment is approximately 7,400m^2, and will include a large hospital building and associated car parking.
Current Ownership (as per current certificates of title)
Fromberg Super Co Pty Ltd: *48-50 New Town Road*
Fromvision Pty Ltd: *52 New Town Road*
Zoning
Urban Mixed Use – *Tasmanian Interim Planning Scheme 2015*
Local Council
Hobart City Council
Proposed Site Use
Nexus Hobart Hospital Project – day surgery and eye clinic – commercial land
Surrounding Land Use
The site is surrounded residential properties and zoning of these properties is mostly *Inner Residential*.

1.3 Investigation Objectives

The objectives of this ESA were to determine:

- In accordance with the Hobart City Council Interim Planning Scheme, if there is there is evidence the land is contaminated;
- Whether any site contamination presents an occupational health and safety risk to workers involved in redevelopment of the site or future site users;
- Whether any site contamination is likely to present an environmental risk from excavation conducted during development at the site;
- If the site is deemed to be contaminated:
    - Determine whether the site is suitable for the proposed use/development;
    - Make recommendations to prepare a contamination management plan (CMP) to manage any contamination risks, provide specific remediation and/or protection measures are required to be implemented before use or excavation commences

1.4 Scope of Works

The scope of works of this ESA was to:

- Conduct a Desktop Assessment including records searches from the Environmental Protection Authority (EPA) Tasmania, WorkSafe Tasmania (WST) and Hobart City Council (HCC) as well as reviewing the relevant Historical Aerial Photographs.
- Conduct an invasive soil investigation across the entire site.
- A total of 53 bore holes were drilled to collect 183 primary soil samples, 142 of which was analysised for total recoverable hydrocarbons (TRH), Benzene Toluene Ethylbenzene Xylene Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAHs) plus leachate and a suite 15 Metals to a National Association of Testing Authorities (NATA) accredited laboratory to determine the presence/ absence of contamination and at what level;
- Conducted two limited groundwater monitoring events to obtain a snapshot of current groundwater conditions down gradient of the former service station site at *48-50 New Town Road.*
- All samples were sent with quality assurance/ quality control samples for analysis.
- All analytical results against were compared against NEPM ASC 2013 and any other relevant guidelines; and
- A Report presenting the findings of the site investigation, a conceptual site model (CSM) was developed, and future contamination management recommendations have been made.

2 PLANNING

2.1 Zoning

The site is zoned Urban Mixed Use under the Tasmanian Interim Planning Scheme of 2015, see Figure 3. The land use surrounding the site is consistent with the zoning.

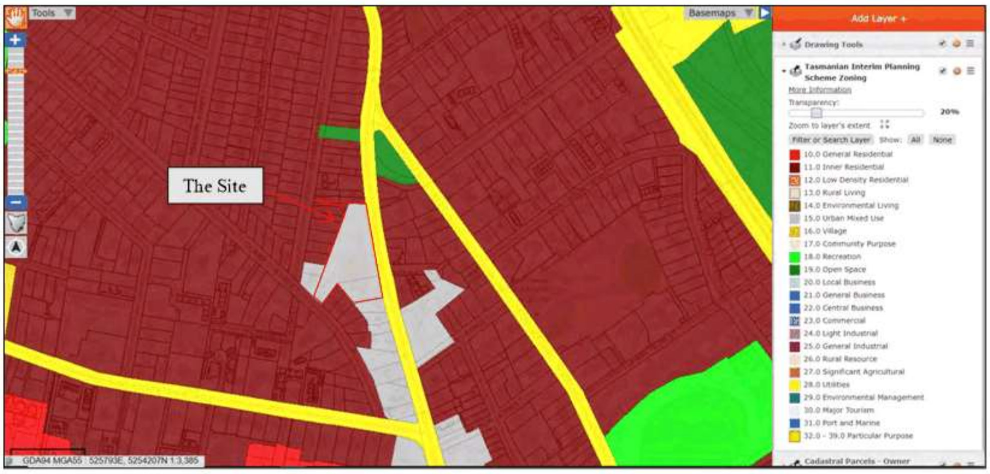


Figure 3 Council Planning Zones (2015) (LIST, 2018)

2.2 Proposed Site Development Works

It is understood that the proposed new development comprising the following (see the Architects plans in Appendix 2):

- Basement Level – Car Parking Area cover the footprint of the entire site, FFL of 55.8 m AHD;
- Ground Floor – retail outlet, car parking, and consulting rooms, lobby & amenities FFL 58.9 to 59.0m AHD;
- First Floor (Level 1) - Tenancy FFL 63.3m AHD;
- Second Floor (Level 2) – Amenities, waiting room, tenancy, admin, consulting rooms theatres and beds (suites and recovery), FFL 67.5 m AHD; and
- Rooftop (Level 3) – Plant level, FFL 71.8m AHD.

During the redevelopment a large volume of fill, with some soil, bedrock as well as all service station refuelling infrastructure will require removal.

2.3 Interim Planning Scheme

The council contaminated site register suggests that potentially contaminating activities may have taken place at the site or on a neighboring site. The proposed development has therefore flagged the Interim Planning Scheme E2.0 Potentially Contaminated Land Code. The following potentially contaminating activities (IPS Table E2.2) have been identified:

- A former service station was hosted at 48-50 New Town Road
  - Commercial engine and machinery repair; and
  - Petroleum product or oil storage;
- A large quantity of uncontrolled fill is present at 52 New Town Road:
  - Fill material imported onto a site from a potentially contaminated source

As the EPA director, or a person approved by the Director has not certified that the land is suitable for the proposed development and there is no approved plan to manage contamination and associated risk to human health or the environment, there are no acceptable solutions to the proposed development and therefore all E2.0 performance criteria relevant to the proposed development are to be addressed.

An environmental site assessment (ESA) is the principal requirement within the IPS E2.0 performance criteria. According to the IPS, the ESA report must be prepared by an suitably qualified person and define the nature, extent and levels of existing contamination and the actual or potential risk to human health or the environment, on or off the site, resulting from that contamination, prepared in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 16 May 2013.

2.3.1 Proposed Excavation Works E2.6.2 P1

As there is proposed excavation works at the site, there are no acceptable solutions to proposed works, E2.6.2 P1 performance criteria are to be addressed. The performance criteria identify that the excavation works must not adversely impact on health and the environment, having regard to:

(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or

(b) a plan to manage contamination and associated risk to human health and the environment that includes:

   i. an environmental site assessment;
   ii. any specific remediation and protection measures required to be implemented before excavation commences; and
   iii. a statement that the excavation does not adversely impact on human health or the environment.

3 DESKTOP STUDY

3.1 Site Walkover

A site walkover was completed by GES staff on the 18 July 2018 and relevant images area presented in Appendix 3. Photographs relating to onsite refueling infrastructure are presented in Plate 2 through to Plate 5.

Plate 2 Tank fill point – at *48-50 New Town road*

Plate 3 Spatial relationship to tank fill point to the building at *48-50 New Town Road*

Plate 4 Diesel Engine Oil in the generator building

Plate 5 52 New Town Road – Diesel AST above the generator building at the rear (western boundary) of the site

Historical site plans were viewed during the site walkover and presented in Figure 4 and Figure 5. It is clear that the plan is for *52 New Town Road* due to the shape of the site and the surrounding street network. The approximate age of this site plan is 1965 for the following reasons:

- The measurements on the site plan are in imperial units (feet),
- There is a service station at *48-50 New Town road* and
- *52 New Town Road* appears to have been filled.

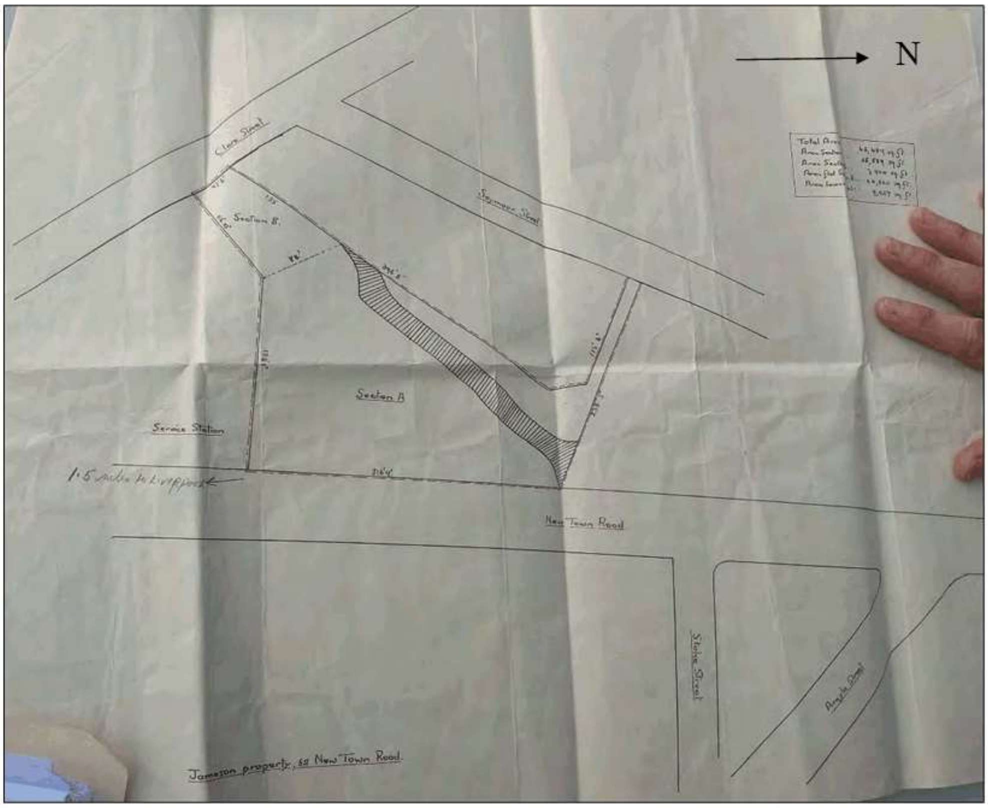


Figure 4 Photograph of historical site plan (date unknown)

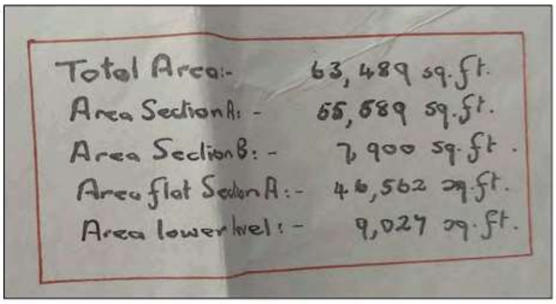


Figure 5 Close up of measurements on the historical site plan

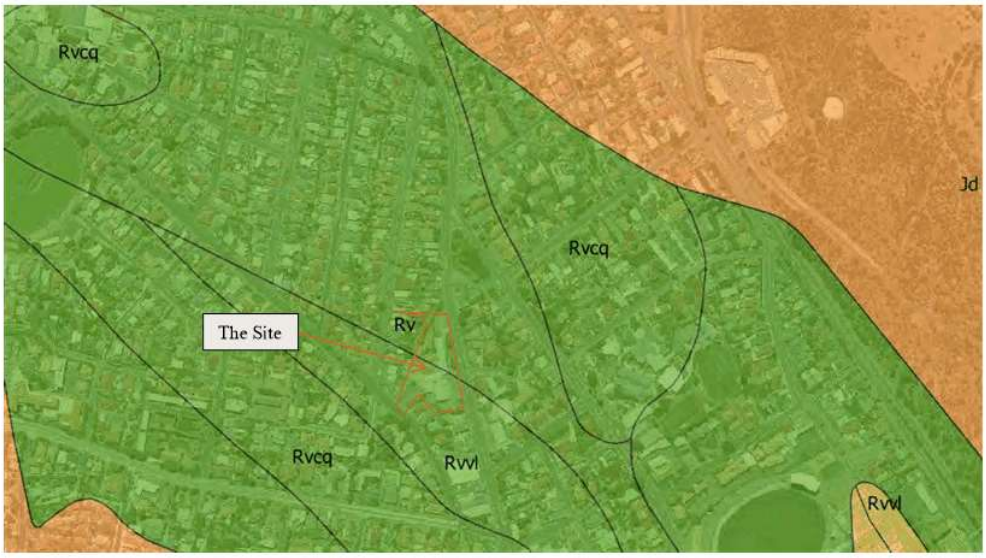
3.2 Surface Coverings and Signs of Contamination

The surface covering at the site are a combination of grass/ garden beds, asphalt and concrete plus a number of brick office buildings, lean to sheds and warehouses. There were no signs of surface contamination such as staining or odour at the site.

3.3 MRT Geology Mapping

- The 1:25,000 scale geology map of Hobart (Map Number 5225), see Figure 6; indicates the site is underlain by the following Triassic sediments and sandstone geological units:
  - Map Unit Rv - Undifferentiated volcaniclastic, quartz-rich lithic and quartzose sandstone, siltstone, mudstone, carbonaceous beds and coal seams; and
  - Map Unit Rvvl - Interbedded yellow brown or grey carbonaceous siltstone, mudstone and thin to thick-bedded quartz-rich lithic arkosic sandstone, some fossil plants, common siltstone palaeosols.

The Rv unit is located to the north of the site, which covers the majority of Stage 1 development site area. The entire Stage 2 development site and the southwestern portion of Stage 1 development site is underlain by the Rvvl unit. The contact between the Rv and Rvvl map units are indicated to be located close to the boundary between stage 1 and stage 2 works, which the deposits are orientated in a north-west south-east orientation. It should be noted that the contact between the two geological units has not been mapped as a fault, only as a geological contact.



Rv – TB - Undifferentiated volcaniclastic, quartz-rich lithic and quartzose sandstone, siltstone, mudstone, carbonaceous beds and coal seams.
Rvcg – TB - Thickly- to thinly-bedded volcanic lithic sandstone, siltstone, mudstone and coal seams, fossil plants on some horizons (Newtown Coal Measures).
Rvvl TB - Interbedded yellow brown or grey carbonaceous siltstone, mudstone and thin to thick-bedded quartz-rich lithic arkosic sandstone, some fossil plants, common siltstone palaeosols.
Rvcq TB Interbedded cross-bedded white quartzose sandstone, quartz-rich lithic sandstone, siltstone and mudstone; Hobart area- upper interval with much dark grey carbonaceous mudstone, thin lenticular coal seams and fossil plants in places, elsewhere these litho
Jd Dolerite and related rocks
Rwl TB Interbedded yellow brown or grey carbonaceous siltstone, mudstone and thin to thick-bedded quartz-rich lithic arkosic sandstone, some fossil plants, common siltstone palaeosols.

Figure 6 Mineral Resources Tasmania 1:25000 Scale Mapping (The LIST).

3.4 Tasmanian EPA

A property information request (PIR) search was conducted by the EPA Tasmania and no records relating to contamination or potentially contaminating activities on the site or at adjacent properties to were identified. See Appendix 3 for confirmation letter from the EPA received on the 31st July 2018.

One property was identified 100m south of the site and upgradient at 30-36 New Town Road which hosted a former Caltex Service Station. The EPA was notified August 2000 that the underground storage tanks (UST's) had been removed and the site remediation works would be completed prior to the construction of a video retail outlet. See Figure 7 for the spatial relationship between the former service station and the site.

3.5 Site Topography, Drainage & Hydrogeology

Overall, the site is gently sloping by 3° downhill to the north. Elevation of the site ranges from 60.3 m AHD to the south-east, 56.2 m AHD to the north and 57.5 m AHD to the west. Along the north-western edge of the site, the site slopes off significantly, likely to form the edge of the fill pad. To the east and west of the site, the site is surfaced by concrete and asphalt forming car parking and hard stranding areas. The central and southern portion of the site is occupied by a series of office and warehouse buildings, covering 35% of the site. The north-western portion of the site is covered by a levelled grassed area.

The hydrogeology of the area is likely to consist of groundwater moving parallel with slope to the north towards the Maypole Creek which is approximately 1.7km away.

All surface waters from the site will discharge into the street stormwater drains. The inferred groundwater flow is illustrated in Figure 7.

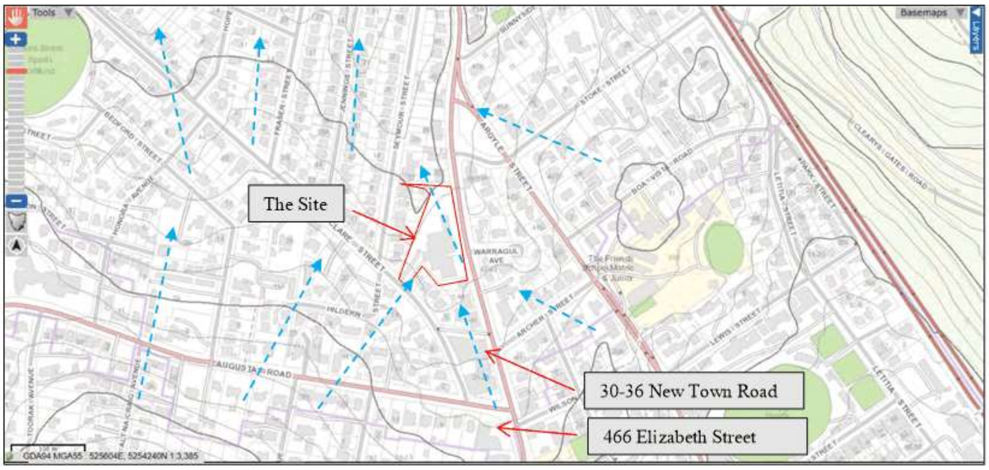


Figure 7 Inferred Groundwater Flow (blue dashed line)

3.6 Historical Aerial Photography Interpretation

The 1989, 1977, 1973, 1965 and 1957 historical aerial photograph were viewed as part of this ESA. Table 2 presents a summary of alterations to the site between photo events and the individual aerial photos are presented in Plate 6 to Plate 18. In summary there was a service station on site prior to 1957 to around 1973; there were two upgradient service stations 30-36 New Town Road and 466 Elizabeth Street from around 1965 to 2000.

Table 2 Historical Aerial Photograph Review

Photo	Observations
1989	• *'48-50 New Town Road'* unchanged. • *'52 New Town Road'* potential bowser at the rear of the building bowser **B5**?; generator building has been constructed. The site has the same building configuration as currently in 2018 except for the transmission dish that has been removed. • Service stations in proximity to the site that may have had potentially contaminating activities included: *30-36 New Town Road; former Caltex Service Station* (According to the EPA tanks were removed from the site around the year 2000) and *466 Elizabeth Street; Currently the Hill Street Grocer.*
1977	• Sites unchanged
1973	• *'48-50 New Town Road'* New building site no longer a service station – current building to this day. • *'52 New Town Road'* site unchanged
1965	• *'48-50 New Town Road'* Service station had a canopy over bowers **B2** and **B3**. Potential bowser **B4** next to the building. Staining on the ground at the rear of the service station building area of approximately 10x15m. (Borehole BH15 in the current study was the closest to this area – however the exact area is now covered by a building) • *'52 New Town Road'* existing building constructed. Potential bowser **B5** • Service stations upgradient present: *30-36 New Town Road; former Caltex Service Station* and *466 Elizabeth Street; Currently the Hill Street Grocer.*

1957	• *'48-50 New Town Road'* service station with three bowsers; *Bowsers* ***B1, B2*** and ***B3.*** • *'52 New Town Road' vacant block, steep drop-off from New Town Road.* • Service stations upgradient not yet constructed: *30-36 New Town Road; former Caltex Service Station* and *466 Elizabeth Street; Currently the Hill Street Grocer.*

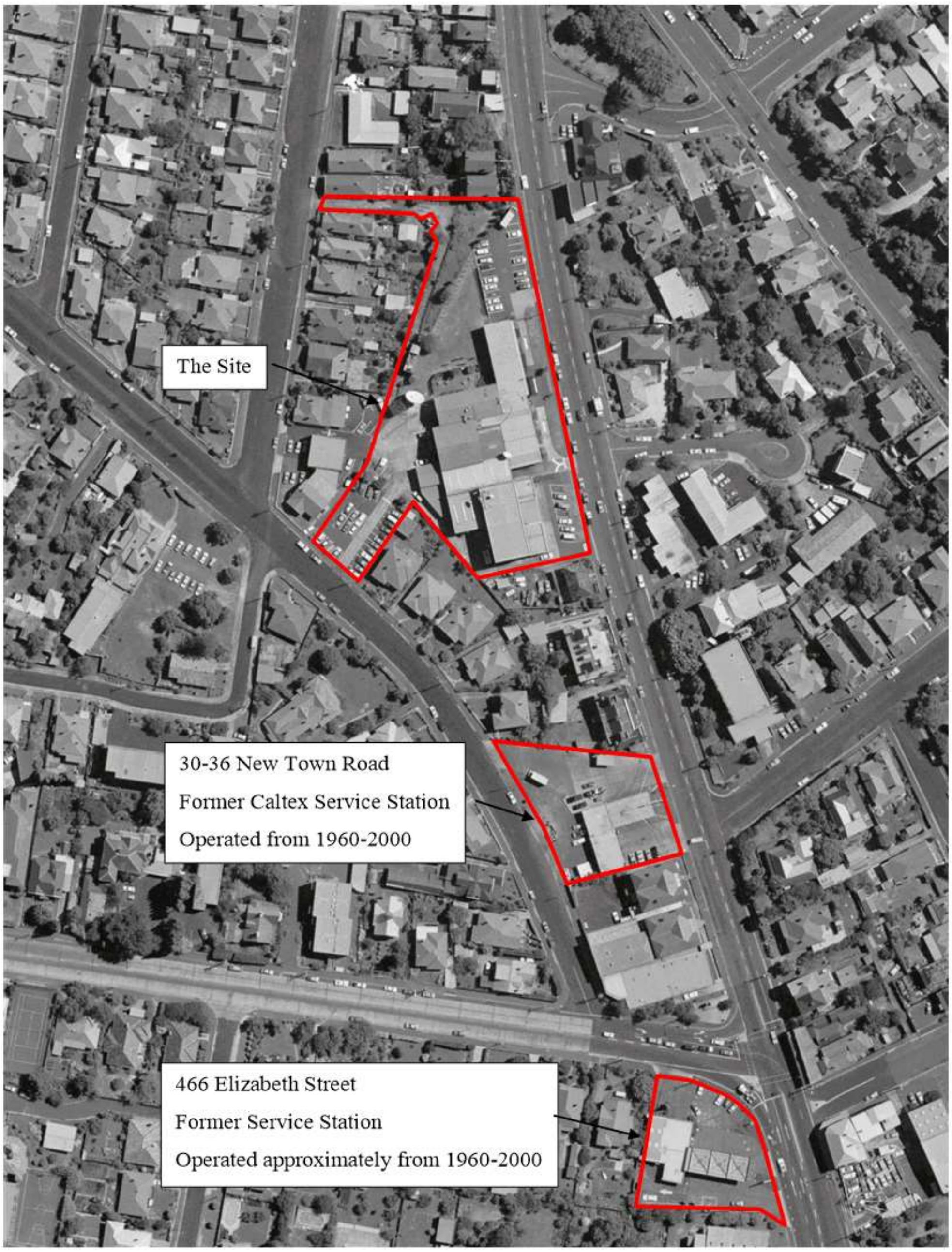


Plate 6 The 1989 Historical Aerial Photograph of the site and surrounding area.

Plate 7 The 1989: Former Service Station at 30-36 New Town Road (100m south and upgradient of the site)

Plate 8 The 1989: Former Service Station, 466 Elizabeth Street, North Hobart (220m S & upgradient of the site)

Plate 9 The 1977 Historical Aerial Photograph of the site.

Plate 10 The 1973 Historical Aerial Photograph of the site.

Plate 11 The 1965 Historical Aerial Photograph the site and the surrounding area.

Plate 12 The 1965 Historical Aerial Photograph of the site.

Plate 13 The 1965 Historical Aerial Photograph of *48-50 New Town Road*.

Plate 14 The 1965 Historical Aerial Photograph of 30-36 New Town Road former Caltex Service Station.

Plate 15 The 1965 Historical Aerial Photograph of 466 Elizabeth Street; former Service Station

Plate 16 The 1957 Historical Aerial Photograph of the surrounding area ('30-36' & '466' service stations not yet constructed).

Plate 17 The 1957 Historical Aerial Photograph of the site.

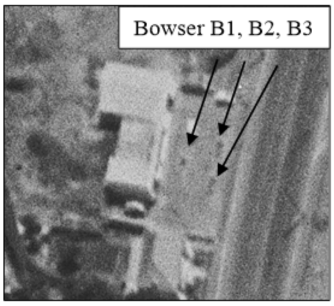


Plate 18 The 1957 Historical Aerial Photograph of *48-50 New Town Road* (Former Service Station).

3.7 Previous Site Investigations

GES is not aware of any contaminated site investigations for the site or any neighboring properties.

3.8 Dangerous Goods Records (WorkSafe Tasmania)

WorkSafe Tasmania, provided GES with Dangerous goods manifests on the 10 July 2018, the records area presented in Appendix 4 and are summarized in Table 3.

Table 3 Dangerous Goods Manifest

Photo	Details
1989	26 June 1989 – File closed for 50-52 New Town Road
1981	24 December 1981. **Application for Licence in respect of Premises for keeping of inflammable liquids or dangerous commodities.** 50-52 New Town Road, New Town. Additional storage inspection. 1x 5.4 K/L inflammable liquid Class A – ie Petrol and 14.49K/L inflammable liquid Class A – ie Petrol
1980	26 June 1980. **Record of Inspection of Installatioin** Premises of Tasmanian Television, BP Australia, approved 17 March 1980. 52 Main Road, New Town. Special conditions: Tank shall be located at least 3 m from boundary and 100 % bund to surround tank. 1x5400k/l u/g and 1x1150 L o/g tank for Diesoleum Plus proposed site plan (13 March 1980) with approximate locations including proposed generator site
1977	16 February 1977. **Application for Licence in respect of Premises for keeping of inflammable liquids or dangerous commodities.** 9.09 K/L inflammable liquid Class A – ie Petrol; 1x2000 …Signed by The Tasmanian Television Limited Secretary on 7 Feb 1977.
1976	6 July 1976. **Record of Inspection of Installatioin** (Tasmanian Telivision and BP on document to the Department of Mines. 1x 2000 u/g tank class A. 1x S/E pimp 9.09KL.
1975	3 October 1975. **Approval of Site and construction of Premises for keeping of inflammable liquids or dangerous commodities.** Install 2000 gallon super spirit connected to a S/E pump as per annotation.
1975	30 September 1975. **Site Plan** – Install 2000 gallon super spirit connected to a S/E pump. Concrete Slab to be provided tank area. Tasmanian Television Ltd. *48-52 New Town Road*, Newtown. 26 September 1975, BP Australia Limited stamp.

3.9 Council Environmental Records

The HCC was contacted on the 9 July 2018. The councils register of potentially contaminated sites stated the following:

> *'48 New Town Road, operated as a "retail activity" from 1975-1989 as Tasmanian Television Ltd and COR/BP with the potential contaminant listed as Hydrocarbons.'*
>
> *'It was possible as a part of these operations that they stored and sold products such as oil or petrol in cans/tins. It's more likely this was COR (commonwealth oil refineries) / BP selling these types of products. Under today's list of potentially contaminating activities this would likely fall under petroleum product or oil storage.'*

3.10 Groundwater

During the investigation, three groundwater monitoring wells were installed and labeled MW1 to MW3; These wells will be used to enable groundwater samples to be collected and to monitor the future groundwater levels. During the investigation, the soil was observed to be wet in boreholes BH08 below 4.6 m depth, BH10 below 4.8 m depth, BH18 below 3.2 m and in geotechnical boreholes GT02 below 6.7 m depth and GT05 below 5.0 m depth. It is likely the groundwater encountered is a combination of perched groundwater within the fill and natural groundwater levels on the contact with the underlying bedrock.

3.10.1 Potential Up-Gradient Contamination Sources

Given the long urban history of the site and the surrounding area, there is the potential for up-gradient off-site contamination to be impacting the site. There are two sites that have been identified, including;

- *30-36 New Town road*, a Former Caltex Service Station currently a video city store. This site is approximately 100m away and is elevated on average by 7m above from the investigation area; and
- The former service station at *466 Elizabeth street*, currently a Hill Street Grocer. This site is approximately 220m away and is elevated on average by 12m above from the investigation area.

No other sources of potential upgradient contamination has been identified.

3.10.2 Downgradient Ecosystem Receptors

Given urban setting and absence of any native vegetation, the vegetation community of the site according to TASVEG 3.0 is classified as Agricultural, urban and exotic vegetation with a description of (FUR) Urban areas.

The hydrogeology of the area is likely to consist of groundwater moving parallel with slope in a northerly direction. The closest water source is Maypole Creek which is 1.7 km to the north near Risdon Road.

There a not identifiable risks to receptors through groundwater movement, with the highest risk being attributed to the drainage of impacted groundwater and surface water into the stormwater system as well as sediments eroding from the site.

3.10.3 Registered Water Bores

Mineral Resources Tasmania Registered water bores locations are presented in Figure 8. The nearest registered groundwater bores are in Lenah Valley and on the eastern side of the Queens Domain. See

Table 4 for bore details. The groundwater is marginally salty with a TDS value of 1800 ppm. It is improbable that the water bore would be used for drinking water purposes given the salinity. The Triassic sandstone coal units nearby are typically quite salty, and similar or higher TDS values are expected.

Given the highly build up urban setting of the site, and the unlikelihood of groundwater boring in the center of Hobart, it is incredibly unlikely that any potential contamination from the site will be impacting groundwater bores.

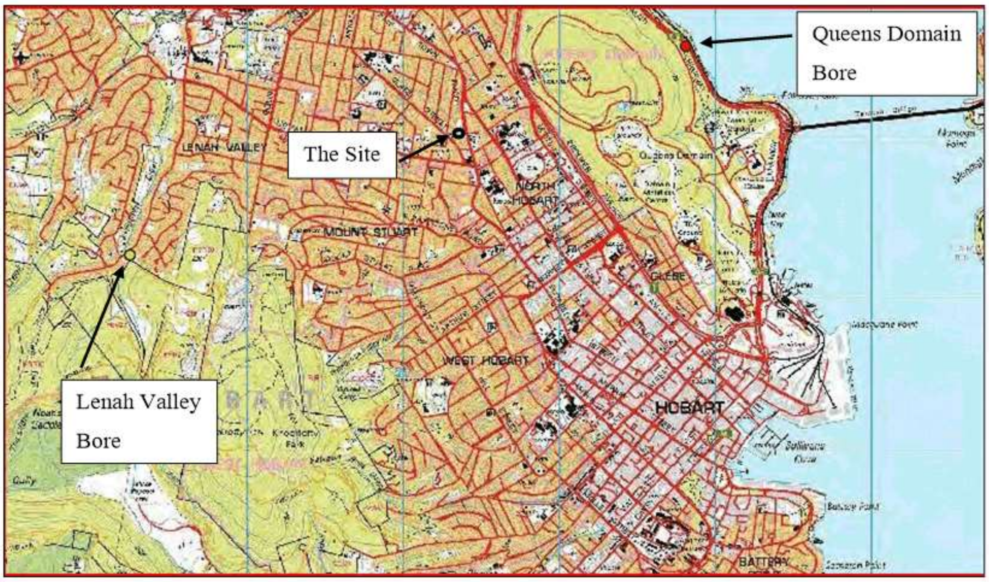


Figure 8 Closest Groundwater Bores.

Table 4 Bore Details

Bore features	Lenah Valley	Queens Domain
Location in relation to site	3 km west	1.5km east
yield L/s	1-2	<0.5
depth mbgs	45-60	45-60
water quality TDS mg/L	1500-3000	1500-3000
last standing water level mBGL	5-10	unknown
operating status	capped	unknown
aquifer geology	Triassic	Jurassic dolerite

3.11 Potential Contamination Issues

3.11.1 Areas of Potential Concern

The following areas of potential concern have been identified at the site, see Figure 9:

- All imported fill at the site, mostly at *52 New Town Road*;
- The entire title of *48-50 New Town Road* was a former service station; and
- The two service stations upgradient to the site at *30-36 New Town Road* and *466 Elizabeth Street*.

It is likely that there was vehicle servicing and maintenance workshops associated with all of these service stations.

3.11.2 Contaminants of Potential Concern

Contaminants Of Potential Concern (COPC) encountered at the site relate to the activities mentioned above and include the following:

- Total Petroleum/Recoverable Hydrocarbons (TPH/TRH);
- Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN);
- Polynuclear Aromatic Hydrocarbons (PAHs); and
- Up to 15 Metals.

Figure 9 Areas of Potential Concern

4 FIELD INVESTIGATION PROCEDURES

4.1 Works Summary

A total of fifteen site visits were conducted to complete the environmental site assessment, see details in Table 5; borehole locations are presented in Figure 10.

Borehole drilling and soil sample collection was conducted over 9 days, a total of 142 primary soil samples were selected for analysis with 9 '*duplicate*' samples and 6 '*triplicate'* samples, 9 rinsate blanks and 4 field blanks.

Groundwater sampling took place over 2 days, a total of 4 groundwater samples were selected for analysis, 2 '*duplicate*' samples and 2 '*triplicate'* samples, 1 rinsate blank and 1 field blank.

Table 5 Summary of Site Investigation Work Dates

Scope	Data	Lab Report	Details
Site Walkover	18 July 2018	-	Photographs taken, preliminary discussion of borehole location selection
Service location/ Drilling/ Sample collection	23 July 2018	EM181858 – Primary Lab ES1822218 – Secondary Lab EM1812173 – Re-batch	Sampled BH01 – BH07; 17 Primary Samples; Duplicate 1- Duplicate 3; Triplicate 1 – Triplicate 3; 1 Field; 1 Rinsate
Drilling/ Sample collection	24 July 2018	EM1811913 – Primary Lab ES1822455 – Secondary Lab EM1812174 – Re-batch	Sampled BH08 – BH12; 16 Primary Samples; Duplicate 4; Triplicate 4; Rinsate 2; Field Blank 2; Rinsate 2
Drilling/ Sample collection	25 July 2018	EM1811891 – Primary Lab EM1812175 – Re-batch	Sampled BH13 – BH19; 12 Primary Samples; Field Blank 3; Rinsate 3
Installation of Groundwater well	26 July 2018	-	MW1 was installed in borehole GT05 which was drilled by Tasmanian Drilling.
Drilling/ Sample collection	30 July 2018	EM1812116 – Primary Lab ES1822592 – Secondary Lab Hold	BH20; 2 primary Samples; Duplicate 5; Rinsate 4; Field Blank 4 Triplicate 5 - HOLD
Sampling of Groundwater well	11 September 2018	EM1814666 – Primary Lab ES1827248 – Secondary Lab	MW1, Duplicate, Triplicate; Field Blank
PAH analysis – Geotech Soil	17 October 201	EM1816786	*GT02, GT01, GT03*
Drilling/ Sample collection	24 October 2018	EM1817421 – Primary Lab EM1817821 – Rebatch	BH21-BH25; 27 Primary Samples; *Duplicate 1. Rinsate Blank 1*
Drilling/ Sample collection	29-31 October 2018	EM1817564 – Primary Lab EM1818156 – Rebatch	BH26-BH40. *Duplicate 2 – Duplicate 3. Rinsate 2 – Rinsate 4.*
Drilling/ Sample collection	5 November 2018	EM1817824 – Primary Lab EM1818266 – Rebatch ES1833261 – Secondary Lab	BH41 – BH53; 28 Primary Samples; *Rinsate 5; Triplicate 1 0.5-0.6; Triplicate 2 1.5-1.6*
Installation of Groundwater well	14-15 November 2018	No sampling.	Drilled and installed MW2 and MW3.
Sampling of Groundwater well	26 November 2018	EM1819122 – ALS 15481 - Envirolab	Sampled MW1, MW2 and MW3. Duplicate and Triplicate collected from MW2. 1x Rinsate

Figure 10 Borehole Plan

Note: BH#-Soil bores; MW# - groundwater bore and GT# - Geotechnical Hole

4.2 Soil Investigation

4.2.1 Borehole Drilling

At each of the bore locations, the following precautions were put in place to avoid disrupting underground service assets:

- Dial Before You Dig plans were obtained;
- Archers Underground Service were engaged; and
- Where practical, the first meter of the bore was cleared with a hand auger.

Concrete coring was undertaken through bitumen or concrete at each drilling location as required. A total of fifty-three (53) 65 mm diameter soil bores were drilled for assessing site geology and sampling for contamination impact. The bores were drilled by GES. There were also 5 Geotech holes drilled.

4.2.2 Soil Sampling

Soil bore soil sampling was conducted per the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM ASC 2013) and AS4482 sampling guidelines. Table 6 presents a summary of the soil assessment methodology adopted at the site.

Table 6 Summary of Soil Sampling Methods

Activity	Details / Comments
Drilling Method	Soil bores were drilled: • Hand auger over the first meter to clear for services; and • Industry recognized Geoprobe direct push drilling system. The selected drilling method involved using a Geoprobe dual tube to retain wall integrity and eliminates risk of profile collapse whilst allowing extraction of 1.0 m length sample cores and allows for deployment of pre packed well systems.
Soil Logging	Logging the soil was conducted in accordance with the unified soil classification system (USCS) as detailed in AS1726 (1993).
Decontamination of Sampling Equipment	Quantum Clean Laboratory Detergent Decon 90 was used to decontaminate reusable sampling equipment (hand auger and core trays) which was triple rinsed, the final rinse was deionised water.
Soil Screening	In accordance with AS4482.2. Individual soil samples were collected from approximately at 0.5 intervals below ground surface (bgs) and/or change in geology. Collected samples were screened for volatile fractions using a Photoionisation Detector (PID). This was done by placing the samples within snap lock bags and analysing the headspace with a PID probe. GES's PID was being serviced during the first round of the investigation, a PID 3000-62 was hired from *ThermoFisher Scientific*, proof of hire is attached in in Appendix 5. A service record for GES's PID is also included in this appendix for the second round of sampling.
Laboratory Soil Sample Collection	In accordance with AS4482.2. All samples were collected using disposable nitrile gloves. Sampling was either grab sampling from the push tube core or taken directly from the hand auger. A minimum number of samples were carefully selected which would provide sufficient information to identify hydrocarbon contamination in soils.
Sample preservation	Samples were placed into a jar for laboratory analysis. Soil jars were placed in a pre-chilled cool box with ice bricks.
Sample holding times	Sample holding times were within acceptable range (based on NEPM B3-2013) from collection to extraction.

4.2.3 Soil Analysis

Primary and QC samples were submitted to Analytical Laboratory Services (ALS) Springvale Avenue in Melbourne for analysis. Triplicate samples were sent to ALS located in Smithfield, NSW. Of the 183 primary samples collected 142 were selected for analysis which included TPH/TRH, PAH, BTEX and 15 Metals. Nine duplicate and six triplicate soil samples were collected, and all underwent analysis. Chain of Custody (COC) documentation was completed and is provided in Appendix 6 plus the Sample Receipt Notification (SRN) for each batch presented in Appendix 7. Table 7 presents a summary of the laboratory analyses undertaken for the soil samples.

Table 7 Overview of Soil Analysis and Quality Control

Analytes	Primary Soil Samples	Duplicates[a]	Triplicate[b]	Rinate Blank[c]	Field Blank[d]
TPH/TRH	142	9	6	9	4
BTEX	142	9	6	9	4
PAH	142	9	6	9	4
15 Metals	142	9	6	9	4

Sampling Quality Control Standards (AS4482):
a – One (1) in twenty (20) intra laboratory split (duplicate) samples
b - One (1) in twenty (20) intra laboratory split (triplicate) samples
c - Single Rinsate Blank sample per piece of equipment per day
d - Single field sample per day recommended but not essential.

Given that a full 15 metal suite was analysed, there was requirement to assess the following soil physical properties to determine soil threshold investigation levels:

- Soil grain class (sand/silt or clay)
- % Clay content;
- Cation exchange capacity; and
- Soil pH

The soil physical properties were assessed through site assessment and chemical properties were based on knowledge of similar soil types encountered around Hobart.

4.3 Groundwater Assessment

4.3.1 Monitoring Well Establishment

Three (3) groundwater monitoring wells were installed as per Minimum Construction Requirements for Water Bores in Australia (MCRWBA 2011); MW1 on the 30th July 2018 and MW2 and MW3 on 14th and 15th November 2018. The groundwater bores were completed with a gatic cover. Full borehole construction details are presented Appendix 10. The monitoring wells were developed immediately following borehole construction.

4.3.2 Well Development

The newly installed wells were purged of silt particulates for a period of time until the sand packing became effective and the groundwater from the bore became clear.

4.3.3 Well Gauging and Sampling

Table 8 summarises the procedures for monitoring well gauging and sampling.

Table 8 Summary of Monitoring Well Gauging and Sampling Procedures

Activity	Procedure Details
Surveying	There are three groundwater monitoring wells surveyed through JSA.
Groundwater Gauging	All groundwater wells were gauged for standing water levels (SWL) from top of casing (TOC) and for the potential presence of Phase Separated Hydrocarbons (PSH) using a Solinst water/oil/air Interface Probe (IP). Despite the odor of hydrocarbons in MW1 and MW3, PSH was not detected in the well.
Groundwater Extraction Method	Groundwater was extracted from the well using a Geoprobe peristaltic pump as the water in the well was shallower than 7m bgs.
Groundwater Purging	To ensure a representative groundwater sample could be collected, the groundwater well was purged dry using the chosen groundwater extraction method for well development. The following physiochemical parameters (PCP's) were monitored whilst purging to ensure that the aquifer and groundwater parameters had stabilised to within 10% variation of the previous reading: • Reduction / Oxidation potential (REDOX); • Temperature; • pH; and • Electrical conductivity (EC).
Decontamination Procedure	Dedicated tubing was used for the monitoring well. All reusable equipment (IP) was decontaminated using Quantum Clean Laboratory Detergent (R213) and deionized water between each monitoring event.
Sample preservation	Following groundwater purging, all groundwater samples were collected in laboratory supplied receptacles, labelled, chilled, and delivered with a COC to National Association of Testing Authorities (NATA) certified laboratories for analysis within the prescribed holding time.
Sample holding times	Sample holding times were within acceptable range (based on NEPM B3-2013) from collection to extraction.

4.3.4 Groundwater Analysis

Primary and QC samples (excluding triplicates) were submitted to Analytical Laboratory Services (ALS) Melbourne for analysis. One Triplicate samples was sent to ALS in Smithfield, New South Wales the other Triplicated was sent to Envirolab in Croydon South, Victoria. Table 9 presents a summary of the sample analysis including the QC sampling based on AS5667.1 and AS5667.11. Chain of Custody (COC) documentation was completed and is provided in Appendix 6 plus the Sample Receipt Notification (SRN) for each batch presented in Appendix 7.

Table 9 Overview of Groundwater Analysis and Quality Control

Analytes	Primary Samples	Duplicates[a]	Triplicate[b]	Rinate Blank[c]	Field Blank[d]
TPH/TRH	4	2	2	1	1
BTEX	4	2	2	1	1
PAH	4	2	2	1	1
15 Metals	4	2	2	1	-

a – One (1) in ten (10) intra laboratory split (duplicate) samples
b - One (1) in ten (10) inter laboratory split (triplicate) sample
c - Single Rinsate Blank sample per piece of equipment per day
d - Single field sample per day recommended but not essential.

5 QUALITY CONTROL

All Field and laboratory Quality Assurance and Quality Control (QA/QC) details, outputs and reports are presented in Appendix 8.

5.1 Field

It is standard to expect up to 10% error in field duplication and up to 10% laboratory error. Therefore, in theory up to 20% error can be assumed on duplicate analysis. Some variation may exist in soil and groundwater because even though all efforts are made to split samples homogeneously, fragments of materials may bias samples in certain elements.

Relative Percentage Differences (RPDs) for the duplicate and triplicate samples where applicable are calculated using the method outlined below.

The acceptance criteria used for the RPDs depend on the levels of contaminants detected and the laboratory's Method Detection Limits. The closer the levels detected are to the MDL the greater the acceptable RPD. RPDs are calculated as follows:

- RPD <50% for low level results (<20 * MDL)
- RPD <30% for medium level results (20-100 * MDL)
- RPD <15% for high level results (>100 * MDL)
- No limit applies at <2 * MDL (Method Detection Limit)

5.1.1 Soil

Field QA/QC procedures and compliance are summarised in Table 10.

Table 10 Soil Field QA/QC procedures and Compliance

QA/QC Requirement	Completed	Comments
Appropriate sampling strategy used and representative samples collected	Yes	Sampling program was undertaken in accordance with AS4482.1-2005
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Decontamination	Yes	Appropriate decontamination such as cleaning tools before sampling and between sample locations was undertaken
Chain-of-custody documentation completed	Yes	COC were completed in accordance with NEPM Schedule B2, Section 5.4.5 and transported under strict COC procedures. The signed COC documents are included in this report, which includes the condition report on arrival of samples to the Laboratory, cross checking of sample identification and paperwork and preservation method.
Required number of duplicate/ triplicate samples collected (1:20)	Almost	8 duplicate and 8 triplicate samples were required from 142 primary samples. 9 Duplicate and 6 Triplicate samples were collected.
QA/QC samples reported method detection limits within indicated guidelines.	No	There were some noncompliance for some metals and PAHs particularly between *BH04 1.5-1.6, Duplicate 1* and *Triplicate 1* samples – this can be attributed to the dense clay medium which meant samples were not homogenous. Non-compliances were attributed to the very low yielding bore and insufficient homogenization of aliquots to obtain low RPD's between splits.
Required numbers of field and rinse blank samples collected	Yes	A total of rinse blanks and 4 fields were collected as per AS4482.1-2005.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

5.1.2 Groundwater

Groundwater field QA/QC procedures and compliance are included in Table 11.

Table 11 Groundwater Field QA/QC procedures and Compliance

QA/QC Requirement	Completed	Comments
Appropriate sampling strategy used and representative samples collected	Yes	Sampling program was undertaken in accordance with AS4482.1-2005
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Chain-of-custody documentation completed	Yes	All samples were transported under strict COC procedures and signed COC documents are included in this report.
Required number of duplicate and triplicates samples collected (1:20)	Yes	2 Primary samples and 2 duplicates and 2 triplicate samples were collected and selected for analysis.
QA/QC samples reported method detection limits within indicated guidelines.	No	In the first sampling round (11/09/2018) there were 27 triplicate noncompliance including 17 PAH's, 1 metal and 9 TRH/TPH. There were fewer (8) duplicate non-compliances including 2 PAH's & 6 TRH/TPH. In the second sampling round (26/11/2018) there were no non-compliances although selection of a non-impacted well for splits meant that reliability could not be ascertained. MW1 well will be selected in preference in future events, and a revisit may be required later in the day to sample to obtain enough volume for sampling with greater reliability between split pairs.
Required numbers of field and rinse blank samples collected	Yes	A field blank and a rinsate was collected as per the recommendations in AS4482.1-2005. All results were below laboratory limit of reporting.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

5.2 Laboratory

5.2.1 Soil

Soil laboratory QA/QC procedures and compliance are summarised in Table 12 and

Table 13.

Table 12 Summary of Soil Laboratory QA/QC Outlines

Date	Report	Method blanks	Laboratory Control	Duplicate	Matrix Spikes	Surrogate recovery	Hold time	Quality control sample frequency
23 Jul 2018	EM1811858	✓	✓	✓	×	✓	✓	✓
	ES1822218	✓	✓	✓	×	✓	✓	✓
	EM1812173	✓	✓	✓	×	✓	✓	✓
24 Jul 2018	EM1811913	✓	✓	×	✓	✓	✓	×
	ES1822455	✓	✓	✓	✓	✓	✓	✓
	EM1812174	✓	✓	×	×	✓	✓	✓
25 Jul 2018	EM1811891	✓	✓	✓	×	✓	✓	×
	EM1812175	✓	✓	×	×	✓	✓	✓
30 Jul 2018	EM1812116	✓	✓	✓	✓	✓	✓	×
17 Oct 2018	EM1816786	✓	✓	✓	×	✓	✓	×
24 Oct 2018	EM1817421	✓	✓	×	×	×	✓	×
	EM1817821	✓	✓	✓	✓	✓	✓	×
29-31 Oct2018	EM1817564	✓	✓	×	×	✓	✓	×
	EM1818156	✓	✓	✓	✓	✓	×	×
5 Nov2018	EM1817824	✓	✓	×	×	✓	✓	×

Date	Report	Method blanks	Laboratory Control	Duplicate	Matrix Spikes	Surrogate recovery	Hold time	Quality control sample frequency
	EM1818266	✓	✓	✓	✓	✓	✓	×
	ES1833261	✓	✓	×	✓	✓	✓	✓

Table 13 Details of Soil Laboratory QA/QC Outlines

QA/QC Requirement	Comments
All analyses NATA accredited	ALS Laboratories is NATA Accredited. Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM. Acceptable laboratory limits of reporting (LORs) adopted.
Method Blanks: zero to <Practical Quantitation Limit (PQL)	No Method Blank outliners exist for any the QCI reports.
Laboratory Control Samples: 70% to 130% recovery for soil.	No Laboratory Control outliners exist in any the QCI reports.
Duplicate Samples:<30% to 50% RPD.	**ES1822218** – Zinc in an anonymous sample – RPD exceeds LOR based limits. **EM1812173** – Lead and Zone in *BH03 3.03.1*– RPD exceeds LOR based limits. **EM1811913** – PAHs including Acenaphthylene, Phenanthrene and Chrysene in *BH08 1.0-1.1* – RPD exceeds LOR based limits. **EM1812174** – Lead and Zinc in two anonymous samples – RPD exceeds LOR based limits. **EM1812175** – Lead and Zinc in two anonymous samples – RPD exceeds LOR based limits. **EM1817421** – many PAH analytes had RPD exceeds LOR based limits in several samples. **EM1817564** – Fluoranthene and pyrene in BH28 1.2-1.3 – RPD exceeds LOR based limits. **EM1817824** – many PAH analytes had RPD exceeds LOR based limits in BH44 2.5-2.6. ES1833261 – Lead and manganese in Triplicate 2 1.5-1.6 – RPD exceeds LOR based limits.
Matrix spikes: 70% to 130% recovery for organics or 80%-120% recovery for inorganics	**EM1811858** – Zinc in *BH01 2.5-2.6* and Pyrene in *BH01 4.4-4.5:* MS recovery not determined, background level greater than or equal to 4x spike level. **EM1812173** – Manganese in *BH04 0.5-0.6* MS recovery not determined, background level greater than or equal to 4x spike level. Zinc *BH04 0.5-0.6* recovery less than lower data quality objective. **EM1812174** – Manganese in *anonymous sample* MS recovery not determined, background level greater than or equal to 4x spike level. Zinc in *anonymous sample* recovery less than lower data quality objective. **EM1811891** – Lead and Zinc recovery greater than upper data quality objective in sample *BH19 1.0-1.1*. Pyrene MS recovery not determined, background level greater than or equal to 4x spike level. **EM1812175** – Manganese in *anonymous sample* MS recovery not determined, background level greater than or equal to 4x spike level. Zinc in *anonymous sample* recovery less than lower data quality objective. **EM1816786** – PAH in GT01 sample, MS recovery not determined, background level greater than or equal to 4x spike level. **EM1817421** – Manganese in *BH22 3.4-3.5 sample* MS recovery not determined, background level greater than or equal to 4x spike level. **EM1817564** - Barium and Manganese in BH26 0.5-0.6 and Manganese in BH35 1.5-1.6; MS recovery not determined, background level greater than or equal to 4x spike level; Copper in BH35 1.5-1.6 Recovery was greater than upper data quality objective. **EM1817824** – Manganese in anonymous sample and BH44 1.5-1.6 plus pyrene in BH42 0.5-0.6 MS recovery not determined, background level greater than or equal to 4x spike level.
Surrogates: 70% to 130% recovery	**EM1817421** – PAH – 4-Terphenyl-d14 in BH22 1.5-1.6 recovery greater than upper data quality objective.
Analysis holding time outliers	**EM1818156** – Non-volatile Leach 14 day turn around, 1 day over BH27 1.0-1.1 and BH28 1.2-1.3
Quality Control Sample Frequency Outliers	**EM1811858** – In soil Total Mercury by FIMS and Total Metals ICP-AES - did not meet NEPM 2013 B3 or ALS QC Standard. Water sample – laboratory duplicates and matrix spikes for laboratory control samples foe PAH/Phenols, TRH did not meet NEPM 2013 B3 or ALS QC Standard. **EM1811913** – Rinsate water sample – laboratory duplicates for laboratory control samples for PAH/Phenols, TRH or matrix spikes of PAH/Phenols did not meet NEPM 2013 B3 or ALS QC Standard. **EM1811891, EM1812116, EM1817421** – Rinsate water sample – laboratory duplicates and matrix spikes for laboratory control samples for PAH/Phenols, TRH did not meet NEPM 2013 B3 or ALS QC Standard.

	EM1816786, EM1817821, EM1818156, EM1818266 – Rinsate water sample – laboratory duplicates and matrix spikes for laboratory control samples for PAH/Phenols, did not meet NEPM 2013 B3 or ALS QC Standard. **EM1817564, EM1817824**– Rinsate water sample – laboratory duplicates and matrix spikes for laboratory control samples for PAH/Phenols, TRH semi-volatile fraction did not meet NEPM 2013 B3 or ALS QC Standard.

5.2.2 Groundwater

Groundwater laboratory QA/QC procedures and compliance are summarised in Table 14.

Table 14 Groundwater Laboratory QA/QC Procedures and Compliance

QA/QC Requirement	Compliance	Comments
All analyses NATA accredited	Yes	ALS Laboratories is NATA Accredited. Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM. Acceptable laboratory limits of reporting (LORs) adopted.
Method Blanks: zero to <Practical Quantitation Limit (PQL)	Yes	There were no method blank value outliners for report EM1814666 or ES1827248.
Duplicate Samples:<30% to 50% RPD.	Yes	There were no Duplicate outliners for report EM1814666 or ES1827248.
Control Samples: 70% to 130% recovery for soil; or 80% to 120% recovery for waters;	Yes	There were no Laboratory Control outliners for report EM1814666 or ES1827248.
Matrix spikes: 70% to 130% recovery for organics or 80%-120% recovery for inorganics	No	EM1814666 - Matrix spikes for Manganese and Zinc in an anonymous sample – MS recovery not determined, background level greater than or equal to 4x spike level. There were no Matrix Spike outliners for report ES1827248.
Surrogates: 70% to 130% recovery	Yes	There were no surrogate recovery outliners for report EM1814666 or ES1827248.
Analysis holding time outliers	Yes	No hold-time outliners exist for report EM1814666 or ES1827248.
Quality Control Sample Frequency Outliers	No	In EM1814666, ES1827248 and EM1819122– laboratory duplicates and matrix spikes for PAH/Phenols and TRH did not meet NEPM 2013 B3 or ALS QC Standard.

6 FIELD INVESTIGATION FINDINGS

6.1 Soil Bores

Pictorials of each borehole location and borehole log is presented in Appendix 9 and borehole logs are presented in Appendix 10.

6.1.1 Geological Interpretation

The geology underlying the site is Triassic sediments and sandstone over laid by several meters (0.5-8.1m) of FILL. The surface covering at the site varies from concrete, asphalt to bare soil. Fill varies in composition from Sandy CLAY with traces of gravel angular to rounded siltstone with brick and charcoal fragments to Gravely Sandy CLAY with dolerite fragments. Natural soil was mostly sandy CLAY with some mottling. The natural bedrock ranged from Mudstone interbedded with Siltstone to Sandstone interbedded with Mudstone. For specific details for each borehole see Appendix 10.

6.1.2 Soil Contamination Observations

Soil samples from BH01 to BH20 were selected for hydrocarbon analyses based on PID analysis information presented in the bore logs and in Table 15. All soil samples had PID values (measured in ppm) below 7.0 which indicates that there is a low levels of volatile hydrocarbon contamination at the site, such as the presence of residual petroleum. Post the first round of sampling and analysis; it was determined that contamination was present. Therefore all proceeding samples collected we tested for hydrocarbons.

Table 15 Summary of PID Screening Results

Soil Bore	Highest PID Value (ppm)	Depth from (m)	Depth to (m)
BH01	0.5	1.5	1.6
BH02	0.1	0.5	0.6
BH03	0.3	3.0	3.1
BH04	0.0	All	-
BH05	0.2	4.5	4.6
BH06	0.2	0.25	0.3
BH07	6.9	0.0	0.1
BH08	0.0	All	-
BH09	5.8	1.0	1.1
BH10	0.9	5.0	5.1
BH11	1.3	2.5	2.6
BH12	3.3	0.5	0.6
BH13	0.9	0.5	0.6
BH14	3.3	0.4	0.5
BH15	1.8	0.2	0.3
BH16	1.2	0.3	0.4
BH17	1.0	1.1	1.2
BH18	1.2	2.7	2.8
BH19	1.1	2.1	2.2
BH20	0.9	0.5	0.6

6.1.3 Grain Class Interpretation

Grain size classifications are applied to all soils at the site to determine threshold screening level concentrations for hydrocarbons (and chromium) to assess soil ecological and human health risks.

Grain class threshold values are determined based on either the:

- sample grain size (in the case of ecological screening levels or chromium limits); or
- average grain class overlying the sample point (when assessing petroleum vapour screening levels).

When assessing petroleum vapour intrusion screening levels, where soil is proposed to be excavated from the site, the excavated material is excluded from the grain class averaging. The corresponding depth class from which the sample is collected is also shallowed based on the renewed basement depth.

Table 16 to Table 18 provides a summary of the grain class averages for material overlying the sample. As idendicated, most material will be excavated.

Table 16 Summary of Grain Class Based on USCS Classification – BH01 – BH20

Sample	Footing Excavation Depth^ - Red Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	Soil Grain Size Class Averaging Above Soil Sample																		Attenuation			Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Existing Pavement (P)	Crawl Space Thickness (m)	Proposed CONCRETE (CH)	Crawl Space	Biodegradation		
BH01 1.0-1.1	2.0	2.0															1.9			NA	0.1	1.0	1.0	CLAY	CI
BH01 2.5-2.6	2.0	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH01 4.4-4.5	2.0	3.4													0.7		2.6			NA	0.1	1.0	1.0	CLAY	CI
BH02 1.0-1.1	2.4	2.7															2.6			NA	0.1	1.0	1.0	CLAY	CI
BH02 2.8-2.9	2.4	1.4															1.3			NA	0.1	1.0	1.0	CLAY	CI
BH02 4.0-4.1	2.4	2.6															2.5			NA	0.1	1.0	1.0	CLAY	CI
BH03 0.5-0.6	2.3	<																		NA	0.1	1.0	1.0	CLAY	CL
BH03 2.5-2.6	2.3	1.2	0.9									0.2								NA	0.1	1.0	1.0	SAND	CL
BH03 3.9-4.0	2.3	2.6	0.9									1.6								NA	0.1	1.0	1.0	CLAY	CL
BH04 1.5-1.6	2.4	0.9	0.8																	NA	0.1	1.0	1.0	SAND	GW
BH04 3.0-3.1	2.4	1.6	0.8														0.7			NA	0.1	1.0	1.0	CLAY	CI
BH04 4.5-4.6	2.4	3.1	0.8														2.2			NA	0.1	1.0	1.0	CLAY	CI
BH05 1.0-1.1	2.8	<																		NA	0.1	1.0	1.0	CLAY	CI
BH05 3.0-3.1	2.8	1.2															1.1			NA	0.1	1.0	1.0	CLAY	CI
BH05 4.5-4.6	2.8	2.7															2.6			NA	0.1	1.0	1.0	CLAY	GP
BH06 0.2-0.3	2.5	<																		NA	0.1	1.0	1.0	CLAY	CI
BH07 1.0-1.1	2.7	<																		NA	0.1	1.0	1.0	CLAY	CI
BH07 2.2-2.3	2.7	0.5	0.4																	NA	0.1	1.0	1.0	SAND	GW
BH01 1.5-1.6	2.0	0.5															0.4			NA	0.1	1.0	1.0	CLAY	CI
BH01 3.5-3.6	2.0	2.5													0.5		1.9			NA	0.1	1.0	1.0	CLAY	CH
BH02 0.5-0.6	2.4	2.7															2.6			NA	0.1	1.0	1.0	CLAY	CI
BH02 2.0-2.1	2.4	0.6															0.5			NA	0.1	1.0	1.0	CLAY	CI
BH03 1.0-1.1	2.3	1.0	0.9																	NA	0.1	1.0	1.0	SAND	GW
BH03 3.0-3.1	2.3	1.7	0.9									0.7								NA	0.1	1.0	1.0	SAND	CL
BH04 0.5-0.6	2.4	<																		NA	0.1	1.0	1.0	CLAY	CI
BH04 2.5-2.6	2.4	1.1	0.8														0.2			NA	0.1	1.0	1.0	SAND	CI
BH04 3.5-3.6	2.4	2.1	0.8														1.2			NA	0.1	1.0	1.0	CLAY	CI
BH05 2.0-2.1	2.8	0.2															0.1			NA	0.1	1.0	1.0	CLAY	CI
BH05 4.0-4.1	2.8	2.2															2.1			NA	0.1	1.0	1.0	CLAY	CI
BH08_1.0-1.1	3.0	2.6															2.5			NA	0.1	1.0	1.0	CLAY	CI
BH08_2.0-2.1	3.0	2.6															2.5			NA	0.1	1.0	1.0	CLAY	CI
BH08_2.5-2.6	3.0	0.5															0.4			NA	0.1	1.0	1.0	CLAY	CI
BH08_4.5-4.6	3.0	2.5															2.4			NA	0.1	1.0	1.0	CLAY	CI
BH09_1.0-1.1	4.0	1.6															1.5			NA	0.1	1.0	1.0	CLAY	CI
BH09_2.5-2.6	4.0	1.6															1.5			NA	0.1	1.0	1.0	CLAY	CI
BH09_4.5-4.6	4.0	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH09_6.0-6.1	4.0	3.0															2.9			NA	0.1	1.0	1.0	CLAY	CI
BH10_1.0-1.1	4.7	<																		NA	0.1	1.0	1.0	CLAY	CI
BH10_3.0-3.1	4.7	<																		NA	0.1	1.0	1.0	CLAY	CI
BH10_5.0-5.1	4.7	1.3									0.8						0.4			NA	0.1	1.0	1.0	SILT	ML
BH11_1.0-1.1	5.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH11_2.0-2.1	5.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH11_2.5-2.6	5.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH11_3.3-3.4	5.0	<																		NA	0.1	1.0	1.0	CLAY	R
BH12_1.0-1.1	4.8	<																		NA	0.1	1.0	1.0	CLAY	CI
BH12_2.0-2.1	4.8	<																		NA	0.1	1.0	1.0	CLAY	CI
BH12_2.5-2.6	4.8	<																		NA	0.1	1.0	1.0	CLAY	CI
BH12_3.5-3.6	4.8	0.6															0.5			NA	0.1	1.0	1.0	CLAY	CI
BH13 1.0-1.1	5.6	<																		NA	0.1	1.0	1.0	CLAY	CH
BH13 1.5-1.6	5.6	<																		NA	0.1	1.0	1.0	CLAY	CH
BH13 2.0-2.1	5.6	<																		NA	0.1	1.0	1.0	CLAY	CH
BH14 0.4-0.5	3.0	<																		NA	0.1	1.0	1.0	CLAY	R
BH15 0.55-0.65	2.9	<																		NA	0.1	1.0	1.0	CLAY	R
BH16 0.3-0.4	2.9	<																		NA	0.1	1.0	1.0	CLAY	GC
BH17 0.5-0.6	2.8	<																		NA	0.1	1.0	1.0	CLAY	CH
BH17 1.1-1.2	2.8	<																		NA	0.1	1.0	1.0	CLAY	R
BH18 0.5-0.6	2.9	<																		NA	0.1	1.0	1.0	CLAY	CI
BH18 1.5-1.6	2.9	1.7															1.6			NA	0.1	1.0	1.0	CLAY	CI
BH18 2.5-2.6	2.9	0.6															0.5			NA	0.1	1.0	1.0	CLAY	CI
BH18 2.7-2.8	2.9	0.8															0.7			NA	0.1	1.0	1.0	CLAY	CI
BH18 3.1-3.2	2.9	1.2															1.1			NA	0.1	1.0	1.0	CLAY	CI
BH18 3.5-3.6	2.9	1.6															1.5			NA	0.1	1.0	1.0	CLAY	CI
BH19 1.0-1.1	2.9	0.2															0.1			NA	0.1	1.0	1.0	CLAY	CI
BH19 2.1-2.2	2.9	0.2															0.1			NA	0.1	1.0	1.0	CLAY	R
BH20 0.5-0.6	2.9	<																		NA	0.1	1.0	1.0	CLAY	CH
BH20 1.0-1.1	2.9	<																		NA	0.1	1.0	1.0	CLAY	CH

Footnote:
* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)
< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in the PVI risk assessment
^ In this case, a 1 m excavation depth below FFL is inferred. Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design.

Table 17 Summary of Grain Class Based on USCS Classification – BH21 – BH40

Sample	Footing Excavation Depth^ - Red Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	Soil Grain Size Class Averaging Above Soil Sample																		Attenuation			Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Existing Pavement (P)	Crawl Space Thickness (m)	Proposed CONCRETE (CH)	Crawl Space	Biodegradation		
BH21 0.5-0.6	2.0	<																		NA	0.1	1.0	1.0	CLAY	CL
BH21 1.5-1.6	2.0	0.5															0.4			NA	0.1	1.0	1.0	CLAY	CI
BH21 2.5-2.6	2.0	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH21 3.5-3.6	2.0	2.5															2.4			NA	0.1	1.0	1.0	CLAY	CI
BH21 4.5-4.6	2.0	3.5															3.4			NA	0.1	1.0	1.0	CLAY	CI
BH21 5.5-5.6	2.0	4.5															4.4			NA	0.1	1.0	1.0	CLAY	CI
BH22 0.5-0.6	2.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH22 1.5-1.6	2.1	0.4				0.1									0.2					NA	0.1	1.0	1.0	CLAY	CH
BH22 2.5-2.6	2.1	1.4				0.7									0.6					NA	0.1	1.0	1.0	CLAY	GC
BH22 3.4-3.5	2.1	2.3				1.6									0.6					NA	0.1	1.0	1.0	SAND	GC
BH23 0.5-0.6	2.6	<																		NA	0.1	1.0	1.0	CLAY	GC
BH23 1.5-1.6	2.6	<																		NA	0.1	1.0	1.0	CLAY	CI
BH23 2.5-2.6	2.6	0.9				0.7											0.1			NA	0.1	1.0	1.0	SAND	CI
BH23 3.5-3.6	2.6	1.9				0.7											1.1			NA	0.1	1.0	1.0	CLAY	CI
BH23 4.5-4.6	2.6	2.9				0.7											2.1			NA	0.1	1.0	1.0	CLAY	CI
BH23 5.5-5.6	2.6	3.9				0.7											3.1			NA	0.1	1.0	1.0	CLAY	CI
BH24 0.5-0.6	2.5	<																		NA	0.1	1.0	1.0	CLAY	GC
BH24 1.5-1.6	2.5	0.2															0.1			NA	0.1	1.0	1.0	CLAY	CI
BH24 2.5-2.6	2.5	1.0															0.9			NA	0.1	1.0	1.0	CLAY	CI
BH24 3.3-3.4	2.5	1.8															1.7			NA	0.1	1.0	1.0	CLAY	CI
BH25 0.5-0.6	2.8	<																		NA	0.1	1.0	1.0	CLAY	GC
BH25 1.5-1.6	2.8	2.3															2.2			NA	0.1	1.0	1.0	CLAY	CI
BH25 2.5-2.6	2.8	0.7															0.6			NA	0.1	1.0	1.0	CLAY	CI
BH25 3.5-3.6	2.8	1.7															1.6			NA	0.1	1.0	1.0	CLAY	CI
BH25 4.5-4.6	2.8	2.7															2.6			NA	0.1	1.0	1.0	CLAY	CI
BH25 5.5-5.6	2.8	3.7															3.6			NA	0.1	1.0	1.0	CLAY	CI
BH26 0.1-0.2	2.8	<																		NA	0.1	1.0	1.0	CLAY	GC
BH26 0.5-0.6	2.8	<																		NA	0.1	1.0	1.0	CLAY	CH
BH27 0.1-0.2	2.9	<																		NA	0.1	1.0	1.0	CLAY	P
BH27 0.5-0.6	2.9	<																		NA	0.1	1.0	1.0	CLAY	P
BH27 1.0-1.1	2.9	<																		NA	0.1	1.0	1.0	CLAY	GW
BH27 1.5-1.6	2.9	<																		NA	0.1	1.0	1.0	CLAY	CI
BH27 1.9-2.0	2.9	<																		NA	0.1	1.0	1.0	CLAY	R
BH28 0.1-0.2	3.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH28 0.5-0.6	3.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH28 1.0-1.1	3.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH28 1.2-1.3	3.2	<																		NA	0.1	1.0	1.0	CLAY	ML
BH29 0.5-0.6	4.9	<																		NA	0.1	1.0	1.0	CLAY	CI
BH29 1.5-1.6	4.9	<																		NA	0.1	1.0	1.0	CLAY	CI
BH29 2.1-2.2	4.9	<																		NA	0.1	1.0	1.0	CLAY	R
BH30 0.3-0.4	3.6	1.4																1.3		NA	0.1	1.0	1.0	CLAY	R
BH31 0.5-0.6	5.7	<																		NA	0.1	1.0	1.0	CLAY	CI
BH31 1.5-1.6	5.7	<																		NA	0.1	1.0	1.0	CLAY	R
BH32 0.5-0.6	6.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH33 0.5-0.6	4.5	<																		NA	0.1	1.0	1.0	CLAY	CH
BH34 0.5-0.6	4.6	<																		NA	0.1	1.0	1.0	CLAY	CI
BH35 0.5-0.6	2.6	0.4															0.3			NA	0.1	1.0	1.0	CLAY	CI
BH35 1.5-1.6	2.6	0.4															0.3			NA	0.1	1.0	1.0	CLAY	CI
BH36 0.5-0.6	2.9	<																		NA	0.1	1.0	1.0	CLAY	CI
BH37 0.5-0.6	3.0	0.8															0.7			NA	0.1	1.0	1.0	CLAY	CI
BH37 1.5-1.6	3.0	0.8															0.7			NA	0.1	1.0	1.0	CLAY	CI
BH37 2.5-2.6	3.0	0.5															0.4			NA	0.1	1.0	1.0	CLAY	CI
BH37 3.5-3.6	3.0	1.5										0.7					0.7			NA	0.1	1.0	1.0	CLAY	CL
BH38 0.5-0.6	3.0	0.4															0.3			NA	0.1	1.0	1.0	CLAY	CI
BH38 1.5-1.6	3.0	0.4															0.3			NA	0.1	1.0	1.0	CLAY	CI
BH38 2.5-2.6	3.0	0.5									0.1						0.3			NA	0.1	1.0	1.0	CLAY	CH
BH39 0.5-0.6	3.6	<																		NA	0.1	1.0	1.0	CLAY	CI
BH39 1.5-1.6	3.6	0.5				0.4														NA	0.1	1.0	1.0	SAND	GC
BH39 2.5-2.6	3.6	0.5				0.4														NA	0.1	1.0	1.0	SAND	GC
BH40 0.5-0.6	4.2	0.8				0.7														NA	0.1	1.0	1.0	SAND	GC
BH40 1.5-1.6	4.2	0.8				0.7														NA	0.1	1.0	1.0	SAND	GC
BH40 2.5-2.6	4.2	0.8				0.7														NA	0.1	1.0	1.0	SAND	GC
BH40 3.5-3.6	4.2	0.3				0.2														NA	0.1	1.0	1.0	SAND	GC

Footnote:
* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)
< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in the PVI risk assessment
^ In this case, a 1 m excavation depth below FFL is inferred. Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design.

Table 18 Summary of Grain Class Based on USCS Classification – BH41-BH53

Sample	Footing Excavation Depth^ - Red Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	Soil Grain Size Class Averaging Above Soil Sample																	Crawl Space Thickness (m)	Attenuation			Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Existing Pavement (P)		Proposed CONCRETE (CH)	Crawl Space	Biodegradation		
BH41 0.5-0.6	3.0	<																		NA	0.1	1.0	1.0	CLAY	GC
BH42 0.5-0.6	5.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH42 1.5-1.6	5.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH42 2.5-2.6	5.2	<																		NA	0.1	1.0	1.0	CLAY	CI
BH43 0.5-0.6	3.6	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH43 1.5-1.6	3.6	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH43 2.5-2.6	3.6	1.5															1.4			NA	0.1	1.0	1.0	CLAY	CI
BH43 3.5-3.6	3.6	0.9															0.8			NA	0.1	1.0	1.0	CLAY	CI
BH44 0.5-0.6	4.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH44 1.5-1.6	4.1	0.8				0.7														NA	0.1	1.0	1.0	SAND	GC
BH44 2.5-2.6	4.1	0.8				0.7														NA	0.1	1.0	1.0	SAND	GC
BH44 3.5-3.6	4.1	0.4				0.3														NA	0.1	1.0	1.0	SAND	GC
BH45 0.5-0.6	3.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH46 0.5-0.6	3.0	<																		NA	0.1	1.0	1.0	CLAY	CI
BH47 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH47 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH48 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH48 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH49 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH49 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH50 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH50 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH51 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH51 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH52 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH52 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH53 0.5-0.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI
BH53 1.5-1.6	3.1	<																		NA	0.1	1.0	1.0	CLAY	CI

Footnote:
* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)
< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in the PVI risk assessment
^ In this case, a 1 m excavation depth below FFL is inferred. Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design.

6.2 Groundwater

6.2.1 Aquifer Interpretation

Based on the three Geotec boreholes drilled at the site, see GES 2018; the site is underlaid by mudstone and sandstone bedrock.

6.2.2 Well Construction

Table 19 presents a summary of the groundwater monitoring wells construction details. The dominant aquifer encountered at the site consists of imported fill overlying sandstone/mudstone units.

Table 19 Summary of Well Construction, Aquifer Details and PHC Impacted Soil Depths

Well	Borehole Number	Date Installed	DWS (m)	Top of Screen (m)	Bottom of Screen (m)	Depth of highest PID reading	Aquifer Lithology at DWS
MW1	GT05 (Geotech hole)	26/07/2018	3.33	2.0	11.5	4.5-4.6: 0.5ppm	0.0-7.7 Fill 7.7-11.5 Mudstone interbedded with Siltstone
MW2	-	14-15 Nov 18	2.8	1.5	3.2	-	0.0-2.8 Fill 2.8-3.2 Mudstone interbedded with Siltstone
MW3	-	14-15 Nov 18	0.5	3.0	15.0	-	0.0-0.2 Fill 0.2-15 Mudstone interbedded with Siltstone

6.2.3 Groundwater Gauging

Field results from the groundwater gauging are presented in Appendix 11. Groundwater depths for the gauging event are presented in Table 20. PSH was not detected (gauged) any of the wells. The surface of the site is proposed to be excavated to 55.8 m AHD which is at the level of the aquifer in MW1 above groundwater in MW2 at 55.2 m AHD and below the groundwater in MW3 at 58.6 m AHD. Groundwater is pressured within the rock at depth and may not expel. On the other hand, there is a possibility that there is a perched aquifer within the fill material which may expel water (most likely from the base of the fill).

Table 20 Summary of Groundwater Gauging Results – 26 November 2018

Monitoring Well	MW1	MW2	MW3
Well Depth (m)	11.5		15.0
Top of Casing (TOC) Height (m AHD)	59.0m AHD	57.6m AHD	58.6m AHD
Groundwater Depth from TOC (m)	3.22	2.39	0
Groundwater Elevation (m AHD)	55.8	55.2	58.6
PSH Thickness (mm)	0	0	0

6.2.4 Hydraulic Gradient and Flow Direction

Field results from the groundwater gauging are presented in Appendix 11. Groundwater depths and groundwater contours for the gauging event are presented in Figure 11.

The groundwater flow direction is inferred to be to the north and the hydraulic gradient is determined to be approximately 6.6% as per Table 21.

Table 21 Summary of Inferred Site Groundwater Flow Directions and Rates

Groundwater flow direction from the site	
Hydraulic Gradient Calculations	
Upgradient Groundwater Elevation	58.5 m AHD contour
Downgradient Groundwater Elevation	55.5 m AHD contour
Distance Between Upgradient and Downgradient Points	45 m
Hydraulic Gradient	6.6 %

Figure 11 Groundwater Flow Direction

6.2.5 Hydraulic Conductivity

Hydraulic conductivity estimates from desktop calculations are presented in Table 20. It is anticipated that the hydraulic conductivity of the individual units; sandstone, mudstone and siltstone a will vary across the site (Freeze & Cherry 1979).

Table 22 Summary of Hydraulic Conductivity Estimates

Lithology	Estimated K
Sandstone	3.65 to 36.5
Siltstone	0.036
Mudstone	0.0036

6.2.6 Groundwater Flow Rates

As with the hydraulic conductivity, the groundwater flow rates are expected to vary between the units ranging from 1-10m in the sandstone and less than a metre in the siltstone and mudstone. A detailed transmissivity analysis has not been conducted but Table 23 will provide approximate flow rates.

Table 23 Summary of Inferred Groundwater Flow Rates at the Site

Aquifer	Hydraulic Conductivity (m/year)	Hydraulic Gradient	Effective Porosity	Flow rate (m/year)
	K	**i_h**	**δ**	**(K x i_h) / δ**
Sandstone	3.65 to 36.5	0.066	0.25	1.0-10
Siltstone	0.036	0.066	0.25	0.01
Mudstone	0.0036	0.066	0.25	0.001

6.2.7 Groundwater Physiochemistry

Two purge volumes were obtained from MW1 and MW2 before the wells were purged dry. Three purge volumes were obtained from MW3. Groundwater physiochemical parameters were collected whilst purging and a representative value for the aquifer is presented in Table 24.

Table 24 Summary of Stabilised Groundwater Properties (26 November 2018 Event)

Parameter	MW1	MW2	MW3	Comment
Temp (°C)	15.8	14.4	15.1	Typical temperature for groundwater within southern Tasmania at this particular time of year.
pH	7.9	8.0	7.2	Indicates alkaline pH conditions of the groundwater.
Redox (mV)	60	60	70	Indicates oxidising REDOX conditions indicating a favourable environment for hydrocarbon breakdown. It also shows that there is only a minimal amount of contamination present.
EC (µs/cm)	2450	1870	2720	Indicates freshwater conditions, too saline and not suitable for drinking.

6.2.8 PSH & Groundwater Contamination Observations

The following groundwater observations were made during the groundwater sampling events:

- The groundwater had a slight hydrocarbon odour in MW1 and MW3.
- The groundwater was turbid in water from all wells especially MW1.
- The groundwater was brown/ grey from MW1; yellowish brown from MW2 and yellow grey from MW3.
- Phase separated hydrocarbons (PSH) was not observed in any of the groundwater wells during the GME.
- MW1 was purged dry at 11 litres, MW2 was purged dry at 3L and MW3 had 4.8 L of water removed.

7 SOIL ECOLOGICAL IMPACT ASSESSMENT

7.1 Protected Environmental Values

The requirement for protecting soil from contaminated activities in Tasmania is managed under the Environmental Management and Pollution Control Act 1994 (EMPCA) which states in Part 5A:

(2) An area of land is a contaminated site if –

(a) there is in, on or under that area of land a pollutant in a concentration that –

(i) is above the background concentration; and

(ii) is causing or is likely to be causing serious or material environmental harm or environmental nuisance, or is likely to cause serious or material environmental harm or environmental nuisance in the future if not appropriately managed;

Potential soil impact at the site is assessed through application of the following environmental investigation guidelines.

7.2 NEPM ASC (2013) Guidelines

The following ecological investigation guidelines are to be addressed to assess acceptable levels of risk to terrestrial ecosystems:

- NEPM ASC (2013) Ecological Investigation Levels (EIL's) – have been developed for selected metal and organic substances. EIL's depend on specific soil and physicochemical properties and land use scenarios and generally apply to the top two (2) metres of the soil profile (NEPM 2013);
- NEPM ASC (2013) Ecological Screening Levels (ESL's) – have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions. ESL's broadly apply to coarse and fine grained soils and various land use scenarios within the top two (2) metres of the soil profile (NEPM ASC 2013).

Soil analytical results are compared against Ecological Screening Levels (ESL's) and Ecological Investigation Levels (EIL's) limits presented in Table 25.

Table 25 Summary of Soil Investigation Limits Considered at the Site based in NEPM ASC (2013)

Investigation Levels (IL)	Analytes Investigated						
	Hydrocarbons				Metals		DDT
	BTEX	TRH (F1 to F4)	Benzo(a) pyrene (PAH)	Naphthalene (PAH)	Zn, Cu, Cr(III), Ni & As	Lead	
ESL's	Analysed	Analysed	Analysed				
EIL's				Analysed	Analysed	Analysed	Not Analysed

7.3 Guidelines

7.3.1 Ecological Screening Levels

The following compounds were compared against NEPM (2013) Ecological Screening Levels (ESL's):

- BTEX;
- F1 to F4 TRH; and
- Benzo(a)pyrene

Selection of ESL threshold investigation limits are set out in the NEPM (2013) guidelines and require classification of the soil according to:

- Land use sensitivity:
    - Areas of ecological significance
    - Urban residential and public open space; and
    - Commercial and industrial.
- Dominant particle size passing through a 2 mm sieve into:
    - Coarse – sand sizes and greater; and
    - Fine – clay and silt sizes.

Adopted NEPM (2013) soil and land use classifications are presented in the results tables.

7.3.2 Ecological Investigation Levels

The following compounds were compared against Environmental Investigation Levels:

- Lead;
- Nickel;
- Chromium;
- Zinc;
- Copper;
- Arsenic; and
- Naphthalene.

There was a requirement to classify the soil according to physicochemical properties given that the above listed compounds. Adopted physicochemical parameters are presented in the results tables.

Selection of EIL threshold investigation limits are set out in the NEPM ASC (2013) guidelines and require classification of the soil per specific soil and physicochemical properties which are presented in the results tables. The adopted land use scenario applied was commercial and industrial guidelines because it was the best fit for current and future land use. Groundwater pH at the site is between 7 and 8 therefore the inferred pH value applied for the site is 7.5.

7.4 Findings

7.4.1 Ecological Screening Levels

Laboratory analytical results for soil are presented in Appendix 12. Table 26 to

Table 28 summaries all soil analytical results relevant to ESLs guideline limits. Concentrations which exceed laboratory limits of reporting (LOR) would be highlighted in bold, and ESL exceedances would be highlighted with a colored cell and samples within the proposed excavation zone are marked with an X.

There were the following exceedances above the ESL guideline limits:

- A total of 98 samples had ESL exceedances for Benzo(a)pyrene; 4 additional samples had laboratory detections but were below guideline limits.
- There were no detections for TRH Fraction F1.
- A total of three samples had ESL exceedances for TRH Fraction F2; 8 additional samples had laboratory detections but were below guideline limits.
- A total of 66 samples had ESL exceedances for TRH Fraction F3; 9 additional samples had laboratory detections but were below guideline limits.
- A total of 35 samples had detections of TRH Fraction F4 above laboratory LOR and there were no guideline exceedances for F4.
- A total of 61 samples from 142 samples were clean and had no detections.

7.4.2 Ecological Investigation Levels

Laboratory analytical results are presented in Appendix 12. Table 29 to Table 31 compares all soil analytical results against relevant ecological investigation limits (EIL's) for commercial land use. Concentrations which exceeded laboratory LOR are detailed in the table, EIL exceedances are highlighted with a colored cell and samples within the proposed excavation zone are marked with an X.

Given the inferred pH value applied for the soil at the site is 7.5, there was one exceedance above the EIL guideline limits for copper in BH23 3.5-3.6.

Table 26 Summary of Soil Analytical Results Compared with Ecological Screening Level's – BH01-BH20

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample Within Inferred Excavation Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - C16)	F3 (>C16 - C34)	F4 (>C34 - C40)
Sample ID	Sample Date	Soil Texture Class (fine /coarse)	Land Use	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH01 1.0-1.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.6	<10	<50	<100	<100
BH01 2.5-2.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	5.1**	<10	<50	370	<100
BH01 4.4-4.5	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	17.4***	<10	<50	1030	200
BH02 1.0-1.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.6	<10	<50	<100	<100
BH02 2.8-2.9	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH02 4.0-4.1	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 0.5-0.6 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.4	<10	<50	<100	<100
BH03 2.5-2.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	7.8**	<10	<50	480	<100
BH03 3.9-4.0	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	8.9**	<10	<50	700	100
BH04 1.5-1.6 X	23/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	25.6***	<10	<50	1190	300
BH04 3.0-3.1	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.7*	<10	<50	<100	<100
BH04 4.5-4.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.5*	<10	<50	<100	<100
BH05 1.0-1.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH05 3.0-3.1	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.9*	<10	<50	120	<100
BH05 4.5-4.6	23/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	3.9**	<10	<50	170	<100
BH06 0.2-0.3 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.7*	<10	<50	120	<100
BH07 1.0-1.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH07 2.2-2.3 X	23/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH01 1.5-1.6 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH01 3.5-3.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	12.7**	<10	<50	740	<100
BH02 0.5-0.6 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.8*	<10	<50	120	<100
BH02 2.0-2.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 1.0-1.1 X	23/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	0.9	<10	<50	<100	<100
BH03 3.0-3.1	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	17.5***	<10	<50	1110	150
BH04 0.5-0.6 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.7**	<10	<50	280	<100
BH04 2.5-2.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 3.5-3.6	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1	<10	<50	<100	<100
BH05 2.0-2.1 X	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.3**	<10	<50	240	<100
BH05 4.0-4.1	23/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.9**	<10	<50	440	100
BH08_1.0-1.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	25.5***	<10	<50	1840	300
BH08_2.0-2.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.5*	<10	<50	<100	<100
BH08_2.5-2.6 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH08_4.5-4.6	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH09_1.0-1.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	16.6***	<10	<50	1420	280
BH09_2.5-2.6 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1	<10	<50	<100	<100
BH09_4.5-4.6	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	22.8***	<10	<50	1300	190
BH09_6.0-6.1	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.7	<10	<50	<100	<100
BH10_1.0-1.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH10_3.0-3.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1	<10	<50	<100	<100
BH10_5.0-5.1	24/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH11_1.0-1.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4**	<10	<50	480	150
BH11_2.0-2.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	5.5**	<10	<50	480	<100
BH11_2.5-2.6 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.9*	<10	<50	120	<100
BH11_3.3-3.4 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH12_1.0-1.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.2	<10	<50	<100	<100
BH12_2.0-2.1 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH12_2.5-2.6 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH12_3.5-3.6 X	24/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH13 1.0-1.1 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	29.8***	<10	220	2760	410
BH13 1.5-1.6 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.8	<10	<50	<100	<100
BH13 2.0-2.1 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.8	<10	<50	<100	<100
BH14 0.4-0.5 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	140	2710	760
BH15 0.55-0.65 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH16 0.3-0.4 X	25/7/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH17 0.5-0.6 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	89.1****	<10	160	4160	1070
BH17 1.1-1.2 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH18 0.5-0.6 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.5	<10	<50	<100	<100
BH18 1.5-1.6 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	3.4*	<10	<50	400	120
BH18 2.5-2.6 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH18 2.7-2.8 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.6*	<10	<50	180	<100
BH18 3.1-3.2	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.3	<10	<50	120	<100
BH18 3.5-3.6	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH19 1.0-1.1 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH19 2.1-2.2 X	25/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH20 0.5-0.6 X	30/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.1	<10	<50	120	<100
BH20 1.0-1.1 X	30/7/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100

Table 27 Summary of Soil Analytical Results Compared with Ecological Screening Level's – BH21-BH40

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample Within Inferred Excavation Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - C16)	F3 (>C16 - C34)	F4 (>C34 - C40)
Sample ID	Sample Date	Soil Texture Class (fine /coarse)	Land Use	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH21 0.5-0.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	14.3***	<10	<50	760	230
BH21 1.5-1.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.8	<10	<50	230	130
BH21 2.5-2.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.9*	<10	<50	<100	<100
BH21 3.5-3.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.6	<10	<50	<100	<100
BH21 4.5-4.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	6.1**	<10	<50	170	<100
BH21 5.5-5.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.6**	<10	<50	160	<100
BH22 0.5-0.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.1**	<10	<50	180	<100
BH22 1.5-1.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH22 2.5-2.6	24/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH22 3.4-3.5	24/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH23 0.5-0.6 X	24/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	6.7**	<10	<50	540	180
BH23 1.5-1.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	3.8**	<10	<50	150	<100
BH23 2.5-2.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	166****	<10	190	5070*	760
BH23 3.5-3.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	2.5*	<10	<50	470	<100
BH23 4.5-4.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	2.2*	<10	<50	<100	<100
BH23 5.5-5.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	45.2****	<10	60	2170	410
BH24 0.5-0.6 X	24/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	4.8**	<10	<50	220	<100
BH24 1.5-1.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH24 2.5-2.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH24 3.3-3.4	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.7	<10	<50	<100	<100
BH25 0.5-0.6 X	24/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	0.9	<10	<50	<100	<100
BH25 1.5-1.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH25 2.5-2.6 X	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH25 3.5-3.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	2.2*	<10	<50	250	<100
BH25 4.5-4.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	14.9***	<10	<50	690	130
BH25 5.5-5.6	24/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH26 0.1-0.2 X	29/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH26 0.5-0.6 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH27 0.1-0.2 X	29/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	1.1	<10	<50	<100	<100
BH27 0.5-0.6 X	29/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH27 1.0-1.1 X	29/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	5.6**	<10	<50	280	<100
BH27 1.5-1.6 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH27 1.9-2.0 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH28 0.1-0.2 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH28 0.5-0.6 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.2	<10	<50	<100	<100
BH28 1.0-1.1 X	29/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH28 1.2-1.3 X	29/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	7.3**	<10	<50	480	<100
BH29 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.6**	<10	<50	390	<100
BH29 1.5-1.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH29 2.1-2.2 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH30 0.3-0.4 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH31 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH31 1.5-1.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH32 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.1	<10	<50	<100	<100
BH33 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH34 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH35 0.5-0.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	2.7*	<10	<50	230	<100
BH35 1.5-1.6 X	30/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.6*	<10	<50	130	<100
BH36 0.5-0.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH37 0.5-0.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	6.8**	<10	<50	400	100
BH37 1.5-1.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	7.4**	<10	<50	370	<100
BH37 2.5-2.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	2*	<10	<50	160	<100
BH37 3.5-3.6	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	3*	<10	<50	160	<100
BH38 0.5-0.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.3	<10	<50	<100	<100
BH38 1.5-1.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.7	<10	<50	<100	<100
BH38 2.5-2.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH39 0.5-0.6 X	31/10/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH39 1.5-1.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	2.2*	<10	<50	110	<100
BH39 2.5-2.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	19***	<10	<50	960	220
BH40 0.5-0.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	76.6****	<10	270	6330*	1050
BH40 1.5-1.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	37.4****	<10	100	2120	400
BH40 2.5-2.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	1.6*	<10	<50	140	<100
BH40 3.5-3.6 X	31/10/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	59.6****	<10	180	3640*	640

Table 28 Summary of Soil Analytical Results Compared with Ecological Screening Level's – BH41-BH53

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample Within Inferred Excavation Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - C16)	F3 (>C16 - C34)	F4 (>C34 - C40)
Sample ID	Sample Date	Soil Texture Class (fine/coarse)	Land Use	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH41 0.5-0.6 X	5/11/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH42 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	18.9***	<10	<50	1150	220
BH42 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	66.4****	<10	60	3020	570
BH42 2.5-2.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH43 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	3.8**	<10	<50	170	<100
BH43 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	13.4**	<10	<50	580	120
BH43 2.5-2.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	4.1**	<10	<50	190	<100
BH43 3.5-3.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	12**	<10	<50	470	<100
BH44 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	5.1**	<10	<50	330	<100
BH44 1.5-1.6 X	5/11/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	33***	<10	<50	1500	320
BH44 2.5-2.6 X	5/11/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	21.6***	<10	<50	1480	320
BH44 3.5-3.6 X	5/11/18	C	COM/IND	<0.2	<0.5	<0.5	<0.5	60.3****	<10	60	2990	530
BH45 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	8.2**	<10	<50	350	<100
BH46 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	3.7**	<10	<50	220	<100
BH47 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	6**	<10	<50	350	110
BH47 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	8.3**	<10	<50	610	120
BH48 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	7.7**	<10	<50	450	150
BH48 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	14.3***	<10	<50	1150	450
BH49 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.1	<10	<50	<100	<100
BH49 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	0.9	<10	<50	<100	<100
BH50 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH50 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH51 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	1.3	<10	<50	<100	<100
BH51 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	9.4**	<10	<50	370	<100
BH52 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH52 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH53 0.5-0.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH53 1.5-1.6 X	5/11/18	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100

Table 29 Soil Analytical Results Compared Against Ecological Investigation Levels – BH01-BH20

NEPM Ecological Investigation Levels for Soil

Bold - Indicates LOR Exceedances
X - Indicates Sample Withiin Inferred Excavation

Colour Shading - Indicates ESL Exceedances:
>1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x

Sample ID	Sample Date	EIL Land Use Sensitivity Class	Soil CEC (cmolc/kg)	Soil pH	Soil Texture Class (fine/coarse)	Copper (CEC)	Copper (pH)	Nickel	Zinc	Chromium III	Lead	Arsenic	Naphthalene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01 1.0-1.1 X	23/7/18	COM/IND	35	7.5 (3)	F	8	8	7	45	8	35	<5	<1
BH01 2.5-2.6	23/7/18	COM/IND	35	7.5 (3)	F	15	15	8	1100	10	25	<5	<1
BH01 4.4-4.5	23/7/18	COM/IND	35	7.5 (3)	F	54	54	12	66	6	52	6	<1
BH02 1.0-1.1 X	23/7/18	COM/IND	35	7.5 (3)	F	46	46	13	132	10	162	<5	<1
BH02 2.8-2.9	23/7/18	COM/IND	35	7.5 (3)	F	12	12	12	71	16	56	<5	<1
BH02 4.0-4.1	23/7/18	COM/IND	35	7.5 (3)	F	54	54	22	35	22	7	<5	<1
BH03 0.5-0.6 X	23/7/18	COM/IND	35	7.5 (3)	F	24	24	16	118	13	502	5	<1
BH03 2.5-2.6	23/7/18	COM/IND	35	7.5 (3)	F	28	28	7	40	3	12	<5	<1
BH03 3.9-4.0	23/7/18	COM/IND	35	7.5 (3)	F	25	25	16	44	12	14	<5	<1
BH04 1.5-1.6 X	23/7/18	COM/IND	10	7.5 (3)	C	35	35	14	113	14	128	<5	<1
BH04 3.0-3.1	23/7/18	COM/IND	35	7.5 (3)	F	35	35	14	127	14	217	<5	<1
BH04 4.5-4.6	23/7/18	COM/IND	35	7.5 (3)	F	28	28	27	184	12	136	<5	<1
BH05 1.0-1.1 X	23/7/18	COM/IND	35	7.5 (3)	F	7	7	11	244	8	21	<5	<1
BH05 3.0-3.1	23/7/18	COM/IND	35	7.5 (3)	F	44	44	22	322	15	94	<5	<1
BH05 4.5-4.6	23/7/18	COM/IND	10	7.5 (3)	C	32	32	14	102	8	122	<5	<1
BH06 0.2-0.3 X	23/7/18	COM/IND	35	7.5 (3)	F	30	30	12	168	10	174	<5	<1
BH07 1.0-1.1 X	23/7/18	COM/IND	35	7.5 (3)	F	20	20	13	161	11	80	<5	<1
BH07 2.2-2.3 X	23/7/18	COM/IND	10	7.5 (3)	C	17	17	7	70	8	120	<5	<1
BH01 1.5-1.6 X	23/7/18	COM/IND	35	7.5 (3)	F	8	8	12	64	15	28	5	<1
BH01 3.5-3.6	23/7/18	COM/IND	45	7.5 (3)	F	29	29	12	60	8	23	<5	<1
BH02 0.5-0.6 X	23/7/18	COM/IND	35	7.5 (3)	F	37	37	12	221	24	349	5	<1
BH02 2.0-2.1 X	23/7/18	COM/IND	35	7.5 (3)	F	11	11	13	62	12	82	<5	<1
BH03 1.0-1.1 X	23/7/18	COM/IND	10	7.5 (3)	C	44	44	17	176	19	93	6	<1
BH03 3.0-3.1	23/7/18	COM/IND	35	7.5 (3)	F	52	52	9	573	5	218	<5	<1
BH04 0.5-0.6 X	23/7/18	COM/IND	35	7.5 (3)	F	35	35	17	236	14	56	<5	<1
BH04 2.5-2.6	23/7/18	COM/IND	35	7.5 (3)	F	25	25	50	74	12	37	<5	<1
BH04 3.5-3.6	23/7/18	COM/IND	35	7.5 (3)	F	26	26	23	130	10	76	<5	<1
BH05 2.0-2.1 X	23/7/18	COM/IND	35	7.5 (3)	F	36	36	14	111	12	120	<5	<1
BH05 4.0-4.1	23/7/18	COM/IND	35	7.5 (3)	F	40	40	13	280	9	221	<5	<1
BH08_1.0-1.1 X	24/7/18	COM/IND	35	7.5 (3)	F	40	40	9	42	6	25	<5	<1
BH08_2.0-2.1 X	24/7/18	COM/IND	35	7.5 (3)	F	18	18	7	12	10	7	<5	<1
BH08_2.5-2.6 X	24/7/18	COM/IND	35	7.5 (3)	F	30	30	12	20	13	29	<5	<1
BH08_4.5-4.6	24/7/18	COM/IND	35	7.5 (3)	F	<5	<5	14	31	11	13	5	<1
BH09_1.0-1.1 X	24/7/18	COM/IND	35	7.5 (3)	F	33	33	10	40	7	16	<5	<1
BH09_2.5-2.6 X	24/7/18	COM/IND	35	7.5 (3)	F	20	20	10	30	7	24	<5	<1
BH09_4.5-4.6	24/7/18	COM/IND	35	7.5 (3)	F	31	31	5	23	4	15	<5	<1
BH09_6.0-6.1	24/7/18	COM/IND	35	7.5 (3)	F	29	29	15	170	13	289	6	<1
BH10_1.0-1.1 X	24/7/18	COM/IND	35	7.5 (3)	F	56	56	13	47	<2	37	<5	<1
BH10_3.0-3.1 X	24/7/18	COM/IND	35	7.5 (3)	F	90	90	11	123	9	114	<5	<1
BH10_5.0-5.1	24/7/18	COM/IND	20	7.5 (3)	C	7	7	12	34	8	14	<5	<1
BH11_1.0-1.1 X	24/7/18	COM/IND	35	7.5 (3)	F	55	55	11	105	8	60	7	<1
BH11_2.0-2.1 X	24/7/18	COM/IND	35	7.5 (3)	F	17	17	20	61	8	14	<5	<1
BH11_2.5-2.6 X	24/7/18	COM/IND	35	7.5 (3)	F	84	84	10	321	11	256	<5	<1
BH11_3.3-3.4 X	24/7/18	COM/IND	10	7.5 (3)	F	7	7	47	44	17	15	13	<1
BH12_1.0-1.1 X	24/7/18	COM/IND	35	7.5 (3)	F	26	26	9	125	9	49	<5	<1
BH12_2.0-2.1 X	24/7/18	COM/IND	35	7.5 (3)	F	24	24	13	50	11	24	<5	<1
BH12_2.5-2.6 X	24/7/18	COM/IND	35	7.5 (3)	F	77	77	7	32	3	9	<5	<1
BH12_3.5-3.6 X	24/7/18	COM/IND	35	7.5 (3)	F	33	33	9	50	7	72	<5	<1
BH13 1.0-1.1 X	25/7/18	COM/IND	45	7.5 (3)	F	51	51	11	44	11	779	5	2
BH13 1.5-1.6 X	25/7/18	COM/IND	45	7.5 (3)	F	44	44	12	41	8	128	<5	<1
BH13 2.0-2.1 X	25/7/18	COM/IND	45	7.5 (3)	F	9	9	13	33	22	30	11	<1
BH14 0.4-0.5 X	25/7/18	COM/IND	10	7.5 (3)	F	10	10	11	32	8	16	5	<1
BH15 0.55-0.65 X	25/7/18	COM/IND	10	7.5 (3)	F	17	17	42	82	14	14	6	<1
BH16 0.3-0.4 X	25/7/18	COM/IND	20	7.5 (3)	C	69	69	10	42	7	7	<5	<1
BH17 0.5-0.6 X	25/7/18	COM/IND	45	7.5 (3)	F	40	40	14	107	12	62	<5	<1
BH17 1.1-1.2 X	25/7/18	COM/IND	10	7.5 (3)	F	9	9	33	57	12	17	12	<1
BH18 0.5-0.6 X	25/7/18	COM/IND	35	7.5 (3)	F	22	22	14	72	14	46	<5	<1
BH18 1.5-1.6 X	25/7/18	COM/IND	35	7.5 (3)	F	35	35	22	242	15	123	5	<1
BH18 2.5-2.6 X	25/7/18	COM/IND	35	7.5 (3)	F	60	60	28	103	34	7	<5	<1
BH18 2.7-2.8 X	25/7/18	COM/IND	35	7.5 (3)	F	136	136	23	593	17	1160	<5	<1
BH18 3.1-3.2	25/7/18	COM/IND	35	7.5 (3)	F	96	96	15	293	16	479	5	<1
BH18 3.5-3.6	25/7/18	COM/IND	35	7.5 (3)	F	<5	<5	19	27	11	11	6	<1
BH19 1.0-1.1 X	25/7/18	COM/IND	35	7.5 (3)	F	58	58	5	66	4	56	<5	<1
BH19 2.1-2.2 X	25/7/18	COM/IND	10	7.5 (3)	F	10	10	19	33	15	10	6	<1
BH20 0.5-0.6 X	30/7/18	COM/IND	45	7.5 (3)	F	23	23	7	40	9	18	<5	<1
BH20 1.0-1.1 X	30/7/18	COM/IND	45	7.5 (3)	F	25	25	11	117	13	114	<5	<1

pH Designation:
1) Using 0.01M CaCl2 extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.
2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the CaCl2 method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.
3) Classified in accordance with parent material typical soil pH as per the tasmanian soils database

Table 30 Soil Analytical Results Compared Against Ecological Investigation Levels – BH21-BH40

NEPM Ecological Investigation Levels for Soil

Bold - Indicates LOR Exceedances
X - Indicates Sample Withiin Inferred Excavation

Colour Shading - Indicates ESL Exceedances:
>1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x

Sample ID	Sample Date	EIL Land Use Sensitivity Class	Soil CEC (cmolc/kg)	Soil pH	Soil Texture Class (fine /coarse)	Copper (CEC) mg/kg	Copper (pH) mg/kg	Nickel mg/kg	Zinc mg/kg	Chromium III mg/kg	Lead mg/kg	Arsenic mg/kg	Naphthalene mg/kg
BH21 0.5-0.6 X	24/10/18	COM/IND	35	7.5 (3)	F	172	172	16	41	15	27	<5	<1
BH21 1.5-1.6 X	24/10/18	COM/IND	35	7.5 (3)	F	11	11	7	57	8	77	<5	<1
BH21 2.5-2.6	24/10/18	COM/IND	35	7.5 (3)	F	94	94	6	42	<2	11	<5	<1
BH21 3.5-3.6	24/10/18	COM/IND	35	7.5 (3)	F	78	78	12	32	4	5	<5	<1
BH21 4.5-4.6	24/10/18	COM/IND	35	7.5 (3)	F	82	82	15	46	9	17	<5	<1
BH21 5.5-5.6	24/10/18	COM/IND	35	7.5 (3)	F	70	70	10	81	6	32	<5	<1
BH22 0.5-0.6 X	24/10/18	COM/IND	35	7.5 (3)	F	30	30	20	122	12	90	<5	<1
BH22 1.5-1.6 X	24/10/18	COM/IND	45	7.5 (3)	F	48	48	16	48	14	32	<5	<1
BH22 2.5-2.6	24/10/18	COM/IND	20	7.5 (3)	C	58	58	24	37	25	<5	<5	<1
BH22 3.4-3.5	24/10/18	COM/IND	20	7.5 (3)	C	57	57	25	44	24	12	<5	<1
BH23 0.5-0.6 X	24/10/18	COM/IND	20	7.5 (3)	C	56	56	24	116	16	141	6	<1
BH23 1.5-1.6 X	24/10/18	COM/IND	35	7.5 (3)	F	41	41	22	302	17	175	<5	<1
BH23 2.5-2.6	24/10/18	COM/IND	35	7.5 (3)	F	39	39	11	123	10	220	<5	<1
BH23 3.5-3.6	24/10/18	COM/IND	35	7.5 (3)	F	2410**	2410*	13	208	10	186	<5	<1
BH23 4.5-4.6	24/10/18	COM/IND	35	7.5 (3)	F	18	18	21	63	11	16	5	<1
BH23 5.5-5.6	24/10/18	COM/IND	35	7.5 (3)	F	39	39	16	134	11	42	9	<1
BH24 0.5-0.6 X	24/10/18	COM/IND	20	7.5 (3)	C	21	21	16	120	12	70	<5	<1
BH24 1.5-1.6 X	24/10/18	COM/IND	35	7.5 (3)	F	15	15	13	51	19	31	<5	<1
BH24 2.5-2.6	24/10/18	COM/IND	35	7.5 (3)	F	16	16	20	56	24	22	<5	<1
BH24 3.3-3.4	24/10/18	COM/IND	35	7.5 (3)	F	42	42	22	220	17	212	<5	<1
BH25 0.5-0.6 X	24/10/18	COM/IND	20	7.5 (3)	C	25	25	15	114	8	49	<5	<1
BH25 1.5-1.6 X	24/10/18	COM/IND	35	7.5 (3)	F	40	40	20	33	16	8	<5	<1
BH25 2.5-2.6 X	24/10/18	COM/IND	35	7.5 (3)	F	29	29	12	38	8	50	<5	<1
BH25 3.5-3.6	24/10/18	COM/IND	35	7.5 (3)	F	26	26	18	134	12	138	<5	<1
BH25 4.5-4.6	24/10/18	COM/IND	35	7.5 (3)	F	43	43	19	215	12	460	<5	<1
BH25 5.5-5.6	24/10/18	COM/IND	35	7.5 (3)	F	<5	<5	<2	<5	4	6	<5	<1
BH26 0.1-0.2 X	29/10/18	COM/IND	20	7.5 (3)	C	23	23	4	30	6	14	<5	<1
BH26 0.5-0.6 X	29/10/18	COM/IND	45	7.5 (3)	F	11	11	42	52	16	17	16	<1
BH27 0.1-0.2 X	29/10/18	COM/IND	0	7.5 (3)	C	46	46	6	59	6	28	<5	<1
BH27 0.5-0.6 X	29/10/18	COM/IND	0	7.5 (3)	C	21	21	15	80	17	43	21	<1
BH27 1.0-1.1 X	29/10/18	COM/IND	10	7.5 (3)	C	38	38	18	75	9	278	<5	<1
BH27 1.5-1.6 X	29/10/18	COM/IND	35	7.5 (3)	F	6	6	34	32	14	10	14	<1
BH27 1.9-2.0 X	29/10/18	COM/IND	10	7.5 (3)	F	7	7	38	53	20	12	14	<1
BH28 0.1-0.2 X	29/10/18	COM/IND	35	7.5 (3)	F	<5	<5	3	12	8	6	<5	<1
BH28 0.5-0.6 X	29/10/18	COM/IND	35	7.5 (3)	F	21	21	20	72	18	34	<5	<1
BH28 1.0-1.1 X	29/10/18	COM/IND	35	7.5 (3)	F	<5	<5	6	43	12	12	<5	<1
BH28 1.2-1.3 X	29/10/18	COM/IND	20	7.5 (3)	C	18	18	9	456	8	81	<5	<1
BH29 0.5-0.6 X	30/10/18	COM/IND	35	7.5 (3)	F	43	43	14	112	8	70	<5	<1
BH29 1.5-1.6 X	30/10/18	COM/IND	35	7.5 (3)	F	25	25	10	86	11	78	<5	<1
BH29 2.1-2.2 X	30/10/18	COM/IND	10	7.5 (3)	F	6	6	11	23	10	10	<5	<1
BH30 0.3-0.4 X	30/10/18	COM/IND	10	7.5 (3)	F	23	23	16	100	12	53	<5	<1
BH31 0.5-0.6 X	30/10/18	COM/IND	35	7.5 (3)	F	9	9	13	61	12	19	7	<1
BH31 1.5-1.6 X	30/10/18	COM/IND	10	7.5 (3)	F	7	7	28	58	13	12	6	<1
BH32 0.5-0.6 X	30/10/18	COM/IND	35	7.5 (3)	F	13	13	13	36	14	21	<5	<1
BH33 0.5-0.6 X	30/10/18	COM/IND	45	7.5 (3)	F	6	6	6	20	9	15	<5	<1
BH34 0.5-0.6 X	30/10/18	COM/IND	35	7.5 (3)	F	6	6	10	16	15	10	<5	<1
BH35 0.5-0.6 X	30/10/18	COM/IND	35	7.5 (3)	F	32	32	12	163	12	152	<5	<1
BH35 1.5-1.6 X	30/10/18	COM/IND	35	7.5 (3)	F	44	44	17	130	11	82	<5	<1
BH36 0.5-0.6 X	31/10/18	COM/IND	35	7.5 (3)	F	40	40	17	40	17	10	<5	<1
BH37 0.5-0.6 X	31/10/18	COM/IND	35	7.5 (3)	F	67	67	14	367	13	231	13	<1
BH37 1.5-1.6 X	31/10/18	COM/IND	35	7.5 (3)	F	30	30	11	73	14	42	<5	2
BH37 2.5-2.6 X	31/10/18	COM/IND	35	7.5 (3)	F	9	9	16	40	25	53	9	<1
BH37 3.5-3.6	31/10/18	COM/IND	35	7.5 (3)	F	11	11	15	44	15	18	<5	<1
BH38 0.5-0.6 X	31/10/18	COM/IND	35	7.5 (3)	F	13	13	13	45	14	57	<5	<1
BH38 1.5-1.6 X	31/10/18	COM/IND	35	7.5 (3)	F	14	14	13	108	9	89	<5	<1
BH38 2.5-2.6 X	31/10/18	COM/IND	45	7.5 (3)	F	14	14	14	40	14	14	<5	<1
BH39 0.5-0.6 X	31/10/18	COM/IND	35	7.5 (3)	F	18	18	16	47	13	42	<5	<1
BH39 1.5-1.6 X	31/10/18	COM/IND	20	7.5 (3)	C	24	24	9	71	15	36	<5	<1
BH39 2.5-2.6 X	31/10/18	COM/IND	20	7.5 (3)	C	198	198	10	227	8	359	<5	<1
BH40 0.5-0.6 X	31/10/18	COM/IND	20	7.5 (3)	C	60	60	12	34	6	12	<5	<1
BH40 1.5-1.6 X	31/10/18	COM/IND	20	7.5 (3)	C	70	70	14	62	6	46	<5	<1
BH40 2.5-2.6 X	31/10/18	COM/IND	20	7.5 (3)	C	14	14	17	60	9	15	<5	<1
BH40 3.5-3.6 X	31/10/18	COM/IND	20	7.5 (3)	C	51	51	14	51	9	22	<5	<1

pH Designation:
1) Using 0.01M CaCl2 extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.
2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the CaCl2 method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.
3) Classified in accordance with parent material typical soil pH as per the tasmanian soils database

Table 31 Soil Analytical Results Compared Against Ecological Investigation Levels – BH41-BH53

NEPM Ecological Investigation Levels for Soil **Bold - Indicates LOR Exceedances** X - Indicates Sample Withiin Inferred Excavation Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x													
Sample ID	Sample Date	EIL Land Use Sensitivity Class	Soil CEC (cmolc/kg)	Soil pH	Soil Texture Class (fine / coarse)	Copper (CEC)	Copper (pH)	Nickel	Zinc	Chromium III	Lead	Arsenic	Naphthalene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH41 0.5-0.6X	5/11/18	COM/IND	20	7.5(3)	C	75	75	15	32	6	9	<5	<1
BH42 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	38	38	13	39	7	17	<5	<1
BH42 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	45	45	18	62	6	13	<5	<1
BH42 2.5-2.6X	5/11/18	COM/IND	35	7.5(3)	F	30	30	12	45	8	84	<5	<1
BH43 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	35	35	7	95	6	67	<5	<1
BH43 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	21	21	13	36	9	11	<5	<1
BH43 2.5-2.6X	5/11/18	COM/IND	35	7.5(3)	F	21	21	12	37	9	110	<5	3
BH43 3.5-3.6X	5/11/18	COM/IND	35	7.5(3)	F	78	78	10	53	4	23	<5	<1
BH44 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	6	6	12	41	12	16	<5	<1
BH44 1.5-1.6X	5/11/18	COM/IND	20	7.5(3)	C	68	68	11	39	5	18	<5	<1
BH44 2.5-2.6X	5/11/18	COM/IND	20	7.5(3)	C	61	61	10	33	5	29	<5	<1
BH44 3.5-3.6X	5/11/18	COM/IND	20	7.5(3)	C	52	52	10	43	6	34	<5	<1
BH45 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	66	66	13	134	11	83	<5	<1
BH46 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	187	187	20	221	17	223	7	<1
BH47 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	41	41	18	373	9	179	<5	<1
BH47 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	50	50	20	77	16	24	<5	<1
BH48 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	95	95	17	265	7	154	<5	<1
BH48 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	59	59	12	254	10	180	<5	<1
BH49 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	39	39	23	65	38	26	8	<1
BH49 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	11	11	25	77	12	22	<5	<1
BH50 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	20	20	22	67	19	25	<5	<1
BH50 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	13	13	16	47	10	17	5	<1
BH51 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	10	10	15	51	12	31	<5	<1
BH51 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	20	20	11	76	9	101	<5	<1
BH52 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	21	21	26	61	32	18	6	<1
BH52 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	17	17	17	57	15	18	6	<1
BH53 0.5-0.6X	5/11/18	COM/IND	35	7.5(3)	F	28	28	32	70	16	25	<5	<1
BH53 1.5-1.6X	5/11/18	COM/IND	35	7.5(3)	F	16	16	7	30	12	49	<5	<1

pH Designation:

1) Using 0.01M $CaCl_2$ extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.
2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the $CaCl_2$ method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.
3) Classified in accordance with parent material typical soil pH as per the tasmanian soils database

8 GROUNDWATER GUIDELINES

8.1 Screening Criteria

The State Policy on Water Quality Management 1997 defines a range of PEV's on the basis of groundwater salinity. Groundwater electrical conductivity (EC) is used as a basis in which to assess total dissolved solid (TDS) concentrations at the site through a conservative ratio of 1 mg/L TDS to 0.75 µS/cm EC.

Groundwater PEV's were explored to assess potential receptors at risk.

The average EC at the site 2347 µS/cm which approximately translates to a TDS concentration average value of 1760 mg/L.

Groundwater beneath the site generally falls within Category B when classified according to the State Policy. The environmental values requiring protection are presented in Table 32.

Table 32 Environmental Values and Uses of Groundwater Requiring Protection (State Policy on Water Quality Management 1997).

Protected Environmental Value	PEV Based on TDS Concentrations (mg/L)			
	A	B	C	D
	Less than 1000	1000 – 3500	3500 – 13000	Greater than 13000
Drinking Water	*			
Irrigation	*	*		
Industry	*	*	*	
Stock Watering	*	*	*	
Ecosystem Protection	*	*	*	*

Note: Blue Shading Indicates Protected Environmental Value Requirement

8.1.1 *Drinking Water*

The aquifer is not considered of drinking water quality given the Category B salinity (exceeding 1000 mg/L). The groundwater is therefore not considered a PEV which needs to compare against Tier 1 screening criteria.

8.1.2 *Irrigation*

Given the urban setting and the development of an extensive reticulated water supply network the potential for groundwater extraction for crop irrigation and groundwater drawdown within the possible extent of groundwater impacts is considered highly unlikely. The PEV for crop irrigation has not been considered in this instance.

8.1.3 *Industrial Water Use*

As the applicable criteria for industrial water use are highly specific to the type of process, criteria for possible future industrial water use at the site have not been included.

8.1.4 *Stock Watering*

The potential for groundwater extraction for stock watering within the nearby area is considered low. The PEV for stock irrigation has therefore not been considered in this instance.

8.1.5 *Ecosystem Protection*

It is considered unlikely that groundwater impacts would extend to the nearest receiving waters of Maypole Creek which is 1.7 km to the north, however stormwater impacts need to be considered given the proposed excavation will be below the water table. Groundwater is compared against ANZECC 2000 ecosystem protection guidelines for 95% protection of Freshwater Ecosystems have been adopted in this instance given the 'moderately' disturbed nature of the Maypole Creek and the River Derwent. The River Derwent is approximately 2 km from the site so ANZECC 2000 ecosystem protection guidelines for 95% protection of Marine water Ecosystems has also been adopted.

8.1.6 HSL's for Assessing Petroleum Vapour Intrusion

Health Screening Levels (HSLs) for vapour intrusion are provided in Table 1A(4) of Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended April 2013 (NEPC, 2013) (the NEPM).

The NEPM groundwater HSLs provide an initial screening assessment for potential health risks via vapour intrusion to users of land overlying petroleum hydrocarbon impacted groundwater. This investigation concerns the following:

- existing commercial buildings plus proposed commercial building, HSL D NEPM HSL screening criteria have been adopted;

Screening level guidelines for assessing petroleum vapour intrusion from groundwater into shallow trenches (less than 1 m BGS) are non-limiting given that the derived groundwater HSL exceeds the water solubility limit (Friebel, E & Nadebaum, P., 2011).

The following classes have been applied to the site to derive an appropriate screening level for assessing petroleum vapour intrusion risk from groundwater:

- Sand grain size - confirmed by a particle size distribution analysis of the main geological strata encountered at the site; and
- A groundwater depth class of 2 to <4 m BGS;
- For the Proposed redevelopment, Commercial D land use class (for existing land use);

8.2 Groundwater Results

Groundwater was sampled from three monitoring wells. Current groundwater analytical results are compared against selected water quality screening levels and are presented in Table 33 to Table 38; and the laboratory certificates are presented in Appendix 13.

8.2.1 Ecosystem

The following can be summarised from the findings of the current groundwater analytical data:

- Copper exceeded both freshwater and marine guideline limits in MW2.
- No free phase hydrocarbons were observed during the groundwater sampling event.
- Although there were detections of TRH's in groundwater and particularly high concentrations of PAH's and benzo(a)pyrene in MW1 (between 267ug/L and 1250ug/L), there are no legislated ecological guideline limits for these analytes. Typically, benzo(a)pyrene is not particularly soluble in water, with high concentrations explained by the presence of naphthalene (potentially sourcing from the diesel) which increases the mobility of benzo(a)pyrene in water (CRC CARE Tech Report 39). Benzo(a)pyrene concentrations in MW1 exceed low reliability freshwater and marine ecosystem values of 0.2 ug/L by between 1335 to 6250 times in MW1 (CRC CARE Tech Report 39) illustrating the need to adequate environmental monitoring and management of the site.
- The laboratory extraction method for Naphthalene varies between the techniques for BTEXN verses PAHs; therefore there is a variation in the analytical results. The outcome of this variation is that this that there was an analyte exceeded guideline limits in the PAH suite but not the BTEXN method but not the other. This variation is attributed to the sediment content of the water column which in this instance was substantial. As a conservative approach the exceedance will be considered as the actual analytical result.

8.2.2 Human Health

Although there were low level detections of hydrocarbons, no indoor risk or risk to trench workers to vapour exposure was confirmed.

Benzo(a)pyrene concentrations in MW1 (at between 267ug/L and 1250ug/L) exceed drinking water guidelines (ANZECC 2000) limit of 0.01ug/L by between 26,700 and 125,000 times the limit. A single millilitre of groundwater from MW1 is equivalent to up to 125 L of water at the drinking water guideline limit which is equivalent to 62 day of benzo(a)pyrene exposure based on consumption of 2 litres of water per day. This highlights the importance of adequate PPE when handling this groundwater. One small splash of water has the potential to exceed recommended drinking water limits for half a year of exposure illustrating the need for exercising precaution when working with groundwater and surface water at the site.

Table 33 Groundwater Analytical Results Compared Against Selected Freshwater (99% Trigger) Water Quality Guidelines – TRH and BTEXN

Fresh Water (95% Trigger) ANZECC (2000)		Benzene	Toluene	Ethyl-benzene	Xylene			BTEX	Napthalene	TRH Carbon Chain Fractions						
					M, P	O	Total	Total		6 - 10	F1	>10 - 16	>16 - 34	>34 - 40	>10 - 40	F2
UNITS		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		1	2	2	2	2	2	1	5	20	20	100	100	100	100	100
Investigation Limit		950				350			16							
Date Collected	Water Sample ID															
11/09/2018	MW1	<1	<2	<2	<2	<2	<2	<1	6	<20	<20	2540	62300	13200	78000	2530
26/11/2018	MW1	<1	<2	<2	<2	<2	<2	<1	<5	20	20	470	11100	2450	14000	470
26/11/2018	MW2	<1	<2	<2	<2	<2	<2	<1	<5	<20	<20	<100	<100	<100	<100	<100
26/11/2018	MW3	<1	<2	<2	<2	<2	<2	<1	<5	<20	<20	<100	2730	230	2960	<100

Table 34 Groundwater Analytical Results Compared Against Selected Marine water (90%) Water Quality Guidelines – TRH and BTEXN

ANZECC (2000) Marine Water (95% trigger)		Benzene	Toluene	Ethyl-benzene	Xylene			BTEX	Napthalene	TRH Carbon Chain Fractions						
					M, P	O	Total	Total		6 - 10	F1	>10 - 16	>16 - 34	>34 - 40	>10 - 40	F2
UNITS		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		1	2	2	2	2	2	1	5	20	20	100	100	100	100	100
Investigation Limit		700							70							
Date Collected	Water Sample ID															
11/09/2018	MW1	<1	<2	<2	<2	<2	<2	<1	6	<20	<20	2540	62300	13200	78000	2530
26/11/2018	MW1	<1	<2	<2	<2	<2	<2	<1	<5	20	20	470	11100	2450	14000	470
26/11/2018	MW2	<1	<2	<2	<2	<2	<2	<1	<5	<20	<20	<100	<100	<100	<100	<100
26/11/2018	MW3	<1	<2	<2	<2	<2	<2	<1	<5	<20	<20	<100	2730	230	2960	<100

Table 35 Groundwater Analytical Results Compared Against Selected Fresh Water Quality Guidelines (99% trigger) – Dissolved Metals

Fresh Water (95% Trigger) ANZECC (2000)		Disolvd Metals														
		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury
	UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001
Investigation Limit		0.024			0.0002			0.0014	0.0034	1.9	0.011	0.011		0.008	0.37	0.0006
Date Collected	**Water Sample ID**															
11/09/2018	MW1	0.002	<0.001	0.068	<0.0001	<0.001	0.001	<0.001	<0.001	0.476	0.003	<0.01	<0.01	<0.005	<0.05	<0.0001
26/11/2018	MW1	0.002	<0.001	0.125	<0.0001	<0.001	0.002	0.001	0.002	0.883	0.002	<0.01	<0.01	<0.005	0.07	<0.0001
26/11/2018	MW2	0.002	<0.001	0.037	<0.0001	0.002	<0.001	0.003	<0.001	0.165	0.001	<0.01	<0.01	<0.005	0.07	<0.0001
26/11/2018	MW3	<0.001	<0.001	0.039	<0.0001	<0.001	<0.001	<0.001	<0.001	0.167	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001

Table 36 Groundwater Analytical Results Compared Against Selected Marine Water Quality Guidelines (90% trigger) – Dissolved Metals

ANZECC (2000) Marine Water (95% trigger)		Disolved Metals														
		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury
UNITS		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR		0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001
Investigation Limit					0.0055	0.0274	0.001	0.0013	0.0044		0.07		0.1	0.015		0.0004
Date Collected	**Water Sample ID**															
11/09/2018	MW1	0.002	<0.001	0.068	<0.0001	<0.001	0.001	<0.001	<0.001	0.476	0.003	<0.01	<0.01	<0.005	<0.05	<0.0001
26/11/2018	MW1	0.002	<0.001	0.125	<0.0001	<0.001	0.002	0.001	0.002	0.883	0.002	<0.01	<0.01	<0.005	0.07	<0.0001
26/11/2018	MW2	0.002	<0.001	0.037	<0.0001	0.002	<0.001	0.003	<0.001	0.165	0.001	<0.01	<0.01	<0.005	0.07	<0.0001
26/11/2018	MW3	<0.001	<0.001	0.039	<0.0001	<0.001	<0.001	<0.001	<0.001	0.167	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001

Table 37 Groundwater Analytical Results Compared Against Selected Fresh Water Quality Guidelines (95% trigger) – PAHs

Fresh Water (95% Trigger) ANZECC (2000)		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	PAH Sum	Benzo(a)pyrene TEQ (WHO)
UNITS		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Investigation Limit		16																	
Date Collected	**Water Sample ID**																		
11/09/2018	MW1	112	339	43	157	1070	464	1390	1540	678	571	910	264	875	393	145	464	9420	1250
26/11/2018	MW1	27.5	56.3	8.4	32.3	265	105	386	459	197	176	205	66.6	186	77.6	23.7	96.8	2370	267
26/11/2018	MW2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
26/11/2018	MW3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

Table 38 Groundwater Analytical Results Compared Against Selected Marine Water Quality Guidelines (95% trigger) – PAHs

ANZECC (2000) Marine Water (95% trigger)		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (WHO)
UNITS		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Investigation Limit		70																	
Date Collected	**Water Sample ID**																		
11/09/2018	MW1	112	339	43	157	1070	464	1390	1540	678	571	910	264	875	393	145	464	9420	1250
26/11/2018	MW1	27.5	56.3	8.4	32.3	265	105	386	459	197	176	205	66.6	186	77.6	23.7	96.8	2370	267
26/11/2018	MW2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
26/11/2018	MW3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

9 SOIL HUMAN HEALTH DIRECT CONTACT ASSESSMENT

9.1 Guidelines

Guidelines presented herein are based on potential exposure of human receptors to soil impact which may include:

- Trench workers repairing or building services (typically to 1 m bgs). This classification is not dependent on the land use class.
- Onsite inhabitants which may be exposed to potential shallow soil impact in non-paved areas of the site; and
- Onsite excavation works which may include potential swimming pools (up to 3 m bgs); basement carparks; and deep foundations.

9.1.1 Land Use Classification

The NEPM (2013) guidelines have been referenced to ensure that the correct land use and density category has been adopted for the site and the surrounding properties (where applicable). As per NEPM (2013) guidelines, the adopted land use class is dependent on the building density and the opportunity for soil access by site occupants (exposure to potentially impacted soil). Aspects needing to be considered include:

- Whether the site is of sensitive land use such as a childcare center, preschool, primary school or aged care facility in which case land use Class A is applicable;
- The percentage of paved area to determine direct contact exposure risk and therefore classification as low or high density; and
- Classification based on residential, recreational or commercial/industrial setting.

9.1.2 Adopted Land Use Classification

The adopted land use class is presented in Table 39.

Land use class is based on the opportunity for soil access as per NEPM (2013) guidelines. A land use class of D has been applied to areas on site with little opportunity for access to impacted soil.

Table 39 Summary of Land Use Setting and Density for Determining Exposure Risk

Soil Bores	Relevant Receptors	Adopted Land Use Class
All soil bores	The site – during construction works	D
	The site – post construction works	D
	Offsite Residents during construction works	A

9.1.3 Health Investigation & Screening Levels

The main exposure pathways and methods for assessing short term heath risk from contaminated soils are presented in Table 40. Vapour inhalation risk is addressed in Section 0 of this report.

Table 40 Summary of Exposure Pathways and Preliminary (Tier 1) Methods for Assessing Human Exposure Risk

Exposure Scenario	Contaminant Type	Tier 1 Assessment Method	Reference
Vapour Inhalation (Petroleum Vapour Intrusion – PVI)	Petroleum Hydrocarbons	HSLs (addressed in PVI section)	CRC CARE (Friebel & Nadebaum, 2011)
Dermal Contact		HSLs	
Dust Inhalation	Metals PAHs Organochlorides Phenols Herbicides Other Pesticides	Health Investigation Levels (HILs)	NEPM ASC (2013)
Soil Ingestion			

PVI – Petroleum Vapour Intrusion

9.2 Findings

9.2.1 Dermal Contact - Petroleum Hydrocarbons

Laboratory analytical results are presented in Appendix 12. Table 41

Table 43 presents soil hydrocarbon analytical results compared against CRC CARE (Friebel & Nadebaum, 2011) Health Screening Levels (HSL) guidelines for assessing dermal contact risk. Concentrations which exceeded laboratory LOR are highlighted in bold, and HSL exceedances are highlighted with a colored cell indicating the highest HSL land used class which is exceeded and samples within the proposed excavation zone are marked with an X.

There were no exceedances above the HSL A guidelines for residential land use (for neighboring properties) or HSL D guidelines for commercial land use (for site development and post development phases) for dermal contact in any of the samples, remaining onsite or proposed to be excavated. There were however detections of hydrocarbons in 98 of the 142 samples sent for analysis.

9.2.2 Dust Inhalation & Soil Ingestion

Laboratory analytical results are presented in Appendix 12. Soil analytical results are compared against combined dust inhalation and soil ingestion risk is assessed through the application of NEPM (2013) Health Investigation Levels (HILs) for exposure to soil contaminants are presented in Table 44 to Table 46. Concentrations which exceeded laboratory LOR would be highlighted in bold except for the metals, and HIL exceedances would highlighted with a colored cell indicating the highest HIL land used class which is exceeded and samples within the proposed excavation zone are marked with an X.

There were ten guideline exceedances for benzo(a)pyrene for dust inhalation and soil ingestion for *commercial land use* HIL D at the site indicating a risk to commercial workers developing the site. Following development of the site, although there is limited opportunity for assess to soil, measures will need to be put in place to ensure there are adequate separation barriers to the underlying soil as will be outlined in the CMP document.

62 of all 142 samples (43 %) exceeded residential Class A guideline limits for assessing dust inhalation and soil ingestion risk to neighboring residential receptors. These exceedances were identified by the following analytes:

- 58 of the 142 samples exceeded for benzo(a)pyrene;
- of the 142 samples exceeded for total PAH's; and
- 7 of the 142 samples exceeded for lead.

It is therefore identified that soil ingestion and dust inhalation is a potential risk to residents whilst the works are being undertaken, and measures will need to be put into place to ensure contaminated soil is not transposed offsite through any means.

Table 41 Soil Analytical Results Compared Against CRC CARE Guidelines for Dermal Contact – BH01-BH20

CRC CARE Health Screening Level Dermal Contact Hazard from Soil Hydrocarbons'		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
23/07/2018	BH01 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH01 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**370**	<100
23/07/2018	BH01 4.4-4.5	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1030**	**200**
23/07/2018	BH02 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH02 2.8-2.9	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH02 4.0-4.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH03 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH03 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**480**	<100
23/07/2018	BH03 3.9-4.0	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**700**	**100**
23/07/2018	BH04 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1190**	**300**
23/07/2018	BH04 3.0-3.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH04 4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH05 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH05 3.0-3.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
23/07/2018	BH05 4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**170**	<100
23/07/2018	BH06 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
23/07/2018	BH07 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH07 2.2-2.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH01 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH01 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**740**	<100
23/07/2018	BH02 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
23/07/2018	BH02 2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH03 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH03 3.0-3.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1110**	**150**
23/07/2018	BH04 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**280**	<100
23/07/2018	BH04 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH04 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
23/07/2018	BH05 2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**240**	<100
23/07/2018	BH05 4.0-4.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**440**	**100**
24/07/2018	BH08_1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1840**	**300**
24/07/2018	BH08_2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH08_2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH08_4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH09_1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1420**	**280**
24/07/2018	BH09_2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH09_4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1300**	**190**
24/07/2018	BH09_6.0-6.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH10_1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH10_3.0-3.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH10_5.0-5.1	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH11_1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**480**	**150**
24/07/2018	BH11_2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**480**	<100
24/07/2018	BH11_2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
24/07/2018	BH11_3.3-3.4 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH12_1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH12_2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH12_2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/07/2018	BH12_3.5-3.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH13 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	**2**	<10	**220**	**2760**	**410**
25/07/2018	BH13 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH13 2.0-2.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH14 0.4-0.5 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**140**	**2710**	**760**
25/07/2018	BH15 0.55-0.65 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH16 0.3-0.4 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH17 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**160**	**4160**	**1070**
25/07/2018	BH17 1.1-1.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH18 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH18 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**400**	**120**
25/07/2018	BH18 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH18 2.7-2.8 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**180**	<100
25/07/2018	BH18 3.1-3.2	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
25/07/2018	BH18 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH19 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
25/07/2018	BH19 2.1-2.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/07/2018	BH20 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**120**	<100
30/07/2018	BH20 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

Table 42 Soil Analytical Results Compared Against CRC CARE Guidelines for Dermal Contact – BH21-BH40

CRC CARE Health Screening Level Dermal Contact Hazard from Soil Hydrocarbons'		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
24/10/2018	BH21 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**760**	**230**
24/10/2018	BH21 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**230**	**130**
24/10/2018	BH21 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH21 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH21 4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**170**	<100
24/10/2018	BH21 5.5-5.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**160**	<100
24/10/2018	BH22 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**180**	<100
24/10/2018	BH22 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH22 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH22 3.4-3.5	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH23 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**540**	**180**
24/10/2018	BH23 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**150**	<100
24/10/2018	BH23 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	**190**	**5070**	**760**
24/10/2018	BH23 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**470**	<100
24/10/2018	BH23 4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH23 5.5-5.6	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**	**2170**	**410**
24/10/2018	BH24 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**220**	<100
24/10/2018	BH24 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH24 2.5-2.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH24 3.3-3.4	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH25 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH25 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH25 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/10/2018	BH25 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**250**	<100
24/10/2018	BH25 4.5-4.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**690**	**130**
24/10/2018	BH25 5.5-5.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH26 0.1-0.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH26 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH27 0.1-0.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH27 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH27 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**280**	<100
29/10/2018	BH27 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH27 1.9-2.0 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH28 0.1-0.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH28 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH28 1.0-1.1 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
29/10/2018	BH28 1.2-1.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**480**	<100
30/10/2018	BH29 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**390**	<100
30/10/2018	BH29 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH29 2.1-2.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH30 0.3-0.4 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH31 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH31 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH32 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH33 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH34 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
30/10/2018	BH35 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**230**	<100
30/10/2018	BH35 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**130**	<100
31/10/2018	BH36 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
31/10/2018	BH37 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**400**	**100**
31/10/2018	BH37 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	**2**	<10	<50	**370**	<100
31/10/2018	BH37 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**160**	<100
31/10/2018	BH37 3.5-3.6	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**160**	<100
31/10/2018	BH38 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
31/10/2018	BH38 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
31/10/2018	BH38 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
31/10/2018	BH39 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
31/10/2018	BH39 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**110**	<100
31/10/2018	BH39 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**960**	**220**
31/10/2018	BH40 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**270**	**6330**	**1050**
31/10/2018	BH40 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**100**	**2120**	**400**
31/10/2018	BH40 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**140**	<100
31/10/2018	BH40 3.5-3.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**180**	**3640**	**640**

Table 43 Soil Analytical Results Compared Against CRC CARE Guidelines for Dermal Contact – BH41-BH45

CRC CARE Health Screening Level Dermal Contact Hazard from Soil Hydrocarbons'		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
5/11/2018	BH41 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH42 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1150**	**220**
5/11/2018	BH42 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**	**3020**	**570**
5/11/2018	BH42 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH43 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**170**	<100
5/11/2018	BH43 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**580**	**120**
5/11/2018	BH43 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	**3**	<10	<50	**190**	<100
5/11/2018	BH43 3.5-3.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**470**	<100
5/11/2018	BH44 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**330**	<100
5/11/2018	BH44 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1500**	**320**
5/11/2018	BH44 2.5-2.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1480**	**320**
5/11/2018	BH44 3.5-3.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**	**2990**	**530**
5/11/2018	BH45 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**350**	<100
5/11/2018	BH46 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**220**	<100
5/11/2018	BH47 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**350**	**110**
5/11/2018	BH47 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**610**	**120**
5/11/2018	BH48 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**450**	**150**
5/11/2018	BH48 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**1150**	**450**
5/11/2018	BH49 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH49 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH50 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH50 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH51 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH51 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**370**	<100
5/11/2018	BH52 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH52 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH53 0.5-0.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
5/11/2018	BH53 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Table 44 Soil Analytical Results Compared Against NEPM (2013) Health Investigation Limit Guidelines – BH01-BH20

Bold - Indicates LOR Exceedance in Non Metalic Compounds			EG005T: Total Metals by ICP-AES														EG035T: Total	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
NEPM Health Investigation Levels (HIL's) Dust Inhalation and Soil Ingestion Assessment X - Indicates Sample Within Proposed Excavation Zone			Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a,h)anthracene	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR			5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential		HIL A	100		60	4500	20		100	6000	300	3800	400	200		7400	40																	300	3
HIL D Commerial/Industrial		HIL D	3000		500	3E+05	900		4000	240000	1500	60000	6000	10000		400000	730																	4000	40
Sample date	Sample ID																																		
23/07/2018	BH01 1.0-1.1 X		<5	50	<1	<50	<1	8	5	8	35	82	7	<5	21	45	<0.1	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	1.5	1.6	0.7	0.6	0.8	<0.5	0.6	<0.5	<0.5	<0.5	7	0.8
23/07/2018	BH01 2.5-2.6		<5	30	<1	<50	<1	10	5	15	25	25	8	<5	39	1100	<0.1	<0.5	1.5	<0.5	0.8	9.7	2.6	14.9	15.0	6.8	6.2	6.2	2.9	5.1	2.5	0.7	2.9	78	7.7
23/07/2018	BH01 4.4-4.5		6	50	<1	<50	<1	6	11	54	52	846	12	<5	51	66	1	1.2	4.0	<0.5	0.6	7.9	2.9	20.8	25.1	14.7	14.4	19.6	6.2	17.4	7.0	2.0	8.3	152	24
23/07/2018	BH02 1.0-1.1 X		<5	440	<1	<50	<1	10	13	46	162	236	13	<5	19	132	0.4	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	1.5	1.6	0.7	0.7	0.9	<0.5	0.6	<0.5	<0.5	<0.5	7	0.8
23/07/2018	BH02 2.8-2.9		<5	730	1	<50	<1	16	13	12	56	63	12	<5	28	71	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH02 4.0-4.1		<5	220	1	<50	<1	22	26	54	7	99	22	<5	103	35	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH03 0.5-0.6 X		5	140	<1	<50	<1	13	14	24	502	378	16	<5	41	118	0.1	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	3.4	3.7	1.7	1.4	1.6	0.7	1.4	0.8	<0.5	1.0	17	1.9
23/07/2018	BH03 2.5-2.6		<5	260	<1	<50	<1	3	10	28	12	105	7	<5	43	40	<0.1	<0.5	2.1	<0.5	<0.5	5.7	2.1	13.5	15.4	8.0	7.5	8.9	3.2	7.8	3.7	1.1	4.7	84	11
23/07/2018	BH03 3.9-4.0		<5	70	<1	<50	<1	12	11	25	14	261	16	<5	42	44	<0.1	0.6	3.2	<0.5	1.3	16.7	4.4	18.8	21.1	10.6	9.8	9.8	3.5	8.9	4.0	1.2	5.0	119	13
23/07/2018	BH04 1.5-1.6 X		<5	130	<1	<50	<1	14	10	35	128	301	14	<5	43	113	0.2	<0.5	2.1	2.3	3.4	37.0	10.7	55.9	52.6	20.2	18.8	28.8	9.6	25.6	15.6	3.4	20.0	306	37
23/07/2018	BH04 3.0-3.1		<5	170	<1	<50	<1	14	11	35	217	224	14	<5	30	127	0.1	<0.5	<0.5	<0.5	<0.5	2.2	0.6	3.9	3.9	1.5	1.4	2.1	0.7	1.7	1.1	<0.5	1.6	21	2.3
23/07/2018	BH04 4.5-4.6		<5	180	<1	<50	<1	12	14	28	136	1040	27	<5	14	184	0.1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	2.8	3.2	1.6	1.4	1.8	0.7	1.5	0.9	<0.5	1.1	16	2
23/07/2018	BH05 1.0-1.1 X		<5	60	<1	<50	<1	8	7	7	21	78	11	<5	16	244	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.1	0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	3	<0.5
23/07/2018	BH05 3.0-3.1		<5	120	<1	<50	2	15	21	44	94	179	22	<5	23	322	0.1	<0.5	<0.5	<0.5	<0.5	1.7	0.6	3.9	4.3	2.2	2.0	2.1	1.1	1.9	1.0	<0.5	1.2	22	2.6
23/07/2018	BH05 4.5-4.6		<5	100	<1	<50	<1	8	17	32	122	199	14	<5	54	102	0.2	<0.5	<0.5	0.5	0.6	8.1	2.5	11.7	11.2	4.2	3.8	4.7	1.7	3.9	2.3	<0.5	3.0	58	5.2
23/07/2018	BH06 0.2-0.3 X		<5	150	<1	<50	<1	10	10	30	174	253	12	<5	27	168	0.4	<0.5	<0.5	<0.5	<0.5	2.5	0.7	4.2	4.5	1.9	1.8	2.1	0.9	1.7	0.9	<0.5	1.2	22	2.3
23/07/2018	BH07 1.0-1.1 X		<5	230	<1	<50	<1	11	11	20	80	173	13	<5	25	161	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	1.1	0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	3	<0.5
23/07/2018	BH07 2.2-2.3 X		<5	260	<1	<50	<1	8	9	17	120	309	7	<5	25	70	0.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH01 1.5-1.6 X		5	40	<1	<50	<1	15	9	8	28	223	12	<5	25	64	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH01 3.5-3.6		<5	20	<1	<50	<1	8	14	29	23	277	12	<5	31	60	<0.1	0.7	3.1	<0.5	0.9	12.2	3.5	20.0	22.6	11.9	10.2	14.2	4.2	12.7	5.8	1.8	7.3	131	18
23/07/2018	BH02 0.5-0.6 X		5	1880	<1	<50	<1	24	10	37	349	297	12	<5	40	221	1.2	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	2.4	2.8	1.7	1.2	2.0	0.8	1.8	1.0	<0.5	1.2	16	2.4
23/07/2018	BH02 2.0-2.1 X		<5	340	1	<50	<1	12	16	11	82	125	13	<5	22	62	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH03 1.0-1.1 X		6	140	<1	<50	<1	19	16	44	93	308	17	<5	63	176	0.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.5	1.6	1.0	0.7	1.1	<0.5	0.9	0.5	<0.5	0.7	9	1.2
23/07/2018	BH03 3.0-3.1		<5	80	<1	<50	<1	5	10	52	218	263	9	<5	59	573	<0.1	1.3	6.7	<0.5	1.9	23.3	5.8	34.8	35.6	18.1	14.6	19.2	6.3	17.5	7.8	2.5	9.3	205	25
23/07/2018	BH04 0.5-0.6 X		<5	110	<1	<50	<1	14	18	35	56	276	17	<5	39	236	0.1	<0.5	1.0	<0.5	0.6	7.4	1.9	11.6	11.4	5.1	3.7	5.5	1.8	4.7	2.3	0.6	2.9	61	6.8
23/07/2018	BH04 2.5-2.6		<5	320	<1	<50	<1	12	24	25	37	576	50	<5	52	74	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
23/07/2018	BH04 3.5-3.6		<5	140	<1	<50	<1	10	17	26	76	441	23	<5	11	130	<0.1	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	1.8	1.9	1.1	0.7	1.1	<0.5	1.0	<0.5	<0.5	0.6	9	1.2
23/07/2018	BH05 2.0-2.1 X		<5	140	<1	<50	<1	12	19	36	120	206	14	<5	43	111	0.3	<0.5	1.0	<0.5	0.5	8.6	1.7	11.0	10.6	4.6	3.1	5.0	1.6	4.3	2.2	<0.5	3.0	57	5.7
23/07/2018	BH05 4.0-4.1		<5	150	<1	<50	<1	9	12	40	221	269	13	<5	26	280	0.3	<0.5	1.3	<0.5	<0.5	4.9	1.4	9.4	9.7	4.7	4.1	6.1	1.9	4.9	2.5	0.6	3.2	55	7.1
24/07/2018	BH08_1.0-1.1 X		<5	50	<1	<50	<1	6	8	40	25	211	9	<5	32	42	<0.1	1.1	8.7	0.6	3.1	39.3	9.3	45.6	50.7	24.8	26.6	26.3	9.1	25.5	12.0	3.3	14.9	301	36
24/07/2018	BH08_2.0-2.1 X		<5	60	<1	<50	<1	10	6	18	7	69	7	<5	41	12	<0.1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	2.1	2.5	1.6	1.1	1.8	0.5	1.5	0.7	<0.5	0.9	14	2
24/07/2018	BH08_2.5-2.6 X		<5	80	<1	<50	<1	13	13	30	29	210	12	<5	84	20	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH08_4.5-4.6		5	90	<1	<50	<1	11	39	<5	13	171	14	<5	17	31	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH09_1.0-1.1 X		<5	50	<1	<50	<1	7	8	33	16	257	10	<5	23	40	<0.1	1.0	4.6	<0.5	0.7	11.4	4.1	23.2	25.4	15.3	14.3	16.8	6.7	16.6	8.1	2.3	10.1	161	24
24/07/2018	BH09_2.5-2.6 X		<5	50	<1	<50	<1	7	7	20	24	377	10	<5	23	30	<0.1	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	1.8	2.0	1.0	1.0	1.2	<0.5	1.0	0.5	<0.5	0.6	11	1.3
24/07/2018	BH09_4.5-4.6		<5	40	<1	<50	<1	4	7	31	15	92	5	<5	49	23	<0.1	2.8	7.8	0.9	5.9	38.7	11.6	38.6	41.9	21.1	19.6	22.3	7.4	22.8	10.4	2.9	13.1	268	32
24/07/2018	BH09_6.0-6.1		6	120	<1	<50	<1	13	11	29	289	120	15	<5	24	170	0.7	<0.5	<0.5	<0.5	<0.5	1.7	0.5	1.6	1.7	0.8	0.7	0.8	<0.5	0.7	<0.5	<0.5	<0.5	9	0.9
24/07/2018	BH10_1.0-1.1 X		<5	140	<1	<50	<1	<2	30	56	37	408	13	<5	67	47	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH10_3.0-3.1 X		<5	140	<1	<50	<1	9	9	90	114	462	11	<5	32	123	0.6	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.4	1.6	0.9	0.9	1.2	<0.5	1.0	0.5	<0.5	0.7	9	1.3
24/07/2018	BH10_5.0-5.1		<5	70	<1	<50	<1	8	16	7	14	325	12	<5	19	34	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH11_1.0-1.1 X		7	120	<1	<50	<1	8	12	55	60	202	11	<5	39	105	0.1	<0.5	0.7	<0.5	<0.5	2.7	0.8	7.0	7.4	3.6	3.7	4.8	1.5	4.0	2.4	0.6	3.0	42	5.9
24/07/2018	BH11_2.0-2.1 X		<5	100	2	<50	<1	8	27	17	14	294	20	<5	19	61	<0.1	<0.5	0.9	<0.5	<0.5	5.0	1.5	11.5	12.3	5.8	5.0	6.5	1.9	5.5	2.4	0.7	3.0	62	7.9
24/07/2018	BH11_2.5-2.6 X		<5	180	<1	<50	<1	11	7	84	256	310	10	<5	32	321	0.8	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	2.4	2.7	1.6	1.6	2.4	0.8	1.9	1.0	<0.5	1.3	17	2.5
24/07/2018	BH11_3.3-3.4 X		13	160	2	<50	<1	17	42	7	15	1630	47	<5	30	44	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH12_1.0-1.1 X		<5	110	<1	<50	<1	9	9	26	49	116	9	<5	17	125	<0.1	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	2.9	3.0	1.2	1.3	1.4	0.6	1.2	0.6	<0.5	0.7	15	1.6
24/07/2018	BH12_2.0-2.1 X		<5	100	<1	<50	<1	11	12	24	24	448	13	<5	34	50	<0.1	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	1.0	1.0	0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4	<0.5
24/07/2018	BH12_2.5-2.6 X		<5	120	<1	<50	<1	3	43	77	9	281	7	<5	147	32	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/07/2018	BH12_3.5-3.6 X		<5	90	<1	<50	<1	7	8	33	72	236	9	<5	31	50	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH13 1.0-1.1 X		5	80	<1	<50	<1	11	10	51	779	296	11	<5	40	44	0.4	4.0	16.8	2.2	8.6	101.0	22.0	80.3	83.6	37.5	34.5	34.8	10.0	29.8	12.3	4.3	14.7	496	44
25/07/2018	BH13 1.5-1.6 X		<5	90	<1	<50	<1	8	10	44	128	252	12	<5	46	41	0.2	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	1.9	2.0	0.9	0.8	1.0	<0.5	0.8	<0.5	<0.5	<0.5	9	1
25/07/2018	BH13 2.0-2.1 X		11	100	1	<50	<1	22	16	9	30	552	13	<5	28	33	<0.1	<0.5	<0.5	<0.5	<0.5	2.0	<0.5	2.0	2.2	1.0	0.8	1.0	<0.5	0.8	<0.5	<0.5	0.5	10	1
25/07/2018	BH14 0.4-0.5 X		5	100	<1	<50	<1	8	11	10	16	1030	11	<5	18	32	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
25/07/2018	BH15 0.55-0.65 X		6	20	1	<50	<1	14	28	17	14	830	42	<5	20	82	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH16 0.3-0.4 X		<5	20	<1	<50	<1	7	11	69	7	381	10	<5	53	42	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH17 0.5-0.6 X		<5	100	<1	<50	<1	12	9	40	62	167	14	<5	37	107	<0.1	1.8	3.4	24.4	31.8	218.0	63.4	250.0	216.0	76.3	68.3	100.0	30.0	89.1	49.6	11.4	57.4	1290	127
25/07/2018	BH17 1.1-1.2 X		12	1620	1	<50	<1	12	18	9	17	111	33	<5	15	57	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH18 0.5-0.6 X		<5	120	<1	<50	<1	14	13	22	46	239	14	<5	38	72	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.0	0.6	<0.5	0.6	<0.5	0.5	<0.5	<0.5	<0.5	4	0.6
25/07/2018	BH18 1.5-1.6 X		5	170	<1	<50	<1	15	18	35	123	242	22	<5	36	242	0.4	<0.5	0.6	<0.5	<0.5	2.9	0.9	5.8	6.0	2.6	2.5	3.9	1.1	3.4	2.1	<0.5	2.6	34	4.4
25/07/2018	BH18 2.5-2.6 X		<5	80	<1	<50	<1	34	29	60	7	517	28	<5	113	103	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH18 2.7-2.8 X		<5	310	<1	<50	<1	17	12	136	1160	199	23	<5	54	593	4.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	2.3	2.6	1.3	1.2	2.0	0.7	1.6	1.0	<0.5	1.2	15	2.1
25/07/2018	BH18 3.1-3.2		5	180	<1	<50	<1	16	10	96	479	194	15	<5	39	293	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.8	2.0	1.3	0.8	1.6	0.6	1.3	0.7	<0.5	1.0	11	1.7
25/07/2018	BH18 3.5-3.6		6	130	1	<50	<1	11	18	<5	11	256	19	<5	24	27	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
25/07/2018	BH19 1.0-1.1 X		<5	150	<1	<50	<1	4	11	58	56	179	5	<5	70	66	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
25/07/2018	BH19 2.1-2.2 X		6	80	1	<50	<1	15	14	10	10	109	19	<5	24	33	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/07/2018	BH20 0.5-0.6 X		<5	40	<1	<50	<1	9	4	23	18	91	7	<5	33	40	<0.1	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	1.8	2.0	1.0	1.0	1.3	<0.5	1.1	0.5	<0.5	0.7	10	1.4
30/07/2018	BH20 1.0-1.1 X		<5	120	<1	<50	<1	13	9	25	114	212	11	<5	34	117	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Table 45 Soil Analytical Results Compared Against NEPM (2013) Health Investigation Limit Guidelines – BH21-BH40

Bold - Indicates LOR Exceedance in Non Metalic Compounds			EG005T: Total Metals by ICP-AES														EG035T: Total	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
NEPM Health Investigation Levels (HIL's) Dust Inhalation and Soil Ingestion Assessment X - Indicates Sample Within Proposed Excavation Zone			Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR			5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential		HIL A	100		60	4500	20		100	6000	300	3800	400	200		7400	40																	300	3
HIL D Commerial/Industrial		HIL D	3000		500	3E+05	900		4000	240000	1500	60000	6000	10000		400000	730																	4000	40
Sample date	Sample ID																																		
24/10/2018	BH21 0.5-0.6 X		<5	30	<1	<50	<1	15	11	172	27	168	16	<5	47	41	<0.1	<0.5	1.5	0.7	0.9	12.8	3.6	26.9	25.2	10.6	10.1	16.3	5.8	14.3	8.6	1.7	11.5	**150**	**20**
24/10/2018	BH21 1.5-1.6 X		<5	70	<1	<50	<1	8	6	11	77	128	7	<5	18	57	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.4	0.6	0.6	0.9	<0.5	0.8	<0.5	<0.5	0.6	**6**	**1**
24/10/2018	BH21 2.5-2.6		<5	50	<1	<50	<1	<2	19	94	11	465	6	<5	69	42	<0.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	2.0	2.6	1.5	1.4	2.1	0.7	1.9	0.9	<0.5	1.2	**15**	**2.4**
24/10/2018	BH21 3.5-3.6		<5	40	<1	<50	<1	4	19	78	5	436	12	<5	128	32	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.9	<0.5	<0.5	0.6	<0.5	0.6	<0.5	<0.5	<0.5	**3**	**0.7**
24/10/2018	BH21 4.5-4.6		<5	70	<1	<50	<1	9	26	82	17	478	15	<5	115	46	<0.1	<0.5	0.9	<0.5	<0.5	0.7	<0.5	5.2	7.0	3.9	3.9	6.0	2.5	6.1	2.8	0.9	3.5	**43**	**8.6**
24/10/2018	BH21 5.5-5.6		<5	60	<1	<50	<1	6	17	70	32	355	10	<5	71	81	<0.1	<0.5	0.8	<0.5	<0.5	2.7	0.9	6.4	7.4	3.7	3.7	5.1	2.1	4.6	2.1	0.7	2.7	**43**	**6.7**
24/10/2018	BH22 0.5-0.6 X		<5	150	<1	<50	<1	12	20	30	90	243	20	<5	44	122	0.2	<0.5	0.7	<0.5	<0.5	3.9	1.0	7.9	8.0	3.4	3.1	4.7	1.8	4.1	2.3	0.6	3.0	**45**	**6**
24/10/2018	BH22 1.5-1.6 X		<5	90	<1	<50	<1	14	24	48	32	256	16	<5	89	48	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1**	<0.5
24/10/2018	BH22 2.5-2.6		<5	90	<1	<50	<1	25	23	58	<5	358	24	<5	119	37	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/10/2018	BH22 3.4-3.5		<5	80	<1	<50	<1	24	18	57	12	428	25	<5	87	44	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2**	<0.5
24/10/2018	BH23 0.5-0.6 X		6	130	<1	<50	<1	16	12	56	141	298	24	<5	41	116	0.2	<0.5	1.2	0.6	0.9	8.7	2.2	13.0	12.9	5.1	5.0	8.0	2.9	6.7	4.1	1.0	5.4	**78**	**9.8**
24/10/2018	BH23 1.5-1.6 X		<5	150	<1	<50	<1	17	12	41	175	310	22	<5	27	302	0.2	<0.5	<0.5	0.6	0.6	6.0	1.6	7.7	7.5	3.1	2.8	4.4	1.5	3.8	2.1	0.6	2.7	**45**	**5.6**
24/10/2018	BH23 2.5-2.6		<5	100	<1	<50	<1	10	10	39	220	180	11	<5	34	123	0.1	<2.4	9.1	32.2	29.0	295.0	132.0	360.0	334.0	133.0	127.0	186.0	75.2	166.0	81.9	19.3	100.0	**2080**	**235**
24/10/2018	BH23 3.5-3.6		<5	3730	<1	<50	<1	10	21	2410	186	405	13	<5	92	208	0.1	<0.5	0.6	<0.5	<0.5	2.4	0.6	4.8	4.8	1.9	2.0	3.0	1.2	2.5	1.4	<0.5	1.8	**27**	**3.3**
24/10/2018	BH23 4.5-4.6		5	140	1	<50	<1	11	18	18	16	1090	21	<5	22	63	<0.1	<0.5	0.6	<0.5	<0.5	1.4	0.5	3.6	4.2	2.1	2.0	2.4	1.0	2.2	1.0	<0.5	1.2	**22**	**2.9**
24/10/2018	BH23 5.5-5.6		9	80	<1	<50	<1	11	13	39	42	630	16	<5	35	134	0.1	2.6	10.5	2.2	5.3	58.0	20.3	70.6	73.8	34.6	36.4	49.5	17.1	45.2	17.6	6.2	22.3	**472**	**64**
24/10/2018	BH24 0.5-0.6 X		<5	100	<1	<50	<1	12	11	21	70	227	16	<5	28	120	0.1	<0.5	1.0	<0.5	<0.5	6.0	1.6	9.2	9.1	4.2	3.9	5.2	2.2	4.8	2.3	0.6	2.8	**53**	**6.8**
24/10/2018	BH24 1.5-1.6 X		<5	160	<1	<50	<1	19	9	15	31	222	13	<5	47	51	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1**	<0.5
24/10/2018	BH24 2.5-2.6		<5	170	<1	<50	<1	24	14	16	22	455	20	<5	56	56	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/10/2018	BH24 3.3-3.4		<5	200	1	<50	<1	17	19	42	212	518	22	<5	29	220	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.3	0.6	0.5	0.8	<0.5	0.7	<0.5	<0.5	<0.5	**5**	**0.8**
24/10/2018	BH25 0.5-0.6 X		<5	210	<1	<50	<1	8	16	25	49	305	15	<5	33	114	<0.1	<0.5	<0.5	<0.5	<0.5	3.4	0.8	3.1	3.0	0.9	1.0	1.1	0.5	0.9	<0.5	<0.5	0.6	**15**	**1.2**
24/10/2018	BH25 1.5-1.6 X		<5	80	<1	<50	<1	16	25	40	8	142	20	<5	82	33	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/10/2018	BH25 2.5-2.6 X		<5	160	2	<50	<1	8	57	29	50	165	12	<5	61	38	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/10/2018	BH25 3.5-3.6		<5	160	<1	<50	<1	12	20	26	138	210	18	<5	22	134	0.4	<0.5	0.6	<0.5	<0.5	2.4	0.7	4.1	4.6	2.2	2.0	2.6	1.2	2.2	1.0	<0.5	1.2	**25**	**2.9**
24/10/2018	BH25 4.5-4.6		<5	170	<1	<50	<1	12	17	43	460	372	19	<5	33	215	0.3	<0.5	2.7	1.0	1.6	14.4	4.1	26.2	27.4	12.9	11.4	16.0	5.5	14.9	5.9	1.2	7.4	**153**	**20**
24/10/2018	BH25 5.5-5.6		<5	20	<1	<50	<1	4	<2	<5	6	28	<2	<5	<5	<5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH26 0.1-0.2 X		<5	30	<1	<50	<1	6	4	23	14	56	4	<5	33	30	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH26 0.5-0.6 X		16	310	2	<50	<1	16	31	11	17	221	42	<5	30	52	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH27 0.1-0.2 X		<5	90	<1	<50	<1	6	10	46	28	255	6	<5	42	59	<0.1	<0.5	<0.5	<0.5	<0.5	2.2	<0.5	2.5	2.8	1.2	1.1	1.2	<0.5	1.1	<0.5	<0.5	0.6	**13**	**1.4**
29/10/2018	BH27 0.5-0.6 X		21	100	1	<50	<1	17	16	21	43	194	15	<5	32	80	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH27 1.0-1.1 X		<5	120	<1	<50	<1	9	16	38	278	215	18	<5	25	75	0.2	<0.5	<0.5	<0.5	<0.5	1.5	0.6	2.9	3.7	3.0	2.7	5.6	1.9	5.6	3.0	0.8	4.1	**35**	**7.8**
29/10/2018	BH27 1.5-1.6 X		14	30	2	<50	<1	14	23	6	10	422	34	<5	18	32	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH27 1.9-2.0 X		14	40	<1	<50	<1	20	22	7	12	1500	38	<5	26	53	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH28 0.1-0.2 X		<5	30	<1	<50	<1	8	<2	<5	6	30	3	<5	21	12	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH28 0.5-0.6 X		<5	80	<1	<50	<1	18	16	21	34	314	20	<5	36	72	<0.1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	2.2	2.3	0.9	0.8	1.3	<0.5	1.2	0.6	<0.5	0.8	**11**	**1.5**
29/10/2018	BH28 1.0-1.1 X		<5	30	<1	<50	<1	12	2	<5	12	124	6	<5	28	43	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
29/10/2018	BH28 1.2-1.3 X		<5	80	<1	<50	<1	8	11	18	81	190	9	<5	25	456	0.4	<0.5	1.1	<0.5	1.1	8.7	3.4	15.6	17.0	8.0	7.2	7.6	3.0	7.3	3.5	0.9	4.2	**88**	**11**
30/10/2018	BH29 0.5-0.6 X		<5	100	<1	<50	<1	8	13	43	70	345	14	<5	42	112	<0.1	<0.5	1.1	<0.5	<0.5	5.8	1.4	8.7	9.5	4.1	3.6	5.0	1.6	4.6	2.3	0.6	3.0	**51**	**6.6**
30/10/2018	BH29 1.5-1.6 X		<5	110	<1	<50	<1	11	9	25	78	249	10	<5	36	86	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH29 2.1-2.2 X		<5	70	<1	<50	<1	10	12	6	10	150	11	<5	22	23	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH30 0.3-0.4 X		<5	100	<1	<50	<1	12	12	23	53	316	16	<5	28	100	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH31 0.5-0.6 X		7	70	<1	<50	<1	12	12	9	19	134	13	<5	25	61	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH31 1.5-1.6 X		6	100	<1	<50	<1	13	17	7	12	584	28	<5	18	58	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH32 0.5-0.6 X		<5	90	<1	<50	<1	14	6	13	21	136	13	<5	25	36	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	1.7	1.0	1.0	1.2	<0.5	1.1	0.5	<0.5	0.6	**9**	**1.4**
30/10/2018	BH33 0.5-0.6 X		<5	80	<1	<50	<1	9	4	6	15	80	6	<5	21	20	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH34 0.5-0.6 X		<5	380	<1	<50	<1	15	8	6	10	45	10	<5	31	16	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
30/10/2018	BH35 0.5-0.6 X		<5	140	<1	<50	<1	12	11	32	152	267	12	<5	40	163	0.2	<0.5	0.5	<0.5	<0.5	2.8	0.8	5.0	5.1	2.3	2.1	3.1	1.0	2.7	1.6	<0.5	2.1	**29**	**3.5**
30/10/2018	BH35 1.5-1.6 X		<5	180	<1	<50	<1	11	15	44	82	346	17	<5	37	130	0.2	<0.5	<0.5	<0.5	<0.5	2.3	0.5	3.6	3.6	1.5	1.3	1.9	0.6	1.6	0.9	<0.5	1.2	**19**	**2.1**
31/10/2018	BH36 0.5-0.6 X		<5	100	<1	<50	<1	17	19	40	10	624	17	<5	68	40	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
31/10/2018	BH37 0.5-0.6 X		13	160	<1	<50	<1	13	12	67	231	295	14	<5	30	367	1	<0.5	1.2	<0.5	<0.5	5.4	1.3	10.1	10.3	5.0	4.4	7.4	2.2	6.8	3.8	1.0	4.9	**64**	**9.7**
31/10/2018	BH37 1.5-1.6 X		<5	40	<1	<50	<1	14	12	30	42	112	11	<5	46	73	<0.1	0.6	0.9	0.6	1.7	18.6	3.6	20.8	18.7	5.8	5.2	8.3	2.3	7.4	4.2	0.9	5.6	**105**	**11**
31/10/2018	BH37 2.5-2.6 X		9	240	1	<50	1	25	11	9	53	350	16	<5	61	40	<0.1	<0.5	<0.5	<0.5	0.6	5.4	1.0	6.1	5.6	1.8	1.5	2.2	0.8	2.0	1.1	<0.5	1.4	**30**	**2.6**
31/10/2018	BH37 3.5-3.6		<5	20	<1	<50	<1	15	12	11	18	238	15	<5	29	44	<0.1	<0.5	<0.5	<0.5	0.7	7.4	1.4	8.7	8.0	2.5	2.2	3.3	1.2	3.0	1.7	<0.5	2.2	**42**	**3.9**
31/10/2018	BH38 0.5-0.6 X		<5	70	<1	<50	<1	14	15	13	57	356	13	<5	30	45	0.2	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	1.9	2.2	1.2	1.1	1.5	<0.5	1.3	0.6	<0.5	0.8	**11**	**1.6**
31/10/2018	BH38 1.5-1.6 X		<5	170	<1	<50	<1	9	17	14	89	174	13	<5	17	108	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.3	0.6	0.6	0.8	<0.5	0.7	<0.5	<0.5	<0.5	**5**	**0.8**
31/10/2018	BH38 2.5-2.6 X		<5	70	<1	<50	<1	14	11	14	14	165	14	<5	28	40	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
31/10/2018	BH39 0.5-0.6 X		<5	60	<1	<50	<1	13	10	18	42	301	16	<5	24	47	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
31/10/2018	BH39 1.5-1.6 X		<5	80	<1	<50	<1	15	7	24	36	146	9	<5	38	71	<0.1	<0.5	<0.5	<0.5	<0.5	3.8	0.9	5.6	5.4	2.1	2.0	2.5	1.1	2.2	1.1	<0.5	1.5	**28**	**2.9**
31/10/2018	BH39 2.5-2.6 X		<5	50	<1	<50	1	8	8	198	359	176	10	<5	39	227	<0.1	1.4	2.5	1.1	2.6	30.2	6.0	43.6	39.0	14.3	13.6	21.2	7.3	19.0	10.8	2.4	14.2	**229**	**27**
31/10/2018	BH40 0.5-0.6 X		<5	30	<1	<50	<1	6	10	60	12	267	12	<5	44	34	<0.1	4.2	24.2	1.2	3.2	50.7	18.6	179.0	200.0	93.0	83.4	158.0	29.0	76.6	54.7	18.5	63.6	**1060**	**130**
31/10/2018	BH40 1.5-1.6 X		<5	50	<1	<50	<1	6	18	70	46	353	14	<5	60	62	<0.1	1.4	8.2	<0.5	1.2	27.4	9.2	59.3	61.1	32.7	28.9	43.9	12.6	37.4	18.9	6.1	22.8	**371**	**55**
31/10/2018	BH40 2.5-2.6 X		<5	60	<1	<50	<1	9	13	14	15	183	17	<5	12	60	<0.1	<0.5	<0.5	<0.5	<0.5	1.0	<0.5	2.3	2.6	1.4	1.2	1.8	0.6	1.6	0.8	<0.5	1.0	**14**	**2.1**
31/10/2018	BH40 3.5-3.6 X		<5	40	<1	<50	<1	9	14	51	22	272	14	<5	40	51	<0.1	2.4	14.0	1.7	5.1	66.7	18.9	99.5	94.7	50.7	44.4	68.2	22.0	59.6	29.1	9.6	34.7	**621**	**87**

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Table 46 Soil Analytical Results Compared Against NEPM (2013) Health Investigation Limit Guidelines – BH41-BH53

Bold - Indicates LOR Exceedance in Non Metalic Compounds

NEPM Health Investigation Levels (HIL's)

Dust Inhalation and Soil Ingestion Assessment

X - Indicates Sample Within Proposed Excavation Zone

			EG005T: Total Metals by ICP-AES														EG035T: Total
			Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR			5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1
HIL A Low Density Residential		☑ HIL A	100		60	4500	20		100	6000	300	3800	400	200		7400	40
HIL D Commerial/Industrial		☑ HIL D	3000		500	3E+05	900		4000	240000	1500	60000	6000	10000		400000	730
Sample date:	Sample ID																
5/11/2018	BH41 0.5-0.6 X		<5	30	<1	<50	<1	6	20	75	9	319	15	<5	43	32	<0.1
5/11/2018	BH42 0.5-0.6 X		<5	50	<1	<50	<1	7	11	38	17	188	13	<5	34	39	<0.1
5/11/2018	BH42 1.5-1.6 X		<5	30	<1	<50	<1	6	25	45	13	354	18	<5	31	62	<0.1
5/11/2018	BH42 2.5-2.6 X		<5	120	<1	<50	<1	8	6	30	84	379	12	<5	17	45	1
5/11/2018	BH43 0.5-0.6 X		<5	90	<1	<50	<1	6	10	35	67	196	7	<5	62	95	0.1
5/11/2018	BH43 1.5-1.6 X		<5	110	<1	<50	<1	9	11	21	11	291	13	<5	38	36	<0.1
5/11/2018	BH43 2.5-2.6 X		<5	90	<1	<50	<1	9	12	21	110	239	12	<5	35	37	<0.1
5/11/2018	BH43 3.5-3.6 X		<5	50	<1	<50	<1	4	15	78	23	351	10	<5	76	53	<0.1
5/11/2018	BH44 0.5-0.6 X		<5	80	<1	<50	<1	12	10	6	16	62	12	<5	17	41	<0.1
5/11/2018	BH44 1.5-1.6 X		<5	40	<1	<50	<1	5	12	68	18	263	11	<5	49	39	<0.1
5/11/2018	BH44 2.5-2.6 X		<5	40	<1	<50	<1	5	11	61	29	218	10	<5	48	33	<0.1
5/11/2018	BH44 3.5-3.6 X		<5	50	<1	<50	<1	6	12	52	34	230	10	<5	46	43	<0.1
5/11/2018	BH45 0.5-0.6 X		<5	100	<1	<50	<1	11	9	66	83	216	13	<5	32	134	0.2
5/11/2018	BH46 0.5-0.6 X		7	170	<1	<50	<1	17	13	187	223	294	20	<5	38	221	0.3
5/11/2018	BH47 0.5-0.6 X		<5	200	<1	<50	<1	9	35	41	179	242	18	<5	34	373	0.5
5/11/2018	BH47 1.5-1.6 X		<5	80	<1	<50	<1	16	16	50	24	540	20	<5	67	77	<0.1
5/11/2018	BH48 0.5-0.6 X		<5	140	<1	<50	<1	7	26	95	154	344	17	<5	113	265	0.2
5/11/2018	BH48 1.5-1.6 X		<5	130	<1	<50	<1	10	9	59	180	232	12	<5	36	254	0.4
5/11/2018	BH49 0.5-0.6 X		8	60	<1	<50	<1	38	13	39	26	923	23	<5	78	65	<0.1
5/11/2018	BH49 1.5-1.6 X		<5	220	1	<50	<1	12	28	11	22	1070	25	<5	20	77	<0.1
5/11/2018	BH50 0.5-0.6 X		<5	60	<1	<50	<1	19	23	20	25	591	22	<5	35	67	<0.1
5/11/2018	BH50 1.5-1.6 X		5	80	<1	<50	<1	10	13	13	17	350	16	<5	22	47	<0.1
5/11/2018	BH51 0.5-0.6 X		<5	640	1	<50	<1	12	19	10	31	112	15	<5	24	51	<0.1
5/11/2018	BH51 1.5-1.6 X		<5	100	<1	<50	<1	9	9	20	101	167	11	<5	20	76	0.4
5/11/2018	BH52 0.5-0.6 X		6	140	<1	<50	<1	32	12	21	18	868	26	<5	29	61	<0.1
5/11/2018	BH52 1.5-1.6 X		6	120	<1	<50	<1	15	11	17	18	406	17	<5	29	57	<0.1
5/11/2018	BH53 0.5-0.6 X		<5	200	2	<50	<1	16	24	28	25	510	32	<5	28	70	<0.1
5/11/2018	BH53 1.5-1.6 X		<5	30	<1	<50	<1	12	5	16	49	122	7	<5	56	30	<0.1

		EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential																		300	3
HIL D Commerial/Industrial																		4000	40
Sample date:	Sample ID																		
5/11/2018	BH41 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH42 0.5-0.6 X	<1.1	5.4	<1.1	1.1	16.3	4.9	27.7	32.7	16.0	14.4	21.3	6.5	18.9	8.0	2.4	9.6	**185**	**27**
5/11/2018	BH42 1.5-1.6 X	2.9	19.5	1.3	5.5	65.9	18.5	95.8	109.0	53.4	49.0	75.1	18.7	66.4	27.2	8.2	32.1	**648**	**93**
5/11/2018	BH42 2.5-2.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH43 0.5-0.6 X	<0.5	0.9	<0.5	<0.5	5.3	1.1	7.1	7.6	3.6	3.2	4.4	1.4	3.8	1.7	<0.5	2.0	**42**	**5**
5/11/2018	BH43 1.5-1.6 X	<0.5	2.4	<0.5	<0.5	8.5	2.5	15.8	18.5	9.6	8.8	14.1	5.3	13.4	6.2	1.6	7.8	**114**	**19**
5/11/2018	BH43 2.5-2.6 X	<0.5	1.0	<0.5	0.7	6.3	1.3	7.4	8.1	3.6	3.2	4.3	1.6	4.1	1.6	<0.5	2.0	**45**	**5.3**
5/11/2018	BH43 3.5-3.6 X	<0.5	2.2	<0.5	0.7	8.8	2.5	17.4	19.3	10.0	9.2	13.5	4.3	12.0	5.1	1.4	5.9	**112**	**17**
5/11/2018	BH44 0.5-0.6 X	<0.5	<0.5	1.0	0.9	8.1	2.7	12.0	11.1	4.6	4.3	5.9	1.8	5.1	2.3	0.5	2.8	**63**	**7.1**
5/11/2018	BH44 1.5-1.6 X	1.4	7.3	<0.5	1.6	23.3	6.7	38.4	43.4	23.6	21.6	36.4	10.2	33.0	14.8	4.1	18.3	**284**	**46**
5/11/2018	BH44 2.5-2.6 X	0.7	4.2	<0.5	0.8	9.8	3.3	22.8	26.8	14.5	13.4	23.0	7.3	21.6	9.8	2.5	12.1	**173**	**30**
5/11/2018	BH44 3.5-3.6 X	3.1	14.8	1.5	5.1	80.1	19.3	105.0	107.0	49.6	43.9	66.5	20.9	60.3	25.7	7.0	29.6	**639**	**84**
5/11/2018	BH45 0.5-0.6 X	<0.5	2.5	<0.5	1.0	15.2	4.8	16.9	15.9	6.9	6.0	9.2	3.1	8.2	3.7	0.9	4.3	**99**	**12**
5/11/2018	BH46 0.5-0.6 X	<0.5	0.7	<0.5	<0.5	3.8	0.8	7.0	6.9	2.6	2.4	4.2	1.4	3.7	1.9	<0.5	2.4	**38**	**4.8**
5/11/2018	BH47 0.5-0.6 X	<0.5	1.2	<0.5	<0.5	3.2	0.9	8.1	8.6	3.8	3.5	6.4	2.3	6.0	3.1	0.7	3.8	**52**	**8.3**
5/11/2018	BH47 1.5-1.6 X	<0.5	1.3	0.8	1.1	12.4	3.4	16.7	17.1	7.1	6.3	9.1	3.5	8.3	4.0	0.9	5.2	**97**	**12**
5/11/2018	BH48 0.5-0.6 X	<0.5	1.6	<0.5	<0.5	3.8	1.2	10.0	10.6	5.0	4.6	8.2	3.2	7.7	4.3	0.9	5.5	**67**	**11**
5/11/2018	BH48 1.5-1.6 X	<0.5	3.1	<0.5	<0.5	4.8	1.8	13.2	15.0	8.2	7.7	14.7	5.4	14.3	7.4	1.7	9.6	**107**	**20**
5/11/2018	BH49 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	0.8	<0.5	<0.5	1.1	0.6	1.1	0.7	<0.5	0.9	**6**	**1.3**
5/11/2018	BH49 1.5-1.6 X	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	1.1	1.3	0.7	0.7	1.1	<0.5	0.9	<0.5	<0.5	0.6	**7**	**1.1**
5/11/2018	BH50 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH50 1.5-1.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH51 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	2.8	2.8	1.0	1.0	1.5	0.5	1.3	0.6	<0.5	0.9	**14**	**1.7**
5/11/2018	BH51 1.5-1.6 X	<0.5	1.3	<0.5	<0.5	2.9	1.2	11.5	13.1	7.9	7.9	11.4	3.5	9.4	4.3	1.2	5.3	**81**	**13**
5/11/2018	BH52 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH52 1.5-1.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5/11/2018	BH53 0.5-0.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2**	<0.5
5/11/2018	BH53 1.5-1.6 X	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	0.9	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2**	<0.5

10 INDOOR INHABITANT PVI ASSESSMENT – HSL's

This PVI assessment has been conducted in accordance with relevant CRC CARE Technical Documentation and NEPM ASC 2013 guidelines presented in references section of this report. The HSL assessment approach is generally the first (Tier 1) investigation phase adopted for assessing PVI risk at petroleum hydrocarbon (PHC) impacted sites. HSL guidelines have been applied for samples collected from the site to account for risks that may be associated with volatile hydrocarbon vapour intrusion into confined spaces where there may be an inhalation risk through longer term exposure. This does not constitute a full vapour risk assessment but provides additional information from which to further quantify any risk.

A detailed investigation (Tier 2 to 3) is recommended over an HSL assessment where an acute risk has been identified at the site (CRC CARE 2013) because of:

- Migrating product on surface soils beneath buildings;
- Strong PHC odors;
- Flammable risk in confined spaces; and/or
- Health complaints from occupants.

Based on the site visits, none of the above conditions have been identified at the site. If the outcome of this Tier 1 assessment reveals HSL exceedances for hydrocarbon vapour intrusion, a more detailed (Tier 2) assessment will be required to further evaluate the human health risk.

PVI risk is initially interpreted through the development of HSL threshold limits from the following classifications:

- The geology and or hydrogeology of the investigation point; and
- Land use sensitivity:

The resulting HSL threshold limits are compared with laboratory analytical results.

10.1 Selected Media for Assessing PVI Risk

Table 47 presents a summary of the preferred HSL approach to assessing PVI risk.

Table 47 Preferred Methods for Determining Site PVI Risk

Media Analysed	Method	Limitations	Order of Preference
Soil Gas	Concentrations of a soil gas through a soil vapor probe	This approach provides the most reliable data in interpreting PVI risk, although direct modelling should be applied if concentrations exceed HSL threshold limits.	Primary
Groundwater	Concentrations of PHC in groundwater through deployment of monitoring wells	Determining PVI risk based on groundwater is inherently conservative when interpreting vapour risk to account for not readily discernable preferential pathways. Reference may be drawn to alternative assessment approaches: 1) Application of site specific conditions to the CRC CARE model for assessing PVI risk 2) Soil gas interpretation for areas where a PVI risk is identified from groundwater analysis.	Secondary
Soil	Concentrations of PHC in soil	Concentrations in soil may be subject variability due to soil moisture, organic content and oxygen ingress all which create significant bias in threshold values. Reliance is place on utilizing groundwater analysis over soil.	Tertiary

10.2 Land Use Class

For surrounding properties, the potential PVI risk is characterized through application of CRC CARE HSL's for each individual properties based on their existing land use (NEPM ASC 2013; Friebel & Nadebaum 2010). The CRC CARE guidelines have been referenced to ensure that the correct land use and density category has been adopted for surrounding land use to ensure health risks are consistent with the HSL models. Aspects considered include the:

- Sensitivity of the existing or potential land use;
- Percentage of paved area for defining potential vapour migration risk;
- Type of basement garage which may influence the confinement of PHC vapors;
- Presence of a slab or cavity for discerning vapour intrusion risk.

If hydrocarbon impacted soil is discerned at the site, consideration is given to downgradient receptors. Where applicable, land use class therefore considers:

- Downgradient receptors where onsite HSL exceedances have been identified in soil; and
- Variations in land use for different parts of the proposed development.

The following land use classes are applied:

- *HSL D for the entire building given ventilation within the basement car park.*

where soil is intended for removal, the indoor vapour risk is not present as identified within findings tables with > slab/cut RL.

10.3 Soil Assessment Findings

Although all soil results have been included in Table 48 to Table 50, only the residual soil samples (non-excavated soil which is to remain at the site) are relevant and have been assessed against the elected NEPM ASC (2013) health screening levels (HSL) to determine potential hydrocarbon vapour risk to site users. Laboratory analytical results are presented in Appendix 12.

Specific grain, depth and land use classes are presented Table 48 to Table 50 and are relevant to the assessment. Concentrations which exceeded laboratory LOR are highlighted in bold, and HSL exceedances would be highlighted with a colored cell.

There were no exceedances for assessing indoor vapour intrusion risk.

Table 48 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk - BH01-BH20

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH01 1.0-1.1	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 2.5-2.6	23/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 4.4-4.5	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.1	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 2.8-2.9	23/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 4.0-4.1	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.5-0.6	23/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 2.5-2.6	23/07/2018	1 - 2	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 3.9-4.0	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 1.5-1.6	23/07/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 3.0-3.1	23/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 4.5-4.6	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 1.0-1.1	23/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 3.0-3.1	23/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 4.5-4.6	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 0.2-0.3	23/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 1.0-1.1	23/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 2.2-2.3	23/07/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	23/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 3.5-3.6	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.5-0.6	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 2.0-2.1	23/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 1.0-1.1	23/07/2018	1 - 2	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 3.0-3.1	23/07/2018	1 - 2	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.5-0.6	23/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 2.5-2.6	23/07/2018	1 - 2	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 3.5-3.6	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 2.0-2.1	23/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 4.0-4.1	23/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_1.0-1.1	24/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_2.0-2.1	24/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_2.5-2.6	24/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_4.5-4.6	24/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_1.0-1.1	24/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_2.5-2.6	24/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_4.5-4.6	24/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_6.0-6.1	24/07/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_1.0-1.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_3.0-3.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_5.0-5.1	24/07/2018	1 - 2	SILT	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_1.0-1.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_2.0-2.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_2.5-2.6	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_3.3-3.4	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_1.0-1.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_2.0-2.1	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_2.5-2.6	24/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_3.5-3.6	24/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 1.0-1.1	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	**2**	<10	**220**
BH13 1.5-1.6	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 2.0-2.1	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 0.4-0.5	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**140**
BH15 0.55-0.65	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 0.3-0.4	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**160**
BH17 1.1-1.2	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.5-0.6	25/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 1.5-1.6	25/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 2.5-2.6	25/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 2.7-2.8	25/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 3.1-3.2	25/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 3.5-3.6	25/07/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 1.0-1.1	25/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 2.1-2.2	25/07/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 0.5-0.6	30/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 1.0-1.1	30/07/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

Table 49 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk – BH21-BH40

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH21 0.5-0.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 1.5-1.6	24/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 2.5-2.6	24/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 3.5-3.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 4.5-4.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 5.5-5.6	24/10/2018	4+	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 0.5-0.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 1.5-1.6	24/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 2.5-2.6	24/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 3.4-3.5	24/10/2018	2 - 4	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 0.5-0.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 1.5-1.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 2.5-2.6	24/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**190**
BH23 3.5-3.6	24/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 4.5-4.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 5.5-5.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH24 0.5-0.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 1.5-1.6	24/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 2.5-2.6	24/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 3.3-3.4	24/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 0.5-0.6	24/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 1.5-1.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 2.5-2.6	24/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 3.5-3.6	24/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 4.5-4.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 5.5-5.6	24/10/2018	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH26 0.1-0.2	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH26 0.5-0.6	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 0.1-0.2	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 0.5-0.6	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.0-1.1	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.5-1.6	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.9-2.0	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 0.1-0.2	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 0.5-0.6	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 1.0-1.1	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 1.2-1.3	29/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 0.5-0.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 1.5-1.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 2.1-2.2	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH30 0.3-0.4	30/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH31 0.5-0.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH31 1.5-1.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH32 0.5-0.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH33 0.5-0.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH34 0.5-0.6	30/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH35 0.5-0.6	30/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH35 1.5-1.6	30/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH36 0.5-0.6	31/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 0.5-0.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 1.5-1.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	**2**	<10	<50
BH37 2.5-2.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 3.5-3.6	31/10/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 0.5-0.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 1.5-1.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 2.5-2.6	31/10/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 0.5-0.6	31/10/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 1.5-1.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 2.5-2.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH40 0.5-0.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**270**
BH40 1.5-1.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**100**
BH40 2.5-2.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH40 3.5-3.6	31/10/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**180**

Table 50 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk – BH41-BH53

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances											
Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH41 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH42 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH42 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH42 2.5-2.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 0.5-0.6	5/11/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 1.5-1.6	5/11/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 2.5-2.6	5/11/2018	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	**3**	<10	<50
BH43 3.5-3.6	5/11/2018	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 1.5-1.6	5/11/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 2.5-2.6	5/11/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 3.5-3.6	5/11/2018	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH45 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH46 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH47 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH47 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH48 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH48 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH49 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH49 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH50 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH50 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH51 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH51 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH52 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH52 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH53 0.5-0.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH53 1.5-1.6	5/11/2018	>SLAB/CUT RL	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

10.4 Groundwater Assessment Findings

10.4.1 LNAPL Classification

Determining the presence of LNAPL at the site is important for understanding petroleum vapour intrusion risk and refining the CSM. The presence of LNAPL is based on CRC CARE (2013 page 8) guidelines for defining LNAPL based on 20% effective solubility of hydrocarbon concentrations in groundwater.

10.4.2 HSL Guidelines

Concentrations of hydrocarbons in groundwater have been assessed against NEPM ASC (2013) HSL's to determine potential risk to nearby habitable buildings because of PVI from the aquifer. Groundwater HSL's are specific to each monitoring well and involves characterisation based on the following variables:

- The HSL's for surrounding properties (already identified);
- The dominant grain class overlying the hydrocarbon impacted groundwater based on US Agriculture Soil Classification System (SCS) and partitioning into either sand, silt or clay; and
- A depth class range is selected in accordance with the depth at which hydrocarbon impacted groundwater was intercepted. The groundwater will fit into one of the following depth classes 2 to 4 m; 4 to 8 m and greater than 8 m. A depth class is not applicable for groundwater shallower than 2 m BGS and in this case, vapour probes are recommended to be installed.

Table 51 summarises groundwater wells and land use classification used to characterise PVI risk for various properties near the site. The limiting land use classification at the site is HSL D which all analytical results will be compared against.

Table 51 Classification Used to Assess Petroleum Vapour Intrusion Risk to Local Receptors from Soil

Property	Monitoring Wells	Land Use Class
The Site	All Monitoring Wells	D

10.4.3 Findings

Groundwater sampling results, the Certificate of Analysis is presented in Appendix 13. Hydrocarbon concentrations within groundwater have been compared against CRC CARE 2013 Guidelines for Assessing indoor vapour PVI risk in Table 52 and for the Presence of LNAPL in Table 53. No LNAPL was identified and although there were low level detections of hydrocarbons there were no indoor risk to vapour exposure was confirmed.

Table 52 Summary of Groundwater Samples That Exceeded Threshold HSL Limits

NEPM (ASC) 2013 Schedule B1 Groundwater HSL's for Assessing Vapour Intrusion Risk						Benzene	Toluene	Ethylbenzene	Xylene	Naphthalene	F1	F2
Units						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR						1	2	2	2	5	20	100
Water Sample ID	Date	Groundwater Depth Class (m)	Grain Class	HSL								
MW1	11/9/18	<2	CLAY	D	Limit	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
					Result	<1	<2	<2	<2	6	<20	2534
MW1	26/11/18	<2	CLAY	D	Limit	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
					Result	<1	<2	<2	<2	<5	20	470
MW2	26/11/18	<2	CLAY	D	Limit	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
					Result	<1	<2	<2	<2	<5	<20	<100
MW3	26/11/18	<2	SAND	D	Limit	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
					Result	<1	<2	<2	<2	<5	<20	<100

#N/A - Requires alternative assessment approach ie. soil vapour assessment
NL - No limit applicable as any derived HSL will exceed analyte solubility limit

Table 53 Summary of Groundwater Concentrations Compared Against CRC CARE (Friebel & Nadebaum, 2011) Guidelines for Assessing for the Presence of LNAPL

Investigation Levels					Xylene					TPH Carbon Chain Fractions		TRH Carbon Chain Fractions							
Indicates >Laboratory LOR / Indicates Likely LNAPL		Benzene	Toluene	Ethyl-benzene	M, P Xylene	O Xylene	Total Xylene	BTEX	Napthalene	C6 - C14	C10 - C14	C6 - C10	C6 - C16	F1	>C10 - C16	>C16 - C34	>C34 - C40	>C10 - C40	F2
UNITS		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		1	2	2	2	2	2	1	5	20	50	20	20	20	100	100	100	100	100
Date Collected	**Water Sample**																		
11/09/2018	MW1	<1	<2	<2	<2	<2	<2	<1	6	1400	1400	<20	2540	<20	2540	62300	13200	78000	2530
26/11/2018	MW1	<1	<2	<2	<2	<2	<2	<1	<5	180	150	20	490	20	470	11100	2450	14000	470
26/11/2018	MW2	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<20	<20	<20	<100	<100	<100	<100	<100
26/11/2018	MW3	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<20	<20	<20	<100	2730	230	2960	<100

Given the excavation is proposed to be below the groundwater level, NEPM ASC (2013) suggests an alternative method should be adopted to assess the vapour intrusion risk (vapour probes).

Overall vapour intrusion risk is considered low due to:

- The age of the tanks;
- The presence of the underground carpark which is ventilated
- Day use only with limited time spent within the building
- The bedrock, natural soil, and majority of the fill is considered a clay texture class
- The lack of any identifiable BTEX or F1 compounds within soil or groundwater;
- The lack of F2 threshold exceedance limits for commercial land use

11 TRENCH WORKER PVI ASSESSMENT – HSL's

11.1 Classification

The following Health Screening Assessment is based on hydrocarbon vapour intrusion risk to subsurface excavation workers within excavations. This is assessed through analysis of vapors from soil and soil vapours. Groundwater is generally not used to assess risk as threashold limits for all depth and grain classes are non-limiting. Land use classes are not applicable when assessing vapour intrusion into trenches.

Soil and soil vapour HSL's for assessing hydrocarbon risk to maintenance workers are based on CRC CARE Technical Report 10 guidelines (Friebel & Nadebaum 2011) and the following variables:

- Dominant grain size class of material at the soil sample depth or based on the dominant grain class of the backfill material based on US Agriculture Soil Classification System (SCS) and partitioning into either sand, silt or clay; and
- Classifying soil according to depth ranges: 0 to 2 m; 2 to 4 m; 4 to 8 m; and greater than 8 m;

11.2 Findings

Laboratory analytical results are presented in Appendix 12. Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers are presented in Table 54 to Table 56. Concentrations that exceeded laboratory LOR are highlighted in bold, and if there were any HSL exceedances they would be highlighted with a colored cell. There were no exceedances of the CRC CARE HSL guidelines for Assessing PVI Risk to Trench Workers.

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Table 54 Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers – BH01-BH20

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg LOR 0.2	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 1	mg/kg LOR 10	mg/kg LOR 50
BH01 1.0-1.1	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 2.5-2.6	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 4.4-4.5	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.1	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 2.8-2.9	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 4.0-4.1	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.5-0.6	23/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 2.5-2.6	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 3.9-4.0	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 1.5-1.6	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 3.0-3.1	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 4.5-4.6	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 1.0-1.1	23/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 3.0-3.1	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 4.5-4.6	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 0.2-0.3	23/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 1.0-1.1	23/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 2.2-2.3	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 3.5-3.6	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.5-0.6	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 2.0-2.1	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 1.0-1.1	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 3.0-3.1	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.5-0.6	23/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 2.5-2.6	23/07/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 3.5-3.6	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 2.0-2.1	23/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 4.0-4.1	23/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_1.0-1.1	24/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_2.0-2.1	24/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_2.5-2.6	24/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH08_4.5-4.6	24/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_1.0-1.1	24/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_2.5-2.6	24/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_4.5-4.6	24/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH09_6.0-6.1	24/07/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_1.0-1.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_3.0-3.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10_5.0-5.1	24/07/2018	0 to 2m	SILT	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_1.0-1.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_2.0-2.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_2.5-2.6	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11_3.3-3.4	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_1.0-1.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_2.0-2.1	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_2.5-2.6	24/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12_3.5-3.6	24/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 1.0-1.1	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	**2**	<10	**220**
BH13 1.5-1.6	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 2.0-2.1	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 0.4-0.5	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**140**
BH15 0.55-0.65	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 0.3-0.4	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**160**
BH17 1.1-1.2	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.5-0.6	25/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 1.5-1.6	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 2.5-2.6	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 2.7-2.8	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 3.1-3.2	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 3.5-3.6	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 1.0-1.1	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 2.1-2.2	25/07/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 0.5-0.6	30/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 1.0-1.1	30/07/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

Table 55 Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers – BH21-BH40

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg LOR 0.2	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 1	mg/kg LOR 10	mg/kg LOR 50
BH21 0.5-0.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 1.5-1.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 2.5-2.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 3.5-3.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 4.5-4.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 5.5-5.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 0.5-0.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 1.5-1.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 2.5-2.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH22 3.4-3.5	24/10/2018	2 to 4m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 0.5-0.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 1.5-1.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 2.5-2.6	24/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	**190**
BH23 3.5-3.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 4.5-4.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH23 5.5-5.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH24 0.5-0.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 1.5-1.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 2.5-2.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH24 3.3-3.4	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 0.5-0.6	24/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 1.5-1.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 2.5-2.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 3.5-3.6	24/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 4.5-4.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH25 5.5-5.6	24/10/2018	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH26 0.1-0.2	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH26 0.5-0.6	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 0.1-0.2	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 0.5-0.6	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.0-1.1	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.5-1.6	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH27 1.9-2.0	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 0.1-0.2	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 0.5-0.6	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 1.0-1.1	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH28 1.2-1.3	29/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 0.5-0.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 1.5-1.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH29 2.1-2.2	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH30 0.3-0.4	30/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH31 0.5-0.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH31 1.5-1.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH32 0.5-0.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH33 0.5-0.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH34 0.5-0.6	30/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH35 0.5-0.6	30/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH35 1.5-1.6	30/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH36 0.5-0.6	31/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 0.5-0.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 1.5-1.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	**2**	<10	<50
BH37 2.5-2.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH37 3.5-3.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 0.5-0.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 1.5-1.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH38 2.5-2.6	31/10/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 0.5-0.6	31/10/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 1.5-1.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH39 2.5-2.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH40 0.5-0.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	**270**
BH40 1.5-1.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	**100**
BH40 2.5-2.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH40 3.5-3.6	31/10/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	**180**

Table 56 Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers – BH41-BH53

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH41 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH42 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH42 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH42 2.5-2.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 0.5-0.6	5/11/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 1.5-1.6	5/11/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH43 2.5-2.6	5/11/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	**3**	<10	<50
BH43 3.5-3.6	5/11/2018	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 1.5-1.6	5/11/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 2.5-2.6	5/11/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH44 3.5-3.6	5/11/2018	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	**60**
BH45 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH46 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH47 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH47 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH48 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH48 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH49 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH49 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH50 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH50 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH51 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH51 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH52 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH52 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH53 0.5-0.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH53 1.5-1.6	5/11/2018	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

12 SOIL DISPOSAL ASSESSSMENT

12.1 Guidelines

Soil which is excavated from the site for landfill disposal is to be assessed against Information Bulletin 105 (IB105) for Classification and Management of Contaminated Soil for Disposal. The Environmental Protection Authority (EPA) uses 4 categories to classify contaminated soil as per Table 57:

- (Level 1) Fill Material;
- (Level 2) Low Level Contaminated Soil;
- (Level 3) Contaminated Soil; and
- (Level 4) Contaminated Soil.

Fixed numerical values are presented for soil concentrations and leachable fraction concentrations.

12.2 Findings

The soil samples were compared against IB105 guidelines for soil disposal, see Table 58 to

Table 62. Material tested at the site is classified in a range from Level 1 to Level 4 Material with an overall average of Level 2 or below. To accurately manage the excavated material for appropriate disposal, grid soil sampling was conducted. The construction company undertaking the development should review these results, this will assist with soil management on site.

Table 57 Summary of IB105 Classification Guidelines

	Classification (with reference to Table 2)	**Controlled Waste**[1]	**Comments**
Fill Material[2] **(Level 1)**	Soil that exhibits levels of contaminants below the limits defined under *Fill Material* in Table 2.	Unlikely	Soil classified as *Fill Material* can still be a 'pollutant' under the *Environmental Management and Pollution Control Act 1994* and needs to be responsibly managed.
Low Level Contaminated Soil (Level 2)	Soil that exhibits levels of contaminants above the limits defined under *Fill Material* but below the limits defined under *Low Level Contaminated Soil* in Table 2.	Likely	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil (Level 3)	Soil that exhibits levels of contaminants above the limits defined under *Low Level Contaminated Soil* but below the limits defined under *Contaminated Soil* in Table 2.	Yes	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil for Remediation (Level 4)	Soil that exhibits levels of contaminants above the limits defined under *Contaminated Soil* in Table 2 (regardless of the maximum total concentrations) is generally ***not*** considered acceptable for off-site disposal without prior treatment.	Yes	Soil that contains contaminants that do not have criteria for leachable concentrations (*e.g.* petroleum hydrocarbons), and the levels of contaminants exceed the maximum total concentrations listed in *Contaminated Soil*, are generally classified as *Contaminated Soil for Remediation*.

[1] Controlled Waste is defined in the *Environmental Management and Pollution Control Act 1994*.
[2] Criteria for *Fill Material* are the limits set by the Director for the purposes of R.9(2)(a)(ii) in the *Regulations*.

Table 58 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH01-BH20

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
23/07/2018	BH01 1.0-1.1 X	<5	50	<1	<1	8	8	5	35	82	<0.1	7	<5	45	0.6	<10	<50	6.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 2.5-2.6	<5	30	<1	<1	10	15	5	25	25	<0.1	8	<5	1100	5.1	<10	420	77.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 4.4-4.5	6	50	<1	<1	6	54	11	52	846	1	12	<5	66	17.4	<10	1170	152	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 1.0-1.1 X	<5	440	<1	<1	10	46	13	162	236	0.4	13	<5	132	0.6	<10	<50	6.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 2.8-2.9	<5	730	1	<1	16	12	13	56	63	<0.1	12	<5	71	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 4.0-4.1	<5	220	1	<1	22	54	26	7	99	<0.1	22	<5	35	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 0.5-0.6 X	5	140	<1	<1	13	24	14	502	378	0.1	16	<5	118	1.4	<10	<50	17	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 2.5-2.6	<5	260	<1	<1	3	28	10	12	105	<0.1	7	<5	40	7.8	<10	540	83.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 3.9-4.0	<5	70	<1	<1	12	25	11	14	261	<0.1	16	<5	44	8.9	<10	780	119	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 1.5-1.6 X	<5	130	<1	<1	14	35	10	128	301	0.2	14	<5	113	25.6	<10	1360	306	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 3.0-3.1	<5	170	<1	<1	14	35	11	217	224	0.1	14	<5	127	1.7	<10	<50	20.7	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 4.5-4.6	<5	180	<1	<1	12	28	14	136	1040	0.1	27	<5	184	1.5	<10	<50	16.1	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 1.0-1.1 X	<5	60	<1	<1	8	7	7	21	78	<0.1	11	<5	244	<0.5	<10	<50	3.1	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 3.0-3.1	<5	120	<1	2	15	44	21	94	179	0.1	22	<5	322	1.9	<10	<50	22	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 4.5-4.6	<5	100	<1	<1	8	32	17	122	199	0.2	14	<5	102	3.9	<10	110	58.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH06 0.2-0.3 X	<5	150	<1	<1	10	30	10	174	253	0.4	12	<5	168	1.7	<10	<50	22.4	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH07 1.0-1.1 X	<5	230	<1	<1	11	20	11	80	173	0.1	13	<5	161	<0.5	<10	<50	3.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH07 2.2-2.3 X	<5	260	<1	<1	8	17	9	120	309	0.4	7	<5	70	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 1.5-1.6 X	5	40	<1	<1	15	8	9	28	223	<0.1	12	<5	64	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH01 3.5-3.6	<5	20	<1	<1	8	29	14	23	277	<0.1	12	<5	60	12.7	<10	820	131	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 0.5-0.6 X	5	1880	<1	<1	24	37	10	349	297	1.2	12	<5	221	1.8	<10	<50	15.8	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH02 2.0-2.1 X	<5	340	1	<1	12	11	16	82	125	0.2	13	<5	62	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 1.0-1.1 X	6	140	<1	<1	19	44	16	93	308	0.1	17	<5	176	0.9	<10	<50	8.6	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH03 3.0-3.1	<5	80	<1	<1	5	52	10	218	263	<0.1	9	<5	573	17.5	<10	1230	205	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 0.5-0.6 X	<5	110	<1	<1	14	35	18	56	276	0.1	17	<5	236	4.7	<10	310	60.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 2.5-2.6	<5	320	<1	<1	12	25	24	37	576	<0.1	50	<5	74	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH04 3.5-3.6	<5	140	<1	<1	10	26	17	76	441	<0.1	23	<5	130	1	<10	<50	9	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 2.0-2.1 X	<5	140	<1	<1	12	36	19	120	206	0.3	14	<5	111	4.3	<10	270	57.2	<0.2	<0.5	<0.5	<0.5
23/07/2018	BH05 4.0-4.1	<5	150	<1	<1	9	40	12	221	269	0.3	13	<5	280	4.9	<10	490	54.7	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_1.0-1.1 X	<5	50	<1	<1	6	40	8	25	211	<0.1	9	<5	42	25.5	<10	2080	301	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_2.0-2.1 X	<5	60	<1	<1	10	18	6	7	69	<0.1	7	<5	12	1.5	<10	<50	13.8	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_2.5-2.6 X	<5	80	<1	<1	13	30	13	29	210	<0.1	12	<5	20	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH08_4.5-4.6	5	90	<1	<1	11	<5	39	13	171	<0.1	14	<5	31	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_1.0-1.1 X	<5	50	<1	<1	7	33	8	16	257	<0.1	10	<5	40	16.6	<10	1610	161	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_2.5-2.6 X	<5	50	<1	<1	7	20	7	24	377	<0.1	10	<5	30	1	<10	<50	10.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_4.5-4.6	<5	40	<1	<1	4	31	7	15	92	<0.1	5	<5	23	22.8	<10	1470	268	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH09_6.0-6.1	6	120	<1	<1	13	29	11	289	120	0.7	15	<5	170	0.7	<10	<50	8.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_1.0-1.1 X	<5	140	<1	<1	<2	56	30	37	408	<0.1	13	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_3.0-3.1 X	<5	140	<1	<1	9	90	9	114	462	0.6	11	<5	123	1	<10	<50	8.8	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH10_5.0-5.1	<5	70	<1	<1	8	7	16	14	325	<0.1	12	<5	34	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_1.0-1.1 X	7	120	<1	<1	8	55	12	60	202	0.1	11	<5	105	4	<10	560	42.2	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_2.0-2.1 X	<5	100	2	<1	8	17	27	14	294	<0.1	20	<5	61	5.5	<10	520	62	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_2.5-2.6 X	<5	180	<1	<1	11	84	7	256	310	0.8	10	<5	321	1.9	<10	<50	16.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH11_3.3-3.4 X	13	160	2	<1	17	7	42	15	1630	<0.1	47	<5	44	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_1.0-1.1 X	<5	110	<1	<1	9	26	9	49	116	<0.1	9	<5	125	1.2	<10	<50	14.7	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_2.0-2.1 X	<5	100	<1	<1	11	24	12	24	448	<0.1	13	<5	50	<0.5	<10	<50	3.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_2.5-2.6 X	<5	120	<1	<1	3	77	43	9	281	<0.1	7	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/07/2018	BH12_3.5-3.6 X	<5	90	<1	<1	7	33	8	72	236	0.5	9	<5	50	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 1.0-1.1 X	5	80	<1	<1	11	51	10	779	296	0.4	11	<5	44	29.8	<10	3260	496	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 1.5-1.6 X	<5	90	<1	<1	8	44	10	128	252	0.2	12	<5	41	0.8	<10	<50	9.2	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH13 2.0-2.1 X	11	100	1	<1	22	9	16	30	552	<0.1	13	<5	33	0.8	<10	<50	10.3	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH14 0.4-0.5 X	5	100	<1	<1	8	10	11	16	1030	<0.1	11	<5	32	<0.5	<10	3220	0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH15 0.55-0.65 X	6	20	1	<1	14	17	28	14	830	<0.1	42	<5	82	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH16 0.3-0.4 X	<5	20	<1	<1	7	69	11	7	381	<0.1	10	<5	42	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH17 0.5-0.6 X	<5	100	<1	<1	12	40	9	62	167	<0.1	14	<5	107	89.1	<10	4870	1290	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH17 1.1-1.2 X	12	1620	1	<1	12	9	18	17	111	<0.1	33	<5	57	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 0.5-0.6 X	<5	120	<1	<1	14	22	13	46	239	<0.1	14	<5	72	0.5	<10	<50	3.6	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 1.5-1.6 X	5	170	<1	<1	15	35	18	123	242	0.4	22	<5	242	3.4	<10	460	34.4	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 2.5-2.6 X	<5	80	<1	<1	34	60	29	7	517	<0.1	28	<5	103	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 2.7-2.8 X	<5	310	<1	<1	17	136	12	1160	199	4.5	23	<5	593	1.6	<10	210	14.8	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 3.1-3.2	5	180	<1	<1	16	96	10	479	194	1.5	15	<5	293	1.3	<10	<50	11.1	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH18 3.5-3.6	6	130	1	<1	11	<5	18	11	256	<0.1	19	<5	27	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH19 1.0-1.1 X	<5	150	<1	<1	4	58	11	56	179	<0.1	5	<5	66	<0.5	<10	<50	1.3	<0.2	<0.5	<0.5	<0.5
25/07/2018	BH19 2.1-2.2 X	6	80	1	<1	15	10	14	10	109	<0.1	19	<5	33	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/07/2018	BH20 0.5-0.6 X	<5	40	<1	<1	9	23	4	18	91	<0.1	7	<5	40	1.1	<10	<50	10.2	<0.2	<0.5	<0.5	<0.5
30/07/2018	BH20 1.0-1.1 X	<5	120	<1	<1	13	25	9	114	212	0.5	11	<5	117	<0.5	<10	<50	1.6	<0.2	<0.5	<0.5	<0.5
Averaging		<5	180	<1	<1	12	35	14	105	300	0.2	14	<5	135	5.5	<10	450	70	<0.2	<0.5	<0.5	<0.5

Note no Leachate testing.
It is likely that if testing had been conducted the metals would come down to Level 1. And Benzo(a)pyrene would come down to Level 2.
Level 1 is not achievable for Benzo(a)pyrene as no test exist to meet the conservative guideline.
C^{10}-C^{36} Total Recoverable Hydrocarbon results will not change with leachate testing either.

Table 59 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH21-BH40 plus GT01-BT03

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
24/10/2018	BH21 0.5-0.6 X	<5	50	<1	<1	15	172	11	27	168	<0.1	16	<5	41	14.3	<10	880	150	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 1.5-1.6 X	<5	70	<1	<1	8	11	6	77	128	<0.1	7	<5	57	0.8	<10	190	6.1	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 2.5-2.6	<5	50	<1	<1	<2	94	19	11	465	<0.1	6	<5	42	1.9	<10	<50	14.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 3.5-3.6	<5	40	<1	<1	4	78	19	5	436	0.1	12	<5	32	0.6	<10	<50	2.7	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 4.5-4.6	<5	70	<1	<1	9	82	26	17	478	<0.1	15	<5	46	6.1	<10	<50	43.4	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH21 5.5-5.6	<5	60	<1	<1	6	70	17	32	355	<0.1	10	<5	81	4.6	<10	<50	42.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 0.5-0.6 X	<5	150	<1	<1	12	30	20	90	243	0.2	20	<5	122	4.1	<10	120	44.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 1.5-1.6 X	<5	90	<1	<1	14	48	24	32	256	0.2	16	<5	48	<0.5	<10	<50	0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 2.5-2.6	<5	90	<1	<1	25	58	23	<5	358	<0.1	24	<5	37	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH22 3.4-3.5	<5	80	<1	<1	24	57	18	12	428	<0.1	25	<5	44	<0.5	<10	<50	1.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 0.5-0.6 X	6	130	<1	<1	16	56	12	141	298	0.2	24	<5	116	6.7	<10	630	77.7	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 1.5-1.6 X	<5	150	<1	<1	17	41	12	175	310	0.2	22	<5	302	3.8	<10	<50	45	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 2.5-2.6	<5	100	<1	<1	10	39	10	220	180	0.1	11	<5	123	166	<10	5790	2080	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 3.5-3.6	<5	3730	<1	<1	10	2410	21	186	405	0.1	13	<5	208	2.5	<10	530	27	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 4.5-4.6	5	140	1	<1	11	18	18	16	1090	<0.1	21	<5	63	2.2	<10	<50	22.2	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH23 5.5-5.6	9	80	<1	<1	11	39	13	42	630	0.1	16	<5	134	45.2	<10	2510	472	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 0.5-0.6 X	<5	100	<1	<1	12	21	11	70	227	0.1	16	<5	120	4.8	<10	260	52.9	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 1.5-1.6 X	<5	160	<1	<1	19	15	9	31	222	<0.1	13	<5	51	<0.5	<10	<50	0.6	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 2.5-2.6	<5	170	<1	<1	24	16	14	22	455	<0.1	20	<5	56	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH24 3.3-3.4	<5	200	1	<1	17	42	19	212	518	0.6	22	<5	220	0.7	<10	<50	5.1	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 0.5-0.6 X	<5	210	<1	<1	8	25	16	49	305	<0.1	15	<5	114	0.9	<10	<50	15.3	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 1.5-1.6 X	<5	80	<1	<1	16	40	25	8	142	<0.1	20	<5	33	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 2.5-2.6 X	<5	160	2	<1	8	29	57	50	165	0.1	12	<5	38	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 3.5-3.6	<5	160	<1	<1	12	26	20	138	210	0.4	18	<5	134	2.2	<10	280	24.8	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 4.5-4.6	<5	170	<1	<1	12	43	17	460	372	0.3	19	<5	215	14.9	<10	770	153	<0.2	<0.5	<0.5	<0.5
24/10/2018	BH25 5.5-5.6	<5	20	<1	<1	4	<5	<2	6	28	<0.1	<2	<5	<5	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH26 0.1-0.2 X	<5	30	<1	<1	6	23	4	14	56	<0.1	4	<5	30	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH26 0.5-0.6 X	16	310	2	<1	16	11	31	17	221	<0.1	42	<5	52	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 0.1-0.2 X	<5	90	<1	<1	6	46	10	28	255	<0.1	6	<5	59	1.1	<10	<50	12.7	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 0.5-0.6 X	21	100	1	<1	17	21	16	43	194	<0.1	15	<5	80	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.0-1.1 X	<5	120	<1	<1	9	38	16	278	215	0.2	18	<5	75	5.6	<10	320	35.4	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.5-1.6 X	14	30	2	<1	14	6	23	10	422	<0.1	34	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH27 1.9-2.0 X	14	40	<1	<1	20	7	22	12	1500	<0.1	38	<5	53	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 0.1-0.2 X	<5	30	<1	<1	8	<5	<2	6	30	<0.1	3	<5	12	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 0.5-0.6 X	<5	80	<1	<1	18	21	16	34	314	<0.1	20	<5	72	1.2	<10	<50	11.2	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 1.0-1.1 X	<5	30	<1	<1	12	<5	2	12	124	<0.1	6	<5	43	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
29/10/2018	BH28 1.2-1.3 X	<5	80	<1	<1	8	18	11	81	190	0.4	9	<5	456	7.3	<10	550	88.4	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 0.5-0.6 X	<5	100	<1	<1	8	43	13	70	345	<0.1	14	<5	112	4.6	<10	440	51.3	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 1.5-1.6 X	<5	110	<1	<1	11	25	9	78	249	0.3	10	<5	86	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH29 2.1-2.2 X	<5	70	<1	<1	10	6	12	10	150	<0.1	11	<5	23	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH30 0.3-0.4 X	<5	100	<1	<1	12	23	12	53	316	0.1	16	<5	100	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH31 0.5-0.6 X	7	70	<1	<1	12	9	12	19	134	<0.1	13	<5	61	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH31 1.5-1.6 X	6	100	<1	<1	13	7	17	12	584	<0.1	28	<5	58	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH32 0.5-0.6 X	<5	90	<1	<1	14	13	6	21	136	<0.1	13	<5	36	1.1	<10	<50	8.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH33 0.5-0.6 X	<5	80	<1	<1	9	6	4	15	80	<0.1	6	<5	20	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH34 0.5-0.6 X	<5	380	<1	<1	15	6	8	10	45	<0.1	10	<5	16	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH35 0.5-0.6 X	<5	140	<1	<1	12	32	11	152	267	0.2	12	<5	163	2.7	<10	270	29.1	<0.2	<0.5	<0.5	<0.5
30/10/2018	BH35 1.5-1.6 X	<5	180	<1	<1	11	44	15	82	346	0.2	17	<5	130	1.6	<10	<50	19	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH36 0.5-0.6 X	<5	100	<1	<1	17	40	19	10	624	<0.1	17	<5	40	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 0.5-0.6 X	13	160	<1	<1	13	67	12	231	295	1	14	<5	367	6.8	<10	470	63.8	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 1.5-1.6 X	<5	40	<1	<1	14	30	12	42	112	<0.1	11	<5	73	7.4	<10	430	105	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 2.5-2.6 X	9	240	1	1	25	9	11	53	350	<0.1	16	<5	40	2	<10	110	29.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH37 3.5-3.6	<5	20	<1	<1	15	11	12	18	238	<0.1	15	<5	44	3	<10	120	42.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 0.5-0.6 X	<5	70	<1	<1	14	13	15	57	356	0.2	13	<5	45	1.3	<10	<50	11.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 1.5-1.6 X	<5	170	<1	<1	9	14	17	89	174	<0.1	13	<5	108	0.7	<10	<50	5.2	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH38 2.5-2.6 X	<5	70	<1	<1	14	14	11	14	165	<0.1	14	<5	40	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 0.5-0.6 X	<5	60	<1	<1	13	18	10	42	301	0.1	16	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 1.5-1.6 X	<5	80	<1	<1	15	24	7	36	146	<0.1	9	<5	71	2.2	<10	<50	28.2	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH39 2.5-2.6 X	<5	50	<1	1	8	198	8	359	176	<0.1	10	<5	227	19	<10	1120	229	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 0.5-0.6 X	<5	30	<1	<1	6	60	10	12	267	<0.1	12	<5	34	76.6	<10	7370	1060	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 1.5-1.6 X	<5	50	<1	<1	6	70	18	46	353	<0.1	14	<5	62	37.4	<10	2470	371	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 2.5-2.6 X	<5	60	<1	<1	9	14	13	15	183	<0.1	17	<5	60	1.6	<10	<50	14.3	<0.2	<0.5	<0.5	<0.5
31/10/2018	BH40 3.5-3.6 X	<5	40	<1	<1	9	51	14	22	272	<0.1	14	<5	51	59.6	<10	4280	621	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 0.5-0.6 X	<5	640	1	<1	12	10	19	31	112	<0.1	15	<5	51	1.3	<10	<50	14	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 1.5-1.6 X	<5	100	<1	<1	9	20	9	101	167	0.4	11	<5	76	9.4	<10	410	80.9	<0.2	<0.5	<0.5	<0.5
17/10/2018	GT01	----	----	----	----	----	----	----	----	----	----	----	----	----	6.7	----	----	101	----	----	----	----
17/10/2018	GT02	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	12.5	----	----	----	----
17/10/2018	GT03	----	----	----	----	----	----	----	----	----	----	----	----	----	9.1	----	----	136	----	----	----	----
Averaging		<5	150	<1	<1	12	65	14	65	285	0.1	14	<5	85	8.5	<10	500	100	<0.2	<0.5	<0.5	<0.5

Table 60 Soil Analytical Results Compared Against IB105 Leachate Investigation Limits for soil Disposal – BH21-BH40

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal Leachable Fraction *Italic/** - Based On Soil (Total) Limit **Bold** - Based On Leach Limit		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Hexavalent Chromium	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin + Dieldrin	DDT + DDD + DDE	Benzo(a)pyrene	Phenol	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Benzo(a)pyrene (TEQ)	Polychlorinated biphenyls (PCB's)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Cyanide	Fluoride
Unit		mg/L	mg/L	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	µg/L	µg/L	µg/L	µg/L			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
LOR		0.1	0.1	0.1	0.1	0.1		0.1		0.1	0.1	0.001	0.1	0.1	0.1	0.1		0.1	0.5	0.5	0.5	1			0.5	1	1	2	2	2	0	0.1
Investigation Level Selected																																
IB105 Level 1																																
IB105 Level 2		<0.5	<35	<1	<0.1	<0.5		<10		<0.5	<25	<0.01	<2.5	<1	<0.1	<0.5		<25	<3	<200	<0.5	<14000			<0.5	<1	<50	<1400	<3000	<5000	<1	<15
IB105 Level 3		0.5	35	1	0.1	0.5		10		0.5	25	0.01	2.5	1	0.1	0.5		25	3	200	0.5	14000			0.5	1	50	1400	3000	5000	1	15
IB105 Level 4		5	350	4	0.5	5		100		5	250	0.1	20	8	1	5		250	30	2000	5	50000				2	500	14000	30000	50000	10	150
24/10/2018	BH21 0.5-0.6 X							*													<0.5				<0.5							
24/10/2018	BH21 1.5-1.6 X																				*											
24/10/2018	BH21 2.5-2.6																				*											
24/10/2018	BH21 3.5-3.6																				*											
24/10/2018	BH21 4.5-4.6																				<0.5				<0.5							
24/10/2018	BH21 5.5-5.6																				<0.5				<0.5							
24/10/2018	BH22 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH22 1.5-1.6 X																															
24/10/2018	BH22 2.5-2.6																															
24/10/2018	BH22 3.4-3.5																															
24/10/2018	BH23 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH23 1.5-1.6 X																	*			<0.5				<0.5							
24/10/2018	BH23 2.5-2.6																				<0.5			*	<0.5							
24/10/2018	BH23 3.5-3.6		**0.8**					**2.9**										*			<0.5				<0.5							
24/10/2018	BH23 4.5-4.6										*										<0.5				<0.5							
24/10/2018	BH23 5.5-5.6										*										<0.5			*	<0.5							
24/10/2018	BH24 0.5-0.6 X																				<0.5				<0.5							
24/10/2018	BH24 1.5-1.6 X																															
24/10/2018	BH24 2.5-2.6																															
24/10/2018	BH24 3.3-3.4										*							*			*											
24/10/2018	BH25 0.5-0.6 X																				*											
24/10/2018	BH25 1.5-1.6 X																															
24/10/2018	BH25 2.5-2.6 X			*																												
24/10/2018	BH25 3.5-3.6																				<0.5				<0.5							
24/10/2018	BH25 4.5-4.6									*								*			<0.5				<0.5							
24/10/2018	BH25 5.5-5.6																															
29/10/2018	BH26 0.1-0.2 X																															
29/10/2018	BH26 0.5-0.6 X		*	*																												
29/10/2018	BH27 0.1-0.2 X																				*											
29/10/2018	BH27 0.5-0.6 X	*																														
29/10/2018	BH27 1.0-1.1 X																				<0.5				<0.5							
29/10/2018	BH27 1.5-1.6 X			*																												
29/10/2018	BH27 1.9-2.0 X										*																					
29/10/2018	BH28 0.1-0.2 X																															
29/10/2018	BH28 0.5-0.6 X																				*											
29/10/2018	BH28 1.0-1.1 X																															
29/10/2018	BH28 1.2-1.3 X																	*			<0.5				<0.5							
30/10/2018	BH29 0.5-0.6 X																				<0.5				<0.5							
30/10/2018	BH29 1.5-1.6 X																															
30/10/2018	BH29 2.1-2.2 X																															
30/10/2018	BH30 0.3-0.4 X																															
30/10/2018	BH31 0.5-0.6 X																															
30/10/2018	BH31 1.5-1.6 X										*																					
30/10/2018	BH32 0.5-0.6 X																				*											
30/10/2018	BH33 0.5-0.6 X																															
30/10/2018	BH34 0.5-0.6 X		*																													
30/10/2018	BH35 0.5-0.6 X																				<0.5				<0.5							
30/10/2018	BH35 1.5-1.6 X																				*											
31/10/2018	BH36 0.5-0.6 X										*																					
31/10/2018	BH37 0.5-0.6 X											*						*			<0.5				<0.5							
31/10/2018	BH37 1.5-1.6 X																				<0.5				<0.5							
31/10/2018	BH37 2.5-2.6 X																				<0.5				<0.5							
31/10/2018	BH37 3.5-3.6																				<0.5				<0.5							
31/10/2018	BH38 0.5-0.6 X																				*											
31/10/2018	BH38 1.5-1.6 X																				*											
31/10/2018	BH38 2.5-2.6 X																															
31/10/2018	BH39 0.5-0.6 X																															
31/10/2018	BH39 1.5-1.6 X																				<0.5				<0.5							
31/10/2018	BH39 2.5-2.6 X							*		*								*			<0.5			*	<0.5							
31/10/2018	BH40 0.5-0.6 X																				<0.5			*	<0.5							
31/10/2018	BH40 1.5-1.6 X																				<0.5			*	<0.5							
31/10/2018	BH40 2.5-2.6 X																				*											
31/10/2018	BH40 3.5-3.6 X																				<0.5			*	<0.5							

Table 61 Soil Analytical Results Compared Against IB105 Total Solids Investigation Limits for soil Disposal – BH41-BH53

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
5/11/2018	BH41 0.5-0.6 X	<5	30	<1	<1	6	75	20	9	319	<0.1	15	<5	32	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 0.5-0.6 X	<5	50	<1	<1	7	38	11	17	188	<0.1	13	<5	39	18.9	<10	1300	185	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 1.5-1.6 X	<5	30	<1	<1	6	45	25	13	354	<0.1	18	<5	62	66.4	<10	3430	648	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH42 2.5-2.6 X	<5	120	<1	<1	8	30	6	84	379	1	12	<5	45	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 0.5-0.6 X	<5	90	<1	<1	6	35	10	67	196	0.1	7	<5	95	3.8	<10	110	42.1	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 1.5-1.6 X	<5	110	<1	<1	9	21	11	11	291	<0.1	13	<5	36	13.4	<10	650	114	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 2.5-2.6 X	<5	90	<1	<1	9	21	12	110	239	<0.1	12	<5	37	4.1	<10	140	45.2	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH43 3.5-3.6 X	<5	50	<1	<1	4	78	15	23	351	<0.1	10	<5	53	12	<10	520	112	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 0.5-0.6 X	<5	80	<1	<1	12	6	10	16	62	<0.1	12	<5	41	5.1	<10	370	63.1	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 1.5-1.6 X	<5	40	<1	<1	5	68	12	18	263	<0.1	11	<5	39	33	<10	1710	284	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 2.5-2.6 X	<5	40	<1	<1	5	61	11	29	218	<0.1	10	<5	33	21.6	<10	1680	173	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH44 3.5-3.6 X	<5	50	<1	<1	6	52	12	34	230	<0.1	10	<5	43	60.3	<10	3400	639	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH45 0.5-0.6 X	<5	100	<1	<1	11	66	9	83	216	0.2	13	<5	134	8.2	<10	400	98.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH46 0.5-0.6 X	7	170	<1	<1	17	187	13	223	294	0.3	20	<5	221	3.7	<10	240	37.8	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH47 0.5-0.6 X	<5	200	<1	<1	9	41	35	179	242	0.5	18	<5	373	6	<10	400	51.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH47 1.5-1.6 X	<5	80	<1	<1	16	50	16	24	540	<0.1	20	<5	77	8.3	<10	680	97.2	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH48 0.5-0.6 X	<5	140	<1	<1	7	95	26	154	344	0.2	17	<5	265	7.7	<10	520	66.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH48 1.5-1.6 X	<5	130	<1	<1	10	59	9	180	232	0.4	12	<5	254	14.3	<10	1370	107	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH49 0.5-0.6 X	8	60	<1	<1	38	39	13	26	923	<0.1	23	<5	65	1.1	<10	<50	5.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH49 1.5-1.6 X	<5	220	1	<1	12	11	28	22	1070	<0.1	25	<5	77	0.9	<10	<50	6.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH50 0.5-0.6 X	<5	60	<1	<1	19	20	23	25	591	<0.1	22	<5	67	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH50 1.5-1.6 X	5	80	<1	<1	10	13	13	17	350	<0.1	16	<5	47	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 0.5-0.6 X	<5	640	1	<1	12	10	19	31	112	<0.1	15	<5	51	1.3	<10	<50	14	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH51 1.5-1.6 X	<5	100	<1	<1	9	20	9	101	167	0.4	11	<5	76	9.4	<10	410	80.9	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH52 0.5-0.6 X	6	140	<1	<1	32	21	12	18	868	<0.1	26	<5	61	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH52 1.5-1.6 X	6	120	<1	<1	15	17	11	18	406	<0.1	17	<5	57	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH53 0.5-0.6 X	<5	200	2	<1	16	28	24	25	510	<0.1	32	<5	70	<0.5	<10	<50	1.6	<0.2	<0.5	<0.5	<0.5
5/11/2018	BH53 1.5-1.6 X	<5	30	<1	<1	12	16	5	49	122	<0.1	7	<5	30	<0.5	<10	<50	2.2	<0.2	<0.5	<0.5	<0.5
Averaging		<5	120	<1	<1	12	45	16	55	360	0.1	16	<5	90	11	<10	650	103	<0.2	<0.5	<0.5	<0.5

Table 62 Soil Analytical Results Compared Against IB105 Leachate Investigation Limits for soil Disposal – BH41-BH53

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal Leachable Fraction *Italic/** - Based On Soil (Total) Limit **Bold** - Based On Leach Limit		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Hexavalent Chromium	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin + Dieldrin	DDT + DDD + DDE	Benzo(a)pyrene	Phenol	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Benzo(a)pyrene (TEQ)	Polychlorinated biphenyls (PCB's)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Cyanide	Fluoride
Unit		mg/L	mg/L	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	µg/L	µg/L	µg/L	µg/L			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
LOR		0.1	0.1	0.1	0.1	0.1		0.1		0.1	0.1	0.001	0.1	0.1	0.1	0.1		0.1	0.5	0.5	0.5	1			0.5	1	1	2	2	2	0	0.1
Investigation Level Selected																																
IB105 Level 1																																
IB105 Level 2		<0.5	<35	<1	<0.1	<0.5		<10		<0.5	<25	<0.01	<2.5	<1	<0.1	<0.5		<25	<3	<200	<0.5	<14000			<0.5	<1	<50	<1400	<3000	<5000	<1	<15
IB105 Level 3		0.5	35	1	0.1	0.5		10		0.5	25	0.01	2.5	1	0.1	0.5		25	3	200	0.5	14000			0.5	1	50	1400	3000	5000	1	15
IB105 Level 4		5	350	4	0.5	5		100		5	250	0.1	20	8	1	5		250	30	2000	5	50000				2	500	14000	30000	50000	10	150
5/11/2018	BH41 0.5-0.6 X																															
5/11/2018	BH42 0.5-0.6 X																				<0.5			*	<0.5							
5/11/2018	BH42 1.5-1.6 X																				<0.5			*	<0.5							
5/11/2018	BH42 2.5-2.6 X											*																				
5/11/2018	BH43 0.5-0.6 X																				<0.5				<0.5							
5/11/2018	BH43 1.5-1.6 X																				<0.5				<0.5							
5/11/2018	BH43 2.5-2.6 X																				<0.5				<0.5							
5/11/2018	BH43 3.5-3.6 X																				<0.5				<0.5							
5/11/2018	BH44 0.5-0.6 X																				<0.5				<0.5							
5/11/2018	BH44 1.5-1.6 X																				<0.5			*	<0.5							
5/11/2018	BH44 2.5-2.6 X																				<0.5			*	<0.5							
5/11/2018	BH44 3.5-3.6 X																				<0.5			*	<0.5							
5/11/2018	BH45 0.5-0.6 X																				<0.5				<0.5							
5/11/2018	BH46 0.5-0.6 X							*										*			<0.5				<0.5							
5/11/2018	BH47 0.5-0.6 X																	*			<0.5				<0.5							
5/11/2018	BH47 1.5-1.6 X										*										<0.5				<0.5							
5/11/2018	BH48 0.5-0.6 X																	*			<0.5				<0.5							
5/11/2018	BH48 1.5-1.6 X																	*			<0.5			*	<0.5							
5/11/2018	BH49 0.5-0.6 X										*										*											
5/11/2018	BH49 1.5-1.6 X										*										*											
5/11/2018	BH50 0.5-0.6 X										*																					
5/11/2018	BH50 1.5-1.6 X																															
5/11/2018	BH51 0.5-0.6 X		*																		*											
5/11/2018	BH51 1.5-1.6 X																				<0.5				<0.5							
5/11/2018	BH52 0.5-0.6 X										*																					
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5/11/2018	BH53 0.5-0.6 X			*							*																					
5/11/2018	BH53 1.5-1.6 X																															

13 CONCEPTUAL SITE MODEL

13.1 Primary Sources of Contamination

13.1.1 Confirmed Primary Source

Primary sources of contamination have been identified on site as the following:

- Imported fill, largely covering *52 New Town Road* and up to a thickness of 6m.
- Underground refueling infrastructure relating to the operation of a former service station at *48-50 New Town Road.*

13.1.2 Potential Primary Sources

There are two off site potential primary sources of hydrocarbon groundwater contamination; the two former service stations at 30-36 New Town Road (currently a V*ideo City*) and 466 Elizabeth Street (currently a *Hill Street Grocer*).

There may be unknown potential sources of onsite or offsite impact (outside of the sampling areas) which GES are unaware of and therefore have not been investigated within this assessment.

13.2 Potential Secondary Sources of Contamination

A potential secondary source of contamination would be contaminated groundwater from the two former service stations at 30-36 New Town Road and 466 Elizabeth Street.

13.3 Potential Receptors

The following presents a summary of all potential receptors considered in the assessment.

13.3.1 Potential Ecological Receptors

There are no onsite ecological receptors. The following offsite ecological receptors have been identified:

- Maypole Creek which is 1.7 km to the north near Risdon Road; and
- The Derwent River at Cornelian Bay which is 2.12 km from the site.

There is the potential for these receptors to be impacted from contamination derived from the site if an adequate soil and water management plan is not in place for the site to protect stormwater from sediments and potentially groundwater discharge.

13.3.2 Potential Human Receptors

Potential current and future onsite human receptors are depictured in Figure 12 and discussed in Table 63.

13.4 Transport Mechanisms and Exposure Pathways

Transport Mechanisms considered as part of the CSM are presented in Figure 12 and include:

- Direct contact – human contact of soil to skin
- Wind erosion
- Stormwater/ surface runoff
- Leaching of heavy metals from the soil
- Volatile hydrocarbon vapours sourcing from contaminated groundwater.

Exposure Pathways considered at the site are presented in Figure 12 and include:

- Dermal contact
- Dust Inhalation and Soil Ingestion
- Stormwater drains; and
- Indoor vapour inhalation

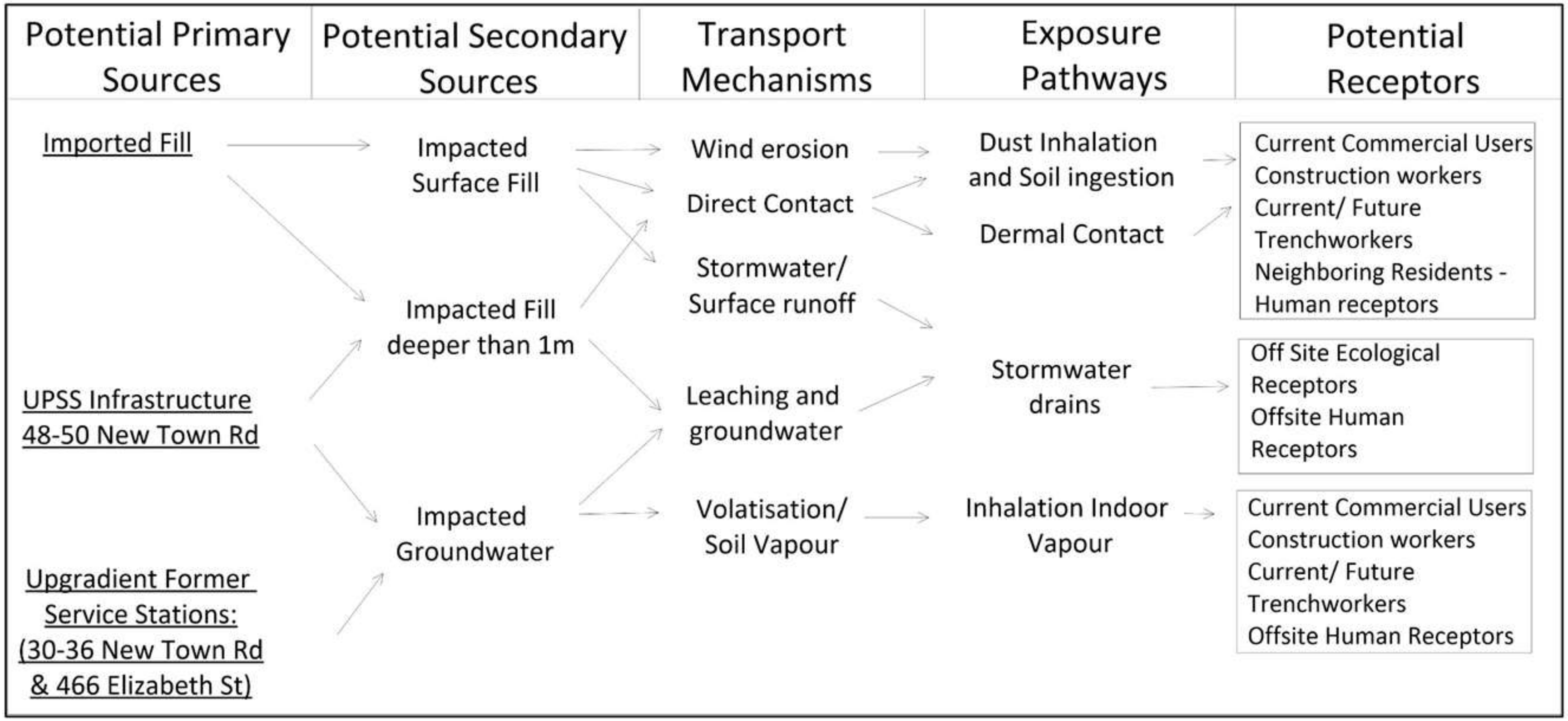

Figure 12 Conceptual Site Model

Table 63 Summary of Potential Receptors

Medium	Specific Receptor	Exposure risk/ Management Strategies
Soil and Deep Soil Impact (to depths of up to 4 m below ground surface)	Current Commercial Workers	• Low risk; current commercial workers under regular circumstances have no reason to come in contact with soil. • As a precaution, Managers should be notified that there may be surface soil contamination and that staff should avoid contact or wash hands thoroughly after contact has occurred.
	Construction workers	• Contamination has been identified in the soil. • As identified in the Contamination Management Plan (CMP), construction workers should be informed of the site contamination during their site induction and a copy of the CMP should be made available within the site office for viewing. • Post construction if contamination is still present then the recommendations in the CMP will still apply.
	Future onsite inhabitants - commercial workers	• Although much of the contaminated material will be removed, measures will need to be put in place to ensure all surfaces are sealed as identified in the CMP. This includes garden beds, lawns, etc.
	Off site Human Receptors	• Neighboring Residence – Dust exposure during construction. CMP to be followed by construction workers to minimise dust and particle movement from the site.
	Ecosystem	• Much of the soil at the site exceeds ESL's for commercial land use and therefore care will need to be taken to ensure no soil is to erode offsite into the stormwater systems. This is to be addressed in a separate soil and water management plan for the site works.
Groundwater Impact	Current Commercial Workers	• Potential vapour risk inside existing building from existing tank. • Although groundwater contamination has been identified, no vapour risk has been identified.
	Future construction workers	• Although groundwater contamination has been identified, no vapour risk has been identified. • As a precaution the CMP should be followed, and workers should follow best practices for working in confined spaces including a buddy system and specalised air monitoring equipment. • Preliminary findings indicate some groundwater at the site is has extremely high concentrations of benzo(a)pyrene which will present a soil and water ingestion risk. Drinking water guidelines are exceeded by over 1,000,000 for benzo(a)pyrene.
	Future onsite inhabitants - commercial workers	• Although groundwater contamination has been identified, no vapour risk has been identified. • As a precaution, once the new building is complete, if it is deemed necessary indoor vapour monitoring may be required to ensure that the spaces are safe to inhabit.
	Offsite Human Receptors	• Although groundwater contamination has been identified, no vapour risk has been identified.
	Ecological receptors	• Groundwater at the site exceeds guideline limits for assessing risk to freshwater and marine water environments. As addressed in the CMP, water monitoring will be required in a separate assessment during site works to identify the risks.
Surface waters	Ecological receptors	• Surface waters moving over the site may also exceed guidelines for assessing risk to waterways. As addressed in the CMP, water monitoring will be required in a separate assessment during site works to identify the risks.

14 CONCLUSIONS

14.1 Desktop Assessment

From the desktop assessment, it is concluded that:

- The geology of the site is Triassic sediments of interbedded sandstone and mudstone.
- The site is situated 56-60m above sea level. The north-western portion of the site is covered by a levelled grassed area.
- All surface waters from the site discharge into the street stormwater drains. The hydrogeology of the area is likely to consist of groundwater moving parallel with slope to the north towards the Maypole Creek which is approximately 1.7 km away. It is unlikely that any potential impact from the site would impact downgradient ecosystem receptors, given the spatial separation.
- The EPA Tasmania identified one property as a host to potentially contaminating activity, it is located 100m south of the site, at 30-36 New Town Road which hosted a former Caltex Service Station.
- The following information was apparent from the listed the historical aerial photographs;
  - '*48-50 New Town Road'* hosted a service station from prior to 1957 to approximately 1970; by 1973 a new building was constructed, and it remains to this day; a total of 4 bowsers were identified in the photographs.
  - *'52 New Town Road'* was a vacant block in 1957. By 1965 the current building plus attached warehouse buildings were constructed. There is a potential refueling bowser in the rear carpark, but it is unclear from the aerial photograph alone.
  - *30-36 New Town Road* hosted a service station between 1965-2000.
  - 466 Elizabeth Street hosted a service station between 1965-2000.
- WorkSafe Tasmania, provided four (4) records relating to dangerous substances held at *'52 New Town Road'* for 2000 gallon underground super spirit tank with a S/E pump later referred to as a 5.4 k/l tank plus a 1150 L on-ground tank for Diesoleum (situated above the generator building). WorkSafe Tasmania provided a site plan for '*48-52 New Town Road'*. BP Australia was mentioned in several of the documents.
- The HCC was contacted on the 9 July 2018. The councils register of potentially contaminated sites confirmed the following: '*48 New Town Road, operated as a "retail activity" from 1975-1989 as Tasmanian Television Ltd and COR/BP with the potential contaminant listed as Hydrocarbons.'*
- Given urban setting and absence of any native vegetation, there is a distinct lack of sensitive ecological receptors in the vicinity of the site.
- Registered water bores are a substantial distance from the site and are not considered to be impacted by any contamination at the site.
- The following areas of potential concern have been identified at the site:
  - All imported fill at the site, mostly at *52 New Town Road*;
  - The entire title of *48-50 New Town Road* was a former service station; and
  - The two service stations upgradient to the site at *30-36 New Town Road* and *466 Elizabeth Street*. It is likely that there was vehicle servicing and maintenance workshops associated with all of these service stations.
- COPC encountered at the site relate to the activities mentioned above and include the following:
  TPH/TRH, BTEXN, PAHs and up to 15 Metals

14.2 Adopted Land Use Settings

The following investigation limits of Commercial/ Industrial guidelines were adopted for the site:

- Ecosystem – commercial/ Industrial use;
- Future land users access to soil – limited as the footprint of the proposed development will cover the entire site including the two lowest levels will be a concrete paved carpark therefore:
    - HIL D for soil ingestion and inhalation and
    - HSL D for dermal contact;
- Future land users vapour inhalation risk – HSL D;
- Site development works:
    - HSL D for vapour intrusion risk based on commercial land use;
    - Standard guidelines for assessing dermal contact risk; and
    - HIL D for assessing dust inhalation and soil ingestion risk
    - HIL A for assessing dermal contact and dust inhalation and soil ingestion risk to neighboring residential receptors
- Contamination exposure to trench workers:
    - HSL D for vapour intrusion risk based on commercial land use;
    - Standard guidelines for assessing dermal contact risk; and
    - HIL D for assessing dust inhalation and soil ingestion risk

14.3 Soil Assessment

From the soil assessment, it is concluded that:

- Many of the soil samples collected from the site had elevated levels of Polynuclear Aromatic Hydrocarbons in the form of Benzo(a)pyrene (Ecological Screening Levels) plus 1 exceedance for copper (Ecological Investigation Levels).
- Given the Health Screening Levels for *dermal contact* risk are not exceeded in any of the soil samples, there is a low risk to all current commercial workers, construction workers and trench workers during construction or future onsite inhabitants or trench workers in terms of dermal contact;
- There were commercial Health Investigation Level D guideline exceedance for assessing *soil ingestion and dust inhalation* risk in ten soil samples for benzo(a)pyrene and PAH's. 43% of soil samples collected at the site exceeded HIL A guidelines for assessing risk to neighboring residents as a result of exceedances from benzo(a)pyrene, PAH's and lead.
- There were no petroleum vapour intrusion risks identified in soil samples (*PVI* Health Screening Levels) which may indicate a risk to site development workers, future onsite inhabitants and future trench workers.
- Material tested at the site is classified under the *Information Bulletin 105* in a range from Level 1 to Level 4 Material with an overall average of Level 2. To accurately manage the excavated material for appropriate disposal, additional soil sampling may be required to be conducted by a suitably experienced environmental consultant.

14.4 Groundwater Assessment

The following conclusions have been made from the groundwater investigation:

- The results indicate that the underground refueling infrastructure relating to the former service station has been compromised overtime probably onsite and possibly upgradient as well;
- No free phase hydrocarbons was identified which suggests that the groundwater contamination is historic;
- Although there were low level detections of hydrocarbons there was no indoor vapour risk identified. Future investigations may be required once the new building is completed;
- Small amounts of trace metals are present in the groundwater and naphthalene exceeded freshwater and marine guideline limits; and
- Although high concentrations of benzo(a)pyrene are present, in accordance with the State Policy on Water Quality Management 1997 and ANZECC (2000) guidelines, an environmental or human health risk is not identified.

14.5 Concluding Summary

The following conclusions have been made from the current investigation:

- In accordance with the Interim Planning Scheme, it is identified from the site assessment that the site is considered a contaminated site and therefore will require a Contamination Management Plan (CMP) prior to the commencement of excavation works to address specific protection measures for human health and the environment;
- Without adequate management (through a CMP), elevated levels of lead and benzo(a)pyrene are present in the fill at the site may pose a risk to:
  - Human health both onsite and offsite during development works through dust inhalation and soil ingestion; and
  - The environment as a result of sediment erosion into the waterways
- It is quite plausible that there is secondary groundwater contamination sourcing from the upgradient former service stations, given 30-36 New Town Road is closer to the site, approximately 100m it is most probably source.
- Elevated levels of naphthalene, benzo(a)pyrene and some other metals are present in the groundwater which may pose a risk human health and the environment without adequate management (through a CMP)
- Given the CMP is put in place and recommendations are adhered to, the site will be suitable for the proposed use/development as a Medical Centre and commercial tenancy.
- In terms of soil disposal; elevated levels of barium, beryllium, lead, manganese, mercury, zinc, copper and benzo(a)pyrene and hydrocarbons have been identified and will require careful consideration when managing.
- The remaining UPSS infrastructure on site is currently a potential ongoing source for hydrocarbon contamination; and
- The proposed site redevelopment will involve the excavation of large volumes of fill from the site at the site which will remove most of the contaminated material at site.

15 RECOMMENDATIONS

GES recommends the following work should be undertaken at the site in relation to contamination investigations mitigation and remediation measures;

- Additional desktop investigations should be undertaken to review decommissioning and potential contamination reports at 30-36 New Town Road and 466 Elizabeth Street.
- All current construction workers and trench workers should be informed of the site contamination during their site induction as identified within the Contamination Management Plan (CMP)
- A CMP should be made available to all contractors prior to the commencement of excavation works. The CMP should include but not be limited to the following:
    - Soil management considerations including dust, wind, and water erosion in terms of human health and the environment;
    - Consideration to the duration of stockpile exposure and physical barriers to stockpiles plus standard building site security fencing
    - Classification and management advice in accordance with EPA IB105.
- The known source of hydrocarbon contamination; the underground fuel tank and associated infrastructure at *48-50 New Town Road*, should be removed as soon as practically possible. A Tank Decommissioning Assessment Report will be required according the EPA Tasmanian's underground petroleum storage systems decommissioning guidelines.
- During construction as a precaution, construction workers working around the former tank and on the section of the site that has the street address 48-50 New Town Road, should consider using personal air monitoring devices.
- Vapour risk to future site users has not been eliminated; once the new building is complete the following should be undertaken:
    - Shallow sub-vapour probes; and potentially
    - Indoor air monitoring

Limitations to this investigation were that the borehole locations and depths were restricted due to existing buildings and underground infrastructure on the site. At some locations, access for the larger drill rig was unworkable and therefore depths unobtainable.

All findings within the report are based on the proposed site development layout presented in Section 2.3. Critical components in the design are basement and sub-basement car parking which allow hydrocarbon vapour venting with limited opportunity for vapour intrusion into overlying floors. If the site layout is to change, this report will need to be amended to reflect these changes. As a note, no air circulation venting should source from within the carpark levels (below 58 m AHD).

Yours faithfully,

Sarah Joyce BSc (Hons)

Environmental Geologist

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LIMITATIONS STATEMENT

This ESA Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and Swanbury Penglase Architects ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site at that point in time. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This investigation was limited by the following factors; the borehole locations were restricted due to existing buildings on the site and many of boreholes did not reach the depth of the footprint of the proposed building.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

Appendix 1 GES Staff

GES is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

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- Engineering Geologist
- Masters in Applied Environmental Geology
- 10 years working as an Engineer and two years experience in contaminated sites; soil, groundwater and conceptual site models.

Mr Aaron Plummer(Cert. IV)

- Soil Technician
- 5 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 10 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Mark Downie B.Agr.Sc (Hons)

- Soil Scientist
- 8 Year experience in contamination assessment and reporting of soils and groundwater.

GES STAFF – WITH CONTAMINATED SITES EXPERIENCE

Ms Peri Lucas B.Agr.Sc (Hons)

- Soil Scientist
- 2 Year experience in contamination assessment and reporting of soils and groundwater.

LIMITATIONS STATEMENT

This ESA Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and Swanbury Penglase Architects ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site at that point in time. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This investigation was limited by the following factors; the borehole locations were restricted due to existing buildings on the site and many of boreholes did not reach the depth of the footprint of the proposed building.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

Appendix 1 GES Staff

GES is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

Geo Environmental Solutions Pty Ltd:

- ACN – 115 004 834
- ABN – 24 115 004 834

GES STAFF - ENGAGED IN SITE INVESTIGATION WORKS

Dr John Paul Cumming B.Agr.Sc (Hons) Phd CPSS GAICD

- Principle Author and Principle Environmental Consultant
- PhD in Environmental Soil Chemistry from the University of Tasmania in 2007
- 12 years' experience in environmental contamination assessment and site remediation.

Ms Sarah Joyce BSc (Hons)

- Environmental Geologist
- Honours in Geography and Environmental Science at the University of Tasmania in 2003;
- Undergraduate Degree Double Major in Geology and Geography & Environmental Science
- 15 years professional work experience and 7 years contaminated site assessment

Mr Kris Taylor Bsc (Hons)

- Senior Environmental & Engineering Geologist
- Honours in Environmental Geology at the University of Tasmania in 1998
- 20 years' experience in environmental contamination assessments and hydrogeology (including honours in mine site tailing pollution assessment). Including 15 years' experience in asbestos assessment.

Mr Matthew Temlett

- Engineering Geologist
- Masters in Applied Environmental Geology
- 10 years working as an Engineer and two years experience in contaminated sites; soil, groundwater and conceptual site models.

Mr Aaron Plummer(Cert. IV)

- Soil Technician
- 5 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 10 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Mark Downie B.Agr.Sc (Hons)

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- 8 Year experience in contamination assessment and reporting of soils and groundwater.

GES STAFF – WITH CONTAMINATED SITES EXPERIENCE

Ms Peri Lucas B.Agr.Sc (Hons)

- Soil Scientist
- 2 Year experience in contamination assessment and reporting of soils and groundwater.

Appendix 2 Architects Plans

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

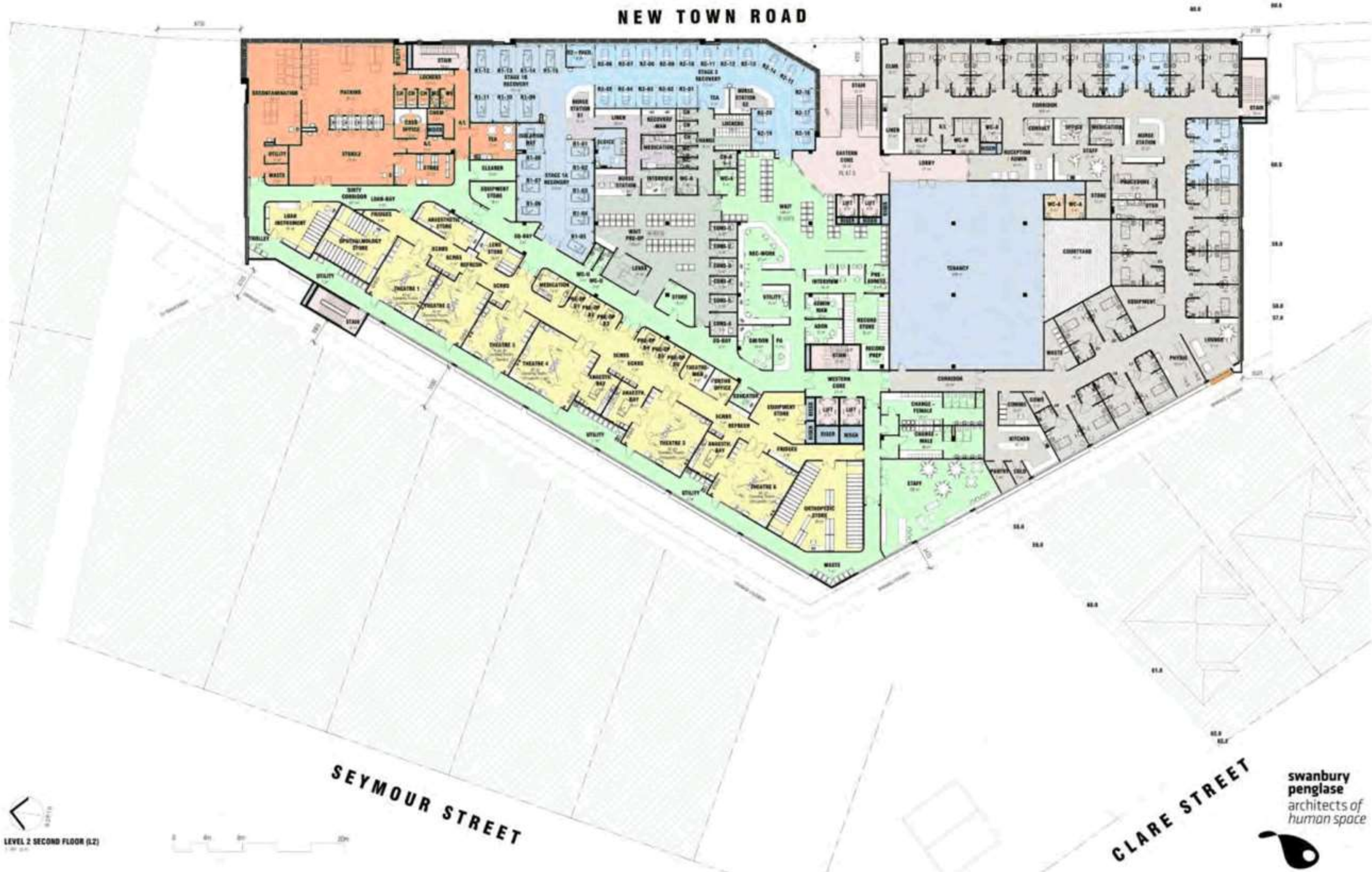
NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

12/04/2019
15153 SK202 - N


NEW TOWN ROAD
SEYMOUR STREET
CLARE STREET
swanbury penglase
architects of human space
PHASE 2 - GROUND LEVEL FLOOR PLAN (L0)
NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART
12/04/2019
15153
SK203 - 0

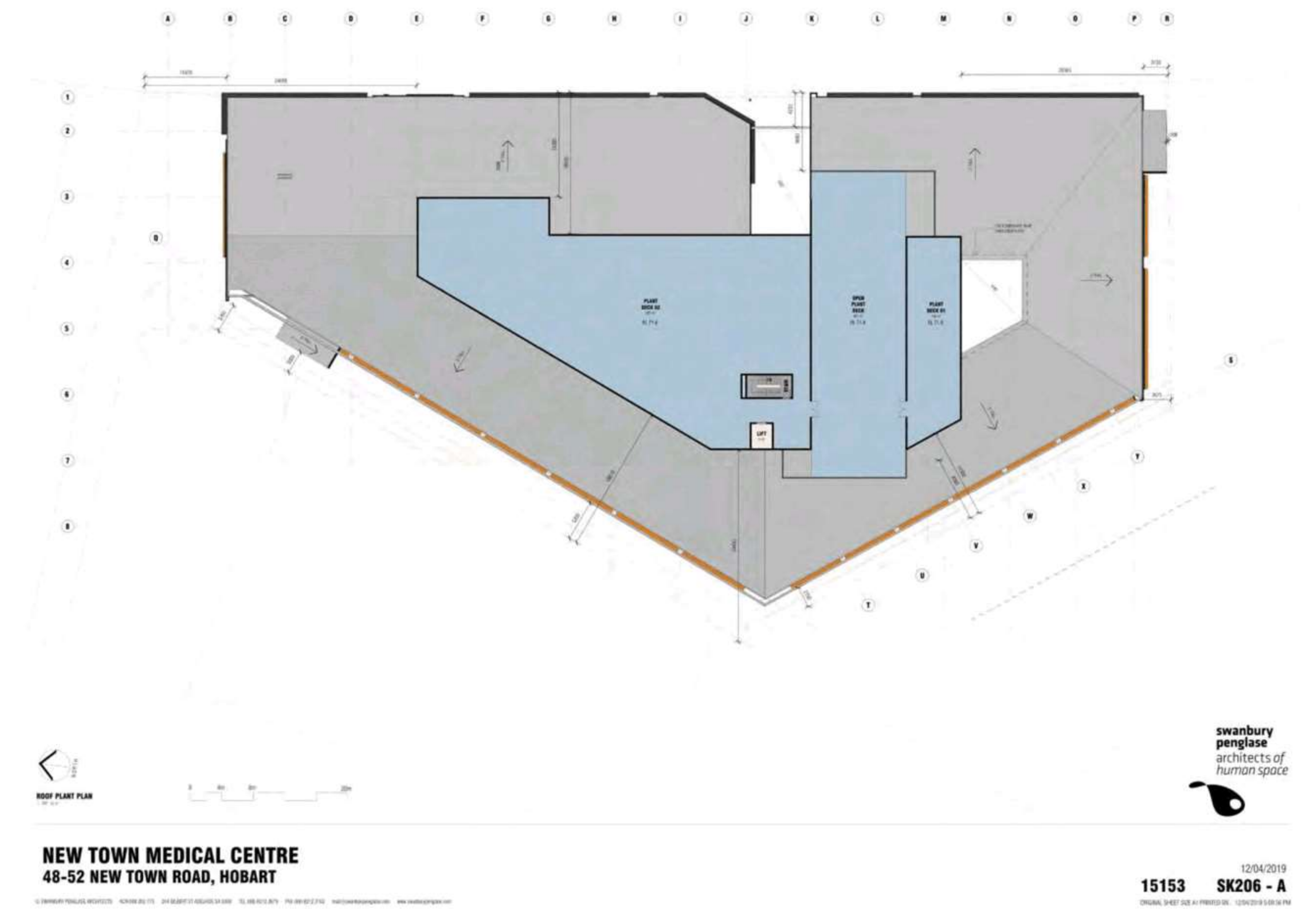
NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

12/04/2019
15153 SK204 - Q



NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

12/04/2019
15153 SK205 - M


ROOF PLANT PLAN
LIFT
swanbury penglase
architects of human space
NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART
12/04/2019
15153
SK206 - A

NEW TOWN MEDICAL CENTRE
48-52 NEW TOWN ROAD, HOBART

12/04/2019
15153 SK207 - H

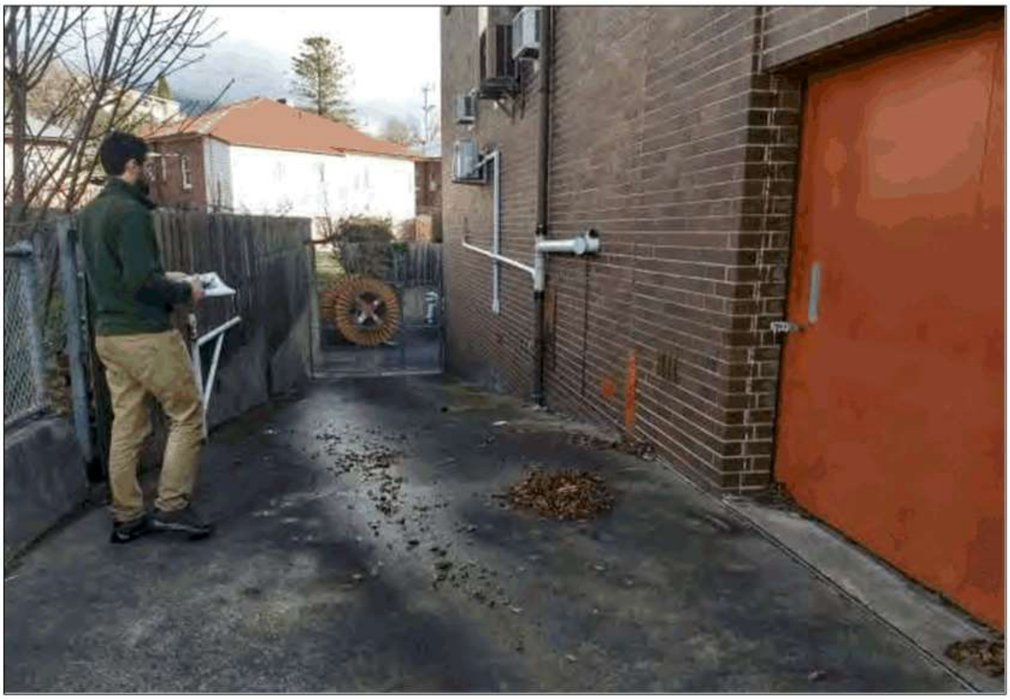
Appendix 3 Site Walkover Photographs

Boundary between *46 New Town Road* and *48-50 New Town Road*

48-50 New Town Road

Garden bed at the front of 48-50 New Town Road

Surface covering at the front of 48-50 New Town Road, view to the north



Laneway to the rear of 48-50 New Town Road

Surface covering at the front of 48-50 New Town Road, view to the South, red concrete slab under asphalt

Laneway to the deliverly entrance into *52 New town road*, adjacent to *48-50 New Town Road*

Street front of *52 New Town Road*

Surface of the carpark at the northern end of *52 New Town Road*

Surface of the carpark at the northern end of *52 New Town Road*

Carpark at the northern end of 52 New Town Road

52 New Town Road – AST above the generator at the rear (western boundary) of the site

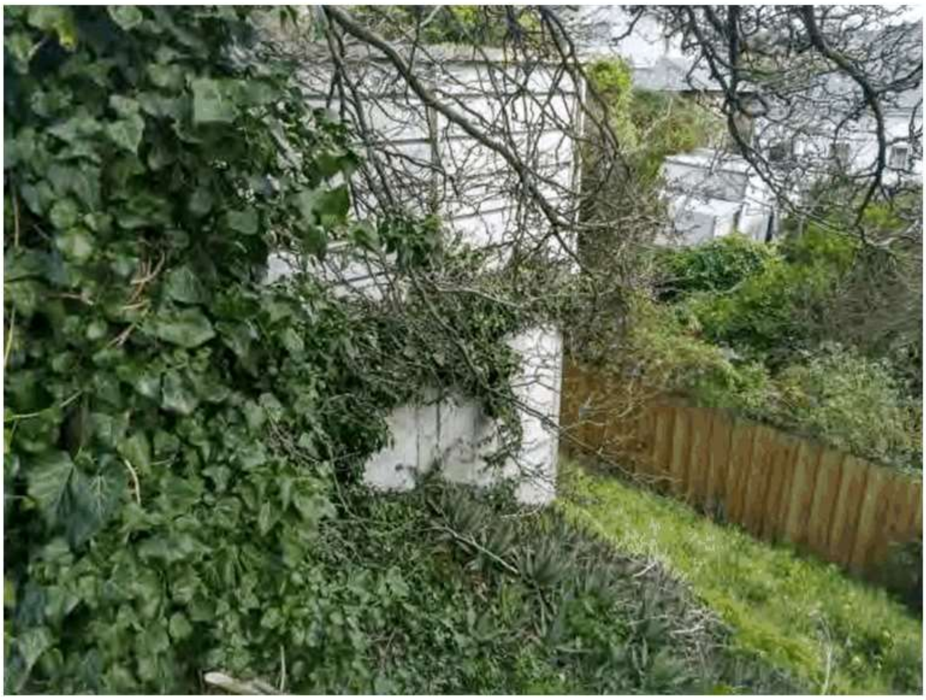
52 New Town Road – concrete pad at the rear of the site near the generator.

52 New Town Road – infrastructure in the concrete pad

Generator room view north

Generator room view north

Product label of generator



Generator shed view of the northern side *52 New Town Road*

52 New Town Road

52 New Town Road

52 New Town Road

52 New Town Road easement to Seymour Street

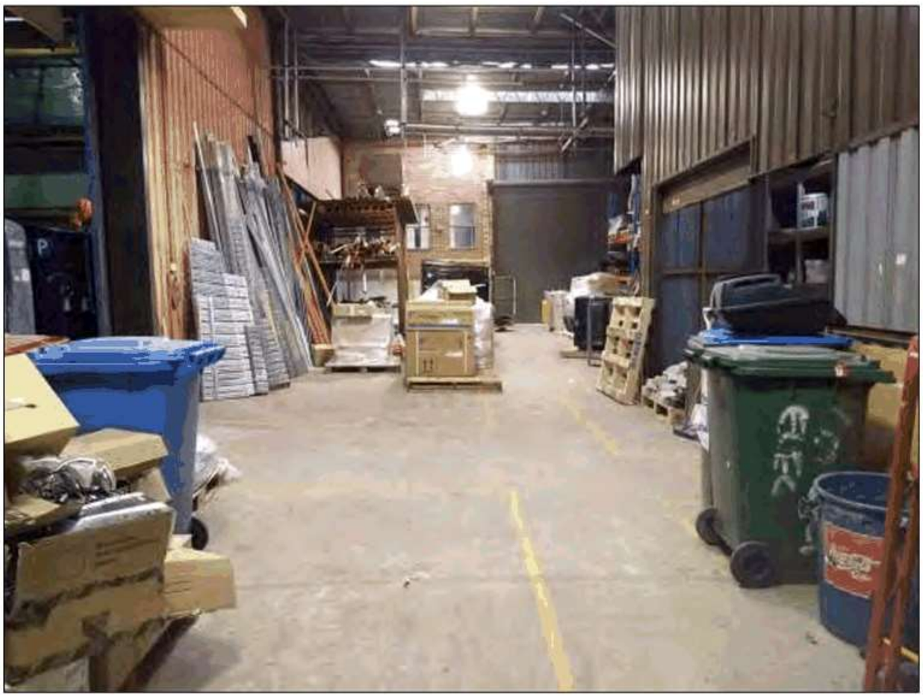
52 New Town Road

Rear entrance to *52 New Town Road* off Clare Street

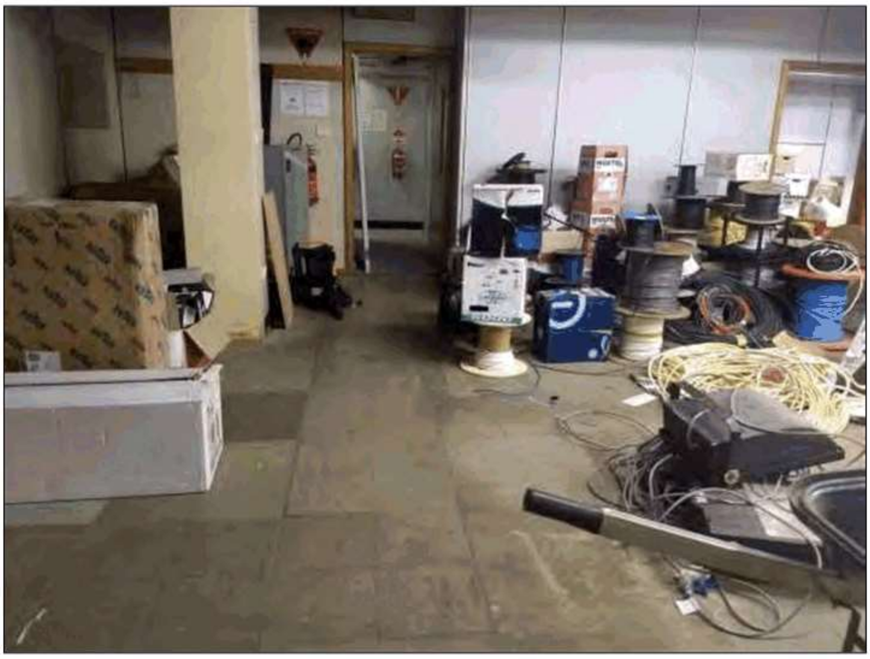
Rear entrance to *52 New Town Road* off Clare Street

Rear of *52 New Town Road,* view to the west. Potential Bowser 5 location??

View towards building of *52 New Town Road,* view to the east



Inside of building *52 New Town Road,* view to the east



Inside of building at the back of *48-50 New Town Road,* view to the east

Inside of building *52 New Town Road,* view to the west

Inside warehouse 52 New Town Road, looking south towards 48-50 New Town Road component of the building network.

Rear of *48-50 New Town Road*

Rear of *48-50 New Town Road*

Rear of *48-50 New Town Road*

Rear of *48-50 New Town Road*

Appendix 3 EPA PIR

Level 7, 134 Macquarie Street, Hobart TAS
GPO Box 1550, Hobart, TAS 7001 Australia

Enquiries: Contaminated Sites Unit
Phone: (03) 6165 4599
Email: contaminatedsites@epa.tas.gov.au
Web: www.epa.tas.gov.au
Our Ref: (EN-EM-AV-100706_38: H906114) sma

ENVIRONMENT PROTECTION AUTHORITY

30 July 2018

Ms Sarah Joyce
Geo-Environmental Solutions
29 Kirksway Place
BATTERY POINT TAS 7004

Dear Ms Joyce

PROPERTY INFORMATION REQUEST

48-50 NEW TOWN ROAD, NEW TOWN — **CERTIFICATE OF TITLE: 198029/1**
52 NEW TOWN ROAD, NEW TOWN — **CERTIFICATE OF TITLE 252465/1**

On 9 July 2018, the Contaminated Sites Unit received your Property Information Request relating to the land referred to above ('the Site'). A search of relevant databases and records has been undertaken.

Historic WorkSafe Tasmania [WST] records indicate that dangerous goods were stored at 48 New Town Road in underground storage tanks [UST] from 1975 to 1989; the site operator name was Tasmanian Television Ltd. The record refers to WST file number 2230.

No further records relating to contamination or potentially contaminating activities on the Site were found

30-36 New Town Road (100m south of the Site) hosted a Caltex service station that closed in the mid 1990's. EPA Tasmania received advice in August 2000 that the removal of USTs and site remediation works would be completed prior to the construction of a video retail outlet.

EPA Tasmania has no further records regarding this property, however The Hobart City Council or WST may have records relevant to your enquiry.

No other records relating to contamination or potentially contaminating activities at adjacent properties were found.

The search of records is restricted to those held by EPA Tasmania and includes records relating to: The *Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2010;* Industrial Sites (which are or have been regulated by EPA Tasmania); historic landfills; and contamination issues reported to the Contaminated Sites Unit. In addition, the Incidents and Complaints database and records relating to the historical storage of dangerous goods (as detailed below) are searched.

WorkSafe Tasmania (1300 366 322 or wstinfo@justice.tas.gov.au) may have issued dangerous goods licences and/or may hold relevant records for the Site and adjoining properties. As the storage of dangerous goods/fuels is an environmentally relevant activity, you may wish to contact them for further information.

Please note that the dangerous goods licensing records referred to by EPA Tasmania are for sites with underground storage tanks that ceased holding Dangerous Goods Licences prior to 1993. WorkSafe Tasmania hold the records for these Licences after 1993.

EPA Tasmania does not hold records on all sites that are or may be contaminated. You should consider obtaining a site history to determine the likelihood of contamination. If contamination on the Site or an adjacent property is considered likely, further assessment by a competent environmental assessment practitioner is recommended. Site assessments should be conducted in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council (or as varied). http://epa.tas.gov.au/regulation/contaminated-sites/identification-and-assessment-of-contaminated-land/contaminated-site-assessment

Please note since 1 July 2015, the Director has required all environmental site assessments and reports submitted to the Contaminated Sites Unit for consideration to be prepared by a person certified as a specialist contaminated sites consultant under a scheme approved by the Director. Effective 30 June 2018, the endorsed scheme is operated by Certified Environmental Practitioners (CEnvP): Consultants certified under this scheme are approved to use the seal **CEnvP Site Contamination**. https://www.cenvp.org.

Further details are available at: http://epa.tas.gov.au/regulation/contaminated-sites/identification-and-assessment-of-contaminated-land/engaging-a-contaminated-site-assessment-consultant.

As local councils are able to issue Environment Protection Notices, Environmental Infringement Notices and record complaints, you may wish to contact them for additional information that may be relevant to the site. Further, if the Site has historically been subject to a permit under the *Land Use Planning and Approvals Act 1993*, the Council would have issued the permit.

Under the *Right to Information Act 2009* (RTI Act), you are entitled to apply for any records mentioned within this letter such as reports, letters, or other relevant documents. For further information on how the RTI process works and how to request information under the RTI Act please visit the Department of Primary Industries, Parks, Water and Environment website.

If you are purchasing a property, you should consider Part 5A of the *Environmental Management and Pollution Control Act 1994* (EMPCA) which defines and specifies requirements for managing contaminated sites. If there is reason to believe the site is, or is likely to be, contaminated there are certain requirements that you must meet (e.g. notification of a likely contaminated site to the Director, EPA as outlined in section 74B of the EMPCA).

Although all due care has been taken in the preparation of this letter, the Crown gives no warranty, express or implied, as to the accuracy or completeness of the information provided. The Crown and its servants or agents accept no responsibility for any loss or damage arising from reliance upon this letter, and any person relying on the letter does so at their own risk absolutely.

As you are aware, property searches incur a charge of $237.00. An invoice is enclosed.

If you have any queries in relation to the matters above, please contact the Contaminated Sites Unit using the details at the head of this correspondence or refer to the EPA website at www.epa.tas.gov.au and click on 'Regulation to locate information on Underground Fuel Tanks and Contaminated Sites.

Yours sincerely

Bruce Napier
ENVIRONMENTAL OFFICER - CONTAMINATED SITES

Email: sjoyce@geosolutions.net.au

Attachment: Invoice

Appendix 4 WorkSafe Tasmania - Dangerous Goods Records

RELEASED ON SECURITY GROUNDS

78091

2230

DEPARTMENT OF MINES, TASMANIA

SUBJECT: TASMANIAN TELEVISION LIMITED

FILE TITLE: 50 - 52 NEW TOWN ROAD.

ADDRESS: G.P.O. BOX 1209 M, HOBART.

Cancelled 26.6.89

RELEASED ON SECURITY GROUNDS

MINES
File Ref. 2230
15 JUN 1989
Doc. Ref. 2024
Action Officer RAP Initials
CB

INSPECTION REPORT - 001
KEEPING DANGEROUS GOODS

2230
FILE NO: T302 AREA CODE JG01 DATE 9-6-89
BUSINESS TRADING NAME:
TASMANIAN TELEVISION LTD
OWNER/OCCUPIER:
AS ABOVE
POSTAL ADDRESS: 50 - 52 NEWTOWN ROAD
NEWTOWN
LOCATION OF STORAGE: AS ABOVE

Licence No.	Debtors No.
Resubmit to	Date

APPROVAL DATE: ______ APPROVAL NO: ______ INSPECTION DATE: 2-6-89
TYPE OF INSPECTION : ~~APPROVAL/FOLLOW-UP~~/ROUTINE/~~NEW/ADDITIONAL~~ SUPPLIER: ?
RECOMMENDED FOR LICENSING: YES/~~NO~~ INSPECTOR: P. DAVIS
U/G
REMARKS: Petrol tanks removed completely
O/H Diesel remains only

File closed.

Name of dangerous goods	Class	Qty.	Size of tanks	O/G O/H U/G	Size - cylinders, drums, packages	Qty and type of pumps
DIESEL	3.3	1	1,150 Litres	O/H		

RESUBMIT DATE: ______ TO: ______

RELEASED ON SECURITY GROUNDS

T302

This file was checked with the licence card to ensure the storage matched with file and card.
Total storage on site: 14-49 k/L Class A
1-15 k/L Class C

[signature]
24-2-84

RELEASED ON SECURITY GROUNDS

16 DEC 1981

Reg. 78

THIS FORM MUST BE RETURNED WITH PAYMENT

FORM 7

TASMANIA

Inflammable Liquids Act 1929

D of M	A.O.	C.G.	E.O.	D.S.I.

Received / Answered 24 DEC 1981

DEPT. OF MINES

APPLICATION FOR LICENCE IN RESPECT OF PREMISES FOR KEEPING OF INFLAMMABLE LIQUIDS OR DANGEROUS COMMODITIES

1. Applicants Full Name TASMANIAN TELEVISION LTD
2. Applicant's Occupation
3. Postal Address 50-52 NEW TOWN ROAD, NEW TOWN, 7008.
4. Situation of Premises to be Licensed AS ABOVE.
5. Name of Municipality and Town or Township within which, or within five miles of which premises are situated
6. Name and quantity to be manufactured / kept under this Application:—
   - Inflammable Liquid Class A (Petrol, etc.) 5.4 k/L
   - Inflammable Liquid Class B (Kerosene, etc.)
   - Dangerous Commodity
7. Number of Tanks and Package Storage Areas under this Application
8. Name and Total Quantity to be kept:—
   - Inflammable Liquid Class A (Petrol, etc.) 16.49 k/L
   - Inflammable Liquid Class B (Kerosene, etc.)
   - Dangerous Commodity
9. Total Number of Tanks and Package Storage Areas installed

I declare that the above statements and answers are true to the best of my knowledge and belief.

(*Signed*)

Dated this 17th day of December 1981

ADDITIONAL STORAGE INSPECTED 26/3/80

This Application, with Licence Fee of $4-00, *to be forwarded to*—

DIRECTOR OF MINES—DEPT OF MINES
34 DAVEY STREET (G.P.O. Box 124B),
HOBART, TASMANIA 7001

FOR OFFICE USE ONLY

File T302	Receipt No.	398451	Initials
	Amount of Cash/Cheque	$4-00	
Licence No. 12/81	Date	24/12/81	

(*Scale of fees is shown on reverse hereof*)

56608

RELEASED ON SECURITY GROUNDS

DEPARTMENT OF MINES
TASMANIA
DATE 26/ 6 / 1950.

For the Director of Mines, Hobart
From the Inspector of Explosives ..Hobart..............

RECORD OF INSPECTION OF INSTALLATION

Premises of:- Tasmanian Television

Known as:

Premises at: 52 Main Rd Newtown.

Oil Company: BP Australia.

Date of Approval: 17/3/50

Date of Inspection: 26/3/60

Finding: ~~Unsuitable~~) for licensing
Suitable)

Pump Outfit package Storage Area: 1 x 5400 l u/g sars

Variation from Approval: no

Application Form: Left with occupier/forwarded herewith

Amount of Fee advised ~~YES~~/NO

....

TOTAL 14.49

sent form 15/12/81

Form 7 (Regulation 34)

Tasmania

Dangerous Goods Act 1976

35709

Nº 4691

RELEASED ON SECURITY GROUNDS

Fee, $2

Granted to BP Australia,

G.P.O. Box 689G,

Hobart.

Approval of Site and Construction of Premises for Keeping Inflammable Liquids or Dangerous Commodities or the Alteration thereof

Approval for the *site and construction ~~*alteration of the site and construction~~ as shown on the approved Plans and specification of a ~~*package/storage area/~~*tank for the undermentioned inflammable liquids and dangerous commodities, subject to the provisions of the *Dangerous Goods Act* 1976, and regulations being observed and subject to the undermentioned special conditions, situate at

Tasmanian Television, 52 Main Rd, New Town

This approval is valid only for one year from the date of issue.

Date of issue 19th Mar 19 80

Chief Inspector of Explosives

Inspector of Explosives

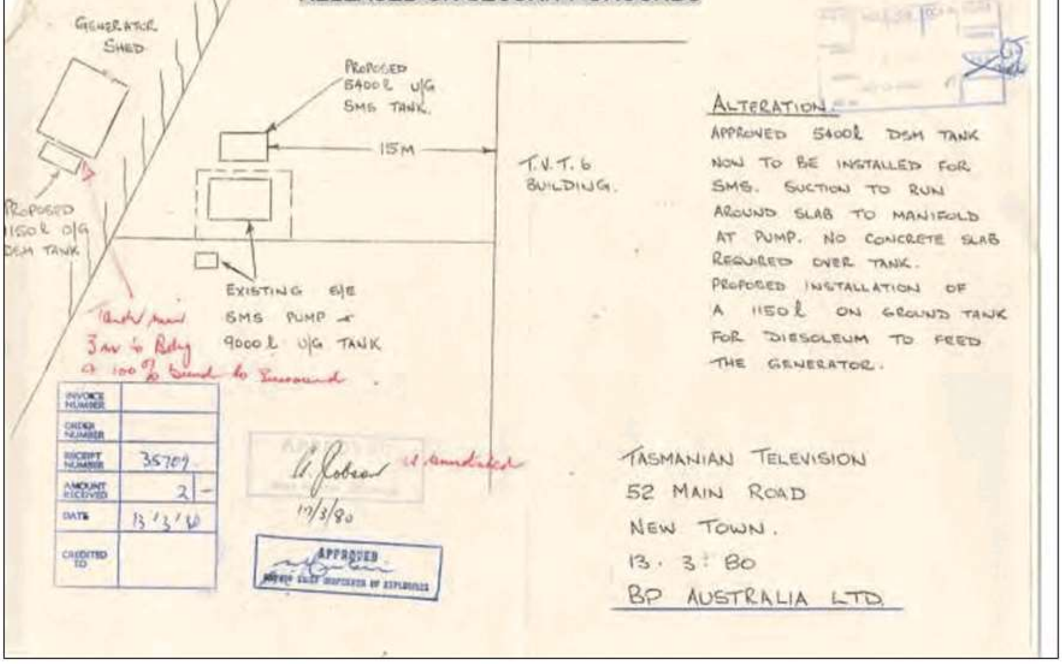
Inflammable liquid:	Class 3·1	FUEL	Litres
	Class 3·2		Litres
	Class 3·3	1 X 1150 O/G Tank	Litres
	L.P.G. (Class 2)		Litres

Dangerous commodities:

SPECIAL CONDITIONS

Tank shall be located at least 5M from boundary and a 100% bund to surround tank.

RELEASED ON SECURITY GROUNDS



Mr. Schott.
Tasmanian Television Stat.
48/52 New Town Rd.
New Town.

RELEASED ON SECURITY GROUNDS

Reg. 78

FORM 7

TASMANIA

Inflammable Liquids Act 1929

RECEIVED 16 FEB 1977 DEPT OF MINES

APPLICATION FOR LICENCE IN RESPECT OF PREMISES FOR KEEPING OF INFLAMMABLE LIQUIDS OR DANGEROUS COMMODITIES

1. Applicant's Full Name TASMANIAN TELEVISION LIMITED
2. Applicant's Occupation COMMERCIAL TELEVISION
3. Postal Address G.P.O. BOX 1209M, HOBART. 7001
4. Situation of Premises to be Licensed rear of 50-52 New Town Road, New Town
5. Name of Municipality and Town or Township within which, or within five miles of which, premises are situated Hobart
6. Name and quantity to be ~~manufactured~~ kept under this Application:—
   - Inflammable Liquid Class A (Petrol, etc.) 9.09 Kl.
   - Inflammable Liquid Class B (Kerosene, etc.) –
   - Dangerous Commodity
7. Number of Tanks and Package Storage Areas under this Application 1 x 2000 gal. tank.
8. Name and Total Quantity to be kept:—
   - Inflammable Liquid Class A (Petrol, etc.) 9.09 Kl.
   - Inflammable Liquid Class B (Kerosene, etc.) –
   - Dangerous Commodity
9. Total Number of Tanks and Package Storage Areas installed one.

I declare that the above statements and answers are true to the best of my knowledge and belief.

TASMANIAN TELEVISION LIMITED

(*Signed*) [signature] Secretary

Dated this 7th day of February, 1977.

(*This Application, with Licence Fee of* $ 10.00, *to be forwarded to*—
DIRECTOR OF MINES—DEPT OF MINES
34 DAVEY STREET (G.P.O. Box 124B),
HOBART, TASMANIA 7001

Please complete this form & return urgently with cheque to

FOR OFFICE USE ONLY

File T 302	Receipt No.	27753	Initials
	Amount of Cash/Cheque	$10.00	
Licence No. 22721	Date	16/2/77	

(*Scale of fees is shown on reverse hereof*)

88374

RELEASED ON SECURITY GROUNDS

Department of Mines
Tasmania
Date 6 / 7 /1976

For the Director of Mines, Hobart
From the Inspector of Explosives ......Hobart..............

RECORD OF INSPECTION OF INSTALLATION

Premises of: Tasmanian Television Stat.
Known as:
Premises at: 48-52 New Town Rd. New Town.
Oil Company: B.P.
Date of Approval: 20-10-75.
Date of Inspection: 5-7-76.
Finding: ~~Unsuitable~~ Suitable } for licensing
Pump Outfit package Storage Area: P.O.
Variation from Approval: NIL.
Application Form: Left with occupier/Forwarded herewith

Amount of Fee advised Yes/No $10.00
1 x 2000 gl U/G tank "A"
1 S/E pump.
9.09 KL.

........J. J. Marsh.........

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

RELEASED ON SECURITY GROUNDS

(Regulation 78)

Form 5
24566
Tasmania

Inflammable Liquids Act 1929

№ 2880

Fee, $2

Granted to B.P. Australia Ltd.,
G.P.O. Box 6890,
HOBART, TAS. 7001

Approval of Site and Construction of premises for Keeping Inflammable Liquids or Dangerous Commodities or the Alteration thereof

Approval for the *site and construction ~~*alteration of the site and construction~~ as shown on the approved plans and specification of a ~~*package/storage area~~/*tank for the undermentioned inflammable liquids and dangerous commodities, subject to the provisions of the *Inflammable Liquids Act 1929*, and regulations being observed and subject to the undermentioned special conditions, situate at

Tasmanian Television Ltd., 48-52 New Town Road, New Town.

This approval is valid only for one year from the date of issue.

Date of issue 3 - 10 - 1975

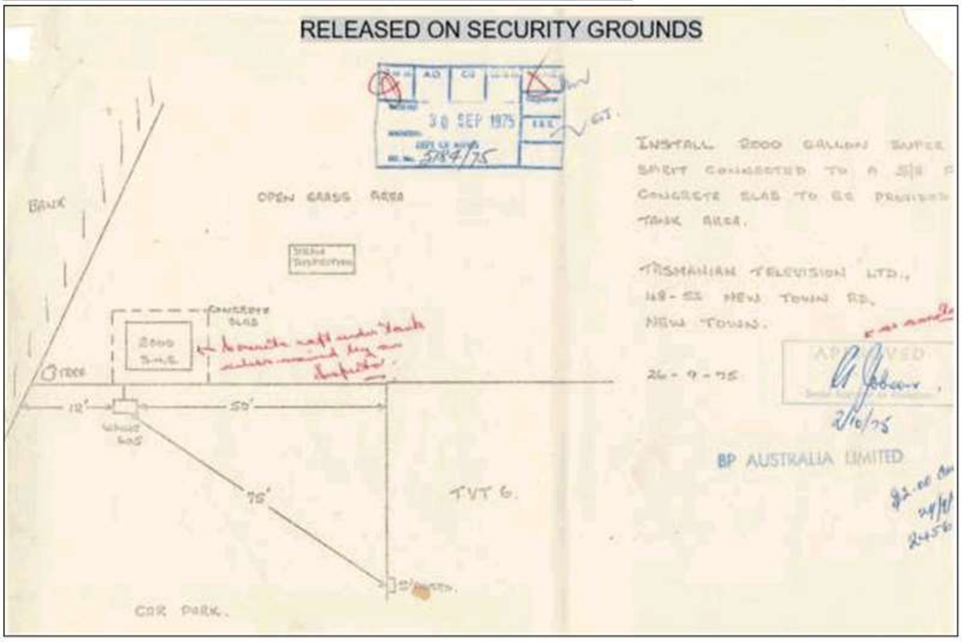
Chief Inspector of Explosives

Inspector of Explosives

Inflammable liquid:	Class A	2000	Gallons
	Class B		Gallons
Dangerous commodities:			

SPECIAL CONDITIONS

Install 1 x 2000gl U/G tank & 1 S/E Pump.
as per annotation.



Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Appendix 5 PID Hire and Service Record

Thermo Fisher SCIENTIFIC

The world leader in serving science

RENTALS

Equipment Report - MiniRAE 3000 PID

This Gas Meter has been performance checked and calibrated as follows:

Lamp	Compound	Concentration	Zero	Span	Traceability Lot #	Pass?
10.6 eV	Isobutylene	100 ppm	0 ppm	100 ppm	553762	☑

Alarm Limits

High	100 ppm
Low	50 ppm

Bump Test

Date	Target Gas	Reading	Pass?
19 Jul 18	100 ppm	100.0 ppm	☑

☑ Battery Status 100%
☑ 10 minutes test complete
☑ Spare battery status: (Min 5.5 volts) 5.77
☑ Electrical Safety Tag attached (AS/NZS 3760)

☐ Performance check (lamp, sensor)
☑ Data cleaned
☑ Filters checked

Tag No: 000700

Valid to: 19/09/2018

Date: 19 Jul 18

Signed:

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☑	☐	MiniRAE 2000 PID / Operational Check / Battery Status 100%
☑	☐	Lamp 10.6 eV, Compound Set to: Isobutylene C/factor: 1.00
☑	☐	Protective yellow rubber boot
☑	☐	Inlet probe (attached to PID)
☑	☐	Spare water trap filter(s) Qty 3
☑	☐	Charger 240V to 12V1250mA
☑	☐	Cradle and Travel Charger
☑	☐	Instruction Manual behind foam on the lid of case
☑	☐	Quick Guide Sheet behind foam on the lid of case
☑	☐	Spare Alkaline Battery Compartment with batteries
☑	☐	Inline Moisture trap Filter Guide Laminated
☑	☐	Carry Case
☑	☐	Check to confirm electrical safety (tag must be valid)
☐	☐	Calibration regulator & tubing (optional)
☐	☐	Data cable and Software CD (optional)

Date: 19 Jul 18

Signed:

TFS Reference	CM 0100978	Return Date:	/ /
Customer Reference	CO PAYMENT	Return Time:	
Equipment ID	PID 3000 - 62	Condition on return:	
Equipment Serial No.			

"We do more than give you great equipment… We give you great solutions!"

Phone: (Free Call) 1300 735 295 Fax: (Free Call) 1800 675 123 Email: RentalsAU@Thermofisher.com

Issue 6 Nov 12 G0555

AES
ACTIVE ENVIRONMENTAL SOLUTIONS

Calibration and Service Report – PID

Company:	Geo-Environmental Solutions	**Manufacturer:**	RAE	**Serial #:**	590-902123
Contact:	Sarah Joyce	**Instrument:**	MINIRAE LITE SN: 590-902123	**Asset #:**	
Address:	29 Kirksway Place Battery Point TAS	**Model:**	MiniRAE Lite	**Part #:**	-
		Configuration:	VOC	**Sold:**	04.09.2012
		Wireless:	-	**Last Cal:**	25.01.2018
Phone:	03 6223 1839	**Network ID:**	-	**Job #:**	54266
Fax:		**Unit ID:**	-	**Cal Spec:**	
Email:	sjoyce@geosolutions.net.au	**Details:**		**Order #:**	-

Item	Test	Pass/Fail	Comments	Serial Number
Battery	NiCd, NiMH, Dry cell, LiIon	P		
Charger	Power Supply	P		
	Cradle, Travel Charger	P		
Pump	Flow	P	Cleaned, >500 mL/min	
Filter	Filter, fitting, etc	P	Dirty, replaced	
Alarms	Audible, visual, vibration	P		
Display	Operation	P		
Switches	Operation	P		
PCB	Operation	P		
Connectors	Condition	P		
Firmware	Version	P	Upgraded, 2.16	
Datalogger	Operation	P		
Monitor Housing	Condition	P		
Case	Condition / Type	P	Dirty, cleaned	
Sensors				
PID	Lamp	P	Dirty, cleaned	
PID	Sensor	P		
THP	Sensor	P		

Engineer's Report

Data download and PC configuration checked - Firmware upgraded to latest (Version: 2.16).
Pump assembly, Lamp and Rubber Boot cleaned. Pump Flow rate >500mL/min.
PID sensor checked if moisture sensitive - passed O.K.
New Filter fitted. Unit calibrated and serviceable.

Melbourne	**Head Office**	2 Merchant Avenue	THOMASTOWN VIC 3074	T: +(613) 9464 2300	F:+ (613) 9464 3421
Sydney	514 Lvl 2	6-8 Holden Street	ASHFIELD NSW 2131	T: +(612) 9716 5966	F:+ (612) 9716 5988
Perth	Unit 6	41 Holder Way	MALAGA WA 6090	T: +(618) 9249 5663	F:+ (618) 9249 5362
Brisbane	Unit 17	23 Ashtan Place	BANYO QLD 4014	T: +(617) 3267 1433	F:+ (617) 3267 3559

sales@aesolutions.com.au ISO Certified 9001:2008 www.aesolutions.com.au

AES
ACTIVE ENVIRONMENTAL SOLUTIONS

Calibration Certificate

Sensor	Type	Serial No.	Span Gas	Concentration	Traceability Lot #	CF	Reading	
							Zero	Span
PID	10.6eV	1062N322047	Isobutylene	100 PPM	S110317-1		0	100.3

Calibrated/Repaired by: DARREN FRANCALANZA Date: 25.07.2018 Next Due: 25.01.2019

Melbourne	**Head Office**	2 Merchant Avenue	THOMASTOWN VIC 3074	T: +(613) 9464 2300	F:+ (613) 9464 3421
Sydney	514 Lvl 2	6-8 Holden Street	ASHFIELD NSW 2131	T: +(612) 9716 5966	F:+ (612) 9716 5988
Perth	Unit 6	41 Holder Way	MALAGA WA 6090	T: +(618) 9249 5663	F:+ (618) 9249 5362
Brisbane	Unit 17	23 Ashtan Place	BANYO QLD 4014	T: +(617) 3267 1433	F:+ (617) 3267 3559

sales@aesolutions.com.au ISO Certified 9001:2008 www.aesolutions.com.au

Appendix 6 Laboratory Chain of Custody

ALS Environmental — CHAIN OF CUSTODY

FREIGHT

Project: New Town Road
Project Manager: S. Joyce
Sampler: S. Joyce
Contact Ph: 0438255259
Relinquished by: Date/Time: 24-7-18
Received by: Date/Time: 24/7, 9:05

Environmental Division Melbourne
Work Order Reference
EM1811858

Sample ID	Date / Time	Matrix	Type & Preservative	Total Containers		HOLD
BH01 0.0-0.1	23/7/18	S	Jar	1		✓
BH01 0.5-0.2						✓
BH01 1.0-1.1					✓	
BH01 1.5-1.6						✓
BH01 2.0-2.6						✓
BH01 2.5-2.6					✓	
BH01 3.0-3.1						✓
BH01 3.5-3.6						✓
BH01 4.0-4.1						✓
BH01 4.4-4.5	4.4-4.5				✓	
BH02 0.0-0.1						✓
BH02 0.5-0.6						✓

ALS Environmental — CHAIN OF CUSTODY

Project: New Town Road
Project Manager: SJ
Sampler: SJ
Contact Ph: 0438255259
Relinquished by: Date/Time: 24-7-18
Received by: Date/Time: 25/7 9.05

Sample ID	Date / Time	Matrix	Type & Preservative	Total Containers		HOLD
BH02 1.0-1.1	23/7/18	S	Jar	1	✓	
BH02 1.5-1.6						✓
BH02 2.0-2.1						✓
BH02 2.8-2.9					✓	
BH02 3.4-3.5						✓
BH02 4.0-4.1					✓	
BH03 0.0-0.1						✓
BH03 0.5-0.6					✓	
BH03 1.0-1.1						✓
BH03 1.5-1.6						✓
BH03 2.0-2.1						✓
BH03 2.5-2.6					✓	

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental

CHAIN OF CUSTODY

CLIENT: GEOENVIRONMENTAL SOLUTIONS
OFFICE: 29 Kirksway Pl, Battery Point TAS 7004
PROJECT: New Town Road
ORDER NUMBER:
PROJECT MANAGER: CONTACT PH:
SAMPLER: SAMPLER MOBILE:
TURNAROUND REQUIREMENTS: Standard TAT
ALS QUOTE NO.:
COC SEQUENCE NUMBER: 33

[redacted]

RELINQUISHED BY: DATE/TIME: 24-7-18
RECEIVED BY:
RELINQUISHED BY:
RECEIVED BY: DATE/TIME: 25/7 9.05

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		HOLD	Additional Information
	BH03 3.0-3.1	23/7/18	S	Jar	1		✓	
	BH03 3.5-3.6						✓	
	BH03 3.9-4.0					✓		
	BH04 0.0-0.1						✓	
	BH04 0.5-0.6						✓	
	BH04 1.0-1.1						✓	
	BH04 1.5-1.6					✓		
	BH04 2.0-2.1						✓	
	BH04 2.5-2.6						✓	
	BH04 3.0-3.1					✓		
	BH04 3.5-3.6						✓	
	BH04 4.0-4.1						✓	
					TOTAL			

ALS Environmental

CHAIN OF CUSTODY

CLIENT: GEOENVIRONMENTAL SOLUTIONS
OFFICE: 29 Kirksway Pl, Battery Point TAS 7004
PROJECT: New Town Rd.
ORDER NUMBER:
PROJECT MANAGER: CONTACT PH:
SAMPLER: SAMPLER MOBILE:
TURNAROUND REQUIREMENTS: Standard TAT
ALS QUOTE NO.:
COC SEQUENCE NUMBER:

[redacted]

RELINQUISHED BY: DATE/TIME: 24-7-18
RECEIVED BY:
RELINQUISHED BY:
RECEIVED BY: DATE/TIME: 25/7 9.05

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Hold	Additional Information
	BH04 4.5-4.6	23-7-18	S	Jar	1	✓		
	BH05 0.0-0.1						✓	
	BH05 0.5-0.1						✓	
	BH05 1.0-1.1					✓		
	BH05 1.5-1.6						✓	
	BH05 2.0-2.1						✓	
	BH05 2.5-2.6						✓	
	BH05 3.0-3.1					✓		
	BH05 3.5-3.6						✓	
	BH05 4.0-4.1						✓	
	BH05 4.5-4.6					✓		
	BH06 0.0-0.1						✓	
					TOTAL			

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental
CHAIN OF CUSTODY

PROJECT: New Town Road
PROJECT MANAGER: S. Joyce

23-7-18

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		HOLD
	BH06 0.2-0.3	23-7-18	S	Jar	1	✓	
	BH07 0.0-0.1		S		1		✓
	BH07 0.5-0.6		S		1		✓
	BH07 1.0-1.1		S		1	✓	
	BH07 1.5-1.6		S		1		✓
	BH07 2.0-2.1		S		1		✓
	BH07 2.2-2.3		S		1	✓	
	Duplicate 1		S		1	✓	
	Duplicate 2		S		1	✓	
	Field Blank		W	2V, 1P, 1A	4	✓	
	Rinsate Blank		W	"	4	✓	
	Duplicate 3		S	Jar	1	✓	

Sydney

ALS Environmental
CHAIN OF CUSTODY

PROJECT: Newtown Rd

RECEIVED BY: Vishal
DATE/TIME: 27/07 10:00AM

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
1	Triplicate 1	23-7-18	S	Jar	1	×
2	Triplicate 2		S	"		×
3	Triplicate 3		S	"		×

analysis as per Sarah
30-7-18

Environmental Division
Sydney
Work Order Reference
ES1822218

re-batch
tray ns 1448-69

Shirley LeCornu

From:	Sarah Joyce <sjoyce@geosolutions.net.au>
Sent:	Tuesday, 31 July 2018 4:25 PM
To:	Shirley LeCornu
Subject:	Rebatch EM1811858
Attachments:	EM1811858_0_SRN_180726095012.pdf

Hello Shirley,

Please conduct analysis (TPH/TRH/PAH/ 15 metals) on the follow samples:

1 EM1811858-004
2 EM1811858-008
3 EM1811858-012
4 EM1811858-015
5 EM1811858-021
6 EM1811858-025
7 EM1811858-029
8 EM1811858-033
9 EM1811858-035
10 EM1811858-042
11 EM1811858-046

SCANNED

Environmental Division
Melbourne
Work Order Reference
EM1812173

THANKS!

Kind Regards,

Sarah Joyce
Environmental Scientist
GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: sjoyce@geosolutions.net.au

GES

MS - 3033 - 3034

BN 01/8

1

BN 01/8

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1811858**		
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 4
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SJ		

Dates

Date Samples Received	: 25-Jul-2018 09:05	Issue Date	: 26-Jul-2018
Client Requested Due Date	: 01-Aug-2018	Scheduled Reporting Date	**01-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 3.9°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 59 / 23

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	26-Jul-2018
Page	2 of 4
Work Order	EM1811858 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: SOIL

	Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
	EM1811858-001	23-Jul-2018 00:00	BH01 0.0-0.1	✓			
	EM1811858-002	23-Jul-2018 00:00	BH01 0.5-0.2	✓			
	EM1811858-003	23-Jul-2018 00:00	BH01 1.0-1.1		✓	✓	✓
1	EM1811858-004	23-Jul-2018 00:00	BH01 1.5-1.6	✗	✓	✓	✓
	EM1811858-005	23-Jul-2018 00:00	BH01 2.0-2.1	✓			
	EM1811858-006	23-Jul-2018 00:00	BH01 2.5-2.6		✓	✓	✓
	EM1811858-007	23-Jul-2018 00:00	BH01 3.0-3.1	✓			
2	EM1811858-008	23-Jul-2018 00:00	BH01 3.5-3.6	✗	✓	✓	✓
	EM1811858-009	23-Jul-2018 00:00	BH01 4.0-4.1	✓			
	EM1811858-010	23-Jul-2018 00:00	BH01 4.4-4.5		✓	✓	✓
	EM1811858-011	23-Jul-2018 00:00	BH02 0.0-0.1	✓			
3	EM1811858-012	23-Jul-2018 00:00	BH02 0.5-0.6	✗	✓	✓	✓
	EM1811858-013	23-Jul-2018 00:00	BH02 1.0-1.1		✓	✓	✓
	EM1811858-014	23-Jul-2018 00:00	BH02 1.5-1.6	✓			
4	EM1811858-015	23-Jul-2018 00:00	BH02 2.0-2.1	✗	✓	✓	✓
	EM1811858-016	23-Jul-2018 00:00	BH02 2.8-2.9		✓	✓	✓
	EM1811858-017	23-Jul-2018 00:00	BH02 3.4-3.5	✓			
	EM1811858-018	23-Jul-2018 00:00	BH02 4.0-4.1		✓	✓	✓
	EM1811858-019	23-Jul-2018 00:00	BH03 0.0-0.1	✓			
	EM1811858-020	23-Jul-2018 00:00	BH03 0.5-0.6		✓	✓	✓
5	EM1811858-021	23-Jul-2018 00:00	BH03 1.0-1.1	✗	✓	✓	✓
	EM1811858-022	23-Jul-2018 00:00	BH03 1.5-1.6	✓			
	EM1811858-024	23-Jul-2018 00:00	BH03 2.5-2.6		✓	✓	✓
6	EM1811858-025	23-Jul-2018 00:00	BH03 3.0-3.1	✗	✓	✓	✓
	EM1811858-026	23-Jul-2018 00:00	BH03 3.5-3.6	✓			
	EM1811858-027	23-Jul-2018 00:00	BH03 3.9-4.0		✓	✓	✓
	EM1811858-028	23-Jul-2018 00:00	BH04 0.0-0.1	✓			
7	EM1811858-029	23-Jul-2018 00:00	BH04 0.5-0.6	✗	✓	✓	✓
	EM1811858-030	23-Jul-2018 00:00	BH04 1.0-1.1	✓			
	EM1811858-031	23-Jul-2018 00:00	BH04 1.5-1.6		✓	✓	✓
	EM1811858-032	23-Jul-2018 00:00	BH04 2.0-2.1	✓			
8	EM1811858-033	23-Jul-2018 00:00	BH04 2.5-2.6	✗	✓	✓	✓
	EM1811858-034	23-Jul-2018 00:00	BH04 3.0-3.1		✓	✓	✓
9	EM1811858-035	23-Jul-2018 00:00	BH04 3.5-3.6	✗	✓	✓	✓
	EM1811858-036	23-Jul-2018 00:00	BH04 4.0-4.1	✓			

Issue Date	26-Jul-2018
Page	3 of 4
Work Order	EM1811858 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

	Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)	
	EM1811858-037	23-Jul-2018 00:00	BH04 4.5-4.6		✓	✓	✓	
	EM1811858-038	23-Jul-2018 00:00	BH05 0.0-0.1	✓				
	EM1811858-039	23-Jul-2018 00:00	BH05 0.5-0.6	✓				
	EM1811858-040	23-Jul-2018 00:00	BH05 1.0-1.1		✓	✓	✓	
	EM1811858-041	23-Jul-2018 00:00	BH05 1.5-1.6	[illegible]	[illegible]	[illegible]	[illegible]	
10	EM1811858-042	23-Jul-2018 00:00	BH05 2.0-2.1	✗	✓	✓	✓	
	EM1811858-043	23-Jul-2018 00:00	BH05 2.5-2.6	✓				
	EM1811858-044	23-Jul-2018 00:00	BH05 3.0-3.1		✓	✓	✓	
	EM1811858-045	23-Jul-2018 00:00	BH05 3.5-3.6	✗	~~✓~~	~~✓~~	~~✓~~	→ No analysis as per attached email
11	EM1811858-046	23-Jul-2018 00:00	BH05 4.0-4.1	✓	✓	✓	✓	– BN 01/8.
	EM1811858-047	23-Jul-2018 00:00	BH05 4.5-4.6		✓	✓	✓	
	EM1811858-048	23-Jul-2018 00:00	BH06 0.0-0.1	✓				
	EM1811858-049	23-Jul-2018 00:00	BH06 0.2-0.3		✓	✓	✓	
	EM1811858-050	23-Jul-2018 00:00	BH07 0.0-0.1	✓				
	EM1811858-051	23-Jul-2018 00:00	BH07 0.5-0.6	✓				
	EM1811858-052	23-Jul-2018 00:00	BH07 1.0-1.1		✓	✓	✓	
	EM1811858-053	23-Jul-2018 00:00	BH07 1.5-1.6	✓				
	EM1811858-054	23-Jul-2018 00:00	BH07 2.0-2.1	✓				
	EM1811858-055	23-Jul-2018 00:00	BH07 2.2-2.3		✓	✓	✓	
	EM1811858-056	23-Jul-2018 00:00	Duplicate 1		✓	✓	✓	
	EM1811858-057	23-Jul-2018 00:00	Duplicate 2		✓	✓	✓	
	EM1811858-060	23-Jul-2018 00:00	Duplicate 3		✓	✓	✓	

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM1811858-058	23-Jul-2018 00:00	Field Blank	✓		✓
EM1811858-059	23-Jul-2018 00:00	Rinsate Blank		✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Bharathi Narayanan

From:	Shirley LeCornu
Sent:	Wednesday, 1 August 2018 9:52 AM
To:	Bharathi Narayanan
Subject:	FW: Rebatch EM1811858

Shirley LeCornu
Client Services Coordinator – Springvale
Environmental

T +61 3 8549 9600 D +61 3 8549 9630
F +61 3 8549 9626
Shirley.lecornu@alsglobal.com
2-4 Westall Rd
Springvale Vic 3171
Australia

From: Sarah Joyce [mailto:sjoyce@geosolutions.net.au]
Sent: Wednesday, 1 August 2018 9:27 AM
To: Shirley LeCornu <shirley.lecornu@alsglobal.com>
Subject: RE: Rebatch EM1811858

Yes 46. (did that a few times yesterday – must have been tired!)

From: Shirley LeCornu <shirley.lecornu@alsglobal.com>
Sent: Wednesday, 1 August 2018 9:08 AM
To: Sarah Joyce <sjoyce@geosolutions.net.au>
Subject: RE: Rebatch EM1811858

Hi Sarah

Can you please confirm last sample on the list.

Marked as 46 below. Mark as 45 on the SRN.

Will log as 46 for now.

Kind regards

Shirley

Shirley LeCornu
Client Services Coordinator – Springvale
Environmental

T +61 3 8549 9600 D +61 3 8549 9630
F +61 3 8549 9626
Shirley.lecornu@alsglobal.com
2-4 Westall Rd
Springvale Vic 3171
Australia

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From: Sarah Joyce [mailto:sjoyce@geosolutions.net.au]
Sent: Tuesday, 31 July 2018 4:25 PM
To: Shirley LeCornu <shirley.lecornu@alsglobal.com>
Subject: Rebatch EM1811858

Hello Shirley,

Please conduct analysis (TPH/TRH/PAH/ 15 metals) on the follow samples:

EM1811858-004
EM1811858-008
EM1811858-012
EM1811858-015
EM1811858-021
EM1811858-025
EM1811858-029
EM1811858-033
EM1811858-035
EM1811858-042
EM1811858-046

THANKS!

Kind Regards,

Sarah Joyce
Environmental Scientist

2

GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: *sjoyce@geosolutions.net.au*

GES

CHAIN OF CUSTODY — ALS Environmental

FREIGHT

Project: New Town Road

Project Manager: S. Jayne

Contact Ph: 0438 255251

Sampler: S. Jayne

25-7-18 0900

26/7 9.03

							HOLD
1	BH08 0.0-0.1	24-7-18	S	1 Jar	1		✓
2	BH08 0.5-0.6						✓
3	BH08 1.0-1.1					✓	
4	BH08 1.5-1.6						✓
5	BH08 2.0-2.1						✓
6	BH08 2.5-2.6					✓	
7	BH08 3.0-3.1						✓
8	BH08 3.5-3.6						✓
9	BH08 4.0-4.1						✓
10	BH08 4.5-4.6					✓	
11	BH09 0.2-0.3						✓
12	BH09 0.5-0.6						✓

Environmental Division

EM1811913

CHAIN OF CUSTODY — ALS Environmental

Project: New Town Rd

25-7-18

26/7 9.03

							HOLD
13	BH09 1.0-1.1	24-7-18	S	Jar	1	✓	
14	BH09 1.5-1.6						✓
15	BH09 2.0-2.1						✓
16	BH09 2.5-2.6					✓	
17	BH09 3.0-3.1						✓
18	BH09 3.5-3.6						✓
19	BH09 4.0-4.1						✓
20	BH09 4.5-4.6					✓	
21	BH09 5.5-5.6						✓
22	BH09 6.0-6.1					✓	
23	BH09 6.4-6.5						✓
24	Duplicate 4					✓	

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental — CHAIN OF CUSTODY

PROJECT: Nuw Town Rd

[redacted]

RELINQUISHED BY: DATE/TIME: 25-7-18

RECEIVED BY: DATE/TIME: 26/7 9:05

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	[illegible]	Hold
25	BH10 0.5-0.6	24.7.18	S	Jar	1		✓
26	BH10 1.0-1.1					✓	
27	BH10 1.5-1.6						✓
28	BH10 2.0-2.1						✓
29	BH10 2.5-2.6						✓
30	BH10 3.0-3.1					✓	
31	BH10 3.5-3.6						✓
32	BH10 4.0-4.1						✓
33	BH10 4.5-4.6						✓
34	BH10 5.0-5.1					✓	
35	BH10 5.4-5.5						✓
36	BH11 0.5-0.6						✓

[redacted]

ALS Environmental — CHAIN OF CUSTODY

PROJECT: New Town Rd

[redacted]

RELINQUISHED BY: DATE/TIME: 25-7-18

RECEIVED BY: DATE/TIME: 26/7 9:05

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	[illegible]	Hold
37	BH11 1.0-1.1	24.7.18	S	Jar	1	✓	
38	BH11 1.5-1.6						✓
39	BH11 2.0-2.1						✓
40	BH11 2.5-2.6					✓	
41	BH11 3.0-3.1						✓
42	BH11 3.3-3.4					✓	
43	BH12 0.5-0.6						✓
44	BH12 1.0-1.1					✓	
45	BH12 1.5-1.6						✓
46	BH12 2.0-2.1						✓
47	BH12 2.5-2.6					✓	
48	BH12 3.0-3.1						✓

[redacted]

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental — CHAIN OF CUSTODY

PROJECT: New Town

[redacted]

RELINQUISHED BY: DATE/TIME: 25-7-18

RECEIVED BY: DATE/TIME: 26/7 9:45

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		HOLD
49	BH12 3.5-3.6	24-7-18	S	Jar	1	✓	
50	BH12 4.0-4.1				1		✓
51	BH12 4.5-4.6				1		✓
52	Field Blank 2		W	2V, 1P, 1A	4	✓	
53	Rinsate ~~Blank~~ 2		W		4	✓	

7/8/18

ALS Environmental — CHAIN OF CUSTODY

PROJECT: New Town Rd

CONTACT PH: 0437 255 234

[redacted]

RELINQUISHED BY: DATE/TIME: 25-7-18 0900

RECEIVED BY: DATE/TIME: 26/7 9:05

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
1	Triplicate 4	24-7-18	S	1 Jar	1	✓

Environmental Division
Sydney
Work Order Reference
ES1822455

re-batch
tray: HS1474-76

Shirley LeCornu

From: Sarah Joyce <sjoyce@geosolutions.net.au>
Sent: Tuesday, 31 July 2018 4:21 PM
To: Shirley LeCornu
Subject: Re-batch's for New Town Road
Attachments: Rebatch request EM1811913.pdf; REbatch request EM1811891.pdf

Hello Shirley,

Please see the attached SRN with Re-batch details for New Town Road:

EM1811913
EM1811891

Kind Regards,

Sarah Joyce
Environmental Scientist
GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: sjoyce@geosolutions.net.au

GES

Environmental Division
Melbourne
Work Order Reference
EM1812174

MS: 3034
BN 01/8

1

Rebatch x3

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	EM1811913		
Client	GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	Environmental Division Melbourne
Contact	SARAH JOYCE	Contact	Shirley LeCornu
Address	29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	4 Westall Rd Springvale VIC Australia 3171
E-mail	sjoyce@geosolutions.net.au	E-mail	shirley.lecornu@Alsglobal.com
Telephone	+61 03 6223 1839	Telephone	+61-3-8549 9630
Facsimile	+61 03 6223 4539	Facsimile	+61-3-8549 9626
Project	Newtown Rd	Page	1 of 4
Order number		Quote number	EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	—	QC Level	NEPM 2013 B3 & ALS QC Standard
Site	—		
Sampler	SARAH JOYCE		

Dates

Date Samples Received	26-Jul-2018 09:05	Issue Date	27-Jul-2018
Client Requested Due Date	02-Aug-2018	Scheduled Reporting Date	**02-Aug-2018**

Delivery Details

Mode of Delivery	Carrier	Security Seal	Intact.
No. of coolers/boxes	2	Temperature	5.9°C - Ice Bricks present
Receipt Detail		No. of samples received / analysed	53 / 19

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	27-Jul-2018
Page	2 of 4
Work Order	EM1811913 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811913-001	24-Jul-2018 00:00	BH08_0.0-0.1	✓			
EM1811913-002	24-Jul-2018 00:00	BH08_0.5-0.6	✓			
EM1811913-003	24-Jul-2018 00:00	BH08_1.0-1.1		✓	✓	✓
EM1811913-004	24-Jul-2018 00:00	BH08_1.5-1.6	✓			
1 EM1811913-005	24-Jul-2018 00:00	BH08_2.0-2.1	x	✓	✓	✓
EM1811913-006	24-Jul-2018 00:00	BH08_2.5-2.6		✓	✓	✓
EM1811913-007	24-Jul-2018 00:00	BH08_3.0-3.1	✓			
EM1811913-008	24-Jul-2018 00:00	BH08_3.5-3.6	✓			
EM1811913-009	24-Jul-2018 00:00	BH08_4.0-4.1	✓			
EM1811913-010	24-Jul-2018 00:00	BH08_4.5-4.6		✓	✓	✓
EM1811913-011	24-Jul-2018 00:00	BH09_0.2-0.3	✓			
EM1811913-012	24-Jul-2018 00:00	BH09_0.5-0.6	✓			
EM1811913-013	24-Jul-2018 00:00	BH09_1.0-1.1		✓	✓	✓
EM1811913-014	24-Jul-2018 00:00	BH09_1.5-1.6	✓			
EM1811913-015	24-Jul-2018 00:00	BH09_2.0-2.1	✓			
EM1811913-016	24-Jul-2018 00:00	BH09_2.5-2.6		✓	✓	✓
EM1811913-017	24-Jul-2018 00:00	BH09_3.0-3.1	✓			
EM1811913-018	24-Jul-2018 00:00	BH09_3.5-3.6	✓			
EM1811913-019	24-Jul-2018 00:00	BH09_4.0-4.1	✓			
EM1811913-020	24-Jul-2018 00:00	BH09_4.5-4.6		✓	✓	✓
EM1811913-021	24-Jul-2018 00:00	BH09_5.5-5.6	✓			
EM1811913-022	24-Jul-2018 00:00	BH09_6.0-6.1		✓	✓	✓
EM1811913-023	24-Jul-2018 00:00	BH09_6.3-6.5	✓			
EM1811913-024	24-Jul-2018 00:00	Duplicate 4		✓	✓	✓
EM1811913-025	24-Jul-2018 00:00	BH10_0.5-0.6	✓			
EM1811913-026	24-Jul-2018 00:00	BH10_1.0-1.1		✓	✓	✓
EM1811913-027	24-Jul-2018 00:00	BH10_1.5-1.6	✓			
EM1811913-028	24-Jul-2018 00:00	BH10_2.0-2.1	✓			
EM1811913-029	24-Jul-2018 00:00	BH10_2.5-2.6	✓			
EM1811913-030	24-Jul-2018 00:00	BH10_3.0-3.1		✓	✓	✓
EM1811913-031	24-Jul-2018 00:00	BH10_3.5-3.6	✓			
EM1811913-032	24-Jul-2018 00:00	BH10_4.0-4.1	✓			
EM1811913-033	24-Jul-2018 00:00	BH10_4.5-4.6	✓			
EM1811913-034	24-Jul-2018 00:00	BH10_5.0-5.1		✓	✓	✓
EM1811913-035	24-Jul-2018 00:00	BH10_5.4-5.5	✓			

Issue Date	27-Jul-2018
Page	3 of 4
Work Order	EM1811913 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

				On Hold SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
	EM1811913-036	24-Jul-2018 00:00	BH11_0.5-0.6	✓			
	EM1811913-037	24-Jul-2018 00:00	BH11_1.0-1.1		✓	✓	✓
	EM1811913-038	24-Jul-2018 00:00	BH11_1.5-1.6	✓			
2	EM1811913-039	24-Jul-2018 00:00	BH11_2.0-2.1	X	✓	✓	✓
	EM1811913-040	24-Jul-2018 00:00	BH11_2.5-2.6		✓	✓	✓
	EM1811913-041	24-Jul-2018 00:00	BH11_3.0-3.1	✓			
	EM1811913-042	24-Jul-2018 00:00	BH11_3.3-3.4		✓	✓	✓
	EM1811913-043	24-Jul-2018 00:00	BH12_0.5-0.6	✓			
	EM1811913-044	24-Jul-2018 00:00	BH12_1.0-1.1		✓	✓	✓
	EM1811913-045	24-Jul-2018 00:00	BH12_1.5-1.6	✓			
3	EM1811913-046	24-Jul-2018 00:00	BH12_2.0-2.1	X	✓	✓	✓
	EM1811913-047	24-Jul-2018 00:00	BH12_2.5-2.6		✓	✓	✓
	EM1811913-048	24-Jul-2018 00:00	BH12_3.0-3.1	✓			
	EM1811913-049	24-Jul-2018 00:00	BH12_3.5-3.6		✓	✓	✓
	EM1811913-050	24-Jul-2018 00:00	BH12_4.0-4.1	✓			
	EM1811913-051	24-Jul-2018 00:00	BH12_4.5-4.6	✓			

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM1811913-052	24-Jul-2018 00:00	Field Blank 2	✓	✓
EM1811913-053	24-Jul-2018 00:00	Rinsate 2	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

FREIGHT

ALS Environmental — **CHAIN OF CUSTODY**

CLIENT: GEOENVIRONMENTAL SOLUTIONS
PROJECT: New Town Rd - 25 July
PROJECT MANAGER: S. Joyce
CONTACT PH: 0438 237 239
SAMPLER: S Joyce
[redacted]
RELINQUISHED BY: DATE/TIME: 25-7-18
RECEIVED BY: DATE/TIME: 26/7, 9-05

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		HOLD
1	BH14 0·2-0·3	25-7-18	S	Jar	1		✓
2	BH14 0·4-0·5					✓	
3	BH15 0·2-0·3						✓
4	BH15 0·55-0·65					✓	
5	BH16 0·3-0·4					✓	
6	BH13 0·5-0·6						✓
7	BH13 1·0-1·1					✓	
8	BH13 1·5-1·6					✓	
9	BH13 2·0-2·1						✓
10	BH17 0·2-0·3						✓
11	BH17 0·5-0·6					✓	
12	BH17 1·0-1·1						✓

Environmental Division
Melbourne
Work Order Reference
EM1811891

[redacted]

ALS Environmental — **CHAIN OF CUSTODY**

CLIENT: GEOENVIRONMENTAL SOLUTIONS
PROJECT: New Town Rd
[redacted]
RELINQUISHED BY: DATE/TIME: 25-7-18
RECEIVED BY: DATE/TIME: 26/7 9-05

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Hold
13	BH17 1·1-1·2	25-7-18	S	Jar	1	✓	
14	BH18 0·5-0·6						✓
15	BH18 1·0-1·1						✓
16	BH18 1·5-1·6					✓	
17	BH18 2·0-2·1						✓
18	BH18 2·5-2·6						✓
19	BH18 2·7-2·8					✓	
20	BH18 3·1-3·2						✓
21	BH18 3·5-3·6					✓	
22	BH19 0·5-0·6						✓
23	BH19 1·0-1·1					✓	
24	BH19 1·5-1·6						✓

[redacted]

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental

CHAIN OF CUSTODY

PROJECT: NewTown Rd

RELINQUISHED BY: DATE/TIME: 25.7.18

RECEIVED BY: DATE/TIME: 26/7 9.05

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Hold	Additional Information
25	BH19 2.1-2.2	25.7.18	S	Jar	1	✓		
26	Field Blank 3		W	2V,1A,1P	4	✓		
27	Rinsate 3		W		4	✓		

re-batch
from ~~[illegible]~~
h31473-79

Shirley LeCornu

From: Sarah Joyce <sjoyce@geosolutions.net.au>
Sent: Tuesday, 31 July 2018 4:21 PM
To: Shirley LeCornu
Subject: Re-batch's for New Town Road
Attachments: Rebatch request EM1811913.pdf; REbatch request EM1811891.pdf

Hello Shirley,

Please see the attached SRN with Re-batch details for New Town Road:

EM1811913
EM1811891

Kind Regards,

Sarah Joyce
Environmental Scientist
GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: sjoyce@geosolutions.net.au

GES

Environmental Division
Melbourne
Work Order Reference
EM1812175

MS: 3036
BN 01/8

Rebatch x 4

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	EM1811891		
Client	GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	Environmental Division Melbourne
Contact	SARAH JOYCE	Contact	Shirley LeCornu
Address	29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	4 Westall Rd Springvale VIC Australia 3171
E-mail	sjoyce@geosolutions.net.au	E-mail	shirley.lecornu@Alsglobal.com
Telephone	+61 03 6223 1839	Telephone	+61-3-8549 9630
Facsimile	+61 03 6223 4539	Facsimile	+61-3-8549 9626
Project	Newtown Rd	Page	1 of 3
Order number		Quote number	EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	----	QC Level	NEPM 2013 B3 & ALS QC Standard
Site	----		
Sampler	SARAH JOYCE		

Dates

Date Samples Received	26-Jul-2018 09:05	Issue Date	26-Jul-2018
Client Requested Due Date	02-Aug-2018	Scheduled Reporting Date	**02-Aug-2018**

Delivery Details

Mode of Delivery	Carrier	Security Seal	Intact.
No. of coolers/boxes	2	Temperature	6.4°C - Ice Bricks present
Receipt Detail		No. of samples received / analysed	27 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	26-Jul-2018
Page	2 of 3
Work Order	EM1811891 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

ALS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Mercury by FIMS : EG035F		
Field Blank 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Rinsate 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
Field Blank 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Rinsate 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: **SOIL**

	Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
	EM1811891-001	25-Jul-2018 00:00	BH14 0.2-0.3	✓			
	EM1811891-002	25-Jul-2018 00:00	BH14 0.4-0.5		✓	✓	✓
	EM1811891-003	25-Jul-2018 00:00	BH15 0.2-0.3	✓			
	EM1811891-004	25-Jul-2018 00:00	BH15 0.55-0.65		✓	✓	✓
	EM1811891-005	25-Jul-2018 00:00	BH15 0.3-0.4		✓	✓	✓
	EM1811891-006	25-Jul-2018 00:00	BH13 0.5-0.6	✓			
	EM1811891-007	25-Jul-2018 00:00	BH13 1.0-1.1		✓	✓	✓
	EM1811891-008	25-Jul-2018 00:00	BH13 1.5-1.6		✓	✓	✓
①	EM1811891-009	25-Jul-2018 00:00	BH13 2.0-2.1	✗	✓	✓	✓
	EM1811891-010	25-Jul-2018 00:00	BH17 0.2-0.3	✓			
	EM1811891-011	25-Jul-2018 00:00	BH17 0.5-0.6		✓	✓	✓
	EM1811891-012	25-Jul-2018 00:00	BH17 1.0-1.1	✓			
	EM1811891-013	25-Jul-2018 00:00	BH17 1.1-1.2		✓	✓	✓
②	EM1811891-014	25-Jul-2018 00:00	BH18 0.5-0.6	✗	✓	✓	✓
	EM1811891-015	25-Jul-2018 00:00	BH18 1.0-1.1	✓			
	EM1811891-016	25-Jul-2018 00:00	BH18 1.5-1.6		✓	✓	✓
	EM1811891-017	25-Jul-2018 00:00	BH18 2.0-2.1				
③	EM1811891-018	25-Jul-2018 00:00	BH18 2.5-2.6	✗	✓	✓	✓
	EM1811891-019	25-Jul-2018 00:00	BH18 2.7-2.8		✓	✓	✓
④	EM1811891-020	25-Jul-2018 00:00	BH18 3.1-3.2	✗	✓	✓	✓
	EM1811891-021	25-Jul-2018 00:00	BH18 3.5-3.6		✓	✓	✓
	EM1811891-022	25-Jul-2018 00:00	BH19 0.5-0.6	✓			
	EM1811891-023	25-Jul-2018 00:00	BH19 1.0-1.1		✓	✓	✓
	EM1811891-024	25-Jul-2018 00:00	BH19 1.5-1.6	✓			
	EM1811891-025	25-Jul-2018 00:00	BH19 2.1-2.2		✓	✓	✓

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

CHAIN OF CUSTODY

ALS Environmental

FREIGHT

CLIENT:	GEOENVIRONMENTAL SOLUTIONS
PROJECT:	New Town Road
ORDER NUMBER:	30 July 2018
PROJECT MANAGER:	ST
SAMPLER:	ST
CONTACT PH:	0438 255 251

DATE/TIME: 30·7·18 1500

RECEIVED BY: [illegible]

DATE/TIME: 31/7, 9·25

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Hold	Additional Information
1	Field Blank 4	30·7·18	W	2V 1P 49	4	✓		
2	Rinsate 4		W		4	✓		
3	BH20 0·5-0·6		S	1 Jar	1	✓		PID 0·1
4	BH20 1·0-1·1					✓		PID 2·6 ppm
5	Duplicate 5						✓	

(Triplicate)

Environmental Division
Melbourne
Work Order Reference
EM1812116

Forward to ALS Sydney – as per Shirley – BW 31/7

CHAIN OF CUSTODY

ALS Environmental

CLIENT:	GEOENVIRONMENTAL SOLUTIONS
PROJECT:	New Town Rd
ORDER NUMBER:	30·7·18
PROJECT MANAGER:	ST
SAMPLER:	ST
CONTACT PH:	0438 255 251

DATE/TIME: 30·7·18

RECEIVED BY: [illegible]

DATE/TIME: 31/7 9·25

Received by Vishal 01/08/2018 10:00 AM

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Hold
	Triplicate 5	30·7·18	S	1 Jar			✓

Environmental Division
Sydney
Work Order Reference
ES1822592

ALS Environmental — CHAIN OF CUSTODY

FREIGHT URGENT

CLIENT:	GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS:	Non Standard or urgent TAT: 48 Hrs
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004		[redacted]
PROJECT:	New Town Rd	ALS QUOTE NO.:	
ORDER NUMBER:			
PROJECT MANAGER:	J Joyce	CONTACT PH:	0438 253 259
SAMPLER:	A Plummer	SAMPLER MOBILE:	0410 951 477

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
A. Plummer			[illegible] (ALS)
DATE/TIME: 11-9-18	DATE/TIME:	DATE/TIME:	DATE/TIME: 13/9. 9:25

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		TPH, BTEX, PAH	Additional Information
								Metals
1	MW1	11-9-18	W	2 VS, 1P, 1 AG	4	X		* Unable to be field filtered!
2	DUPLICATE	↓	↓	↓	4	X		
3	TRIPLICATE	↓	↓	↓	4	X		
4	FIELD BLANK	11-9-18	W	2VS, 1 AG	3		X	Needs to be filtered in lab.
				TOTAL	15			

Environmental Division
Melbourne
Work Order Reference
EM1814666

AR 13/9

Shirley LeCornu

From:	Sarah Joyce <sjoyce@geosolutions.net.au>
Sent:	Thursday, 13 September 2018 10:42 AM
To:	Shirley LeCornu; ALS Enviro Melbourne
Cc:	Aaron Plummer
Subject:	FW: SRN for ALS Workorder : EM1814666 | Your Reference: New Town Rd
Attachments:	EM1814666_0_SRN_180913103610.pdf

Hi All,

Please forward the Triplicate (your ID EM1814666-003) sample to ALS Sydney – Smithfield.

Thanks!

From: angel-no-reply@alsglobal.com <angel-no-reply@alsglobal.com>
Sent: Thursday, 13 September 2018 10:36 AM
To: Sarah Joyce <sjoyce@geosolutions.net.au>
Subject: SRN for ALS Workorder : EM1814666 | Your Reference: New Town Rd

ALS Environmental

Deliverables for ALS Workorder EM1814666

Project: New Town Rd

Dear SARAH JOYCE,

Please find enclosed the following deliverables for **EM1814666**:

- EM1814666_0_SRN_180913103610.pdf

Report Recipients

- SARAH JOYCE
  - EM1814666_0_SRN_180913103610.pdf (Email)
- JOHN PAUL CUMMING
  - EM1814666_0_SRN_180913103610.pdf (Email)

1

ALS CHAIN OF CUSTODY

FREIGHT URGENT

PROJECT: New Town Rd
PROJECT MANAGER: S Joyce
SAMPLER: A Plummer
CONTACT PH: 0438 255 259
SAMPLER MOBILE: 0400 821477
RELINQUISHED BY: A Plummer — 11-9-18
RELINQUISHED BY: Scott Anezy — 13/9/18, 17:50
RECEIVED BY: [illegible] (ALS) — 13/9 9:25
Received by Vishal [illegible] 14/09/2018

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		TM, BTEX PAH	Additional Information
1	MW1	11-9-18	W	2 VS, 1P, 1 AG	4	X		Metals
2	DUPLICATE	↓	↓	↓	4	X		* Unable to be field filtered!
~~3~~	TRIPLICATE				4	X		
4	FIELD BLANK	11-9-18	W	2VS, 1 AG	3		X	Needs to be filtered in lab.
				TOTAL	15			

TAT

Environmental Division
Sydney
Work Order Reference
ES1827248

ALS CHAIN OF CUSTODY

CLIENT: GEOENVIRONMENTAL SOLUTIONS
PROJECT: New Town Road
PROJECT MANAGER: JP
SAMPLER: SJ
SAMPLER MOBILE: 0438 255 259
RELINQUISHED BY: [illegible] — 17-10-18 1400
RECEIVED BY: [illegible] — 18/10 9:10

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Total and TCLP PAH
1	GT02	17-10-18	S	1 glass jar	1		✓
2	GT01				1		✓
3	GT03				1		✓

Environmental Division
Melbourne
Work Order Reference
EM1816786

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental

CHAIN OF CUSTODY

FREIGHT

PROJECT: 48 - 52

PROJECT MANAGER: JP CONTACT PH: 0413 541531

SAMPLER: G m

[redacted]

RELINQUISHED BY: DATE/TIME: 29/10/18

RECEIVED BY: DATE/TIME: 30/10, 9:00

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
1	BH21 0.5 - 0.6	24.10.18	S	Jar	1	✓
2	BH21 1.5 - 1.6				1	✓
3	BH21 2.5 - 2.6				1	✓
4	BH21 3.5 - 3.6				1	✓
5	BH21 4.5 - 4.6				1	✓
6	BH21 5.5 - 5.6				1	✓
7	BH22 0.5 - 0.6				1	✓
8	BH22 1.5 - 1.6				1	✓
9	BH22 2.5 - 2.6				1	✓
10	BH22 3.4 - 3.5				1	✓
11	BH23 0.5 - 0.6				1	✓
12	BH23 1.5 - 1.6				1	✓

Environmental Division
Melbourne
Work Order Reference
EM1817421

ALS Environmental

CHAIN OF CUSTODY

PROJECT: 48 - 52

[redacted]

RELINQUISHED BY: DATE/TIME: 29/10/18

RECEIVED BY: DATE/TIME: 30/10 9:40

[redacted]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
13	BH23 2.5 - 2.6	24.10.18	S	Jar	1	✓
14	BH23 3.5 - 3.6				1	✓
15	BH23 4.5 - 4.6				1	✓
16	BH23 5.5 - 5.6				1	✓
17	BH24 0.5 - 0.6				1	✓
18	BH24 1.5 - 1.6				1	✓
19	BH24 2.5 - 2.6				1	✓
20	BH24 3.3 - 3.4				1	✓
21	BH25 0.5 - 0.6				1	✓
22	BH25 1.5 - 1.6				1	✓
23	BH25 2.5 - 2.6				1	✓
24	BH25 3.5 - 3.6				1	✓

ALS ENVIRONMENTAL

CHAIN OF CUSTODY

CLIENT: GEOENVIRONMENTAL SOLUTIONS
PROJECT: 48 - 52
PROJECT MANAGER: JP
SAMPLER: CLM
TURNAROUND REQUIREMENTS: Standard TAT
RELINQUISHED BY: DATE/TIME: 29/10/18
RECEIVED BY: DATE/TIME: 30/10 9:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Additional Information
25	BH25 4.5-4.6	24-10-18	S	Jar	1	✓	
26	BH25 5.5-5.6				1	✓	
27	DUPLICATE 1				1	✓	
28	Rinsate Blank		W	2V 1P, 1A	4	✓	
					TOTAL		

Rebatch

Client / Client code: GEOENVSOL
Project: 48-52
Project Manager: John Paul Cumming
Date /time sample rec: 30/10 @ 9:40am
Date/time Instructions rec: 5/11 @ 5:29pm
Due date: STANDARD
Due date surcharge:

CS Contact: Kaie
Additional Information
OUT OF HOLDING TIME TODAY

URGENT

Environmental Division
Melbourne
Work Order Reference
EM1817821

New Lab ID	Client ID	Sampling Date / Time	Previous Work Order Reference	Previous ALS ID	Tray Number(s)	Container	Number of Containers	TCLP	PAH	Copper	Barium	Shortest Holding time expiry
	BH21 0.5-0.6	24/10/2018 0:00	EM1817421	1	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH21 4.5-4.6	24/10/2018 0:00	EM1817421	5	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH21 5.5-5.6	24/10/2018 0:00	EM1817421	6	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH22 0.5-0.6	24/10/2018 0:00	EM1817421	7	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH23 0.5-0.6	24/10/2018 0:00	EM1817421	11	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH23 1.5-1.6	24/10/2018 0:00	EM1817421	12	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH23 2.5-2.6	24/10/2018 0:00	EM1817421	13	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH23 3.5-3.6	24/10/2018 0:00	EM1817421	14	MS-4443-44	Jar	1	X	X	X	X	07-Nov-18
	BH23 4.5-4.6	24/10/2018 0:00	EM1817421	15	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH23 5.5-5.6	24/10/2018 0:00	EM1817421	16	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH24 0.5-0.6	24/10/2018 0:00	EM1817421	17	MS-4443-44	Jar	1	X	X			07-Nov-18
	BH25 3.5-3.6	24/10/2018 0:00	EM1817421	24	MS-4443-44	Jar	1	X	X			07-Nov-18
13	BH25 4.5-4.6	24/10/2018 0:00	EM1817421	25	MS-4443-44	Jar	1	X	X			07-Nov-18
						TOTAL	13					

Kane Vorwerk

From:	JP Cumming <jcumming@geosolutions.net.au>
Sent:	Monday, 5 November 2018 5:28 PM
To:	Melbourne Enviro Services
Cc:	Sarah Joyce
Subject:	FW: RESULTS & EDD & INVOICE for ALS Workorder : EM1817421 | Your Reference: 48-52
Follow Up Flag:	Follow up
Flag Status:	Flagged

Got auto reply Shirley was away so see samples please

From: JP Cumming
Sent: Monday, 5 November 2018 5:26 PM
To: 'Shirley LeCornu' <shirley.lecornu@alsglobal.com>
Cc: Sarah Joyce <sjoyce@geosolutions.net.au>
Subject: FW: RESULTS & EDD & INVOICE for ALS Workorder : EM1817421 | Your Reference: 48-52

Hi Shirley can we get leachate and the PAH analysis on the following samples that exceeded level 2 for our EPA IB105

Thanks

JP

BH21 0.5-0.6	BH21 4.5-4.6	BH21 5.5-5.6	BH22 0.5-0.6
24/10/2018	24/10/2018	24/10/2018	24/10/2018
EM1817421001	EM1817421005	EM1817421006	EM1817421007
SOIL	SOIL	SOIL	SOIL

BH23 0.5-0.6	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6	BH23 5.5-5.6	BH24 0.5-0.6
24/10/2018	24/10/2018	24/10/2018	24/10/2018	24/10/2018	24/10/2018	24/10/2018
EM1817421011	EM1817421012	EM1817421013	EM1817421014	EM1817421015	EM1817421016	EM1817421017
SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL

BH25 3.5-3.6	BH25 4.5-4.6
24/10/2018	24/10/2018
EM1817421024	EM1817421025
SOIL	SOIL

On sample below it was also high on copper and barium so would need analysis on leachate for those two elements as well as the PAH

1

BH23 3.5-3.6
24/10/2018
EM1817421034
SOIL

From: angel-no-reply@alsglobal.com <angel-no-reply@alsglobal.com>
Sent: Monday, 5 November 2018 4:54 PM
To: JP Cumming <jcumming@geosolutions.net.au>
Subject: RESULTS & EDD & INVOICE for ALS Workorder : EM1817421 | Your Reference: 48-52

ALS Environmental

Deliverables for ALS Workorder EM1817421

Project: 48-52

Dear JOHN PAUL CUMMING,

Please find enclosed the following deliverables for **EM1817421**:

- EM1817421_0_COA.pdf
- EM1817421_0_ENMRG.CSV
- EM1817421_0_XTAB.XLS
- EM1817421_0_QC.pdf
- EM1817421_0_QCI.pdf
- L763274_INV.pdf
- EM1817421_COC.pdf

Report Recipients

- JOHN PAUL CUMMING
  - EM1817421_0_COA.pdf (Email)
  - EM1817421_0_ENMRG.CSV (Email)
  - EM1817421_0_XTAB.XLS (Email)
  - EM1817421_0_QC.pdf (Email)
  - EM1817421_0_QCI.pdf (Email)
  - L763274_INV.pdf (Email)
  - EM1817421_COC.pdf (Email)
- SARAH JOYCE
  - EM1817421_0_COA.pdf (Email)
  - EM1817421_0_ENMRG.CSV (Email)
  - EM1817421_0_XTAB.XLS (Email)
  - EM1817421_0_QC.pdf (Email)
  - EM1817421_0_QCI.pdf (Email)
  - L763274_INV.pdf (Email)
  - EM1817421_COC.pdf (Email)

2

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

CHAIN OF CUSTODY

FREIGHT

48 - 52

JPC

AP

Environmental Division
Melbourne
Work Order Reference
EM1817564

1	BH26 0·1-0·2	29-10-18	S	Jar	1	✓
2	BH26 0·5-0·6					✓
3	BH27 0·1-0·2					✓
4	BH27 0·5-0·6					✓
5	BH27 1·0-1·1					✓
6	BH27 1·5-1·6					✓
7	BH27 1·9-2·0					✓
8	BH28 0·1-0·2					✓
9	BH28 0·5-0·6					✓
10	BH28 1·0-1·1					✓
11	BH28 1·2-1·3					✓
12	BH29 0·5-0·6	30-10-18				✓

CHAIN OF CUSTODY

48 - 52

30-10-18

13	BH29 1·5-1·6	30-10-18	S	Jar	1	✓
14	BH29 2·1-2·2				1	✓
15	BH30 0·3-0·4				1	✓
16	BH31 0·5-0·6				1	✓
17	BH31 1·5-1·6				1	✓
18	BH32 0·5-0·6				1	✓
19	BH33 0·5-0·6				1	✓
20	BH34 0·5-0·6				1	✓
21	BH35 0·5-0·6				1	✓
22	BH35 1·5-1·6				1	✓
23	Duplicate 2				1	✓
24	Rinsate 2	29-10-18	W	2V 1P 1A	4	✓

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS Environmental

CHAIN OF CUSTODY

PROJECT: 48 - 52

PROJECT MANAGER: JPC

SAMPLER: AP

RECEIVED BY: Maxine Ch[illegible]

DATE/TIME: 1/11 9 20[illegible]

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	[illegible]
25	Rinsate 3	30·10·18	W	2V 2P 1A	4	✓
26	Rinsate 4	3·10·18	W	1	4	✓
27	BH36 0·5-0·6	-	S	Jar	1	✓
28	BH37 0·5-0·6				1	✓
29	1·5-1·6				1	✓
30	2·5-2·6				1	✓
31	3·5-3·6				1	✓
32	BH38 0·5-0·6				1	✓
33	1·5-1·6				1	✓
34	2·5-2·6				1	✓
35	BH39 0·5-0·6				1	✓
36	1·5-1·6				1	✓
	TOTAL					

ALS Environmental

CHAIN OF CUSTODY

PROJECT: 48 - 52

DATE/TIME: 31·10·18

RECEIVED BY: Maven Ch[illegible]

DATE/TIME: 1/11 9:40

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	[illegible]
37	BH39 2·5-2·6	31·10·18	S	Jar	1	✓
38	BH40 0·5-0·6					✓
39	1·5-1·6					✓
40	2·5-2·6					✓
41	3·5-3·6					✓
42	Duplicate 3					✓
43	Duplicate 4					✓
	TOTAL					

Rebatch

Client / Client code: GEOENVSOL
Project: 48-52
Project Manager: John Paul Cumming
Date /time sample rec: 1/11 @ 9:40
Date/time Instructions rec: 12/11 @ 1:09
Due date: 3 Day TAT
Due date surcharge: 10% surcharge √ approved

URGENT

MS 4602 - 4643

New Lab ID	Client ID	Sampling Date / Time	Previous Work Order Reference	Previous ALS ID	Tray Number(s)	Container	Number of Containers	Analysis: Standard					Leach: TCLP	Leach PAH				Shortest Holding time expiry
1	BH27 1.0-1.1	29/10/2018 0:00	EM1817564	5	MS 4460 - 88								X	X				
2	BH28 1.2-1.3	29/10/2018 0:00	EM1817564	11	MS 4460 - 88								X	X				
3	BH29 0.5-0.6	30/10/2018 0:00	EM1817564	12	MS 4460 - 88								X	X				
4	BH35 0.5-0.6	30/10/2018 0:00	EM1817564	21	MS 4460 - 88								X	X				
5	BH37 0.5-0.6	31/10/2018 0:00	EM1817564	24	MS 4460 - 88								X	X				
6	BH37 1.5-1.6	31/10/2018 0:00	EM1817564	25	MS 4460 - 88								X	X				
7	BH37 2.5-2.6	31/10/2018 0:00	EM1817564	30	MS 4460 - 88								X	X				
8	BH37 3.5-3.6	31/10/2018 0:00	EM1817564	31	MS 4460 - 88								X	X				
9	BH38 1.5-1.6	31/10/2018 0:00	EM1817564	35	MS 4460 - 88								X	X				
10	BH39 2.5-2.6	31/10/2018 0:00	EM1817564	37	MS 4460 - 88								X	X				
11	BH40 0.5-0.6	31/10/2018 0:00	EM1817564	38	MS 4460 - 88								X	X				
12	BH40 1.5-1.6	31/10/2018 0:00	EM1817564	39	MS 4460 - 88								X	X				
13	BH40 3.5-3.6	31/10/2018 0:00	EM1817564	41	MS 4460 - 88								X	X				

Environmental Division
Melbourne
Work Order Reference
EM1818156

CHAIN OF CUSTODY

ALS Environmental

URGENT

CLIENT: GEOENVIRONMENTAL SOLUTIONS
OFFICE: 29 Kirksway Pl, Battery Point TAS 7004
PROJECT: 48 - 52
ORDER NUMBER:
PROJECT MANAGER: JPC
SAMPLER: RP

TURNAROUND REQUIREMENTS: 3 day turn around
ALS QUOTE NO.:
CONTACT PH:
SAMPLER MOBILE:
EDD FORMAT (or default):

RELINQUISHED BY: DATE/TIME: 5/11/18 1500
RECEIVED BY: DATE/TIME:
RELINQUISHED BY: DATE/TIME:
RECEIVED BY: DATE/TIME: 9/11 9:15

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

FREIGHT

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS		Additional Information
1	BH41 0.5-0.6	5/11/18	S	Jar	1	✓	
2	BH42 0.5-0.6					✓	
3	BH42 1.5-1.6					✓	
4	BH42 2.5-2.6					✓	
5	BH43 0.5-0.6					✓	
6	BH43 1.5-1.6					✓	
7	BH43 2.5-2.6					✓	
8	BH43 3.5-3.6					✓	
9	BH44 0.5-0.6					✓	
10	BH44 1.5-1.6					✓	
11	BH44 2.5-2.6					✓	
12	BH44 3.5-3.6					✓	

Environmental Division
Melbourne
Work Order Reference
EM1817824

ALS Environmental

CHAIN OF CUSTODY

PROJECT: 48 - 52

PROJECT MANAGER: JPK

SAMPLER: AF

TURNAROUND REQUIREMENTS: 3 Day turn around

[redacted]

RELINQUISHED BY: 5/11/18

RECEIVED BY: 9:15

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
13	BH45 0.5-0.6	5/11/18	S	Jar	1	✓
14	BH46 0.5-0.6					✓
15	BH47 0.5-0.6					✓
16	BH47 1.5-1.6					✓
17	BH48 0.5-0.6					✓
18	BH48 1.5-1.6					✓
19	BH49 0.5-0.6					✓
20	BH49 1.5-1.6					✓
21	BH50 0.5-0.6					✓
22	BH50 1.5-1.6					✓
23	BH51 0.5-0.6					✓
24	BH51 1.5-1.6					✓

ALS Environmental

CHAIN OF CUSTODY

PROJECT: 48 - 52

TURNAROUND REQUIREMENTS: 3 Day turn around

RELINQUISHED BY: 5/11/18

RECEIVED BY: 9:15

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
25	BH52 0.5-0.6	5/11/18	S	Jar	1	✓
26	BH52 1.5-1.6				1	✓
27	BH53 0.5-0.6				1	✓
28	BH53 1.5-1.6				1	✓
29	Rinsate 5		W	2Y [illegible]P, 1A	4	✓

Rebatch

Client / Client code: GEOENVSOL
Project: 48-52
Project Manager: Sarah Joyce, John Paul Cumming
Date /time sample rec: 7/11 @ 9:15
Date/time instructions rec: 14/11 @ 9:12
Due date: ASAP
Due date surcharge: TBA 3 day ✓

CS Contact: L Burns
Additional Information:

URGENT URGI

Environmental Division
Melbourne
Work Order Reference
EM1818266

New Lab ID	Sample information						Number of Containers	Analysis										Shortest Holding time expiry
	Client ID	Sampling Date / Time	Previous Work Order Reference	Previous ALS ID	Tray Number(s)	Container		Standard					Leach: TCLP PAH					
1	BH42 0.5-0.8	5/11/2018 0:00	EM1817824	2	MS 4554-4556	150							X					19-Nov-18
2	BH42 1.5-1.8	5/11/2018 0:00	EM1817824	3	MS 4554-4556	150							X					19-Nov-18
3	BH43 0.5-0.8	5/11/2018 0:00	EM1817824	5	MS 4554-4556	150							X					19-Nov-18
4	BH43 1.5-1.8	5/11/2018 0:00	EM1817824	6	MS 4554-4556	150							X					19-Nov-18
5	BH43 2.5-2.8	5/11/2018 0:00	EM1817824	7	MS 4554-4556	150							X					19-Nov-18
6	BH43 3.5- 38	5/11/2018 0:00	EM1817824	8	MS 4554-4556	150							X					19-Nov-18
7	BH44 0.5-0.8	5/11/2018 0:00	EM1817824	9	MS 4554-4556	150							X					19-Nov-18
8	BH44 1.5-1.8	5/11/2018 0:00	EM1817824	10	MS 4554-4556	150							X					19-Nov-18
9	BH44 2.5-2.8	5/11/2018 0:00	EM1817824	11	MS 4554-4556	150							X					19-Nov-18
10	BH44 3.5-3.8	5/11/2018 0:00	EM1817824	12	MS 4554-4556	150							X					19-Nov-18
11	BH45 0.5-0.8	5/11/2018 0:00	EM1817824	13	MS 4554-4556	150							X					19-Nov-18
12	BH46 0.5-0.8	5/11/2018 0:00	EM1817824	14	MS 4554-4556	150							X					19-Nov-18
13	BH47 0.5-0.8	5/11/2018 0:00	EM1817824	15	MS 4554-4556	150							X					19-Nov-18
14	BH47 1.5-1.8	5/11/2018 0:00	EM1817824	16	MS 4554-4556	150							X					19-Nov-18
15	BH48 0.5-0.8	5/11/2018 0:00	EM1817824	17	MS 4554-4556	150							X					19-Nov-18
16	BH48 1.5-1.8	5/11/2018 0:00	EM1817824	18	MS 4554-4556	150							X					19-Nov-18
17	BH51 1.5-1.8	5/11/2018 0:00	EM1817824	24	MS 4554-4556	150							X					19-Nov-18
						TOTAL	0											

Kane Vorwerk

From:	Sarah Joyce <sjoyce@geosolutions.net.au>
Sent:	Wednesday, 14 November 2018 9:12 AM
To:	Kane Vorwerk
Cc:	ALS Enviro Melbourne; JP Cumming
Subject:	Rebatch EM1817824
Attachments:	Rebatch for EM1817824.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Hello Kane,

Another rebatch please.

TCLP Leach for PAHs on 17 Samples see attached scan of SRN.

I understand you guys have a lot of sample analysis to conduct at the moment but the fastest turn around possible would be appreciated.

Kind Regards,

Sarah Joyce
Environmental Scientist
GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: sjoyce@geosolutions.net.au

GES

Issue Date	07-Nov-2018
Page	2 of 3
Work Order	EM1817824 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: **SOIL**

- TCLP leach for PAHs

	Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
	EM1817824-001	05-Nov-2018 00:00	BH41 0.5-0.6	✓	✓	✓
1	EM1817824-002	05-Nov-2018 00:00	BH42 0.5-0.6	✓	✓	✓
2	EM1817824-003	05-Nov-2018 00:00	BH42 1.5-1.6	✓	✓	✓
	EM1817824-004	05-Nov-2018 00:00	BH42 2.5-2.6	✓	✓	✓
3	EM1817824-005	05-Nov-2018 00:00	BH43 0.5-0.6	✓	✓	✓
4	EM1817824-006	05-Nov-2018 00:00	BH43 1.5-1.6	✓	✓	✓
5	EM1817824-007	05-Nov-2018 00:00	BH43 2.5-2.6	✓	✓	✓
6	EM1817824-008	05-Nov-2018 00:00	BH43 3.5-3.6	✓	✓	✓
7	EM1817824-009	05-Nov-2018 00:00	BH44 0.5-0.6	✓	✓	✓
8	EM1817824-010	05-Nov-2018 00:00	BH44 1.5-1.6	✓	✓	✓
9	EM1817824-011	05-Nov-2018 00:00	BH44 2.5-2.6	✓	✓	✓
10	EM1817824-012	05-Nov-2018 00:00	BH44 3.5-3.6	✓	✓	✓
11	EM1817824-013	05-Nov-2018 00:00	BH45 0.5-0.6	✓	✓	✓
12	EM1817824-014	05-Nov-2018 00:00	BH46 0.5-0.6	✓	✓	✓
13	EM1817824-015	05-Nov-2018 00:00	BH47 0.5-0.6	✓	✓	✓
14	EM1817824-016	05-Nov-2018 00:00	BH47 1.5-1.6	✓	✓	✓
15	EM1817824-017	05-Nov-2018 00:00	BH48 0.5-0.6	✓	✓	✓
16	EM1817824-018	05-Nov-2018 00:00	BH48 1.5-1.6	✓	✓	✓
	EM1817824-019	05-Nov-2018 00:00	BH49 0.5-0.6	✓	✓	✓
	EM1817824-020	05-Nov-2018 00:00	BH49 1.5-1.6	✓	✓	✓
	EM1817824-021	05-Nov-2018 00:00	BH50 0.5-0.6	✓	✓	✓
	EM1817824-022	05-Nov-2018 00:00	BH50 1.5-1.6	✓	✓	✓
	EM1817824-023	05-Nov-2018 00:00	BH51 0.5-0.6	✓	✓	✓
17	EM1817824-024	05-Nov-2018 00:00	BH51 1.5-1.6	✓	✓	✓
	EM1817824-025	05-Nov-2018 00:00	BH52 0.5-0.6	✓	✓	✓
	EM1817824-026	05-Nov-2018 00:00	BH52 1.5-1.6	✓	✓	✓
	EM1817824-027	05-Nov-2018 00:00	BH53 0.5-0.6	✓	✓	✓
	EM1817824-028	05-Nov-2018 00:00	BH53 1.5-1.6	✓	✓	✓

ECEIPT INFC

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory

CLIENT:	GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS:	2 Day Turn around
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004		
PROJECT:	48 - 52	ALS QUOTE NO.:	
ORDER NUMBER:			COC SEQUENCE NUMBER (Circle)
PROJECT MANAGER:	JPC	CONTACT PH:	
SAMPLER:	AP	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
	Morc Cm		MC
DATE/TIME: 5/11/18	DATE/TIME: 7/11 9.13	DATE/TIME:	DATE/TIME: 8/11/18 9:00AM

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH, BTEX, PAH, TI, MAHS	Additional Information
1	Triplicate 1 0.5-0.6	5.11.18	S	Jar	1	✓	
2	Triplicate 2 1.5-1.6	⊥	⊥	⊥	1	✓	

TAT

Environmental Division
Sydney
Work Order Reference
ES1833261

Groundwater

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS

CHAIN OF CUSTODY

FREIGHT

CLIENT:	GEOENVIRONMENTAL SOLUTIONS
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004
PROJECT:	48 - 52
ORDER NUMBER:	
PROJECT MANAGER:	JP
SAMPLER:	MD

TURNAROUND REQUIREMENTS: 3 DAY Turn around please

RELINQUISHED BY: DATE/TIME: 27/11/18

RECEIVED BY: DATE/TIME: 28/11 9-30

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

URGENT

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS	
1	MW1	26/11/18	W	2V, 1P, 1A	4	✓
2	MW2				4	✓
3	MW3				4	✓
4	Duplicate				4	✓
5	Rinsate				4	✓
					TOTAL 20	

Environmental Division
Melbourne
Work Order Reference
EM1819122

ENVIROLAB **mpl**

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

Client:	GES (Geo Environmental Solutions)
Contact Person:	S. Joyce
Project Mgr:	JP
Sampler:	M. Dowie
Address:	29 Kirksway Place, Battery Point
Phone:	6223 1839
Mob:	0418 232 259
Email:	sjoyce@geosolutions.net.au

Client Project Name / Number / Site etc (ie report title): 48 - 52 New Town Road

PO No.:

Envirolab Quote No.:

Date results required:

Or choose: standard / same day / 1 day / 2 day / 3 day

Additional report format: esdat / equis /

Lab Comments:

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/BTEX	15 metals	Comments
	Triplicate		26/11/18	Water	✓	✓	Possibly hydrocarbons + metals

Relinquished by (Company): GES	Received by (Company):	Lab Use Only	
Print Name: Sarah Joyce	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 27/11/18	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Appendix 7 Laboratory Sample Receipt Notification

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1811858**

Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 4
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SJ		

Dates

Date Samples Received	: 25-Jul-2018 09:05	Issue Date	: 26-Jul-2018
Client Requested Due Date	: 01-Aug-2018	Scheduled Reporting Date	: **01-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 3.9°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 59 / 23

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	: 26-Jul-2018
Page	: 2 of 4
Work Order	: EM1811858 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811858-001	23-Jul-2018 00:00	BH01 0.0-0.1	✓			
EM1811858-002	23-Jul-2018 00:00	BH01 0.5-0.2	✓			
EM1811858-003	23-Jul-2018 00:00	BH01 1.0-1.1		✓	✓	✓
EM1811858-004	23-Jul-2018 00:00	BH01 1.5-1.6	✓			
EM1811858-005	23-Jul-2018 00:00	BH01 2.0-2.1	✓			
EM1811858-006	23-Jul-2018 00:00	BH01 2.5-2.6		✓	✓	✓
EM1811858-007	23-Jul-2018 00:00	BH01 3.0-3.1	✓			
EM1811858-008	23-Jul-2018 00:00	BH01 3.5-3.6	✓			
EM1811858-009	23-Jul-2018 00:00	BH01 4.0-4.1	✓			
EM1811858-010	23-Jul-2018 00:00	BH01 4.4-4.5		✓	✓	✓
EM1811858-011	23-Jul-2018 00:00	BH02 0.0-0.1	✓			
EM1811858-012	23-Jul-2018 00:00	BH02 0.5-0.6	✓			
EM1811858-013	23-Jul-2018 00:00	BH02 1.0-1.1		✓	✓	✓
EM1811858-014	23-Jul-2018 00:00	BH02 1.5-1.6	✓			
EM1811858-015	23-Jul-2018 00:00	BH02 2.0-2.1	✓			
EM1811858-016	23-Jul-2018 00:00	BH02 2.8-2.9		✓	✓	✓
EM1811858-017	23-Jul-2018 00:00	BH02 3.4-3.5	✓			
EM1811858-018	23-Jul-2018 00:00	BH02 4.0-4.1		✓	✓	✓
EM1811858-019	23-Jul-2018 00:00	BH03 0.0-0.1	✓			
EM1811858-020	23-Jul-2018 00:00	BH03 0.5-0.6		✓	✓	✓
EM1811858-021	23-Jul-2018 00:00	BH03 1.0-1.1	✓			
EM1811858-022	23-Jul-2018 00:00	BH03 1.5-1.6	✓			
EM1811858-024	23-Jul-2018 00:00	BH03 2.5-2.6		✓	✓	✓
EM1811858-025	23-Jul-2018 00:00	BH03 3.0-3.1	✓			
EM1811858-026	23-Jul-2018 00:00	BH03 3.5-3.6	✓			
EM1811858-027	23-Jul-2018 00:00	BH03 3.9-4.0		✓	✓	✓
EM1811858-028	23-Jul-2018 00:00	BH04 0.0-0.1	✓			
EM1811858-029	23-Jul-2018 00:00	BH04 0.5-0.6	✓			
EM1811858-030	23-Jul-2018 00:00	BH04 1.0-1.1	✓			
EM1811858-031	23-Jul-2018 00:00	BH04 1.5-1.6		✓	✓	✓
EM1811858-032	23-Jul-2018 00:00	BH04 2.0-2.1	✓			
EM1811858-033	23-Jul-2018 00:00	BH04 2.5-2.6	✓			
EM1811858-034	23-Jul-2018 00:00	BH04 3.0-3.1		✓	✓	✓
EM1811858-035	23-Jul-2018 00:00	BH04 3.5-3.6	✓			
EM1811858-036	23-Jul-2018 00:00	BH04 4.0-4.1	✓			

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811858-037	23-Jul-2018 00:00	BH04 4.5-4.6		✓	✓	✓
EM1811858-038	23-Jul-2018 00:00	BH05 0.0-0.1	✓			
EM1811858-039	23-Jul-2018 00:00	BH05 0.5-0.6	✓			
EM1811858-040	23-Jul-2018 00:00	BH05 1.0-1.1		✓	✓	✓
EM1811858-041	23-Jul-2018 00:00	BH05 1.5-1.6	✓			
EM1811858-042	23-Jul-2018 00:00	BH05 2.0-2.1	✓			
EM1811858-043	23-Jul-2018 00:00	BH05 2.5-2.6	✓			
EM1811858-044	23-Jul-2018 00:00	BH05 3.0-3.1		✓	✓	✓
EM1811858-045	23-Jul-2018 00:00	BH05 3.5-3.6	✓			
EM1811858-046	23-Jul-2018 00:00	BH05 4.0-4.1	✓			
EM1811858-047	23-Jul-2018 00:00	BH05 4.5-4.6		✓	✓	✓
EM1811858-048	23-Jul-2018 00:00	BH06 0.0-0.1	✓			
EM1811858-049	23-Jul-2018 00:00	BH06 0.2-0.3		✓	✓	✓
EM1811858-050	23-Jul-2018 00:00	BH07 0.0-0.1	✓			
EM1811858-051	23-Jul-2018 00:00	BH07 0.5-0.6	✓			
EM1811858-052	23-Jul-2018 00:00	BH07 1.0-1.1		✓	✓	✓
EM1811858-053	23-Jul-2018 00:00	BH07 1.5-1.6	✓			
EM1811858-054	23-Jul-2018 00:00	BH07 2.0-2.1	✓			
EM1811858-055	23-Jul-2018 00:00	BH07 2.2-2.3		✓	✓	✓
EM1811858-056	23-Jul-2018 00:00	Duplicate 1		✓	✓	✓
EM1811858-057	23-Jul-2018 00:00	Duplicate 2		✓	✓	✓
EM1811858-060	23-Jul-2018 00:00	Duplicate 3		✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM1811858-058	23-Jul-2018 00:00	Field Blank	✓		✓
EM1811858-059	23-Jul-2018 00:00	Rinsate Blank		✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Issue Date	26-Jul-2018
Page	4 of 4
Work Order	EM1811858 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1822218**

Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-2-8784 8500
Project	: Newtown Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 27-Jul-2018 10:00	Issue Date	: 30-Jul-2018
Client Requested Due Date	: 02-Aug-2018	Scheduled Reporting Date	: **02-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 5.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

RIGHT SOLUTIONS RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
ES1822218-001	23-Jul-2018 00:00	Triplicate 1	✓	✓	✓
ES1822218-002	23-Jul-2018 00:00	Triplicate 2	✓	✓	✓
ES1822218-003	23-Jul-2018 00:00	Triplicate 3	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1812173**

Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 25-Jul-2018 09:05	Issue Date	: 01-Aug-2018
Client Requested Due Date	: 07-Aug-2018	Scheduled Reporting Date	: **07-Aug-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 11 / 11

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1811858.

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	01-Aug-2018
Page	2 of 2
Work Order	EM1812173 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1812173-001	23-Jul-2018 00:00	BH01 1.5-1.6	✓	✓	✓
EM1812173-002	23-Jul-2018 00:00	BH01 3.5-3.6	✓	✓	✓
EM1812173-003	23-Jul-2018 00:00	BH02 0.5-0.6	✓	✓	✓
EM1812173-004	23-Jul-2018 00:00	BH02 2.0-2.1	✓	✓	✓
EM1812173-005	23-Jul-2018 00:00	BH03 1.0-1.1	✓	✓	✓
EM1812173-006	23-Jul-2018 00:00	BH03 3.0-3.1	✓	✓	✓
EM1812173-007	23-Jul-2018 00:00	BH04 0.5-0.6	✓	✓	✓
EM1812173-008	23-Jul-2018 00:00	BH04 2.5-2.6	✓	✓	✓
EM1812173-009	23-Jul-2018 00:00	BH04 3.5-3.6	✓	✓	✓
EM1812173-010	23-Jul-2018 00:00	BH05 2.0-2.1	✓	✓	✓
EM1812173-011	23-Jul-2018 00:00	BH05 4.0-4.1	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1811913**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 4
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SARAH JOYCE		

Dates

Date Samples Received	: 26-Jul-2018 09:05	Issue Date	: 27-Jul-2018
Client Requested Due Date	: 02-Aug-2018	Scheduled Reporting Date	: **02-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 5.9°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 53 / 19

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	: 27-Jul-2018
Page	: 2 of 4
Work Order	: EM1811913 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811913-001	24-Jul-2018 00:00	BH08_0.0-0.1	✓			
EM1811913-002	24-Jul-2018 00:00	BH08_0.5-0.6	✓			
EM1811913-003	24-Jul-2018 00:00	BH08_1.0-1.1		✓	✓	✓
EM1811913-004	24-Jul-2018 00:00	BH08_1.5-1.6	✓			
EM1811913-005	24-Jul-2018 00:00	BH08_2.0-2.1	✓			
EM1811913-006	24-Jul-2018 00:00	BH08_2.5-2.6		✓	✓	✓
EM1811913-007	24-Jul-2018 00:00	BH08_3.0-3.1	✓			
EM1811913-008	24-Jul-2018 00:00	BH08_3.5-3.6	✓			
EM1811913-009	24-Jul-2018 00:00	BH08_4.0-4.1	✓			
EM1811913-010	24-Jul-2018 00:00	BH08_4.5-4.6		✓	✓	✓
EM1811913-011	24-Jul-2018 00:00	BH09_0.2-0.3	✓			
EM1811913-012	24-Jul-2018 00:00	BH09_0.5-0.6	✓			
EM1811913-013	24-Jul-2018 00:00	BH09_1.0-1.1		✓	✓	✓
EM1811913-014	24-Jul-2018 00:00	BH09_1.5-1.6	✓			
EM1811913-015	24-Jul-2018 00:00	BH09_2.0-2.1	✓			
EM1811913-016	24-Jul-2018 00:00	BH09_2.5-2.6		✓	✓	✓
EM1811913-017	24-Jul-2018 00:00	BH09_3.0-3.1	✓			
EM1811913-018	24-Jul-2018 00:00	BH09_3.5-3.6	✓			
EM1811913-019	24-Jul-2018 00:00	BH09_4.0-4.1	✓			
EM1811913-020	24-Jul-2018 00:00	BH09_4.5-4.6		✓	✓	✓
EM1811913-021	24-Jul-2018 00:00	BH09_5.5-5.6	✓			
EM1811913-022	24-Jul-2018 00:00	BH09_6.0-6.1		✓	✓	✓
EM1811913-023	24-Jul-2018 00:00	BH09_6.3-6.5	✓			
EM1811913-024	24-Jul-2018 00:00	Duplicate 4		✓	✓	✓
EM1811913-025	24-Jul-2018 00:00	BH10_0.5-0.6	✓			
EM1811913-026	24-Jul-2018 00:00	BH10_1.0-1.1		✓	✓	✓
EM1811913-027	24-Jul-2018 00:00	BH10_1.5-1.6	✓			
EM1811913-028	24-Jul-2018 00:00	BH10_2.0-2.1	✓			
EM1811913-029	24-Jul-2018 00:00	BH10_2.5-2.6	✓			
EM1811913-030	24-Jul-2018 00:00	BH10_3.0-3.1		✓	✓	✓
EM1811913-031	24-Jul-2018 00:00	BH10_3.5-3.6	✓			
EM1811913-032	24-Jul-2018 00:00	BH10_4.0-4.1	✓			
EM1811913-033	24-Jul-2018 00:00	BH10_4.5-4.6	✓			
EM1811913-034	24-Jul-2018 00:00	BH10_5.0-5.1		✓	✓	✓
EM1811913-035	24-Jul-2018 00:00	BH10_5.4-5.5	✓			

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811913-036	24-Jul-2018 00:00	BH11_0.5-0.6	✓			
EM1811913-037	24-Jul-2018 00:00	BH11_1.0-1.1		✓	✓	✓
EM1811913-038	24-Jul-2018 00:00	BH11_1.5-1.6	✓			
EM1811913-039	24-Jul-2018 00:00	BH11_2.0-2.1	✓			
EM1811913-040	24-Jul-2018 00:00	BH11_2.5-2.6		✓	✓	✓
EM1811913-041	24-Jul-2018 00:00	BH11_3.0-3.1	✓			
EM1811913-042	24-Jul-2018 00:00	BH11_3.3-3.4		✓	✓	✓
EM1811913-043	24-Jul-2018 00:00	BH12_0.5-0.6	✓			
EM1811913-044	24-Jul-2018 00:00	BH12_1.0-1.1		✓	✓	✓
EM1811913-045	24-Jul-2018 00:00	BH12_1.5-1.6	✓			
EM1811913-046	24-Jul-2018 00:00	BH12_2.0-2.1	✓			
EM1811913-047	24-Jul-2018 00:00	BH12_2.5-2.6		✓	✓	✓
EM1811913-048	24-Jul-2018 00:00	BH12_3.0-3.1	✓			
EM1811913-049	24-Jul-2018 00:00	BH12_3.5-3.6		✓	✓	✓
EM1811913-050	24-Jul-2018 00:00	BH12_4.0-4.1	✓			
EM1811913-051	24-Jul-2018 00:00	BH12_4.5-4.6	✓			

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM1811913-052	24-Jul-2018 00:00	Field Blank 2	✓	✓
EM1811913-053	24-Jul-2018 00:00	Rinsate 2	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES1822455**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-2-8784 8500
Project	: Newtown Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SARAH JOYCE		

Dates

Date Samples Received	: 31-Jul-2018 23:30	Issue Date	: 31-Jul-2018
Client Requested Due Date	: 07-Aug-2018	Scheduled Reporting Date	: **07-Aug-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 4.4'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	: 31-Jul-2018
Page	: 2 of 2
Work Order	: ES1822455 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
ES1822455-001	24-Jul-2018 00:00	Triplicate 4	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: EM1812174		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 26-Jul-2018 09:05	Issue Date	: 01-Aug-2018
Client Requested Due Date	: 07-Aug-2018	Scheduled Reporting Date	: **07-Aug-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1811913.

RIGHT SOLUTIONS RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1812174-001	24-Jul-2018 00:00	BH08_2.0-2.1	✓	✓	✓
EM1812174-002	24-Jul-2018 00:00	BH11_2.0-2.1	✓	✓	✓
EM1812174-003	24-Jul-2018 00:00	BH12_2.0-2.1	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1811891**

Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 3
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SARAH JOYCE		

Dates

Date Samples Received	: 26-Jul-2018 09:05	Issue Date	: 26-Jul-2018
Client Requested Due Date	: 02-Aug-2018	Scheduled Reporting Date	: **02-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 6.4°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 27 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Mercury by FIMS : EG035F		
Field Blank 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Rinsate 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
Field Blank 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Rinsate 3	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1811891-001	25-Jul-2018 00:00	BH14 0.2-0.3	✓			
EM1811891-002	25-Jul-2018 00:00	BH14 0.4-0.5		✓	✓	✓
EM1811891-003	25-Jul-2018 00:00	BH15 0.2-0.3	✓			
EM1811891-004	25-Jul-2018 00:00	BH15 0.55-0.65		✓	✓	✓
EM1811891-005	25-Jul-2018 00:00	BH16 0.3-0.4		✓	✓	✓
EM1811891-006	25-Jul-2018 00:00	BH13 0.5-0.6	✓			
EM1811891-007	25-Jul-2018 00:00	BH13 1.0-1.1		✓	✓	✓
EM1811891-008	25-Jul-2018 00:00	BH13 1.5-1.6		✓	✓	✓
EM1811891-009	25-Jul-2018 00:00	BH13 2.0-2.1	✓			
EM1811891-010	25-Jul-2018 00:00	BH17 0.2-0.3	✓			
EM1811891-011	25-Jul-2018 00:00	BH17 0.5-0.6		✓	✓	✓
EM1811891-012	25-Jul-2018 00:00	BH17 1.0-1.1	✓			
EM1811891-013	25-Jul-2018 00:00	BH17 1.1-1.2		✓	✓	✓
EM1811891-014	25-Jul-2018 00:00	BH18 0.5-0.6	✓			
EM1811891-015	25-Jul-2018 00:00	BH18 1.0-1.1	✓			
EM1811891-016	25-Jul-2018 00:00	BH18 1.5-1.6		✓	✓	✓
EM1811891-017	25-Jul-2018 00:00	BH18 2.0-2.1	✓			
EM1811891-018	25-Jul-2018 00:00	BH18 2.5-2.6	✓			
EM1811891-019	25-Jul-2018 00:00	BH18 2.7-2.8		✓	✓	✓
EM1811891-020	25-Jul-2018 00:00	BH18 3.1-3.2	✓			
EM1811891-021	25-Jul-2018 00:00	BH18 3.5-3.6		✓	✓	✓
EM1811891-022	25-Jul-2018 00:00	BH19 0.5-0.6	✓			
EM1811891-023	25-Jul-2018 00:00	BH19 1.0-1.1		✓	✓	✓
EM1811891-024	25-Jul-2018 00:00	BH19 1.5-1.6	✓			
EM1811891-025	25-Jul-2018 00:00	BH19 2.1-2.2		✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1811891-026	25-Jul-2018 00:00	Field Blank 3	✓	✓
EM1811891-027	25-Jul-2018 00:00	Rinsate 3	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1812175**

Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Newtown Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 26-Jul-2018 09:05	Issue Date	: 01-Aug-2018
Client Requested Due Date	: 07-Aug-2018	Scheduled Reporting Date	: **07-Aug-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1811891.

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	: 01-Aug-2018
Page	: 2 of 2
Work Order	: EM1812175 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1812175-001	25-Jul-2018 00:00	BH13 2.0-2.1	✓	✓	✓
EM1812175-002	25-Jul-2018 00:00	BH18 0.5-0.6	✓	✓	✓
EM1812175-003	25-Jul-2018 00:00	BH18 2.5-2.6	✓	✓	✓
EM1812175-004	25-Jul-2018 00:00	BH18 3.1-3.2	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1812116**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: New Town Road	Page	: 1 of 3
Order number	: 30 July 2018	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SJ		

Dates

Date Samples Received	: 31-Jul-2018 09:25	Issue Date	: 31-Jul-2018
Client Requested Due Date	: 07-Aug-2018	Scheduled Reporting Date	: **07-Aug-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 4.6°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 5 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1812116-003	30-Jul-2018 00:00	BH20 0.5-0.6		✓	✓	✓
EM1812116-004	30-Jul-2018 00:00	BH20 1.0-1.1		✓	✓	✓
EM1812116-005	30-Jul-2018 00:00	Duplicate 5	✓			

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM1812116-001	30-Jul-2018 00:00	Field Blank 4	✓	✓
EM1812116-002	30-Jul-2018 00:00	Rinsate 4	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Issue Date	31-Jul-2018
Page	3 of 3
Work Order	EM1812116 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1814666**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: New Town Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AARON PLUMMER		

Dates

Date Samples Received	: 13-Sep-2018 09:25	Issue Date	: 13-Sep-2018
Client Requested Due Date	: 17-Sep-2018	Scheduled Reporting Date	: **17-Sep-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 7.2°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	13-Sep-2018
Page	2 of 2
Work Order	EM1814666 Amendment 0
Client	GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1814666-001	11-Sep-2018 00:00	MW1	✓	✓
EM1814666-002	11-Sep-2018 00:00	DUPLICATE	✓	✓
EM1814666-003	11-Sep-2018 00:00	TRIPLICATE	✓	✓
EM1814666-004	11-Sep-2018 00:00	FIELD BLANK		✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES1827248**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sjoyce@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-2-8784 8500
Project	: New Town Rd	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: A. Plummer		

Dates

Date Samples Received	: 14-Sep-2018 09:00	Issue Date	: 14-Sep-2018
Client Requested Due Date	: 18-Sep-2018	Scheduled Reporting Date	: **18-Sep-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 11.4'C - Ice present
Receipt Detail	: ICE MELTED	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

RIGHT SOLUTIONS RIGHT PARTNER

Issue Date	: 14-Sep-2018
Page	: 2 of 2
Work Order	: ES1827248 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Mercury by FIMS : EG035F		
TRIPLICATE	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
TRIPLICATE	- Clear Plastic Bottle - Unfiltered; Lab-acidified	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
ES1827248-001	11-Sep-2018 00:00	TRIPLICATE	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1816786**

Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: New Town Road	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: SJ		

Dates

Date Samples Received	: 18-Oct-2018 09:10	Issue Date	: 19-Oct-2018
Client Requested Due Date	: 25-Oct-2018	Scheduled Reporting Date	: **25-Oct-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 5.0°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Issue Date	: 19-Oct-2018
Page	: 2 of 2
Work Order	: EM1816786 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

ALS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - EN33a TCLP Leachate	SOIL - EP075 SIM PAH only SIM - PAH only
EM1816786-001	17-Oct-2018 00:00	GT02	✓	✓	✓
EM1816786-002	17-Oct-2018 00:00	GT01	✓	✓	✓
EM1816786-003	17-Oct-2018 00:00	GT03	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: EM1817421		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 3
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: GM		

Dates

Date Samples Received	: 30-Oct-2018 09:40	Issue Date	: 30-Oct-2018
Client Requested Due Date	: 07-Nov-2018	Scheduled Reporting Date	: **07-Nov-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 7.3°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 28 / 28

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS | RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1817421-001	24-Oct-2018 00:00	BH21 0.5-0.6	✓	✓	✓
EM1817421-002	24-Oct-2018 00:00	BH21 1.5-1.6	✓	✓	✓
EM1817421-003	24-Oct-2018 00:00	BH21 2.5-2.6	✓	✓	✓
EM1817421-004	24-Oct-2018 00:00	BH21 3.5-3.6	✓	✓	✓
EM1817421-005	24-Oct-2018 00:00	BH21 4.5-4.6	✓	✓	✓
EM1817421-006	24-Oct-2018 00:00	BH21 5.5-5.6	✓	✓	✓
EM1817421-007	24-Oct-2018 00:00	BH22 0.5-0.6	✓	✓	✓
EM1817421-008	24-Oct-2018 00:00	BH22 1.5-1.6	✓	✓	✓
EM1817421-009	24-Oct-2018 00:00	BH22 2.5-2.6	✓	✓	✓
EM1817421-010	24-Oct-2018 00:00	BH22 3.4-3.5	✓	✓	✓
EM1817421-011	24-Oct-2018 00:00	BH23 0.5-0.6	✓	✓	✓
EM1817421-012	24-Oct-2018 00:00	BH23 1.5-1.6	✓	✓	✓
EM1817421-013	24-Oct-2018 00:00	BH23 2.5-2.6	✓	✓	✓
EM1817421-014	24-Oct-2018 00:00	BH23 3.5-3.6	✓	✓	✓
EM1817421-015	24-Oct-2018 00:00	BH23 4.5-4.6	✓	✓	✓
EM1817421-016	24-Oct-2018 00:00	BH23 5.5-5.6	✓	✓	✓
EM1817421-017	24-Oct-2018 00:00	BH24 0.5-0.6	✓	✓	✓
EM1817421-018	24-Oct-2018 00:00	BH24 1.5-1.6	✓	✓	✓
EM1817421-019	24-Oct-2018 00:00	BH24 2.5-2.6	✓	✓	✓
EM1817421-020	24-Oct-2018 00:00	BH24 3.3-3.4	✓	✓	✓
EM1817421-021	24-Oct-2018 00:00	BH25 0.5-0.6	✓	✓	✓
EM1817421-022	24-Oct-2018 00:00	BH25 1.5-1.6	✓	✓	✓
EM1817421-023	24-Oct-2018 00:00	BH25 2.5-2.6	✓	✓	✓
EM1817421-024	24-Oct-2018 00:00	BH25 3.5-3.6	✓	✓	✓
EM1817421-025	24-Oct-2018 00:00	BH25 4.5-4.6	✓	✓	✓
EM1817421-026	24-Oct-2018 00:00	BH25 5.5-5.6	✓	✓	✓
EM1817421-027	24-Oct-2018 00:00	DUPLICATE 1	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1817421-028	24-Oct-2018 00:00	Rinsate Blank	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1817821**		
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 3
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 30-Oct-2018 09:40	Issue Date	: 07-Nov-2018
Client Requested Due Date	: 09-Nov-2018	Scheduled Reporting Date	: **09-Nov-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 13 / 13

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1817421

RIGHT SOLUTIONS | RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EG005C Leachable Metals by ICPAES	SOIL - EN33a TCLP Leachate	SOIL - EP075 SIM PAH only SIM - PAH only
EM1817821-001	24-Oct-2018 00:00	BH21 0.5-0.6		✓	✓
EM1817821-002	24-Oct-2018 00:00	BH21 4.5-4.6		✓	✓
EM1817821-003	24-Oct-2018 00:00	BH21 5.5-5.6		✓	✓
EM1817821-004	24-Oct-2018 00:00	BH22 0.5-0.6		✓	✓
EM1817821-005	24-Oct-2018 00:00	BH23 0.5-0.6		✓	✓
EM1817821-006	24-Oct-2018 00:00	BH23 1.5-1.6		✓	✓
EM1817821-007	24-Oct-2018 00:00	BH23 2.5-2.6		✓	✓
EM1817821-008	24-Oct-2018 00:00	BH23 3.5-3.6	✓	✓	✓
EM1817821-009	24-Oct-2018 00:00	BH23 4.5-4.6		✓	✓
EM1817821-010	24-Oct-2018 00:00	BH23 5.5-5.6		✓	✓
EM1817821-011	24-Oct-2018 00:00	BH24 0.5-0.6		✓	✓
EM1817821-012	24-Oct-2018 00:00	BH25 3.5-3.6		✓	✓
EM1817821-013	24-Oct-2018 00:00	BH25 4.5-4.6		✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1817564**

Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 4
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AARON PLUMMER		

Dates

Date Samples Received	: 01-Nov-2018 09:40	Issue Date	: 01-Nov-2018
Client Requested Due Date	: 09-Nov-2018	Scheduled Reporting Date	: **09-Nov-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 8.2°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 43 / 43

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS | RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1817564-001	29-Oct-2018 00:00	BH26 0.1-0.2	✓	✓	✓
EM1817564-002	29-Oct-2018 00:00	BH26 0.5-0.6	✓	✓	✓
EM1817564-003	29-Oct-2018 00:00	BH27 0.1-0.2	✓	✓	✓
EM1817564-004	29-Oct-2018 00:00	BH27 0.5-0.6	✓	✓	✓
EM1817564-005	29-Oct-2018 00:00	BH27 1.0-1.1	✓	✓	✓
EM1817564-006	29-Oct-2018 00:00	BH27 1.5-1.6	✓	✓	✓
EM1817564-007	29-Oct-2018 00:00	BH27 1.9-2.0	✓	✓	✓
EM1817564-008	29-Oct-2018 00:00	BH28 0.1-0.2	✓	✓	✓
EM1817564-009	29-Oct-2018 00:00	BH28 0.5-0.6	✓	✓	✓
EM1817564-010	29-Oct-2018 00:00	BH28 1.0-1.1	✓	✓	✓
EM1817564-011	29-Oct-2018 00:00	BH28 1.2-1.3	✓	✓	✓
EM1817564-012	30-Oct-2018 00:00	BH29 0.5-0.6	✓	✓	✓
EM1817564-013	30-Oct-2018 00:00	BH29 1.5-1.6	✓	✓	✓
EM1817564-014	30-Oct-2018 00:00	BH29 2.1-2.2	✓	✓	✓
EM1817564-015	30-Oct-2018 00:00	BH30 0.3-0.4	✓	✓	✓
EM1817564-016	30-Oct-2018 00:00	BH31 0.5-0.6	✓	✓	✓
EM1817564-017	30-Oct-2018 00:00	BH31 1.5-1.6	✓	✓	✓
EM1817564-018	30-Oct-2018 00:00	BH32 0.5-0.6	✓	✓	✓
EM1817564-019	30-Oct-2018 00:00	BH33 0.5-0.6	✓	✓	✓
EM1817564-020	30-Oct-2018 00:00	BH34 0.5-0.6	✓	✓	✓
EM1817564-021	30-Oct-2018 00:00	BH35 0.5-0.6	✓	✓	✓
EM1817564-022	30-Oct-2018 00:00	BH35 1.5-1.6	✓	✓	✓
EM1817564-023	30-Oct-2018 00:00	Duplicate 2	✓	✓	✓
EM1817564-027	31-Oct-2018 00:00	BH36 0.5-0.6	✓	✓	✓
EM1817564-028	31-Oct-2018 00:00	BH37 0.5-0.6	✓	✓	✓
EM1817564-029	31-Oct-2018 00:00	BH37 1.5-1.6	✓	✓	✓
EM1817564-030	31-Oct-2018 00:00	BH37 2.5-2.6	✓	✓	✓
EM1817564-031	31-Oct-2018 00:00	BH37 3.5-3.6	✓	✓	✓
EM1817564-032	31-Oct-2018 00:00	BH38 0.5-0.6	✓	✓	✓
EM1817564-033	31-Oct-2018 00:00	BH38 1.5-1.6	✓	✓	✓
EM1817564-034	31-Oct-2018 00:00	BH38 2.5-2.6	✓	✓	✓
EM1817564-035	31-Oct-2018 00:00	BH39 0.5-0.6	✓	✓	✓
EM1817564-036	31-Oct-2018 00:00	BH39 1.5-1.6	✓	✓	✓
EM1817564-037	31-Oct-2018 00:00	BH39 2.5-2.6	✓	✓	✓
EM1817564-038	31-Oct-2018 00:00	BH40 0.5-0.6	✓	✓	✓

			SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1817564-039	31-Oct-2018 00:00	BH40 1.5-1.6	✓	✓	✓
EM1817564-040	31-Oct-2018 00:00	BH40 2.5-2.6	✓	✓	✓
EM1817564-041	31-Oct-2018 00:00	BH40 3.5-3.6	✓	✓	✓
EM1817564-042	31-Oct-2018 00:00	Duplicate 3	✓	✓	✓
EM1817564-043	31-Oct-2018 00:00	Duplicate 4	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1817564-024	29-Oct-2018 00:00	Rinsate 2	✓	✓
EM1817564-025	30-Oct-2018 00:00	Rinsate 3	✓	✓
EM1817564-026	31-Oct-2018 00:00	Rinsate 4	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1818156**

Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 3
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 01-Nov-2018 09:40	Issue Date	: 12-Nov-2018
Client Requested Due Date	: 15-Nov-2018	Scheduled Reporting Date	: **15-Nov-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 13 / 13

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1817564

RIGHT SOLUTIONS | RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EN33a TCLP Leachate	SOIL - EP075 SIM PAH only SIM - PAH only
EM1818156-001	29-Oct-2018 00:00	BH27 1.0-1.1	✓	✓
EM1818156-002	29-Oct-2018 00:00	BH28 1.2-1.3	✓	✓
EM1818156-003	30-Oct-2018 00:00	BH29 0.5-0.6	✓	✓
EM1818156-004	30-Oct-2018 00:00	BH35 0.5-0.6	✓	✓
EM1818156-005	31-Oct-2018 00:00	BH37 0.5-0.6	✓	✓
EM1818156-006	31-Oct-2018 00:00	BH37 1.5-1.6	✓	✓
EM1818156-007	31-Oct-2018 00:00	BH37 2.5-2.6	✓	✓
EM1818156-008	31-Oct-2018 00:00	BH37 3.5-3.6	✓	✓
EM1818156-009	31-Oct-2018 00:00	BH39 1.5-1.6	✓	✓
EM1818156-010	31-Oct-2018 00:00	BH39 2.5-2.6	✓	✓
EM1818156-011	31-Oct-2018 00:00	BH40 0.5-0.6	✓	✓
EM1818156-012	31-Oct-2018 00:00	BH40 1.5-1.6	✓	✓
EM1818156-013	31-Oct-2018 00:00	BH40 3.5-3.6	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- *AU Certificate of Analysis - NATA (COA)	Email	miran@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	miran@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	miran@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	miran@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	miran@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	miran@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: EM1817824		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 3
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AP		

Dates

Date Samples Received	: 07-Nov-2018 09:15	Issue Date	: 07-Nov-2018
Client Requested Due Date	: 12-Nov-2018	Scheduled Reporting Date	: **12-Nov-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 17.5°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 29 / 29

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1817824-001	05-Nov-2018 00:00	BH41 0.5-0.6	✓	✓	✓
EM1817824-002	05-Nov-2018 00:00	BH42 0.5-0.6	✓	✓	✓
EM1817824-003	05-Nov-2018 00:00	BH42 1.5-1.6	✓	✓	✓
EM1817824-004	05-Nov-2018 00:00	BH42 2.5-2.6	✓	✓	✓
EM1817824-005	05-Nov-2018 00:00	BH43 0.5-0.6	✓	✓	✓
EM1817824-006	05-Nov-2018 00:00	BH43 1.5-1.6	✓	✓	✓
EM1817824-007	05-Nov-2018 00:00	BH43 2.5-2.6	✓	✓	✓
EM1817824-008	05-Nov-2018 00:00	BH43 3.5-3.6	✓	✓	✓
EM1817824-009	05-Nov-2018 00:00	BH44 0.5-0.6	✓	✓	✓
EM1817824-010	05-Nov-2018 00:00	BH44 1.5-1.6	✓	✓	✓
EM1817824-011	05-Nov-2018 00:00	BH44 2.5-2.6	✓	✓	✓
EM1817824-012	05-Nov-2018 00:00	BH44 3.5-3.6	✓	✓	✓
EM1817824-013	05-Nov-2018 00:00	BH45 0.5-0.6	✓	✓	✓
EM1817824-014	05-Nov-2018 00:00	BH46 0.5-0.6	✓	✓	✓
EM1817824-015	05-Nov-2018 00:00	BH47 0.5-0.6	✓	✓	✓
EM1817824-016	05-Nov-2018 00:00	BH47 1.5-1.6	✓	✓	✓
EM1817824-017	05-Nov-2018 00:00	BH48 0.5-0.6	✓	✓	✓
EM1817824-018	05-Nov-2018 00:00	BH48 1.5-1.6	✓	✓	✓
EM1817824-019	05-Nov-2018 00:00	BH49 0.5-0.6	✓	✓	✓
EM1817824-020	05-Nov-2018 00:00	BH49 1.5-1.6	✓	✓	✓
EM1817824-021	05-Nov-2018 00:00	BH50 0.5-0.6	✓	✓	✓
EM1817824-022	05-Nov-2018 00:00	BH50 1.5-1.6	✓	✓	✓
EM1817824-023	05-Nov-2018 00:00	BH51 0.5-0.6	✓	✓	✓
EM1817824-024	05-Nov-2018 00:00	BH51 1.5-1.6	✓	✓	✓
EM1817824-025	05-Nov-2018 00:00	BH52 0.5-0.6	✓	✓	✓
EM1817824-026	05-Nov-2018 00:00	BH52 1.5-1.6	✓	✓	✓
EM1817824-027	05-Nov-2018 00:00	BH53 0.5-0.6	✓	✓	✓
EM1817824-028	05-Nov-2018 00:00	BH53 1.5-1.6	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1817824-029	05-Nov-2018 00:00	Rinsate 5	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1818266**

Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 07-Nov-2018 09:15	Issue Date	: 14-Nov-2018
Client Requested Due Date	: 19-Nov-2018	Scheduled Reporting Date	: **19-Nov-2018**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 17 / 17

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- This is a rebatch of EM1817824.

RIGHT SOLUTIONS | RIGHT PARTNER

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EN33a TCLP Leachate	SOIL - EP075 SIM PAH only SIM - PAH only
EM1818266-001	05-Nov-2018 00:00	BH42 0.5-0.6	✓	✓
EM1818266-002	05-Nov-2018 00:00	BH42 1.5-1.6	✓	✓
EM1818266-003	05-Nov-2018 00:00	BH43 0.5-0.6	✓	✓
EM1818266-004	05-Nov-2018 00:00	BH43 1.5-1.6	✓	✓
EM1818266-005	05-Nov-2018 00:00	BH43 2.5-2.6	✓	✓
EM1818266-006	05-Nov-2018 00:00	BH43 3.5-3.6	✓	✓
EM1818266-007	05-Nov-2018 00:00	BH44 0.5-0.6	✓	✓
EM1818266-008	05-Nov-2018 00:00	BH44 1.5-1.6	✓	✓
EM1818266-009	05-Nov-2018 00:00	BH44 2.5-2.6	✓	✓
EM1818266-010	05-Nov-2018 00:00	BH44 3.5-3.6	✓	✓
EM1818266-011	05-Nov-2018 00:00	BH45 0.5-0.6	✓	✓
EM1818266-012	05-Nov-2018 00:00	BH46 0.5-0.6	✓	✓
EM1818266-013	05-Nov-2018 00:00	BH47 0.5-0.6	✓	✓
EM1818266-014	05-Nov-2018 00:00	BH47 1.5-1.6	✓	✓
EM1818266-015	05-Nov-2018 00:00	BH48 0.5-0.6	✓	✓
EM1818266-016	05-Nov-2018 00:00	BH48 1.5-1.6	✓	✓
EM1818266-017	05-Nov-2018 00:00	BH51 1.5-1.6	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: ES1833261		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-2-8784 8500
Project	: 48 - 52	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AP		

Dates

Date Samples Received	: 08-Nov-2018 09:00	Issue Date	: 08-Nov-2018
Client Requested Due Date	: 12-Nov-2018	Scheduled Reporting Date	: **12-Nov-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 7.8' C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

RIGHT SOLUTIONS | RIGHT PARTNER

Issue Date	: 08-Nov-2018
Page	: 2 of 2
Work Order	: ES1833261 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

ES1833261-001	: [05-Nov-2018]	: Triplicate 1 0.5-0.6
ES1833261-002	: [05-Nov-2018]	: Triplicate 2 1.5-1.6

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
ES1833261-001	05-Nov-2018 00:00	Triplicate 1 0.5-0.6	✓	✓	✓
ES1833261-002	05-Nov-2018 00:00	Triplicate 2 1.5-1.6	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1819122**

Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: 48-52	Page	: 1 of 2
Order number	:	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: MD		

Dates

Date Samples Received	: 28-Nov-2018 09:50	Issue Date	: 28-Nov-2018
Client Requested Due Date	: 03-Dec-2018	Scheduled Reporting Date	: **03-Dec-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 5.1°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 5 / 5

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1819122-001	26-Nov-2018 00:00	MW1	✓	✓
EM1819122-002	26-Nov-2018 00:00	MW2	✓	✓
EM1819122-003	26-Nov-2018 00:00	MW3	✓	✓
EM1819122-004	26-Nov-2018 00:00	Duplicate	✓	✓
EM1819122-005	26-Nov-2018 00:00	Rinsate	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Attachment - Report (SUBCO)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Attachment - Report (SUBCO)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Geo-Environmental Solutions Pty Ltd
Attention	S Joyce

Sample Login Details	
Your reference	48-52 New Town Road
Envirolab Reference	15481
Date Sample Received	28/11/2018
Date Instructions Received	28/11/2018
Date Results Expected to be Reported	03/12/2018

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1
Turnaround Time Requested	72hr
Temperature on Receipt (°C)	5.8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Pamela Adams	Analisa Mathrick
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: amathrick@envirolab.com.au**

Invoice will be emailed separately. Results will be reported only if payment has been made. Details of analysis on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	TRH Water(C10-C40) NEPM	PAHs in Water	HM in water - dissolved
Triplicate	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

Appendix 8 Quality Assurance and Quality Control Documentation

Soil Duplicate

Duplicate Comparrison	Sample	Moisture Content (dried @ 103°C)	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Sum of polycyclic aromatic hyd	Benzo(a)pyrene TEQ (WHO)	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Sum of BTEX	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2	Selenium	Boron	Benzo(a)pyrene TEQ (half LOR)	Benzo(a)pyrene TEQ (LOR)
Unit		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23/07/2018	BH04 1.5-1.6	10.3	<5	130	<1	<1	14	10	35	128	301	14	43	113	0.2	<0.5	2.1	2.3	3.4	37	10.7	55.9	52.6	20.2	18.8	28.8	9.6	25.6	15.6	3.4	20	306	36.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	810	550	1360	<10	<10	<50	1190	300	1490	<50	<5	<50	36.8	36.8
23/07/2018	Duplicate 1	8.8	<5	140	<1	<1	12	10	37	116	216	13	42	111	0.2	<0.5	0.8	2.8	3.3	29.6	7.6	31.6	29.3	10.9	10.1	12.7	5.3	11.5	6.7	1.5	8.6	172	16.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	410	270	680	<10	<10	<50	600	150	750	<50	<5	<50	16.7	16.7
Relative Percentage Difference (RPD) %		15.7	NA	7.4	NA	NA	15.4	0.0	5.6	9.8	32.9	7.4	2.4	1.8	0.0	NA	89.7	19.6	3.0	22.2	33.9	55.5	56.9	59.8	60.2	77.6	57.7	76.0	79.8	77.6	79.7	56.1	75.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65.6	68.3	66.7	NA	NA	NA	65.9	66.7	66.1	NA	NA	NA	75.1	75.1
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	29/56 (52%)	NO	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO
Deviation from MDL (%)		-1	NONE	8	NONE	NONE	0	15	9	5	-18	8	13	13	15	NONE	-75	-5	12	-7	-19	-41	-42	-45	-45	-63	-43	-61	-65	-63	-65	-41	-60	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-51	-53	-52	NONE	NONE	NONE	-51	-52	-51	NONE	NONE	NONE	-60	-60
23/07/2018	BH04 1.5-1.6	10.3	<5	130	<1	<1	14	10	35	128	301	14	43	113	0.2	<0.5	2.1	2.3	3.4	37	10.7	55.9	52.6	20.2	18.8	28.8	9.6	25.6	15.6	3.4	20	306	36.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	810	550	1360	<10	<10	<50	1190	300	1490	<50	<5	<50	36.8	36.8
23/07/2018	Triplicate 1	10.1	<5	120	<1	<1	14	10	28	122	231	12	39	99	0.2	<0.5	2	0.9	1.4	13.1	3.6	22.2	20.7	8.4	7.8	10.6	3.8	10	5.7	1.1	8.4	120	14.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	610	370	980	<10	<10	<50	900	310	1210	<50	<5	<50	14.1	14.1
Relative Percentage Difference (RPD) %		2.0	NA	8.0	NA	NA	0.0	0.0	22.2	4.8	26.3	15.4	9.8	13.2	0.0	NA	4.9	87.5	83.3	95.4	99.3	86.3	87.0	82.5	82.7	92.4	86.6	87.6	93.0	102.2	81.7	87.3	89.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28.2	39.1	32.5	NA	NA	NA	27.8	3.3	20.7	NA	NA	NA	89.2	89.2
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	30/56 (54%)	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	NO	NO
Deviation from MDL (%)		13	NONE	7	NONE	NONE	15	15	-7	10	-11	0	5	2	15	NONE	10	-73	-68	-80	-84	-71	-72	-68	-68	-77	-72	-73	-78	-87	-67	-72	-74	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-13	-24	-17	NONE	NONE	NONE	-13	12	-6	NONE	NONE	NONE	-74	-74
23/07/2018	BH05 1.0-1.1	19.9	<5	60	<1	<1	8	7	7	21	78	11	16	244	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.1	0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.7	1.2
23/07/2018	Duplicate 2	18.6	<5	300	<1	<1	11	10	20	48	134	13	24	262	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
Relative Percentage Difference (RPD) %		6.8	NA	133.3	NA	NA	31.6	35.3	96.3	78.3	52.8	16.7	40.0	7.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.4	0.0
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	47/56 (84%)	YES	YES	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
Deviation from MDL (%)		8	NONE	-118	NONE	NONE	-17	-20	-81	-63	-38	-2	-25	8	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	0	15
23/07/2018	BH05 1.0-1.1	19.9	<5	60	<1	<1	8	7	7	21	78	11	16	244	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.1	0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.7	1.2
23/07/2018	Triplicate 2	19.4	<5	100	2	<1	8	16	18	73	150	23	18	346	0.3	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	1	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.6	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
Relative Percentage Difference (RPD) %		2.5	NA	50.0	NA	NA	0.0	78.3	88.0	110.6	63.2	70.6	11.8	34.6	NA	NA	NA	NA	NA	NA	NA	10.5	20.0	NA	NA	NA	NA	NA	NA	NA	NA	17.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.4	0.0
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	46/56 (82%)	YES	YES	NO	YES	YES	YES	NO	NO	NO	NO	NO	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
Deviation from MDL (%)		12	NONE	-35	NONE	NONE	15	-63	-73	-96	-48	-56	3	-20	NONE	NONE	NONE	NONE	NONE	NONE	NONE	4	-5	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-3	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	0	15
23/07/2018	BH03 1.0-1.1	22.1	6	140	<1	<1	19	16	44	93	308	17	63	176	0.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.5	1.6	1	0.7	1.1	<0.5	0.9	0.5	<0.5	0.7	8.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	1.4	1.7
23/07/2018	Duplicate 3	23	<5	140	<1	<1	20	25	40	57	443	19	98	130	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
Relative Percentage Difference (RPD) %		4.0	NA	0.0	NA	NA	5.1	43.9	9.5	48.0	36.0	11.1	43.5	30.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80.0	34.5
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	49/56 (88%)	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
Deviation from MDL (%)		11	NONE	15	NONE	NONE	10	-29	5	-33	-21	4	-28	-15	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-65	-19
23/07/2018	BH03 1.0-1.1	22.1	6	140	<1	<1	19	16	44	93	308	17	63	176	0.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.5	1.6	1	0.7	1.1	<0.5	0.9	0.5	<0.5	0.7	8.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	1.4	1.7
23/07/2018	Triplicate 3	22	<5	120	<1	<1	17	23	34	85	500	17	93	288	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
Relative Percentage Difference (RPD) %		0.5	NA	15.4	NA	NA	11.1	35.9	25.6	9.0	47.5	0.0	38.5	48.3	0.0	NA	NA	NA	NA	NA	NA	85.7	90.9	NA	NA	NA	NA	NA	NA	NA	NA	151.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80.0	34.5
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	45/56 (80%)	YES	YES	NO	YES	YES	YES	NO	NO	YES	NO	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
Deviation from MDL (%)		15	NONE	0	NONE	NONE	4	-21	-11	6	-33	15	-23	-33	15	NONE	NONE	NONE	NONE	NONE	NONE	-71	-76	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-136	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-65	-19
24/07/2018	BH09_4.5-4.6	20.9	<5	40	<1	<1	4	7	31	15	92	5	49	23	<0.1	2.8	7.8	0.9	5.9	38.7	11.6	38.6	41.9	21.1	19.6	22.3	7.4	22.8	10.4	2.9	13.1	268	32.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	990	480	1470	<10	<10	<50	1300	190	1490	<50	<5	<50	32.1	32.1
24/07/2018	Duplicate 4	15.3	<5	40	<1	<1	4	8	45	13	137	8	35	26	<0.1	2.8	8.6	0.9	6	39	11.8	40.7	44.2	22.6	21.9	26.7	9.7	25.9	12.1	3.3	15	291	36.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	1130	580	1710	<10	<10	<50	1500	270	1770	<50	<5	<50	36.7	36.7
Relative Percentage Difference (RPD) %		30.9	NA	0.0	NA	NA	0.0	13.3	36.8	14.3	39.3	46.2	33.3	12.2	NA	0.0	9.8	0.0	1.7	0.8	1.7	5.3	5.3	6.9	11.1	18.0	26.9	12.7	15.1	12.9	13.5	8.2	13.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.2	18.9	15.1	NA	NA	NA	14.3	34.8	17.2	NA	NA	NA	13.4	13.4
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	44/56 (79%)	NO	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES
Deviation from MDL (%)		-16	NONE	15	NONE	NONE	15	2	-22	1	-24	-31	-18	3	NONE	15	5	15	13	14	13	10	10	8	4	-3	-12	2	0	2	1	7	2	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	2	-4	0	NONE	NONE	NONE	1	-20	-2	NONE	NONE	NONE	2	2
24/07/2018	BH09_4.5-4.6	20.9	<5	40	<1	<1	4	7	31	15	92	5	49	23	<0.1	2.8	7.8	0.9	5.9	38.7	11.6	38.6	41.9	21.1	19.6	22.3	7.4	22.8	10.4	2.9	13.1	268	32.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	990	480	1470	<10	<10	<50	1300	190	1490	<50	<5	<50	32.1	32.1
24/07/2018	Triplicate 4	21.2	<5	50	<1	<1	6	12	60	16	91	9	77	39	0.1	4.1	10.6	1.6	12	60.6	17.6	45.1	48.8	24.8	21.8	24.1	6.8	20.6	8.7	2.3	11	320	29.7	0.2	<0.5	<0.5	<0.5	<0.5	0.2	<0.5	10	<10	<50	770	390	1160	<10	<10	60	990	280	1330	50	<5	<50	29.7	29.7
Relative Percentage Difference (RPD) %		1.4	NA	22.2	NA	NA	40.0	52.6	63.7	6.5	1.1	57.1	44.4	51.6	NA	37.7	30.4	56.0	68.2	44.1	41.1	15.5	15.2	16.1	10.6	7.8	8.5	10.1	17.8	23.1	17.4	17.7	7.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25.0	20.7	23.6	NA	NA	NA	27.1	38.3	11.3	NA	NA	NA	7.8	7.8
Method Detection Limit (MDL)		>0	NA	>0	NA	NA	>0	>0	>0	>0	>0	>0	>0	>0	NA	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0	>0	NA	NA	NA	>0	>0
MDL Class		HIGH	NONE	HIGH	NONE	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	31/56 (55%)	YES	YES	NO	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		14	NONE	-7	NONE	NONE	-25	-38	-49	9	14	-42	-29	-37	NONE	-23	-15	-41	-53	-29	-26	-1	0	-1	4	7	7	5	-3	-8	-2	-3	7	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-10	-6	-9	NONE	NONE	NONE	-12	-23	4	NONE	NONE	NONE	7	7

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Duplicate/ triplicates BH21-BH53

Duplicate Comparison	Sample	Moisture Content (dried @ 103°C)	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene
Unit		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0	2	2	5	5	5	2	5	5	0	0	0.1	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
24/10/2018	BH22 2.5-2.6	17.4	<5	90	<1	<1	25	23	58	<5	358	24	119	37	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/10/2018	DUPLICATE 1	17.2	<5	90	<1	<1	29	21	60	<5	364	25	127	40	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Relative Percentage Difference (RPD) %		1.2	NA	0.0	NA	NA	14.8	9.1	3.4	NA	1.7	4.1	6.5	7.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		>0	NA	200	NA	NA	100	40	100	NA	>0	>0	>10	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL Class		HIGH	NONE	MED	NONE	NONE	LOW	LOW	LOW	NONE	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?	56/56 (100%)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		14	NONE	30	NONE	NONE	35	41	47	NONE	13	11	8	7	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
30/10/2018	BH20 0.5-0.6	13.5	<5	100	<1	<1	8	13	43	70	345	14	42	112	<0.1	<0.5	1.1	<0.5	<0.5	5.8	1.4	8.7	9.5
30/10/2018	Duplicate 2	11.4	<5	90	<1	<1	9	14	51	88	322	13	50	104	<0.1	0.7	3.3	1.8	4.9	49.2	9.8	57.9	51
Relative Percentage Difference (RPD) %		16.9	NA	10.5	NA	NA	11.8	7.4	17.0	22.8	6.9	7.4	17.4	7.4	NA	NA	100.0	NA	NA	157.8	150.0	147.7	137.2
Method Detection Limit (MDL)		>0	NA	200	NA	NA	100	40	100	500	>0	>0	>10	>0	NA	NA	10	10	10	>50	50	>50	>50
MDL Class		HIGH	NONE	MED	NONE	NONE	LOW	LOW	LOW	MED	HIGH	HIGH	HIGH	HIGH	NONE	NONE	LOW	LOW	LOW	HIGH	MED	HIGH	HIGH
RPD Compliance With MDL?	31/56 (55%)	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO
Deviation from MDL (%)		-2	NONE	19	NONE	NONE	38	43	33	7	8	8	-2	8	NONE	NONE	-50	NONE	NONE	-143	-100	-133	-122
31/10/2018	BH39 1.5-1.6	17.8	<5	80	<1	<1	15	7	24	36	146	9	38	71	<0.1	<0.5	<0.5	<0.5	<0.5	3.8	0.9	5.8	5.4
31/10/2018	Duplicate 3	17.8	10	80	<1	<1	17	18	50	89	481	16	91	175	<0.1	<0.5	0.8	0.5	0.7	11.2	2.4	12.5	12
Relative Percentage Difference (RPD) %		0.0	NA	0.0	NA	NA	12.5	88.0	70.3	62.9	106.9	56.0	82.2	84.6	NA	NA	NA	NA	NA	98.7	90.9	76.2	75.9
Method Detection Limit (MDL)		>0	NA	200	NA	NA	100	40	100	100	>0	>0	>10	>0	NA	NA	10	NA	NA	50	10	50	50
MDL Class		HIGH	NONE	MED	NONE	NONE	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	NONE	NONE	LOW	NONE	NONE	MED	LOW	MED	MED
RPD Compliance With MDL?	33/56 (59%)	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES	YES	NO	YES	YES	NO	NO	NO	NO
Deviation from MDL (%)		15	NONE	30	NONE	NONE	38	-58	-20	-13	-92	-41	-67	-70	NONE	NONE	NONE	NONE	NONE	-69	-41	-46	-46
31/10/2018	BH40 3.5-3.6	8.8	<5	40	<1	<1	9	14	51	22	272	14	40	51	<0.1	2.4	14	1.7	5.1	66.7	18.8	99.5	94.7
31/10/2018	Duplicate 4	7.4	<5	40	<1	<1	9	17	55	28	270	16	42	60	<0.1	2.2	11.5	1.2	4	50	14.3	79.7	78.4
Relative Percentage Difference (RPD) %		15.0	NA	0.0	NA	NA	0.0	19.4	7.5	24.0	0.7	13.3	4.9	16.2	NA	8.7	19.6	34.5	24.2	28.6	27.7	22.1	18.8
Method Detection Limit (MDL)		>0	NA	200	NA	NA	100	40	100	100	>0	>0	>10	>0	NA	10	50	10	10	>50	50	>50	>50
MDL Class		HIGH	NONE	MED	NONE	NONE	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	NONE	LOW	MED	LOW	LOW	HIGH	MED	HIGH	HIGH
RPD Compliance With MDL?	41/56 (73%)	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES	NO	NO
Deviation from MDL (%)		0	NONE	30	NONE	NONE	50	31	42	26	14	2	10	-1	NONE	41	10	16	26	-14	2	-7	-4
5/11/2018	BH51 0.5-0.6	18.4	<5	640	1	<1	12	19	10	31	112	15	24	51	<0.1	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	2.8	2.8
5/11/2018	Triplicate 1 0.5-0.6	18.2	<5	140	<1	<1	15	19	34	109	264	19	40	143	<0.1	<0.5	<0.5	<0.5	<0.5	1.8	0.6	4.7	4.7
Relative Percentage Difference (RPD) %		1.1	NA	128.2	NA	NA	22.2	0.0	109.1	111.4	80.9	23.5	50.0	94.8	NA	NA	NA	NA	NA	11.8	NA	50.7	50.7
Method Detection Limit (MDL)		>0	NA	>200	NA	NA	100	40	100	500	>0	>0	>10	>0	NA	NA	NA	NA	NA	10	NA	10	10
MDL Class		HIGH	NONE	HIGH	NONE	NONE	LOW	LOW	LOW	MED	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	LOW	NONE	LOW	LOW
RPD Compliance With MDL?	37/56 (66%)	YES	YES	NO	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO
Deviation from MDL (%)		14	NONE	-113	NONE	NONE	28	50	-59	-81	-66	-9	-35	-80	NONE	NONE	NONE	NONE	NONE	38	NONE	-1	-1
5/11/2018	BH51 1.5-1.6	15.6	<5	100	<1	<1	9	9	20	101	167	11	20	76	0.4	<0.5	1.3	<0.5	<0.5	2.9	1.2	11.5	13.1
5/11/2018	Triplicate 2 1.5-1.6	17.5	<5	150	<1	<1	10	16	15	102	161	14	26	70	0.2	<0.5	0.6	<0.5	<0.5	1.9	0.6	5.8	6.8
Relative Percentage Difference (RPD) %		10.3	NA	26.1	NA	NA	10.5	56.0	28.6	1.0	3.7	24.0	26.1	8.2	66.7	NA	73.7	NA	NA	41.7	66.7	65.9	63.3
Method Detection Limit (MDL)		>0	NA	200	NA	NA	100	40	100	500	>0	>0	>10	>0	>0	NA	10	NA	NA	10	10	50	50
MDL Class		HIGH	NONE	MED	NONE	NONE	LOW	LOW	LOW	MED	HIGH	HIGH	HIGH	HIGH	HIGH	NONE	LOW	NONE	NONE	LOW	LOW	MED	MED
RPD Compliance With MDL?	32/56 (57%)	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO	YES	NO	YES	NO	YES	YES	YES	NO	NO	NO
Deviation from MDL (%)		5	NONE	4	NONE	NONE	39	-6	21	29	11	-9	-11	7	-52	NONE	-24	NONE	NONE	8	-17	-36	-33

Duplicate Comparison	Sample	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (WHO)	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Sum of BTEX	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2	Selenium	Boron	Benzo(a)pyrene TEQ (half LOR)	Benzo(a)pyrene TEQ (LOR)
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.5	0.5	0.5	0.5	0.5	0.5	0	0	0	0	0.5	0	0	0.2	0.5	0	10	50	50	0	0	10	10	100	50	50			0.2	0.5	0.5	0	0.05	0.05
24/10/2018	BH22 2.5-2.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
24/10/2018	DUPLICATE 1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	0.6	1.2
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	5
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	LOW	MED
RPD Compliance With MDL?	56/56 (100%)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	50	30
30/10/2018	BH20 0.5-0.6	4.1	3.6	5	1.6	4.6	2.3	0.6	3	51.3	6.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	280	180	440	<10	<10	<50	390	<100	390	<50	<5	<50	6.6	6.6
30/10/2018	Duplicate 2	17.2	15.1	23.1	8	21.6	11.7	2.5	14.6	292	30.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	600	370	970	<10	<10	<50	820	190	1010	<50	<5	<50	30.4	30.4
Relative Percentage Difference (RPD) %		123.0	123.0	128.8	133.3	129.8	134.3	122.6	131.8	140.2	128.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	79.1	69.1	75.2	NA	NA	NA	71.1	NA	88.6	NA	NA	NA	128.8	128.6
Method Detection Limit (MDL)		50	50	50	10	50	50	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	1000	>1000	NA	NA	NA	NA	NA	>20	NA	NA	NA	>5	>5
MDL Class		MED	MED	MED	LOW	MED	MED	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	MED	HIGH	NONE	NONE	NONE	NONE	NONE	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	31/56 (55%)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO
Deviation from MDL (%)		-93	-93	-99	-83	-100	-104	-108	-117	-125	-114	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-64	-39	-60	NONE	NONE	NONE	NONE	NONE	-74	NONE	NONE	NONE	-114	-114
31/10/2018	BH39 1.5-1.6	2.1	2	2.5	1.1	2.2	1.1	<0.5	1.5	28.2	2.9	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	110	<100	110	<50	<5	<50	3.2	3.4
31/10/2018	Duplicate 3	4.8	4.5	5.6	1.6	4.7	2.3	0.7	2.8	67.1	6.9	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	280	200	480	<10	<10	<50	400	110	510	<50	<5	<50	6.9	6.9
Relative Percentage Difference (RPD) %		78.3	76.9	76.5	37.0	72.5	70.6	NA	60.5	81.6	81.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	113.7	NA	129.0	NA	NA	NA	73.3	68.0
Method Detection Limit (MDL)		10	10	10	10	10	10	NA	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>20	NA	NA	NA	>5	>5
MDL Class		LOW	LOW	LOW	LOW	LOW	LOW	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	33/56 (59%)	NO	NO	NO	YES	NO	NO	YES	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO
Deviation from MDL (%)		-28	-27	-27	13	-22	-21	NONE	-45	-67	-67	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-114	NONE	NONE	NONE	-55	-53
31/10/2018	BH40 3.5-3.6	50.7	44.4	68.2	22	59.6	29.1	9.6	34.7	621	87	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	50	2620	1610	4280	<10	<10	180	3640	840	4460	180	<5	<50	87	87
31/10/2018	Duplicate 4	42.4	38.5	58.8	15.8	49	24	8	27.8	505	71.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	50	2510	1520	4080	<10	<10	180	3470	590	4240	180	<5	<50	71.7	71.7
Relative Percentage Difference (RPD) %		17.8	14.2	15.1	32.8	19.5	19.2	18.2	22.1	20.6	19.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	4.3	5.8	4.8	NA	NA	0.0	4.8	8.1	5.1	0.0	NA	NA	19.3	19.3
Method Detection Limit (MDL)		>50	>50	>50	50	>50	50	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	>0	>1000	>1000	NA	NA	1000	NA	NA	>20	>50	NA	NA	>5	>5
MDL Class		HIGH	HIGH	HIGH	MED	HIGH	MED	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	HIGH	HIGH	HIGH	NONE	NONE	LOW	NONE	NONE	HIGH	HIGH	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	41/56 (73%)	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
Deviation from MDL (%)		-3	1	0	-3	-5	11	-3	-7	-6	-4	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	15	11	9	10	NONE	NONE	50	NONE	NONE	10	15	NONE	NONE	-4	-4
5/11/2018	BH51 0.5-0.6	1	1	1.5	0.5	1.3	0.6	<0.5	0.9	14	1.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<5	<50	1.9	2.2
5/11/2018	Triplicate 1 0.5-0.6	1.8	1.8	2.4	1.2	2.7	1.6	<0.5	2.4	25.7	3.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	150	<100	150	<50	<5	<50	3.7	3.9
Relative Percentage Difference (RPD) %		57.1	57.1	46.2	82.4	70.0	90.9	NA	90.9	58.9	66.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	64.3	55.7
Method Detection Limit (MDL)		10	10	10	10	10	10	NA	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	FALSE
MDL Class		LOW	LOW	LOW	LOW	LOW	LOW	NONE	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	MED	
RPD Compliance With MDL?	37/56 (66%)	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	FALSE
Deviation from MDL (%)		-7	-7	4	-32	-20	-41	NONE	-70	-44	-52	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-34	
5/11/2018	BH51 1.5-1.6	7.9	7.9	11.4	3.5	9.4	4.3	1.2	5.3	80.9	13.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	230	180	410	<10	<10	<50	370	<100	370	<50	<5	<50	13.4	13.4
5/11/2018	Triplicate 2 1.5-1.6	3.8	3.7	5	1.8	4.8	2.1	0.6	2.8	40.1	6.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	110	100	210	<10	<10	<50	180	<100	180	<50	<5	<50	6.7	6.7
Relative Percentage Difference (RPD) %		70.1	72.4	78.0	64.2	64.8	88.8	66.7	68.4	67.4	66.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	70.6	57.1	64.5	NA	NA	NA	69.1	NA	69.1	NA	NA	NA	66.7	66.7
Method Detection Limit (MDL)		10	10	50	10	10	10	>0	>0	>0	>0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>0	200	1000	NA	NA	NA	NA	NA	>20	NA	NA	NA	>5	>5
MDL Class		LOW	LOW	MED	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	HIGH	LOW	MED	NONE	NONE	NONE	NONE	NONE	HIGH	NONE	NONE	NONE	HIGH	HIGH
RPD Compliance With MDL?	32/56 (57%)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO
Deviation from MDL (%)		-20	-22	-28	-14	-15	-19	-52	-53	-52	-52	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	-56	-7	-35	NONE	NONE	NONE	NONE	NONE	-54	NONE	NONE	NONE	-52	-52

Field and Rinsate Blanks for Soil analysis

Quality Control Blanks		EG020F: Dissolved Metals by ICP-MS														EP080					EP080/071			
		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001	1	2	2	2	2	2	1	5
Date	Sample																							
23/07/2018	Field Blank	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
23/07/2018	Rinsate Blank	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
24/07/2018	Field Blank 2	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
24/07/2018	Rinsate 2	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
25/07/2018	Field Blank 3	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
25/07/2018	Rinsate 3	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
30/07/2018	Field Blank 4	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
30/07/2018	Rinsate 4	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5

Quality Control Blanks				EP080/071																											
		C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction minus Naphthalene (F2)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (zero)
Unit		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		20	50	100	50	50	20	20	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Date	Sample																														
23/07/2018	Field Blank	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
23/07/2018	Rinsate Blank	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
24/07/2018	Field Blank 2	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
24/07/2018	Rinsate 2	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
25/07/2018	Field Blank 3	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
25/07/2018	Rinsate 3	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
30/07/2018	Field Blank 4	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
30/07/2018	Rinsate 4	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

Rinsate Blanks for Soil analysis – Additional samples BH21-BH53

Quality Control Blanks		EG020F: Dissolved Metals by ICP-MS														EP080					EP080/071			
		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001	1	2	2	2	2	2	1	5
Date	Sample																							
24/10/2018	Rinsate Blank	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
29/10/2018	Rinsate 2	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
30/10/2018	Rinsate 3	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
31/10/2018	Rinsate 4	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5
5/11/2018	Rinsate 5	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5

Quality Control Blanks				EP080/071																											
		C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction minus Naphthalene (F2)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (zero)
Unit		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		20	50	100	50	50	20	20	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Date	Sample																														
24/10/2018	Rinsate Blank	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
29/10/2018	Rinsate 2	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
30/10/2018	Rinsate 3	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
31/10/2018	Rinsate 4	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
5/11/2018	Rinsate 5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

Groundwater QA/QC – Blanks 11/09/2018 & 26/11/2018

Sample Date	Client sample ID (Primary):	EG020F: Dissolved Metals by ICP-MS Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	EG035 Mercury
	LOR	0.001	0.001	0.001	1E-04	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	1E-04
Blanks																
11/09/2018	FIELD BLANK	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
26/11/2018	Rinsate	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001

Sample Date	Client sample ID (Primary):	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (WHO)
	LOR	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Blanks																			
11/09/2018	FIELD BLANK	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
26/11/2018	Rinsate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

Sample Date	Client sample ID (Primary):	EP080: BTEXN Benzene	Toluene	EthylBenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene	EP080/071:TPH C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	EP080/071: TRH - NEPM 2013 C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2
	LOR	1	2	2	2	2	2	1	5	20	50	100	50	50	20	20	100	100	100	100	100
Blanks																					
11/09/2018	FIELD BLANK	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
26/11/2018	Rinsate	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100

Groundwater QA/QC – Splits 11/09/2018

Sample Date	Client sample ID (Primary):	EG020F: Dissolved Metals by ICP-MS Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	EG035F Mercury
	LOR	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0	0.01	0.01	0.005	0.05	0.0001
Duplicate / Triplicate																
Groundwater Splits - Fixed RPD Method (20%)																
11/09/2018	DUPLICATE	0.002	<0.001	0.076	<0.0001	<0.001	0.001	<0.001	<0.001	0.512	0	<0.01	<0.01	<0.005	<0.05	<0.0001
11/09/2018	MW1	0.002	<0.001	0.068	<0.0001	<0.001	0.001	<0.001	<0.001	0.476	0	<0.01	<0.01	<0.005	<0.05	<0.0001
RPD %		0	NA	11	NA	NA	NA	NA	NA	7	0	NA	NA	NA	NA	NA
11/09/2018	TRIPLICATE	0.001	<0.001	0.059	<0.0001	<0.001	<0.001	<0.001	<0.001	0.407	0	<0.01	<0.01	<0.005	<0.05	<0.0001
11/09/2018	MW1	0.002	<0.001	0.068	<0.0001	<0.001	0.001	<0.001	<0.001	0.476	0	<0.01	<0.01	<0.005	<0.05	<0.0001
RPD %		NA	NA	14	NA	NA	NA	NA	NA	16	0	NA	NA	NA	NA	NA
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																
LOR		<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.01	<0.01	<0.005	<0.05	<0.0001
Duplicate																
Level Calculation		LOW	NONE	MED	NONE	NONE	NONE	NONE	NONE	HIGH	LOW	NONE	NONE	NONE	NONE	NONE
Compliance?		YES	NA	YES	NA	NA	NA	NA	NA	YES	YES	NA	NA	NA	NA	NA
Triplicate																
Level Calculation		NONE	NONE	MED	NONE	NONE	NONE	NONE	NONE	HIGH	LOW	NONE	NONE	NONE	NONE	NONE
Compliance?		<LOR	NA	YES	NA	NA	NA	NA	NA	NO	YES	NA	NA	NA	NA	NA

Sample Date	Client sample ID (Primary):	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (WHO)
	LOR	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Duplicate / Triplicate																			
Groundwater Splits - Fixed RPD Method (20%)																			
11/09/2018	DUPLICATE	104	315	34	121	983	426	1280	1300	593	556	872	241	779	352	118	408	8550	1110
11/09/2018	MW1	112	339	43	157	1070	464	1390	1540	678	571	910	264	875	393	145	464	9420	1250
RPD %		7	7	23	26	8	9	10	10	13	3	4	9	12	11	21	13	10	12
11/09/2018	TRIPLICATE	39.3	101	<10.2	35.5	292	132	340	399	120	105	96.7	48.1	136	65.9	20.7	80.2	2020	192
11/09/2018	MW1	112	339	43	157	1070	464	1390	1540	678	571	910	264	875	393	145	464	9420	1250
RPD %		96	108	NA	126	114	111	120	118	140	138	162	138	146	143	150	141	129	147
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																			
LOR		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
Duplicate																			
Level Calculation		HIGH	HIGH	MED	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Compliance?		YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Triplicate																			
Level Calculation		MED	HIGH	NA	MED	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MED	HIGH	HIGH	HIGH
Compliance?		NO	NO	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Sample Date	Client sample ID (Primary):	EP080: BTEXN Benzene	Toluene	EthylBenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene	EP080/071:TPH C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	EP080/071: TRH - NEPM 2013 C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2
	LOR	1	2	2	2	2	2	1	5	20	50	100	50	50	20	20	100	100	100	100	100
Duplicate / Triplicate																					
Groundwater Splits - Fixed RPD Method (20%)																					
11/09/2018	DUPLICATE	<1	<2	<2	<2	<2	<2	<1	5	<20	1050	31800	20200	53000	<20	<20	1900	46200	10400	58500	1900
11/09/2018	MW1	<1	<2	<2	<2	<2	<2	<1	6	<20	1400	43200	26700	71300	<20	<20	2540	62300	13200	78000	2530
RPD %		NA	NA	NA	NA	NA	NA	NA	18	NA	29	30	28	29	NA	NA	29	30	24	29	28
11/09/2018	TRIPLICATE	<1	<2	<2	<2	<2	<2	<1	<5	<20	80	8440	5350	13900	<20	<20	320	11800	3200	15300	320
11/09/2018	MW1	<1	<2	<2	<2	<2	<2	<1	6	<20	1400	43200	26700	71300	<20	<20	2540	62300	13200	78000	2530
RPD %		NA	NA	NA	NA	NA	NA	NA	NA	NA	178	135	133	135	NA	NA	155	136	122	134	165
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																					
LOR		<1.0	<2	<2	<2	<2	<2	<1.0	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
Duplicate																					
Level Calculation		NA	NONE	NONE	NONE	NONE	NONE	NA	LOW	NONE	MED	HIGH	HIGH	HIGH	NONE	NONE	MED	HIGH	HIGH	HIGH	MED
Compliance?		NA	NA	NA	NA	NA	NA	NA	<LOR	NA	YES	NO	NO	NO	NA	NA	YES	NO	NO	NO	YES
Triplicate																					
Level Calculation		NA	NONE	NONE	NONE	NONE	NONE	NA	NONE	NONE	LOW	HIGH	HIGH	HIGH	NONE	NONE	LOW	HIGH	MED	HIGH	LOW
Compliance?		NA	NA	NA	NA	NA	NA	NA	<LOR	NA	NO	NO	NO	NO	NA	NA	NO	NO	NO	NO	NO

Groundwater QA/QC – Splits 11/09/2018

		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury
	LOR	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001
Duplicate / Triplicate																
Groundwater Splits - Fixed RPD Method (20%)																
26/11/2018	Duplicate	0.002	<0.001	0.04	<0.0001	0.002	<0.001	0.003	<0.001	0.167	0.002	<0.01	<0.01	<0.005	0.05	<0.0001
26/11/2018	MW2	0.002	<0.001	0.037	<0.0001	0.002	<0.001	0.003	<0.001	0.165	0.001	<0.01	<0.01	<0.005	0.07	<0.0001
RPD %		0	NA	8	NA	0	NA	0	NA	1	67	NA	NA	NA	NA	NA
26/11/2018	Triplicate	0.002	<0.001	0.038	<0.0001	0.001	<0.001	0.003	<0.001	0.17	0.002	0.001	0.006	0.002	0.08	<0.0001
26/11/2018	MW2	0.002	<0.001	0.037	<0.0001	0.002	<0.001	0.003	<0.001	0.165	0.001	<0.01	<0.01	<0.005	0.07	<0.0001
RPD %		0	NA	3	NA	NA	NA	0	NA	3	67	NA	NA	NA	13	NA
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																
LOR		<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001
Duplicate																
Level Calculation		LOW	NONE	MED	NONE	LOW	NONE	LOW	NONE	HIGH	LOW	NONE	NONE	NONE	LOW	NONE
Compliance?		YES	NA	YES	NA	YES	NA	YES	NA	YES	<LOR	NA	NA	NA	<LOR	NA
Triplicate																
Level Calculation		LOW	NONE	MED	NONE	LOW	NONE	LOW	NONE	HIGH	LOW	NONE	NONE	NONE	LOW	NONE
Compliance?		YES	NA	YES	NA	<LOR	NA	YES	NA	YES	<LOR	<LOR	<LOR	<LOR	YES	NA

		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (WHO)
	LOR	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Duplicate / Triplicate																			
Groundwater Splits - Fixed RPD Method (20%)																			
26/11/2018	Duplicate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
26/11/2018	MW2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
RPD %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26/11/2018	Triplicate	<1	<1	<1	<1	<1	<1	1	1	<1	<1	---	---	<1	<1	<1	<1	2	<5
26/11/2018	MW2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
RPD %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																			
LOR		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
Duplicate																			
Level Calculation		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
Compliance?		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Triplicate																			
Level Calculation		NA	NA	NA	NA	NA	NA	NONE	NONE	NA	NA	NA	NA	NA	NA	NA	NA	LOW	NA
Compliance?		<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA	NA	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

		Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2
	LOR	1	2	2	2	2	2	1	5	20	50	100	50	50	20	20	100	100	100	100	100
Duplicate / Triplicate																					
Groundwater Splits - Fixed RPD Method (20%)																					
26/11/2018	Duplicate	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
26/11/2018	MW2	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
RPD %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26/11/2018	Triplicate	<1	<2	<2	<2	<2	<2	<1	<5	<10	<50	<100	<100	<50	<10	<10	<10	<100	<100	<100	<50
26/11/2018	MW2	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
RPD %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Groundwater Splits - Mean Detection Limit (MDL) Method (Variable %)																					
LOR		<1.0	<2	<2	<2	<2	<2	<1.0	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
Duplicate																					
Level Calculation		NA	NONE	NONE	NONE	NONE	NONE	NA	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
Compliance?		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Triplicate																					
Level Calculation		NA	NONE	NONE	NONE	NONE	NONE	NA	NONE	NA	NONE	NONE	NA	NONE	NA	NA	NA	NONE	NONE	NONE	NA
Compliance?		NA	NA	NA	NA	NA	NA	NA	NA	<LOR	NA	NA	<LOR	NA	<LOR	<LOR	<LOR	NA	NA	NA	<LOR

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: EM1811858	Page	: 1 of 17
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018
Order number	:	Date Analysis Commenced	: 26-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 59		
No. of samples analysed	: 23		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1830316)									
EM1811855-003	Anonymous	EA055: Moisture Content	----	0.1	%	20.4	20.0	1.96	0% - 20%
EM1811858-003	BH01 1.0-1.1	EA055: Moisture Content	----	0.1	%	18.3	17.8	2.60	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1830317)									
EM1811858-034	BH04 3.0-3.1	EA055: Moisture Content	----	0.1	%	6.1	6.5	5.86	No Limit
EM1811858-060	Duplicate 3	EA055: Moisture Content	----	0.1	%	23.0	23.1	0.00	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1830274)									
EM1811858-003	BH01 1.0-1.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	70	30.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	8	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	5	6	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	7	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	8	12	39.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	35	47	28.4	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	82	100	19.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	21	22	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	45	49	8.39	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1811858-031	BH04 1.5-1.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	130	150	13.8	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	14	14	0.00	No Limit

Page : 3 of 17
Work Order : EM1811858
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 1830274) - continued									
EM1811858-031	BH04 1.5-1.6	EG005T: Cobalt	7440-48-4	2	mg/kg	10	13	28.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	14	15	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	35	41	16.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	128	116	9.48	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	301	256	16.1	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	43	45	4.43	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	113	120	5.53	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1830276)									
EM1811858-060	Duplicate 3	EG005T: Zinc	7440-66-6	5	mg/kg	130	131	0.00	0% - 20%
EM1811858-060	Duplicate 3	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	140	100	32.0	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	20	22	13.9	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	25	25	0.00	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	19	22	11.6	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	40	39	3.67	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	57	54	4.90	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	443	391	12.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	98	102	3.83	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1830275)									
EM1811858-003	BH01 1.0-1.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.00	No Limit
EM1811858-031	BH04 1.5-1.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.3	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1830277)									
EM1811858-060	Duplicate 3	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830376)									
EM1811858-003	BH01 1.0-1.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.9	<0.5	55.9	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.5	0.5	93.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.6	0.6	89.1	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830376) - continued									
EM1811858-003	BH01 1.0-1.1	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.7	<0.5	33.6	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.6	<0.5	24.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	<0.5	43.5	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.6	<0.5	21.4	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1811858-034	BH04 3.0-3.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	2.2	2.4	6.59	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.6	0.6	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	3.9	4.1	4.02	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	3.9	4.2	6.85	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	1.5	1.6	7.11	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.4	1.4	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.1	2.1	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.7	0.8	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.7	1.7	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.1	1.2	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.6	1.7	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830383)									
EM1811636-003	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL** — Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830383) - continued									
EM1811636-003	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830301)									
EM1811858-003	BH01 1.0-1.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1811858-034	BH04 3.0-3.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830302)									
EM1811775-003	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1811775-028	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830377)									
EM1811858-003	BH01 1.0-1.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1811858-034	BH04 3.0-3.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830382)									
EM1811855-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1811636-003	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830301)									
EM1811858-003	BH01 1.0-1.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1811858-034	BH04 3.0-3.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830302)									
EM1811775-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1811775-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830377)									
EM1811858-003	BH01 1.0-1.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830377) - continued									
EM1811858-034	BH04 3.0-3.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830382)									
EM1811855-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1811636-003	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1830301)									
EM1811858-003	BH01 1.0-1.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1811858-034	BH04 3.0-3.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1830302)									
EM1811775-003	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1811775-028	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Page : 7 of 17
Work Order : EM1811858
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080: BTEXN (QC Lot: 1838302) - continued									
EM1811775-028	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1832824)									
EM1811857-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.014	0.013	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.018	0.017	0.00	0% - 50%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.087	0.084	3.70	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.035	0.034	5.06	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.28	0.28	0.00	No Limit
EM1811889-007	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.013	0.013	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1832788)									
EM1811858-059	Rinsate Blank	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 1832788) - continued									
EM1811858-059	Rinsate Blank	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EM1811880-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.007	0.006	0.00	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1832823)									
EM1811653-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1811653-011	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1830516)									
EM1811547-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	0.0002	0.0002	0.00	No Limit
EM1811823-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1832678)									
EM1811898-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1811898-005	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	2020	1940	4.26	0% - 20%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1832678)									
EM1811898-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1811898-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	1920	1840	4.12	0% - 20%
EP080: BTEXN (QC Lot: 1832678)									
EM1811898-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit

Page	: 9 of 17
Work Order	: EM1811856
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1832678) - continued									
EM1811898-001	Anonymous	EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1811898-005	Anonymous	EP080: Benzene	71-43-2	1	µg/L	88	83	5.60	0% - 20%
		EP080: Toluene	108-88-3	2	µg/L	3	2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	6	6	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	9	9	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	46	42	9.34	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1830274)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	95.0	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	104	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	102	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	109	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	89.8	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	95.7	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	92.6	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	90.9	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	105	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	97.6	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	97.8	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.4	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	94.4	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	97.6	82	111
EG005T: Total Metals by ICP-AES (QCLot: 1830276)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	92.5	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	104	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	102	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	107	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	89.2	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	94.2	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	92.6	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	90.8	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	99.4	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	97.0	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	97.1	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.1	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	93.4	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	96.2	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1830275)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	93.4	77	104
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1830277)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	90.2	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830376)								

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830376) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	108	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	119	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	103	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	102	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	107	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.8 mg/kg	98.0	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	110	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	116	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	102	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	104	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	94.8	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	102	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	82.8	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.2	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	91.0	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	81.4	68	127
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830383)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	98.1	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	95.7	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	98.2	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	99.6	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	104	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	102	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	99.9	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	104	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	92.1	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	99.3	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	93.5	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	100	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	87.8	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	91.6	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	93.4	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	92.1	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830301)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.0	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830302)								

Page	12 of 17
Work Order	EM1811858
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830302) - continued								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	82.0	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830377)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	84.1	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	91.6	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	85.5	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830382)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	100	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	108	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	94.4	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830301)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	96.7	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830302)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	78.7	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830377)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	83.2	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	89.3	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	81.6	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830382)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	101	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	101	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	94.2	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1830301)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	96.9	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	93.2	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	105	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	99.2	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	107	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	116	66	130
EP080: BTEXN (QCLot: 1830302)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	77.8	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	81.2	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	78.6	73	125

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1830302) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	88.4	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	91.3	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	95.4	66	130

Sub-Matrix: WATER

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1832824)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	101	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	93.1	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	104	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	99.0	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.7	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	95.3	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.0	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.2	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.4	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.8	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	97.1	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	97.6	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.2	84	116
EG020T: Total Metals by ICP-MS (QCLot: 1832788)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.1	90	110
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	104	88	113
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	96.7	88	112
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.7	88	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.3	87	109
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	96.2	88	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.2	87	108
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.7	88	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.8	88	111
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.3	87	111
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	99.2	85	113
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	97.2	88	112
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	87	113
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	104	88	118
EG035F: Dissolved Mercury by FIMS (QCLot: 1832823)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1832823) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.4	81	114
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1830516)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	94.7	81	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830911)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	83.5	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	89.9	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	89.8	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	78.3	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	83.0	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	84.1	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	91.4	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	90.5	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	93.2	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	90.0	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	93.9	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	93.4	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	95.2	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	92.2	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	90.6	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	92.1	53	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830912)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	74.5	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	77.0	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	77.4	54	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1832678)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	90.5	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830912)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	75.1	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	79.8	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	78.7	58	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1832678)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	89.2	66	123
EP080: BTEXN (QCLot: 1832678)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	87.2	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	93.5	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	91.1	73	126

Sub-Matrix: WATER

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1832678) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	94.9	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	96.2	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	84.5	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1830274)							
EM1811858-006	BH01 2.5-2.6	EG005T: Arsenic	7440-38-2	50 mg/kg	106	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	105	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	105	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.8	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	99.0	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	106	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	107	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	108	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	103	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	91.3	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	101	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	# Not Determined	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1830275)							
EM1811858-006	BH01 2.5-2.6	EG035T: Mercury	7439-97-6	5 mg/kg	107	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830376)							
EM1811858-010	BH01 4.4-4.5	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	99.2	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	# Not Determined	52	148
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1830383)							
EM1811825-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	101	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	108	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830301)							
EM1811858-006	BH01 2.5-2.6	EP080: C6 - C9 Fraction	----	28 mg/kg	81.6	42	131

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830302)							
EM1811775-004	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	82.2	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830377)							
EM1811858-006	BH01 2.5-2.6	EP071: C10 - C14 Fraction	----	806 mg/kg	84.3	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	97.0	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	93.5	64	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830382)							
EM1811636-008	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	106	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	112	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	97.9	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830301)							
EM1811858-006	BH01 2.5-2.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	76.4	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830302)							
EM1811775-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	77.7	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830377)							
EM1811858-006	BH01 2.5-2.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	87.0	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	95.5	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	88.6	44	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830382)							
EM1811636-008	Anonymous	EP071: >C10 - C16 Fraction	----	1160 mg/kg	106	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	104	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	97.9	44	126
EP080: BTEXN (QCLot: 1830301)							
EM1811858-006	BH01 2.5-2.6	EP080: Benzene	71-43-2	2 mg/kg	107	50	136
		EP080: Toluene	108-88-3	2 mg/kg	102	56	139
EP080: BTEXN (QCLot: 1830302)							
EM1811775-004	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	96.7	50	136
		EP080: Toluene	108-88-3	2 mg/kg	106	56	139

Sub-Matrix: WATER

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1832824)							
EM1811857-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	107	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	91.1	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	104	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	94.9	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	93.8	71	135

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1832824) - continued							
EM1811857-001	Anonymous	EG020A-F: Cobalt	7440-48-4	0.2 mg/L	99.0	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	94.5	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	92.2	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	93.1	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	96.6	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	94.5	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	97.5	75	131
EG020T: Total Metals by ICP-MS (QCLot: 1832788)							
EM1811858-059	Rinsate Blank	EG020A-T: Arsenic	7440-38-2	1 mg/L	94.4	82	118
		EG020A-T: Beryllium	7440-41-7	1 mg/L	104	79	121
		EG020A-T: Barium	7440-39-3	1 mg/L	92.1	80	114
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	92.6	75	129
		EG020A-T: Chromium	7440-47-3	1 mg/L	95.2	80	118
		EG020A-T: Cobalt	7440-48-4	1 mg/L	86.9	82	120
		EG020A-T: Copper	7440-50-8	1 mg/L	92.2	81	115
		EG020A-T: Lead	7439-92-1	1 mg/L	86.6	83	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	94.3	73	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	95.6	80	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	94.9	81	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	92.3	74	116
EG035F: Dissolved Mercury by FIMS (QCLot: 1832823)							
EM1811653-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	72.7	70	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1830516)							
EM1811547-002	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	71.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1832678)							
EM1811890-007	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	84.1	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1832678)							
EM1811890-007	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	81.2	44	122
EP080: BTEXN (QCLot: 1832678)							
EM1811890-007	Anonymous	EP080: Benzene	71-43-2	20 µg/L	102	68	130
		EP080: Toluene	108-88-3	20 µg/L	107	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1811858**	Page	: 1 of 10
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018
Site	: ----	Issue Date	: 31-Jul-2018
Sampler	: SJ	No. of samples received	: 59
Order number	:	No. of samples analysed	: 23

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1811858-006	BH01 2.5-2.6	Zinc	7440-66-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1811858-010	BH01 4.4-4.5	Pyrene	129-00-0	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Total Mercury by FIMS	1	21	4.76	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	1	21	4.76	5.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Page	: 3 of 10
Work Order	: EM1811858
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: SOIL

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2, Duplicate 3	23-Jul-2018	----	----	----	26-Jul-2018	06-Aug-2018	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2, Duplicate 3	23-Jul-2018	26-Jul-2018	19-Jan-2019	✓	26-Jul-2018	19-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2, Duplicate 3	23-Jul-2018	26-Jul-2018	20-Aug-2018	✓	27-Jul-2018	20-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	26-Jul-2018	04-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2, Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	26-Jul-2018	04-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP071) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓

Matrix: **SOIL** — Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2, Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	26-Jul-2018	04-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP071) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) BH01 1.0-1.1, BH01 2.5-2.6, BH01 4.4-4.5, BH02 1.0-1.1, BH02 2.8-2.9, BH02 4.0-4.1, BH03 0.5-0.6, BH03 2.5-2.6, BH03 3.9-4.0, BH04 1.5-1.6, BH04 3.0-3.1, BH04 4.5-4.6, BH05 1.0-1.1, BH05 3.0-3.1, BH05 4.5-4.6, BH06 0.2-0.3, Duplicate 1, BH07 1.0-1.1, BH07 2.2-2.3, Duplicate 2	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	26-Jul-2018	06-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080) Duplicate 3	23-Jul-2018	26-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓

Matrix: **WATER** — Evaluation: × = Holding time breach ; ✓ = Within holding time.

Matrix: **WATER** Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
Field Blank	23-Jul-2018	----	----	----	27-Jul-2018	19-Jan-2019	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unspecified; Lab-acidified (EG020A-T)							
Rinsate Blank	23-Jul-2018	27-Jul-2018	19-Jan-2019	✓	27-Jul-2018	19-Jan-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
Field Blank	23-Jul-2018	----	----	----	27-Jul-2018	20-Aug-2018	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unspecified; Lab-acidified (EG035T)							
Rinsate Blank	23-Jul-2018	----	----	----	27-Jul-2018	20-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
Field Blank, Rinsate Blank	23-Jul-2018	26-Jul-2018	30-Jul-2018	✓	30-Jul-2018	04-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
Field Blank, Rinsate Blank	23-Jul-2018	26-Jul-2018	30-Jul-2018	✓	30-Jul-2018	04-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Field Blank, Rinsate Blank	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
Field Blank, Rinsate Blank	23-Jul-2018	26-Jul-2018	30-Jul-2018	✓	30-Jul-2018	04-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Field Blank, Rinsate Blank	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
Field Blank, Rinsate Blank	23-Jul-2018	27-Jul-2018	06-Aug-2018	✓	27-Jul-2018	06-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	31	12.90	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	21	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	21	19.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	21	9.52	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	21	4.76	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	21	4.76	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

ALS

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3). ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1822218**	Page	: 1 of 7
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 27-Jul-2018
Order number	:	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 02-Aug-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

Page : 2 of 7
Work Order : ES1822218
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1840392)									
ES1822216-034	Anonymous	EA055: Moisture Content	----	0.1	%	21.3	20.6	3.34	0% - 20%
ES1822220-002	Anonymous	EA055: Moisture Content	----	0.1	%	8.9	9.0	1.52	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1843083)									
ES1822065-049	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	<10	<10	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
ES1822292-002	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	240	220	5.63	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	10	10	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	3	3	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	5	28.1	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	18	15	17.3	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	18	20	11.3	No Limit

Work Order : ES1822218
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1843083) - continued									
ES1822292-002	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	48	57	21.7	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	354	382	7.63	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	141	124	12.8	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	295	# 471	46.0	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843084)									
ES1822065-049	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1822292-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1839417)									
ES1822218-001	Triplicate 1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	2.0	1.8	13.3	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	0.9	0.8	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	1.4	1.2	21.2	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	13.1	11.6	12.4	0% - 20%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	3.6	3.1	12.9	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	22.2	18.9	16.0	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	20.7	19.2	7.69	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	8.4	7.8	6.67	0% - 50%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	7.8	7.3	6.92	0% - 50%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	10.6	9.3	12.2	0% - 20%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.8	3.4	13.7	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	10.0	9.1	9.98	0% - 20%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	5.7	5.1	12.0	0% - 50%
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.1	1.0	12.1	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	8.4	7.4	12.8	0% - 50%
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	120	107	11.2	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	14.1	12.8	9.70	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1839404)									
ES1822218-001	Triplicate 1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1839416)									
ES1822218-001	Triplicate 1	EP071: C15 - C28 Fraction	----	100	mg/kg	610	660	8.73	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	370	410	11.8	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1839404)									
ES1822218-001	Triplicate 1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1839416)									

Sub-Matrix: MOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/031: TosaRevoFer9l æ Hbdrov9rl oui - NEPS y01) 7r9vsbui rQC Los 18) Xc14* - vousfut ed									
ES1822218-001	Triplicate 1	EP071: >C16 - C34 Fraction	----	100	mg/kg	900	910	1.71	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	310	280	9.20	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTE6N rQC Los 18) Xc0c*									
ES1822218-001	Triplicate 1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Page	: 5 of 7
Work Order	: ES1822218
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **MOIL**				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG002T: To8aMe8a I b ICP-AEN rQCLos 18c) 08)*								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	102	86	126
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	101	85	115
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	113	90	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	104	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	99.0	76	128
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	106	88	120
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	99.8	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	105	80	114
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	105	85	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	108	87	123
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	110	75	131
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	109	92	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	121	80	122
EG0) 2T: To8aRevoFer9l æ S ervt rb I b 7IS N rQCLos 18c) 08c*								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	76.3	70	105
EP032rMM*B: Po8ut væ9r Arom9s6 Hbdrov9rl oui rQCLos 18) Xc13*								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	90.0	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	93.7	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	90.2	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	94.4	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	94.0	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	97.4	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	97.0	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	96.8	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	91.2	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	94.3	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	95.2	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	90.8	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	94.2	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	94.7	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	97.0	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	90.7	63	121

Sub-Matrix: MOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/031: TosaPesroæt m Hbdrov9rl oui rQCLos 18) Xc0c*								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	84.4	68	128
EP080/031: TosaPesroæt m Hbdrov9rl oui rQCLos 18) Xc14*								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	107	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	103	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	92.0	71	129
EP080/031: TosaRevoFer9l æ Hbdrov9rl oui - NEPS y01) 7r9vsfoui rQCLos 18) Xc0c*								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	88.6	68	128
EP080/031: TosaRevoFer9l æ Hbdrov9rl oui - NEPS y01) 7r9vsfoui rQCLos 18) Xc14*								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	104	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	96.5	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	83.5	63	131
EP080: BTE6N rQCLos 18) Xc0c*								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	96.5	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	95.9	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	93.9	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	97.7	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	95.9	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	104	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: MOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG002T: TosaMesa I b ICP-AEM rQCLos 18c) 08) *							
ES1822065-049	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	102	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	103	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	108	70	130
EG0) 2T: TosaRevoFer9l æ S ervt rb I b 7IS N rQCLos 18c) 08c*							
ES1822065-049	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	85.8	70	130

Sub-Matrix: **MOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP032nMM°B: Poabut væ9r Arom9s&r Hbdrov9rl oui rQCLos 18) Xc13°							
ES1822218-001	Triplicate 1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	85.6	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	80.5	70	130
EP080/031: Tos9aPesroæt m Hbdrov9rl oui rQCLos 18) Xc0c°							
ES1822218-001	Triplicate 1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	81.2	70	130
EP080/031: Tos9aPesroæt m Hbdrov9rl oui rQCLos 18) Xc14°							
ES1822218-001	Triplicate 1	EP071: C10 - C14 Fraction	----	523 mg/kg	78.1	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	67.7	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	80.8	52	132
EP080/031: Tos9aRevoFer9l æ Hbdrov9rl oui - NEPS y01) 7r9vs&oui rQCLos 18) Xc0c°							
ES1822218-001	Triplicate 1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	80.8	70	130
EP080/031: Tos9aRevoFer9l æ Hbdrov9rl oui - NEPS y01) 7r9vs&oui rQCLos 18) Xc14°							
ES1822218-001	Triplicate 1	EP071: >C10 - C16 Fraction	----	860 mg/kg	88.0	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	65.6	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	81.4	52	132
EP080: BTE6N rQCLos 18) Xc0c°							
ES1822218-001	Triplicate 1	EP080: Benzene	71-43-2	2.5 mg/kg	84.2	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	83.9	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	82.7	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.6	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.3	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	84.7	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1822218	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 27-Jul-2018
Site	: ----	Issue Date	: 02-Aug-2018
Sampler	: ----	No. of samples received	: 3
Order number	:	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

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Page	: 2 of 5
Work Order	: ES1822218
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	ES1822292--002	Anonymous	Zinc	7440-66-6	46.0 %	0% - 20%	**RPD exceeds LOR based limits**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	----	----	----	31-Jul-2018	06-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	01-Aug-2018	19-Jan-2019	✓	01-Aug-2018	19-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	01-Aug-2018	20-Aug-2018	✓	01-Aug-2018	20-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	31-Jul-2018	06-Aug-2018	✓	31-Jul-2018	09-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	31-Jul-2018	06-Aug-2018	✓	31-Jul-2018	06-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) Triplicate 1, Triplicate 3	Triplicate 2,	23-Jul-2018	31-Jul-2018	06-Aug-2018	✓	31-Jul-2018	06-Aug-2018	✓

Page	: 3 of 5
Work Order	: ES1822218
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
Triplicate 1, Triplicate 3	Triplicate 2,	**23-Jul-2018**	**31-Jul-2018**	06-Aug-2018	✓	**31-Jul-2018**	06-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1812173**	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 11		
No. of samples analysed	: 11		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843762)									
EM1812170-045	Anonymous	EA055: Moisture Content	----	0.1	%	22.5	23.2	2.94	0% - 20%
EM1812172-024	Anonymous	EA055: Moisture Content	----	0.1	%	14.2	17.8	22.5	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843763)									
EM1812173-005	BH03 1.0-1.1	EA055: Moisture Content	----	0.1	%	22.1	22.8	3.43	0% - 20%
EM1812175-001	Anonymous	EA055: Moisture Content	----	0.1	%	11.8	11.9	1.18	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1843748)									
EM1812172-024	Anonymous	EG005T: Manganese	7439-96-5	5	mg/kg	288	255	12.3	0% - 20%
EM1812170-046	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	2	2	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	60	100	44.1	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	24	30	20.0	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	14	19	27.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	24	31	24.8	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	7	27.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	12	13.2	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	66	76	13.3	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	31	44	34.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	5	6	18.9	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1812172-024	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	140	130	0.00	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1843748) - continued									
EM1812172-024	Anonymous	EG005T: Chromium	7440-47-3	2	mg/kg	17	16	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	22	16	30.5	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	29	24	17.9	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	28	26	3.98	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	56	58	4.37	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	37	35	5.02	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	60	48	22.2	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1843751)									
EM1812173-006	BH03 3.0-3.1	EG005T: Lead	7439-92-1	5	mg/kg	218	# 105	69.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	573	# 216	90.6	0% - 20%
EM1812173-006	BH03 3.0-3.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	80	50	50.5	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	9	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	52	38	30.8	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	263	316	18.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	59	36	48.7	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1812175-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	90	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	22	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	16	14	17.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	13	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	11	10	11.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	9	9	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	30	30	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	552	496	10.8	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	28	26	8.18	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	33	32	3.18	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843749)									

Page	4 of 9
Work Order	EM1812173
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843749) - continued									
EM1812170-046	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1812172-024	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.4	0.3	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843750)									
EM1812173-006	BH03 3.0-3.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1812175-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1843424)									
EM1812173-001	BH01 1.5-1.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.6	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.3	1.2	10.8	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	4.9	3.4	35.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	1.4	1.0	32.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	9.4	7.2	26.4	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	9.7	7.7	22.8	0% - 50%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	4.7	3.7	23.4	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	4.1	2.9	32.5	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	6.1	5.0	20.0	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.9	1.6	16.5	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.9	4.1	18.8	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.5	2.1	16.1	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.6	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.2	2.7	16.1	No Limit

Page	5 of 9
Work Order	EM1812173
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843360)									
EM1812173-001	BH01 1.5-1.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843425)									
EM1812173-001	BH01 1.5-1.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP071: C15 - C28 Fraction	----	100	mg/kg	280	230	18.7	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	210	200	8.88	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	490	430	13.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843360)									
EM1812173-001	BH01 1.5-1.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843425)									
EM1812173-001	BH01 1.5-1.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	440	380	15.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	540	380	34.8	0% - 50%
EP080: BTEXN (QC Lot: 1843360)									
EM1812173-001	BH01 1.5-1.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1812173-011	BH05 4.0-4.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843748)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	87.2	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.7	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.1	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	97.5	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	105	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.8	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	84.4	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.7	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.7	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	88.2	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	90.2	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.8	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	86.3	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	93.3	82	111
EG005T: Total Metals by ICP-AES (QCLot: 1843751)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	87.5	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.7	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.3	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	99.7	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	100.0	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.7	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	84.3	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.5	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.1	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	87.8	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	90.2	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.0	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	86.1	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	93.4	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843749)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	88.3	77	104
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	94.2	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)								

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	95.6	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	92.2	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	93.9	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	92.7	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	97.5	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	96.5	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	92.1	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	96.9	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	87.6	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	86.2	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	81.5	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.8	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	84.6	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	88.0	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.2	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	97.2	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	104	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	97.6	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	96.3	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	99.3	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	102	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	84.0	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1843360)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	101	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	103	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	108	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	108	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	106	81	128

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1843360) - continued								
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	96.3	66	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843748)							
EM1812170-047	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.6	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	119	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	98.2	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	88.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	91.4	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	90.3	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	93.2	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	111	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	91.3	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	84.8	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	83.2	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	104	74	128
EG005T: Total Metals by ICP-AES (QCLot: 1843751)							
EM1812173-007	BH04 0.5-0.6	EG005T: Barium	7440-39-3	50 mg/kg	112	71	135
		EG005T: Lead	7439-92-1	50 mg/kg	109	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Vanadium	7440-62-2	50 mg/kg	98.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	# 12.1	74	128
EM1812173-007	BH04 0.5-0.6	EG005T: Arsenic	7440-38-2	50 mg/kg	88.8	78	124
		EG005T: Beryllium	7440-41-7	50 mg/kg	94.6	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	84.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	85.5	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	103	82	124
		EG005T: Nickel	7440-02-0	50 mg/kg	81.9	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	81.0	71	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843749)							
EM1812170-047	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	85.5	76	116

Page	: 9 of 9
Work Order	: EM1812173
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)							
EM1812173-007	BH04 0.5-0.6	EG035T: Mercury	7439-97-6	5 mg/kg	90.2	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)							
EM1812173-003	BH02 0.5-0.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	94.4	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	105	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)							
EM1812173-002	BH01 3.5-3.6	EP080: C6 - C9 Fraction	----	28 mg/kg	71.3	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)							
EM1812173-002	BH01 3.5-3.6	EP071: C10 - C14 Fraction	----	806 mg/kg	94.8	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	100	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	97.6	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)							
EM1812173-002	BH01 3.5-3.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	71.6	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)							
EM1812173-002	BH01 3.5-3.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	96.5	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	99.3	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	93.8	44	126
EP080: BTEXN (QCLot: 1843360)							
EM1812173-002	BH01 3.5-3.6	EP080: Benzene	71-43-2	2 mg/kg	79.1	50	136
		EP080: Toluene	108-88-3	2 mg/kg	86.2	56	139

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1812173**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018
Site	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----	No. of samples received	: 11
Order number	:	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

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Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: SOIL

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	EM1812173-006	BH03 3.0-3.1	Lead	7439-92-1	69.9 %	0% - 20%	RPD exceeds LOR based limits
EG005T: Total Metals by ICP-AES	EM1812173-006	BH03 3.0-3.1	Zinc	7440-66-6	90.6 %	0% - 20%	RPD exceeds LOR based limits
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1812173-007	BH04 0.5-0.6	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG005T: Total Metals by ICP-AES	EM1812173-007	BH04 0.5-0.6	Zinc	7440-66-6	12.1 %	74-128%	Recovery less than lower data quality objective

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH01 1.5-1.6, BH02 0.5-0.6, BH03 1.0-1.1, BH04 0.5-0.6, BH04 3.5-3.6, BH05 4.0-4.1	BH01 3.5-3.6, BH02 2.0-2.1, BH03 3.0-3.1, BH04 2.5-2.6, BH05 2.0-2.1,	23-Jul-2018	----	----	----	01-Aug-2018	06-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH01 1.5-1.6, BH02 0.5-0.6, BH03 1.0-1.1, BH04 0.5-0.6, BH04 3.5-3.6, BH05 4.0-4.1	BH01 3.5-3.6, BH02 2.0-2.1, BH03 3.0-3.1, BH04 2.5-2.6, BH05 2.0-2.1,	23-Jul-2018	02-Aug-2018	19-Jan-2019	✓	02-Aug-2018	19-Jan-2019	✓

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH01 1.5-1.6, BH01 3.5-3.6, BH02 0.5-0.6, BH02 2.0-2.1, BH03 1.0-1.1, BH03 3.0-3.1, BH04 0.5-0.6, BH04 2.5-2.6, BH04 3.5-3.6, BH05 2.0-2.1, BH05 4.0-4.1	23-Jul-2018	02-Aug-2018	20-Aug-2018	✓	02-Aug-2018	20-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH01 1.5-1.6, BH01 3.5-3.6, BH02 0.5-0.6, BH02 2.0-2.1, BH03 1.0-1.1, BH03 3.0-3.1, BH04 0.5-0.6, BH04 2.5-2.6, BH04 3.5-3.6, BH05 2.0-2.1, BH05 4.0-4.1	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
BH01 1.5-1.6, BH01 3.5-3.6, BH02 0.5-0.6, BH02 2.0-2.1, BH03 1.0-1.1, BH03 3.0-3.1, BH04 0.5-0.6, BH04 2.5-2.6, BH04 3.5-3.6, BH05 2.0-2.1, BH05 4.0-4.1	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH01 1.5-1.6, BH01 3.5-3.6, BH02 0.5-0.6, BH02 2.0-2.1, BH03 1.0-1.1, BH03 3.0-3.1, BH04 0.5-0.6, BH04 2.5-2.6, BH04 3.5-3.6, BH05 2.0-2.1, BH05 4.0-4.1	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	03-Aug-2018	06-Aug-2018	✓

Matrix: SOIL

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071)								
BH01 1.5-1.6,	BH01 3.5-3.6,	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓
BH02 0.5-0.6,	BH02 2.0-2.1,							
BH03 1.0-1.1,	BH03 3.0-3.1,							
BH04 0.5-0.6,	BH04 2.5-2.6,							
BH04 3.5-3.6,	BH05 2.0-2.1,							
BH05 4.0-4.1								
Soil Glass Jar - Unpreserved (EP080)								
BH01 1.5-1.6,	BH01 3.5-3.6,	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	03-Aug-2018	06-Aug-2018	✓
BH02 0.5-0.6,	BH02 2.0-2.1,							
BH03 1.0-1.1,	BH03 3.0-3.1,							
BH04 0.5-0.6,	BH04 2.5-2.6,							
BH04 3.5-3.6,	BH05 2.0-2.1,							
BH05 4.0-4.1								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH01 1.5-1.6,	BH01 3.5-3.6,	23-Jul-2018	01-Aug-2018	06-Aug-2018	✓	03-Aug-2018	06-Aug-2018	✓
BH02 0.5-0.6,	BH02 2.0-2.1,							
BH03 1.0-1.1,	BH03 3.0-3.1,							
BH04 0.5-0.6,	BH04 2.5-2.6,							
BH04 3.5-3.6,	BH05 2.0-2.1,							
BH05 4.0-4.1								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	37	10.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	6	39	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	39	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1811913**	Page	: 1 of 12
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Order number	:	Date Analysis Commenced	: 27-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018
Sampler	: SARAH JOYCE		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 53		
No. of samples analysed	: 19		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1833305)									
EM1811832-001	Anonymous	EA055: Moisture Content	----	0.1	%	12.1	11.8	1.85	0% - 50%
EM1811913-030	BH10_3.0-3.1	EA055: Moisture Content	----	0.1	%	21.2	21.9	3.44	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1833822)									
EM1811913-003	BH08_1.0-1.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	70	31.4	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	8	25.7	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	8	10	19.9	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	9	10	12.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	40	52	25.7	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	25	35	32.9	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	211	226	6.93	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	32	44	34.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	42	63	41.0	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1811913-030	BH10_3.0-3.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	140	140	0.00	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	9	9	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	9	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	11	11	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	90	82	9.55	0% - 50%

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 1833822) - continued									
EM1811913-030	BH10_3.0-3.1	EG005T: Lead	7439-92-1	5	mg/kg	114	114	0.00	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	462	393	16.1	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	32	33	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	123	119	3.45	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1833823)									
EM1811913-003	BH08_1.0-1.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.00	No Limit
EM1811913-030	BH10_3.0-3.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.6	0.7	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1833298)									
EM1811913-003	BH08_1.0-1.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	1.1	<0.5	78.4	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	8.7	# 4.6	62.3	0% - 50%
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	0.6	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	3.1	1.3	83.3	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	39.3	# 25.4	42.8	0% - 20%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	9.3	7.3	24.3	0% - 50%
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	45.6	44.4	2.68	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	50.7	46.7	8.37	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	24.8	22.3	10.9	0% - 20%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	26.6	# 20.8	24.4	0% - 20%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	26.3	24.2	8.40	0% - 20%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	9.1	8.3	9.24	0% - 50%
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	25.5	23.0	10.2	0% - 20%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	12.0	10.9	9.61	0% - 20%
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	3.3	3.1	5.94	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	14.9	13.6	9.00	0% - 20%
EM1811913-034	BH10_5.0-5.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1833298) - continued									
EM1811913-034	BH10_5.0-5.1	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1833294)									
EM1811913-003	BH08_1.0-1.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1811913-034	BH10_5.0-5.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1833299)									
EM1811913-003	BH08_1.0-1.1	EP071: C15 - C28 Fraction	----	100	mg/kg	1370	1080	23.3	0% - 50%
		EP071: C29 - C36 Fraction	----	100	mg/kg	710	700	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	2080	1780	15.5	0% - 20%
EM1811913-034	BH10_5.0-5.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1833294)									
EM1811913-003	BH08_1.0-1.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1811913-034	BH10_5.0-5.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1833299)									
EM1811913-003	BH08_1.0-1.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	1840	1580	15.6	0% - 50%
		EP071: >C34 - C40 Fraction	----	100	mg/kg	300	300	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	2140	1880	12.9	0% - 20%
EM1811913-034	BH10_5.0-5.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1833294)									
EM1811913-003	BH08_1.0-1.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1811913-034	BH10_5.0-5.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Work Order : EM1811913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1833294) - continued									
EM1811913-034	BH10_5.0-5.1	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

						Laboratory Duplicate (DUP) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 1834578)									
EM1811913-052	Field Blank 2	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1833467)									
EM1811889-003	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1811900-009	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1833981)									
EM1811913-052	Field Blank 2	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1834186)									
EM1811950-005	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	360	540	41.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	970	1180	19.4	0% - 20%
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	60	24.9	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1833981)									
EM1811913-052	Field Blank 2	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1834186)									
EM1811950-005	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	720	890	21.4	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	310	500	46.7	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
EP080: BTEXN (QC Lot: 1833981)									
EM1811913-052	Field Blank 2	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1833981) - continued									
EM1811913-052	Field Blank 2	EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1833822)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	98.7	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	101	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	101	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	116	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	91.8	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	92.6	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	91.6	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	93.8	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	90.3	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	94.5	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	96.9	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	98.2	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	94.7	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	96.6	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1833823)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	104	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1833298)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	99.7	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	103	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	99.6	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	100	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	106	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	106	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	104	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	108	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	96.7	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	99.7	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	93.2	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	96.5	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	88.6	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	87.6	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	89.3	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	87.2	68	127

Page	8 of 12
Work Order	EM1811913
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833294)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	89.8	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833299)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	86.9	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	100	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	93.3	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833294)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	87.9	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833299)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	90.5	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	97.5	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	77.6	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1833294)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	81.7	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	89.5	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	88.9	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	87.7	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	92.8	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	77.5	66	130

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1834578)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	90	110
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	100	88	113
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	103	88	112
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	86	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	87	109
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	101	88	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	99.3	87	108
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	88	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	103	88	111
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	101	87	111
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	105	85	113
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	101	88	112
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	87	113

Page : 9 of 12
Work Order : EM1811913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1834578) - continued								
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	105	88	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1833467)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	103	81	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1834185)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	88.7	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	87.7	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	93.0	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	94.1	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	94.3	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	110	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	96.8	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	93.8	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	95.9	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	95.7	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	94.7	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	94.4	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	95.5	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	92.1	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	92.4	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	95.5	53	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833981)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	123	68	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1834186)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	113	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	116	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	110	54	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833981)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	122	66	123
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1834186)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	112	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	112	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	111	58	137
EP080: BTEXN (QCLot: 1833981)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	114	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	119	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	123	73	126

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1833981) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	128	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	129	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	99.6	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1833822)							
EM1811913-006	BH08_2.5-2.6	EG005T: Arsenic	7440-38-2	50 mg/kg	90.8	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	101	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	99.6	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.4	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	95.1	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	92.1	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	87.0	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	80.8	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	89.3	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	84.9	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	94.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	87.5	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1833823)							
EM1811913-006	BH08_2.5-2.6	EG035T: Mercury	7439-97-6	5 mg/kg	111	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1833298)							
EM1811913-010	BH08_4.5-4.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	93.6	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	98.5	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833294)							
EM1811913-006	BH08_2.5-2.6	EP080: C6 - C9 Fraction	----	28 mg/kg	90.1	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833299)							
EM1811913-006	BH08_2.5-2.6	EP071: C10 - C14 Fraction	----	806 mg/kg	84.4	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	97.2	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	91.4	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833294)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833294) - continued							
EM1811913-006	BH08_2.5-2.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	89.1	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833299)							
EM1811913-006	BH08_2.5-2.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	87.8	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	95.0	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	76.3	44	126
EP080: BTEXN (QCLot: 1833294)							
EM1811913-006	BH08_2.5-2.6	EP080: Benzene	71-43-2	2 mg/kg	83.5	50	136
		EP080: Toluene	108-88-3	2 mg/kg	98.8	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 1834578)							
EM1811913-052	Field Blank 2	EG020A-T: Arsenic	7440-38-2	1 mg/L	97.6	82	118
		EG020A-T: Beryllium	7440-41-7	1 mg/L	98.0	79	121
		EG020A-T: Barium	7440-39-3	1 mg/L	97.5	80	114
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	96.6	75	129
		EG020A-T: Chromium	7440-47-3	1 mg/L	99.1	80	118
		EG020A-T: Cobalt	7440-48-4	1 mg/L	98.4	82	120
		EG020A-T: Copper	7440-50-8	1 mg/L	95.1	81	115
		EG020A-T: Lead	7439-92-1	1 mg/L	94.2	83	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	100.0	73	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	97.6	80	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	99.3	81	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	94.9	74	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1833467)							
EM1811889-004	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	92.5	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1833981)							
EM1811913-053	Rinsate 2	EP080: C6 - C9 Fraction	----	280 µg/L	89.0	43	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1834186)							
EM1811950-005	Anonymous	EP071: C10 - C14 Fraction	----	4331 µg/L	111	50	130
		EP071: C15 - C28 Fraction	----	16952 µg/L	110	54	136
		EP071: C29 - C36 Fraction	----	8695 µg/L	105	50	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1833981)							
EM1811913-053	Rinsate 2	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	88.7	44	122
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1834186)							
EM1811950-005	Anonymous	EP071: >C10 - C16 Fraction	----	6292 µg/L	108	50	128

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1834186) - continued							
EM1811950-005	Anonymous	EP071: >C16 - C34 Fraction	----	22143 µg/L	107	50	150
		EP071: >C34 - C40 Fraction	----	1677 µg/L	110	51	159
EP080: BTEXN (QCLot: 1833981)							
EM1811913-053	Rinsate 2	EP080: Benzene	71-43-2	20 µg/L	97.7	68	130
		EP080: Toluene	108-88-3	20 µg/L	101	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1811913	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Site	: ----	Issue Date	: 31-Jul-2018
Sampler	: SARAH JOYCE	No. of samples received	: 53
Order number	:	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 9
Work Order	: EM1811913
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: SOIL

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1811913--003	BH08_1.0-1.1	Acenaphthylene	208-96-8	62.3 %	0% - 50%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1811913--003	BH08_1.0-1.1	Phenanthrene	85-01-8	42.8 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1811913--003	BH08_1.0-1.1	Chrysene	218-01-9	24.4 %	0% - 20%	RPD exceeds LOR based limits

Outliers : Frequency of Quality Control Samples

Matrix: WATER

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	1	14	7.14	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH08_1.0-1.1,	BH08_2.5-2.6,	24-Jul-2018	----	----	----	27-Jul-2018	07-Aug-2018	✓
BH08_4.5-4.6,	BH09_1.0-1.1,							
BH09_2.5-2.6,	BH09_4.5-4.6,							
BH09_6.0-6.1,	Duplicate 4,							
BH10_1.0-1.1,	BH10_3.0-3.1,							
BH10_5.0-5.1,	BH11_1.0-1.1,							
BH11_2.5-2.6,	BH11_3.3-3.4,							
BH12_1.0-1.1,	BH12_2.5-2.6,							
BH12_3.5-3.6								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH08_1.0-1.1, BH08_4.5-4.6, BH09_2.5-2.6, BH09_6.0-6.1, BH10_1.0-1.1, BH10_5.0-5.1, BH11_2.5-2.6, BH12_1.0-1.1, BH12_3.5-3.6	BH08_2.5-2.6, BH09_1.0-1.1, BH09_4.5-4.6, Duplicate 4, BH10_3.0-3.1, BH11_1.0-1.1, BH11_3.3-3.4, BH12_2.5-2.6,	24-Jul-2018	27-Jul-2018	20-Jan-2019	✓	27-Jul-2018	20-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH08_1.0-1.1, BH08_4.5-4.6, BH09_2.5-2.6, BH09_6.0-6.1, BH10_1.0-1.1, BH10_5.0-5.1, BH11_2.5-2.6, BH12_1.0-1.1, BH12_3.5-3.6	BH08_2.5-2.6, BH09_1.0-1.1, BH09_4.5-4.6, Duplicate 4, BH10_3.0-3.1, BH11_1.0-1.1, BH11_3.3-3.4, BH12_2.5-2.6,	24-Jul-2018	27-Jul-2018	21-Aug-2018	✓	30-Jul-2018	21-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH08_1.0-1.1, BH08_4.5-4.6, BH09_2.5-2.6, BH09_6.0-6.1, BH10_1.0-1.1, BH10_5.0-5.1, BH11_2.5-2.6, BH12_1.0-1.1, BH12_3.5-3.6	BH08_2.5-2.6, BH09_1.0-1.1, BH09_4.5-4.6, Duplicate 4, BH10_3.0-3.1, BH11_1.0-1.1, BH11_3.3-3.4, BH12_2.5-2.6,	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓

Matrix: **SOIL** — Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
BH08_1.0-1.1,	BH08_2.5-2.6,	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
BH08_4.5-4.6,	BH09_1.0-1.1,							
BH09_2.5-2.6,	BH09_4.5-4.6,							
BH09_6.0-6.1,	Duplicate 4,							
BH10_1.0-1.1,	BH10_3.0-3.1,							
BH10_5.0-5.1,	BH11_1.0-1.1,							
BH11_2.5-2.6,	BH11_3.3-3.4,							
BH12_1.0-1.1,	BH12_2.5-2.6,							
BH12_3.5-3.6								
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071)								
BH08_1.0-1.1,	BH08_2.5-2.6,	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
BH08_4.5-4.6,	BH09_1.0-1.1,							
BH09_2.5-2.6,	BH09_4.5-4.6,							
BH09_6.0-6.1,	Duplicate 4,							
BH10_1.0-1.1,	BH10_3.0-3.1,							
BH10_5.0-5.1,	BH11_1.0-1.1,							
BH11_2.5-2.6,	BH11_3.3-3.4,							
BH12_1.0-1.1,	BH12_2.5-2.6,							
BH12_3.5-3.6								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH08_1.0-1.1,	BH08_2.5-2.6,	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	07-Aug-2018	✓
BH08_4.5-4.6,	BH09_1.0-1.1,							
BH09_2.5-2.6,	BH09_4.5-4.6,							
BH09_6.0-6.1,	Duplicate 4,							
BH10_1.0-1.1,	BH10_3.0-3.1,							
BH10_5.0-5.1,	BH11_1.0-1.1,							
BH11_2.5-2.6,	BH11_3.3-3.4,							
BH12_1.0-1.1,	BH12_2.5-2.6,							
BH12_3.5-3.6								

Matrix: **WATER** — Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	20-Jan-2019	✓	30-Jul-2018	20-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)								
Field Blank 2,	Rinsate 2	24-Jul-2018	----	----	----	27-Jul-2018	21-Aug-2018	✓

Matrix: **WATER** Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	31-Jul-2018	✓	30-Jul-2018	05-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	31-Jul-2018	✓	30-Jul-2018	05-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	07-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	31-Jul-2018	✓	30-Jul-2018	05-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	07-Aug-2018	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 2,	Rinsate 2	24-Jul-2018	27-Jul-2018	07-Aug-2018	✓	27-Jul-2018	07-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 7 of 9
Work Order	: EM1811913
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Mercury by FIMS	EG035T	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A. The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D. Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1822455**	Page	: 1 of U
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division cy2ney
Contadt	: cARAH JOYCE	Contadt	: chirley LeCornu
A22ress	: 97 KIRKc WAY PLACE BATTERY POINT TAc S ANIAM, cTRALIA U004	A22ress	: 9UU9+7 Woo2- arz Roa2 cmithfiel2 NcW Australia 9164
Tele- hone	: k61 0p 699p 1+p7	Tele- hone	: k615p5+347 76p0
Projedt	: Newtown R2	Date cam- les Redeive2	: p15Jul901+
Or2er number	:	Date Analysis Commende2	: 015Aug901+
C5O5C number	: 555	Issue Date	: 065Aug901+
cam- ler	: cARAH JOYCE		
cite	: 555		
Quote number	: EN/999/1U		
No. of sam- les redeive2	: 1		
No. of sam- les analyse2	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This re- ort su- erse2es any - revious re- ort(s) with this referende. Results a- - ly to the sam- le(s) as submitte2. This 2odument shall not be re- ro2ude2Mexde- t in full.

This Quality Control Re- ort dontains the following information:

- Laboratory Du- lidate (D, P) Re- ort; Relative Perdentage Differende (RPD) an2 Adde- tande Limits
- Setho2 Blanz (SB) an2 Laboratory Control c- ize (LCc) Re- ort; Redovery an2 Adde- tande Limits
- Satrix c- ize (Sc) Re- ort; Redovery an2 Adde- tande Limits

Signatories

This 2odument has been eledtronidally signe2 by the authoriGe2 signatories below. Eledtronid signing is darrie2 out in dom- liande with - rode2ures s- edifie2 in 91 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
E2wan2y Fa2jar	Organid Coor2inator	cy2ney InorganidsMcmithfiel2MNcW
E2wan2y Fa2jar	Organid Coor2inator	cy2ney OrganidsMcmithfiel2MNcW
Ivan Taylor	Analyst	cy2ney InorganidsMcmithfiel2MNcW

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843964)									
ES1822340-001	Anonymous	EA055: Moisture Content	----	0.1	%	12.6	12.5	1.12	0% - 50%
ES1822467-002	Anonymous	EA055: Moisture Content	----	0.1	%	50.4	50.1	0.692	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1847615)									
ES1822455-001	Triplicate 4	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	40	31.9	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	5	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	12	8	43.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	9	6	33.8	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	60	38	44.1	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	16	11	36.9	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	91	100	9.41	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	77	60	24.8	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	39	27	36.6	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EW1803034-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	70	70	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	19	16	14.6	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	5	4	30.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	5	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	30	22	28.8	No Limit

Page	3 of 7
Work Order	ES1822455
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1847615) - continued									
EW1803034-001	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	63	39	47.0	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	93	77	19.1	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	50	47	6.49	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	90	60	40.6	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1847614)									
ES1822274-010	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1822455-001	Triplicate 4	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1842647)									
ES1822434-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1842646)									
ES1822329-021	Anonymous	EP071: C15 - C28 Fraction	—	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	—	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	—	50	mg/kg	<50	<50	0.00	No Limit
ES1822434-001	Anonymous	EP071: C15 - C28 Fraction	—	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	—	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	—	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843422)									
ES1822300-003	Anonymous	EP080: C6 - C9 Fraction	—	10	mg/kg	<10	<10	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1842646)									
ES1822329-021	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1822434-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843422)									
ES1822300-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 1843422)									
ES1822300-003	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Page	: 5 of U
WorZ Order	: EC 1733456
Client	: ЧEO ENSIRONSENTAL COL' TIONC
Project	: Newtown Rd

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The <uality control term Sethod / Laboratory BlanZ refers to an analyte free matrix to which all reagents are added in the same volumes or -ro-ortions as used in standard sam-le -re-arstion. The -ur-ose of this QC -arameter is to monitor -otential laboratory contamination. The <uality control term Laboratory Control C-iZe (LCC) refers to a certified reference material, or a Znown interference free matrix s-iZed with target analytes. The -ur-ose of this QC -arameter is to monitor method -recision and accuracy inde-endent of sam-le matrix. Dynamic Recovery Limits are based on statistical evaluation of -rocessed LCC.

Cub-Satrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1847615)								
EЧ005T: Arsenic	U440 P7 3	5	mg/Zg	=5	31.U mg/Zg	11P	76	136
EЧ005T: Barium	U440 P9 P	10	mg/Zg	=10	14P mg/Zg	11P	75	115
EЧ005T: Beryllium	U440 41 U	1	mg/Zg	=1	5.6P mg/Zg	113	90	11P
EЧ005T: Boron	U440 43 7	50	mg/Zg	=50	----	----	----	----
EЧ005T: Cadmium	U440 4P 9	1	mg/Zg	=1	4.64 mg/Zg	104	7P	11P
EЧ005T: Chromium	U440 4U P	3	mg/Zg	=3	4P.9 mg/Zg	134	U8	137
EЧ005T: Cobalt	U440 47 4	3	mg/Zg	=3	16 mg/Zg	113	77	130
EЧ005T: Co--er	U440 50 7	5	mg/Zg	=5	P3 mg/Zg	114	76	130
EЧ005T: Lead	U4P9 93 1	5	mg/Zg	=5	40 mg/Zg	106	70	114
EЧ005T: Sanganese	U4P9 96 5	5	mg/Zg	=5	1P0 mg/Zg	107	75	11U
EЧ005T: NicZel	U440 03 0	3	mg/Zg	=3	55 mg/Zg	115	7U	13P
EЧ005T: Celenium	UU73 49 3	5	mg/Zg	=5	5.PU mg/Zg	13U	U5	1P1
EЧ005T: Sanadium	U440 63 3	5	mg/Zg	=5	39.6 mg/Zg	115	93	133
EЧ005T: ¯inc	U440 66 6	5	mg/Zg	=5	60.7 mg/Zg	113	70	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1847614)								
EЧ0P5T: Sercury	U4P9 9U 6	0.1	mg/Zg	=0.1	3.5U mg/Zg	70.9	U0	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1842647)								
EP0U5(CIS): Na-hthalene	91 30 P	0.5	mg/Zg	=0.5	6 mg/Zg	9UP	UU	135
EP0U5(CIS): Acena-hthylene	307 96 7	0.5	mg/Zg	=0.5	6 mg/Zg	9U6	U3	134
EP0U5(CIS): Acena-hthene	7P P3 9	0.5	mg/Zg	=0.5	6 mg/Zg	99.3	UP	13U
EP0U5(CIS): Fluorene	76 UP U	0.5	mg/Zg	=0.5	6 mg/Zg	96.1	U3	136
EP0U5(CIS): Phenanthrene	75 01 7	0.5	mg/Zg	=0.5	6 mg/Zg	79.5	U5	13U
EP0U5(CIS): Anthracene	130 13 U	0.5	mg/Zg	=0.5	6 mg/Zg	95.4	UU	13U
EP0U5(CIS): Fluoranthene	306 44 0	0.5	mg/Zg	=0.5	6 mg/Zg	9UP	UP	13U
EP0U5(CIS): Pyrene	139 00 0	0.5	mg/Zg	=0.5	6 mg/Zg	96.7	U4	137
EP0U5(CIS): Benr(a)anthracene	56 55 P	0.5	mg/Zg	=0.5	6 mg/Zg	93.7	69	13P
EP0U5(CIS): Chrysene	317 01 9	0.5	mg/Zg	=0.5	6 mg/Zg	97.5	U5	13U
EP0U5(CIS): Benro(bkj)fluoranthene	305 99 3 305 73 P	0.5	mg/Zg	=0.5	6 mg/Zg	95.6	67	116
EP0U5(CIS): Benro(Z)fluoranthene	30U 07 9	0.5	mg/Zg	=0.5	6 mg/Zg	91.P	U4	136
EP0U5(CIS): Benro(a)-yrene	50 P3 7	0.5	mg/Zg	=0.5	6 mg/Zg	79.9	U0	136
EP0U5(CIS): Indeno(1.3.P.cd)-yrene	19P P9 5	0.5	mg/Zg	=0.5	6 mg/Zg	9P.U	61	131
EP0U5(CIS): Dibenr(a.h)anthracene	5P U0 P	0.5	mg/Zg	=0.5	6 mg/Zg	93.4	63	117
EP0U5(CIS): Benro(g.h.i)-erylene	191 34 3	0.5	mg/Zg	=0.5	6 mg/Zg	9U6	6P	131

Page	: 6 of 7
Work Order	: ES1822455
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1842646)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	87.5	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	102	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	95.2	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843422)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	91.6	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1842646)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	104	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	101	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	78.0	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843422)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	94.5	68	128
EP080: BTEXN (QCLot: 1843422)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	90.5	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	94.8	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	87.5	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	93.2	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	91.9	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	83.2	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1847615)							
EW1803034-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	95.3	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	105	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.8	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1847614)							
ES1822274-010	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.7	70	130

ᶜub-Satric: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1842647)							
E^c 17334P4-001	Anonymous	EP0U5(^cIS): Acena⁻hthene	7P-P3-9	10 mg/^zg	75.1	UD	1P0
		EP0U5(^cIS): Pyrene	139-00-0	10 mg/^zg	95.U	UD	1P0
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1842646)							
E^c 17334P4-001	Anonymous	EP0U1: C10 - C14 Fraction	----	53P mg/^zg	90.P	UP	1PU
		EP0U1: C15 - C37 Fraction	----	3P19 mg/^zg	10P	5P	1P1
		EP0U1: C39 - CP6 Fraction	----	1U14 mg/^zg	109	53	1P3
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843422)							
E^c 1733P00-00P	Anonymous	EP070: C6 - C9 Fraction	----	P3.5 mg/^zg	105	UD	1P0
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1842646)							
E^c 17334P4-001	Anonymous	EP0U1: >C10 - C16 Fraction	----	760 mg/^zg	90.5	UP	1PU
		EP0U1: >C16 - CP4 Fraction	----	P33P mg/^zg	106	5P	1P1
		EP0U1: >CP4 - C40 Fraction	----	1057 mg/^zg	106	53	1P3
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843422)							
E^c 1733P00-00P	Anonymous	EP070: C6 - C10 Fraction	C6&C10	PU.5 mg/^zg	103	UD	1P0
EP080: BTEXN (QCLot: 1843422)							
E^c 1733P00-00P	Anonymous	EP070: Benrene	U1-4P-3	3.5 mg/^zg	73.U	UD	1P0
		EP070: Toluene	107-77-P	3.5 mg/^zg	90.5	UD	1P0
		EP070: Ethylbenrene	100-41-4	3.5 mg/^zg	91.U	UD	1P0
		EP070: meta-X⁻ara-Vylene	107-P7-P 106-43-P	3.5 mg/^zg	9P.3	UD	1P0
		EP070: ortho-Vylene	95-4U-6	3.5 mg/^zg	9P.6	UD	1P0
		EP070: Na⁻hthalene	91-30-P	3.5 mg/^zg	U0.7	UD	1P0

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1822455**	Page	: 1 of 4
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 31-Jul-2018
Site	: ----	Issue Date	: 06-Aug-2018
Sampler	: SARAH JOYCE	No. of samples received	: 1
Order number	:	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) Triplicate 4	24-Jul-2018	----	----	----	01-Aug-2018	07-Aug-2018	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) Triplicate 4	24-Jul-2018	02-Aug-2018	20-Jan-2019	✓	02-Aug-2018	20-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) Triplicate 4	24-Jul-2018	02-Aug-2018	21-Aug-2018	✓	03-Aug-2018	21-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) Triplicate 4	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	02-Aug-2018	10-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) Triplicate 4	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	02-Aug-2018	07-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) Triplicate 4	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	02-Aug-2018	07-Aug-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) Triplicate 4	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	02-Aug-2018	07-Aug-2018	✓

Page : 3 of 4
Work Order : ES1822456
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: SOIL

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 4 of 4
Work Order	: ES1822456
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Preparation Methods	**Method**	**Matrix**	**Method Descriptions**
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1812174**	Page	: 1 of 8
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA

Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843763)									
EM1812173-005	Anonymous	EA055: Moisture Content	----	0.1	%	22.1	22.8	3.43	0% - 20%
EM1812175-001	Anonymous	EA055: Moisture Content	----	0.1	%	11.8	11.9	1.18	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1843751)									
EM1812173-006	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	218	# 105	69.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	573	# 216	90.6	0% - 20%
EM1812173-006	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	80	50	50.5	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	9	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	52	38	30.8	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	263	316	18.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	59	36	48.7	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1812175-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	90	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	22	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	16	14	17.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	13	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	11	10	11.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	9	9	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 1843751) - continued									
EM1812175-001	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	30	30	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	552	496	10.8	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	28	26	8.18	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	33	32	3.18	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843750)									
EM1812173-006	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1812175-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1843424)									
EM1812173-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1812173-011	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.6	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.3	1.2	10.8	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	4.9	3.4	35.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	1.4	1.0	32.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	9.4	7.2	26.4	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	9.7	7.7	22.6	0% - 50%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	4.7	3.7	23.4	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	4.1	2.9	32.5	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	6.1	5.0	20.0	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.9	1.6	16.5	No Limit

Work Order : EM1812174
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1843424) - continued									
EM1812173-011	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.9	4.1	18.8	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.6	2.1	16.1	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.6	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.2	2.7	16.1	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843425)									
EM1812173-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	280	230	18.7	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	210	200	8.88	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	490	430	13.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843425)									
EM1812173-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	440	380	15.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	540	380	34.8	0% - 50%
EP080: BTEXN (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1812173-011	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1843360) - continued									
EM1812173-011	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843751)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	87.5	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.7	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.3	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	99.7	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	100.0	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.7	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	84.3	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.5	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.1	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	87.8	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	90.2	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.0	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	86.1	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	93.4	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	94.2	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	95.6	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	92.2	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	93.9	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	92.7	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	97.5	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	96.5	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	92.1	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	96.9	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	87.6	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	86.2	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	81.5	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.8	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	84.6	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	88.0	68	127

Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.2	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	97.2	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	104	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	97.6	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	96.3	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	99.3	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	102	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	84.0	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1843360)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	101	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	103	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	108	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	108	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	106	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	96.3	66	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843751)							
EM1812173-007	Anonymous	EG005T: Barium	7440-39-3	50 mg/kg	112	71	135
		EG005T: Lead	7439-92-1	50 mg/kg	109	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Vanadium	7440-62-2	50 mg/kg	98.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	# 12.1	74	128
EM1812173-007	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	88.8	78	124
		EG005T: Beryllium	7440-41-7	50 mg/kg	94.6	85	125

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843751) - continued							
EM1812173-007	Anonymous	EG005T: Cadmium	7440-43-9	50 mg/kg	84.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	85.5	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	103	82	124
		EG005T: Nickel	7440-02-0	50 mg/kg	81.9	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	81.0	71	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)							
EM1812173-007	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.2	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)							
EM1812173-003	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	94.4	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	105	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	71.3	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)							
EM1812173-002	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	94.8	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	100	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	97.6	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	71.6	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)							
EM1812173-002	Anonymous	EP071: >C10 - C16 Fraction	----	1160 mg/kg	96.5	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	99.3	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	93.8	44	126
EP080: BTEXN (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	79.1	50	136
		EP080: Toluene	108-88-3	2 mg/kg	86.2	56	139

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1812174**	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Site	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----	No. of samples received	: 3
Order number	:	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	EM1812173--006	Anonymous	Lead	7439-92-1	69.9 %	0% - 20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	EM1812173--006	Anonymous	Zinc	7440-66-6	90.6 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1812173--007	Anonymous	Manganese	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EM1812173--007	Anonymous	Zinc	7440-66-6	12.1 %	74-128%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	**24-Jul-2018**	----	----	----	**01-Aug-2018**	07-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	**24-Jul-2018**	**02-Aug-2018**	20-Jan-2019	✓	**02-Aug-2018**	20-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	**24-Jul-2018**	**02-Aug-2018**	21-Aug-2018	✓	**02-Aug-2018**	21-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	**24-Jul-2018**	**01-Aug-2018**	07-Aug-2018	✓	**01-Aug-2018**	10-Sep-2018	✓

Matrix: SOIL

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	03-Aug-2018	07-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	03-Aug-2018	07-Aug-2018	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) BH08_2.0-2.1, BH12_2.0-2.1	BH11_2.0-2.1,	24-Jul-2018	01-Aug-2018	07-Aug-2018	✓	03-Aug-2018	07-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	19	15.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	10.53	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house. Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house. Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house. Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1811891**	Page	: 1 of 14
Client	: - EOVENSIRONMENTAL OOLUTIONO	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Order number	:	Date Analysis Commenced	: 26-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018
Sampler	: SARAH JOYCE		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 27		
No. of samples analysed	: 14		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1831020)									
EM1811890-003	Anonymous	EA055: Moisture Content	----	0.1	%	7.8	8.0	2.72	No Limit
EM1811891-013	BH17 1.1-1.2	EA055: Moisture Content	----	0.1	%	9.4	9.4	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1830954)									
EM1811855-002	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	2	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	40	80	54.7	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	19	17	11.6	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	14	17	24.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	11	11	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	9	8	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	37	52	32.3	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	29	23	24.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	5	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1811855-016	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	100	0.00	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	23	20	12.5	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	7	6	16.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	10	11.1	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	6	0.00	No Limit

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1830954) - continued									
EM1811855-016	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	10	10	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	20	16	26.1	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	24	20	18.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	7	6	24.2	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1830956)									
EM1811891-021	BH18 3.5-3.6	EG005T: Manganese	7439-96-5	5	mg/kg	256	286	10.8	0% - 20%
EM1811891-021	BH18 3.5-3.6	EG005T: Beryllium	7440-41-7	1	mg/kg	1	2	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	130	100	34.3	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	11	11	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	18	26	38.8	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	19	20	8.34	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	13	10.6	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	24	28	14.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	27	28	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1830953)									
EM1811855-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1811855-016	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1830955)									
EM1811891-021	BH18 3.5-3.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830977)									
EM1811891-021	BH18 3.5-3.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Page : 7 of 17
I ork Order : EM1811821
Client : GEO-EBVIROBMEBTAL SOL. TIOBS
Project : Bewtown Rd

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1830977) - continued									
EM1811821-041	WH18 3.5-3.6	EP0U5(SIM): Wenzo(k)fluoranthene	40U-08-2	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(a)pyrene	50-34-8	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Kideno(1.4.3.cd)pyrene	123-32-5	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Dibenz(a.h)anthracene	53-U0-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(g.h.i)perylene	121-47-4	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
EM1811821-007	WH15 0.55-0.65	EP0U5(SIM): Baphthalene	21-40-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Acenaphthylene	408-26-8	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Acenaphthene	83-34-2	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Fluorene	86-U8-U	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Anthracene	140-14-U	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Fluoranthene	406-77-0	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Pyrene	142-00-0	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Chrysene	418-01-2	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(b+j)fluoranthene	405-22-4 405-84-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(k)fluoranthene	40U-08-2	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(a)pyrene	50-34-8	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Kideno(1.4.3.cd)pyrene	123-32-5	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Dibenz(a.h)anthracene	53-U0-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP0U5(SIM): Wenzo(g.h.i)perylene	121-47-4	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830894)									
EM1811821-007	WH15 0.55-0.65	EP080: C8 - C2 Fraction	----	10	mg/kg	<10	<10	0.00	Bo Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830976)									
EM1811821-041	WH18 3.5-3.6	EP0U1: C15 - C48 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U1: C42 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U1: C10 - C17 Fraction	----	50	mg/kg	<50	<50	0.00	Bo Limit
		EP0U1: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	Bo Limit
EM1811821-007	WH15 0.55-0.65	EP0U1: C15 - C48 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U1: C42 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U1: C10 - C17 Fraction	----	50	mg/kg	<50	<50	0.00	Bo Limit
		EP0U1: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	Bo Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1830985)									
EM18118UU-004	Anonymous	EP080: C8 - C2 Fraction	----	10	mg/kg	<10	<10	0.00	Bo Limit
EM1811821-012	WH18 4.U-4.8	EP080: C8 - C2 Fraction	----	10	mg/kg	<10	<10	0.00	Bo Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830894)									
EM1811821-007	WH15 0.55-0.65	EP080: C8 - C10 Fraction	C8ZC10	10	mg/kg	<10	<10	0.00	Bo Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830976)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830976) - continued									
EM1811821-041	WH18 3.5-3.6	EP0U!: >C16 - C37 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U!: >C37 - C70 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U!: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	Bo Limit
		EP0U!: >C10 - C70 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	Bo Limit
EM1811821-007	WH15 0.55-0.65	EP0U!: >C16 - C37 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U!: >C37 - C70 Fraction	----	100	mg/kg	<100	<100	0.00	Bo Limit
		EP0U!: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	Bo Limit
		EP0U!: >C10 - C70 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	Bo Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1830985)									
EM18118UU-004	Anonymous	EP080: C6 - C10 Fraction	C6ZC10	10	mg/kg	61	<10	177	Bo Limit
EM1811821-012	WH18 4.U-4.8	EP080: C6 - C10 Fraction	C6ZC10	10	mg/kg	<10	<10	0.00	Bo Limit
EP080: BTEXN (QC Lot: 1830894)									
EM1811821-007	WH15 0.55-0.65	EP080: Vénzene	U1-73-4	0.4	mg/kg	<0.4	<0.4	0.00	Bo Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Ethylbenzene	100-71-7	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: meta- & para-Xylene	108-38-3 106-74-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: ortho-Xylene	25-7U6	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Baphthalene	21-40-3	1	mg/kg	<1	<1	0.00	Bo Limit
EP080: BTEXN (QC Lot: 1830985)									
EM18118UU-004	Anonymous	EP080: Vénzene	U1-73-4	0.4	mg/kg	<0.4	<0.4	0.00	Bo Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Ethylbenzene	100-71-7	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: meta- & para-Xylene	108-38-3 106-74-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: ortho-Xylene	25-7U6	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Baphthalene	21-40-3	1	mg/kg	<1	<1	0.00	Bo Limit
EM1811821-012	WH18 4.U-4.8	EP080: Vénzene	U1-73-4	0.4	mg/kg	<0.4	<0.4	0.00	Bo Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Ethylbenzene	100-71-7	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: meta- & para-Xylene	108-38-3 106-74-3	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: ortho-Xylene	25-7U6	0.5	mg/kg	<0.5	<0.5	0.00	Bo Limit
		EP080: Baphthalene	21-40-3	1	mg/kg	<1	<1	0.00	Bo Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1832824)									
EM181185U-001	Anonymous	EG040A-F: Cadmium	U770-73-2	0.0001	mg/L	<0.0001	0.0001	0.00	Bo Limit
		EG040A-F: Arsenic	U770-38-4	0.001	mg/L	<0.001	<0.001	0.00	Bo Limit

Page	: 6 of 14
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
E- 5y56: @t t ozed Meu2t I b ICPWI0 IIQC Lou 18Gy8yH3 V4o(u(ned									
EM1811857-001	Anonymous	EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.014	0.013	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.018	0.017	0.00	0% - 50%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.087	0.084	3.70	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.035	0.034	5.06	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.28	0.28	0.00	No Limit
EM1811889-007	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.013	0.013	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
E- 5G 6: @t t ozed Mer4nrb I b 6IM0 IIQC Lou 18Gy8yi 3									
EM1811889-007	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP585r6v1: Tou2aPeuroæn7 Bbdro42rl o(t IIQC Lou 18GyXv83									
EM1811898-001	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	<20	<20	0.00	No Limit
EM1811898-005	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	2020	1940	4.26	0% - 20%
EP585r6v1: Tou2aRe4ocer2l æ Bbdro42rl o(t VNEPM y51G6r24uo(t IIQC Lou 18GyXv83									
EM1811898-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1811898-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	1920	1840	4.12	0% - 20%
EP585: F TE/ N IIQC Lou 18GyXv83									
EM1811898-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit

Page	: Uof 17
I ork Order	: EM1811821
Client	: GEO-EBVIROBMEBTAL SOL. TIOBS
Project	: Bewtown Rd

Sub-Matrix: WATER

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1832678) - continued									
EM1811828-001	Anonymous	EP080: ortho-Xylene	25-7U6	4	µg/L	<4	<4	0.00	Bo Limit
		EP080: Baphthalene	21-40-3	5	µg/L	<5	<5	0.00	Bo Limit
EM1811828-005	Anonymous	EP080: Venzene	U1-73-4	1	µg/L	88	83	5.60	0% - 40%
		EP080: Toluene	108-88-3	4	µg/L	3	4	0.00	Bo Limit
		EP080: Ethylbenzene	100-71-7	4	µg/L	6	6	0.00	Bo Limit
		EP080: meta- & para-Xylene	108-38-3 106-74-3	4	µg/L	2	2	0.00	Bo Limit
		EP080: ortho-Xylene	25-7U6	4	µg/L	<4	<4	0.00	Bo Limit
		EP080: Baphthalene	21-40-3	5	µg/L	76	74	2.37	Bo Limit

Page	: 8 of 14
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **0 OIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
E- 55i T: TouaMeuzt I b ICPVAE0 IQCLou 18G59i H3								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	95.8	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	108	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	100	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	110	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	89.1	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	98.6	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	91.9	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	92.8	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	90.2	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	95.6	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	97.0	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.8	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	95.7	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	97.1	82	111
E- 55i T: TouaMeuzt I b ICPVAE0 IQCLou 18G59i X3								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	95.6	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	108	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	100	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	107	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	88.2	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	98.4	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	91.4	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	92.5	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	90.5	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	95.2	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	96.6	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.2	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	95.3	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	96.8	82	111
E- 5G T: TouaRe4ocer2I æ Mer4nrb I b 6IM0 IQCLou 18G59i G3								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	84.0	77	104
E- 5G T: TouaRe4ocer2I æ Mer4nrb I b 6IM0 IQCLou 18G59i i 3								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	85.2	77	104
EP5vi IDIM3F: Poab(n4æ2r Aro7 2ua Bbdro42rl o(t IQCLou 18G59vv3								

Sub-Matrix: 0 OIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP5vi DIM3F: Podb(n4æ2r Aro7 2ust Bbdro42rl o(t DQCLou 18G59vv3 V4o(u(ned								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	100	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	112	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	102	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	105	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	108	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	108	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	106	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	110	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	101	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	101	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	99.1	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	102	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	95.4	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	92.9	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	93.6	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	91.5	68	127
EP585r6v1: Tou2aPeuroæn7 Bbdro42rl o(t DQCLou 18G589H3								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	78.7	70	127
EP585r6v1: Tou2aPeuroæn7 Bbdro42rl o(t DQCLou 18G59vX3								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	99.6	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	104	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	92.6	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP585r6v1: Tou2aPeuroæn7 Bbdro42rl o(t DQCLou 18G598i 3								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	106	70	127
EP585r6v1: Tou2aRe4ocer2l æ Bbdro42rl o(t VNEPM y51G6r24uo(t DQCLou 18G589H3								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	79.2	68	125
EP585r6v1: Tou2aRe4ocer2l æ Bbdro42rl o(t VNEPM y51G6r24uo(t DQCLou 18G59vX3								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	99.2	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	97.9	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	93.8	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP585r6v1: Tou2aRe4ocer2l æ Bbdro42rl o(t VNEPM y51G6r24uo(t DQCLou 18G598i 3								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	104	68	125
EP585: FTE/ N DQCLou 18G589H3								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	78.8	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	80.4	77	125

Sub-Matrix: **0OIL**

Method: Compound	*CAS Number*	*LOR*	*Unit*	*Method Blank (MB) Report*	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
				Result	*Concentration*	*LCS*	*Low*	*High*
EP585: FTE/ N DQCLou 18G589H3 V4o(u(ned								
EP080: Ethylbenzene	100-71-7	0.5	mg/kg	<0.5	4 mg/kg	U8.5	U3	145
EP080: meta- & para-Xylene	108-38-3 106-74-3	0.5	mg/kg	<0.5	7 mg/kg	81.4	UU	148
EP080: ortho-Xylene	25-7U-6	0.5	mg/kg	<0.5	4 mg/kg	87.U	81	148
EP080: Baphthalene	21-40-3	1	mg/kg	<1	0.5 mg/kg	8U4	66	130
EP585: FTE/ N DQCLou 18G598i 3								
EP080: Wenzene	U1-73-4	0.4	mg/kg	<0.4	4 mg/kg	87.6	U7	147
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	4 mg/kg	105	UU	145
EP080: Ethylbenzene	100-71-7	0.5	mg/kg	<0.5	4 mg/kg	22.1	U3	145
EP080: meta- & para-Xylene	108-38-3 106-74-3	0.5	mg/kg	<0.5	7 mg/kg	103	UU	148
EP080: ortho-Xylene	25-7U-6	0.5	mg/kg	<0.5	4 mg/kg	10U	81	148
EP080: Baphthalene	21-40-3	1	mg/kg	<1	0.5 mg/kg	23.7	66	130

Sub-Matrix: **WATER**

Method: Compound	*CAS Number*	*LOR*	*Unit*	*Method Blank (MB) Report*	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
				Result	*Concentration*	*LCS*	*Low*	*High*
E- 5y56: @t t oxed MeU2d I b ICPWM0 DQCLou 18Gy8yH3								
EG040A-F: Arsenic	U770-38-4	0.001	mg/L	<0.001	0.1 mg/L	101	21	10U
EG040A-F: Weryllium	U770-71-U	0.001	mg/L	<0.001	0.1 mg/L	23.1	84	113
EG040A-F: Warium	U770-32-3	0.001	mg/L	<0.001	0.1 mg/L	107	87	106
EG040A-F: Cadmium	U770-73-2	0.0001	mg/L	<0.0001	0.1 mg/L	22.0	87	107
EG040A-F: Chromium	U770-7U-3	0.001	mg/L	<0.001	0.1 mg/L	27.U	83	103
EG040A-F: Cobalt	U770-78-7	0.001	mg/L	<0.001	0.1 mg/L	25.3	83	106
EG040A-F: Copper	U770-50-8	0.001	mg/L	<0.001	0.1 mg/L	27.0	84	103
EG040A-F: Lead	U732-24-1	0.001	mg/L	<0.001	0.1 mg/L	28.4	83	105
EG040A-F: Manganese	U732-26-5	0.001	mg/L	<0.001	0.1 mg/L	2U7	83	105
EG040A-F: Bickel	U770-04-0	0.001	mg/L	<0.001	0.1 mg/L	26.8	84	106
EG040A-F: Selenium	UU84-72-4	0.01	mg/L	<0.01	0.1 mg/L	2U1	84	102
EG040A-F: Vanadium	U770-64-4	0.01	mg/L	<0.01	0.1 mg/L	2U6	83	106
EG040A-F: _inc	U770-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	85	102
EG040A-F: Woron	U770-74-8	0.05	mg/L	<0.05	0.5 mg/L	22.4	87	116
E- 5G 6: @t t oxed Mer4nrb I b 6IM0 DQCLou 18Gy8yi 3								
EG035F: Mercury	U732-2U-6	0.0001	mg/L	<0.0001	0.01 mg/L	108	81	117
EP5vi DIM3F: Poab(n4æ2r Aro7 2ud Bbdro42rl o(t DQCLou 18GI1893								
EP0U5(SIM): Baphthalene	21-40-3	1	µg/L	<1.0	5 µg/L	8UU	78	110
EP0U5(SIM): Acenaphthylene	408-26-8	1	µg/L	<1.0	5 µg/L	82.4	72	147
EP0U5(SIM): Acenaphthene	83-34-2	1	µg/L	<1.0	5 µg/L	24.2	53	11U
EP0U5(SIM): Fluorene	86-U8-U	1	µg/L	<1.0	5 µg/L	28.2	57	118

Page	: 11 of 14
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP029n6IM"7 : Polyut 6lear AroB a&5 mydro6arboui rQCLos 18) 118X" - 6ou5it ed								
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	99.5	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	99.3	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	104	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	103	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	104	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	101	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	104	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	100	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	101	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	104	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	102	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	103	53	125
EP080I021: Tosal Pesrolet B mydro6arboui rQCLos 18) 11X0"								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	71.2	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	73.6	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	73.9	54	137
EP080I021: Tosal Pesrolet B mydro6arboui rQCLos 18) 4328"								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	90.5	68	125
EP080I021: Tosal Re6overable mydro6arboui - NEPM 401) Fra6s5oui rQCLos 18) 11X0"								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	71.8	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	76.2	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	75.6	58	137
EP080I021: Tosal Re6overable mydro6arboui - NEPM 401) Fra6s5oui rQCLos 18) 4328"								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	89.2	66	123
EP080: 7TE/ N rQCLos 18) 4328"								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	87.2	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	93.5	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	91.1	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	94.9	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	96.2	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	84.5	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG009T: Tosal Mesali by ICP-AES rQCLos 18) 0X9c*							
EM1811855-003	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	82.6	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	126	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	102	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	93.9	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	104	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	98.6	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	98.5	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	115	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	103	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	79.0	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	112	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	100	74	128
EG009T: Tosal Mesali by ICP-AES rQCLos 18) 0X93*							
EM1811891-023	BH19 1.0-1.1	EG005T: Lead	7439-92-1	50 mg/kg	# 125	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	117	68	136
		EG005T: Zinc	7440-66-6	50 mg/kg	# 160	74	128
EM1811891-023	BH19 1.0-1.1	EG005T: Arsenic	7440-38-2	50 mg/kg	95.0	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	89.8	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	104	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.0	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	95.3	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	97.8	82	124
		EG005T: Nickel	7440-02-0	50 mg/kg	96.0	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	85.7	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	108	76	124
EG0) 9T: Tosal Re6overable Mer6t ry by FIMS rQCLos 18) 0X9) *							
EM1811855-003	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.0	76	116
EG0) 9T: Tosal Re6overable Mer6t ry by FIMS rQCLos 18) 0X99*							
EM1811891-023	BH19 1.0-1.1	EG035T: Mercury	7439-97-6	5 mg/kg	100	76	116
EP029n6IM*7 : Polyut 6lear AroB as6 mydro6arboui rQCLos 18) 0X22*							
EM1811816-002	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	83.4	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	# Not Determined	52	148
EP080I021: Tosal Pesrolet B mydro6arboui rQCLos 18) 08Xc*							
EM1811891-004	BH15 0.55-0.65	EP080: C6 - C9 Fraction	----	28 mg/kg	116	42	131
EP080I021: Tosal Pesrolet B mydro6arboui rQCLos 18) 0X23*							
EM1811891-005	BH16 0.3-0.4	EP071: C10 - C14 Fraction	----	806 mg/kg	101	53	123

Page	13 of 17
I ork Order	EM1811821
Client	GEO-EBVIROBMEBTAL SOL. TIOBS
Project	Bewtown Rd

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830976) - continued							
EM1811821-005	WH16 0.3-0.7	EP0U1: C15 - C48 Fraction	----	3006 mg/kg	105	UD	147
		EP0U1: C42 - C36 Fraction	----	1587 mg/kg	23.8	67	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1830985)							
EM1811820-001	Anonymous	EP080: C6 - C2 Fraction	----	48 mg/kg	83.6	74	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830894)							
EM1811821-007	WH15 0.55-0.65	EP080: C6 - C10 Fraction	C6ZC10	33 mg/kg	112	32	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830976)							
EM1811821-005	WH16 0.3-0.7	EP0U1: >C10 - C16 Fraction	----	1160 mg/kg	22.8	65	143
		EP0U1: >C16 - C37 Fraction	----	32U8 mg/kg	28.8	6U	141
		EP0U1: >C37 - C70 Fraction	----	313 mg/kg	101	77	146
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1830985)							
EM1811820-001	Anonymous	EP080: C6 - C10 Fraction	C6ZC10	33 mg/kg	84.8	32	142
EP080: BTEXN (QCLot: 1830894)							
EM1811821-007	WH15 0.55-0.65	EP080: Wenzene	Ut-73-4	4 mg/kg	23.8	50	136
		EP080: Toluene	108-88-3	4 mg/kg	23.7	56	132
EP080: BTEXN (QCLot: 1830985)							
EM1811820-001	Anonymous	EP080: Wenzene	Ut-73-4	4 mg/kg	23.1	50	136
		EP080: Toluene	108-88-3	4 mg/kg	28.8	56	132

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1832824)							
EM181185U-001	Anonymous	EG040A-F: Arsenic	U770-38-4	0.4 mg/L	10U	85	131
		EG040A-F: Weryllium	U770-71-U	0.4 mg/L	21.1	U3	171
		EG040A-F: Warium	U770-32-3	0.4 mg/L	107	U5	14U
		EG040A-F: Cadmium	U770-73-2	0.05 mg/L	27.2	81	133
		EG040A-F: Chromium	U770-7U-3	0.4 mg/L	23.8	Ut	135
		EG040A-F: Cobalt	U770-76-7	0.4 mg/L	22.0	U6	134
		EG040A-F: Copper	U770-50-8	0.4 mg/L	27.5	U6	130
		EG040A-F: Lead	U732-24-1	0.4 mg/L	24.4	U5	133
		EG040A-F: Manganese	U732-26-5	0.4 mg/L	23.1	67	137
		EG040A-F: Bickel	U770-04-0	0.4 mg/L	26.6	U3	131
		EG040A-F: Vanadium	U770-64-4	0.4 mg/L	27.5	U3	131
		EG040A-F: _inc	U770-66-6	0.4 mg/L	2U5	U5	131
EG035F: Dissolved Mercury by FIMS (QCLot: 1832825)							
EM1811821-046	Field Wank 3	EG035F: Mercury	U732-2U-6	0.01 mg/L	10U	UD	140

Page	: 14 of 14
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP585rfiv1: TouPeuroaen7 Bbdro42rl o(t BQCLou 18GyXv83							
EM1811890-007	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	84.1	43	125
EP585rfiv1: TouRe4ocer2l æ Bbdro42rl o(t VNEPM y51G6r24um(t BQCLou 18GyXv83							
EM1811890-007	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	81.2	44	122
EP585: FTE/ N BQCLou 18GyXv83							
EM1811890-007	Anonymous	EP080: Benzene	71-43-2	20 µg/L	102	68	130
		EP080: Toluene	108-88-3	20 µg/L	107	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1811891	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Site	: ----	Issue Date	: 31-Jul-2018
Sampler	: SARAH JOYCE	No. of samples received	: 27
Order number	:	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1811891--023	BH19 1.0-1.1	Lead	7439-92-1	125 %	76-124%	Recovery greater than upper data quality objective
EG005T: Total Metals by ICP-AES	EM1811891--023	BH19 1.0-1.1	Zinc	7440-66-6	160 %	74-128%	Recovery greater than upper data quality objective
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1811816--002	Anonymous	Pyrene	129-00-0	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	----	----	----	26-Jul-2018	08-Aug-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Page	: 3 of 9
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	27-Jul-2018	21-Jan-2019	✓	27-Jul-2018	21-Jan-2019	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	27-Jul-2018	22-Aug-2018	✓	30-Jul-2018	22-Aug-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	26-Jul-2018	08-Aug-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH17 0.5-0.6,	BH18 1.5-1.6,							
BH18 3.5-3.6,	BH19 2.1-2.2							
Soil Glass Jar - Unpreserved (EP080)								
BH13 1.5-1.6,	BH17 1.1-1.2,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓
BH18 2.7-2.8,	BH19 1.0-1.1							
Soil Glass Jar - Unpreserved (EP071)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							

Page	: 4 of 9
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	26-Jul-2018	08-Aug-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH17 0.5-0.6,	BH18 1.5-1.6,							
BH18 3.5-3.6,	BH19 2.1-2.2							
Soil Glass Jar - Unpreserved (EP080)								
BH13 1.5-1.6,	BH17 1.1-1.2,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓
BH18 2.7-2.8,	BH19 1.0-1.1							
Soil Glass Jar - Unpreserved (EP071)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	05-Sep-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH13 1.5-1.6,	BH17 0.5-0.6,							
BH17 1.1-1.2,	BH18 1.5-1.6,							
BH18 2.7-2.8,	BH18 3.5-3.6,							
BH19 1.0-1.1,	BH19 2.1-2.2							
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH14 0.4-0.5,	BH15 0.55-0.65,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	26-Jul-2018	08-Aug-2018	✓
BH16 0.3-0.4,	BH13 1.0-1.1,							
BH17 0.5-0.6,	BH18 1.5-1.6,							
BH18 3.5-3.6,	BH19 2.1-2.2							
Soil Glass Jar - Unpreserved (EP080)								
BH13 1.5-1.6,	BH17 1.1-1.2,	25-Jul-2018	26-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓
BH18 2.7-2.8,	BH19 1.0-1.1							

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-F)								
Field Blank 3,	Rinsate 3	25-Jul-2018	----	----	----	27-Jul-2018	21-Jan-2019	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035F)								
Field Blank 3,	Rinsate 3	25-Jul-2018	----	----	----	27-Jul-2018	08-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
Field Blank 3,	Rinsate 3	25-Jul-2018	26-Jul-2018	01-Aug-2018	✓	30-Jul-2018	04-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 3,	Rinsate 3	25-Jul-2018	26-Jul-2018	01-Aug-2018	✓	30-Jul-2018	04-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 3,	Rinsate 3	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 3,	Rinsate 3	25-Jul-2018	26-Jul-2018	01-Aug-2018	✓	30-Jul-2018	04-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 3,	Rinsate 3	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 3,	Rinsate 3	25-Jul-2018	27-Jul-2018	08-Aug-2018	✓	27-Jul-2018	08-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	23	13.04	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	23	17.39	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	20	15.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	23	13.04	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 8 of 9
Work Order	: EM1811891
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house. Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house. Referenced to USEPA SW 846 - 8015A. The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D. Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1812175**	Page	: 1 of 8
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843763)									
EM1812173-005	Anonymous	EA055: Moisture Content	----	0.1	%	22.1	22.8	3.43	0% - 20%
EM1812175-001	BH13 2.0-2.1	EA055: Moisture Content	----	0.1	%	11.8	11.9	1.18	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1843751)									
EM1812173-006	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	218	# 105	69.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	573	# 216	90.6	0% - 20%
EM1812173-006	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	80	50	50.5	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	9	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	52	38	30.8	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	263	316	18.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	59	36	48.7	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1812175-001	BH13 2.0-2.1	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	90	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	22	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	16	14	17.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	13	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	11	10	11.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	9	9	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1843751) - continued									
EM1812175-001	BH13 2.0-2.1	EG005T: Lead	7439-92-1	5	mg/kg	30	30	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	552	496	10.8	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	28	26	8.18	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	33	32	3.18	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843750)									
EM1812173-006	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1812175-001	BH13 2.0-2.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1843424)									
EM1812173-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1812173-011	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.6	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.3	1.2	10.8	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	4.9	3.4	35.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	1.4	1.0	32.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	9.4	7.2	26.4	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	9.7	7.7	22.8	0% - 50%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	4.7	3.7	23.4	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	4.1	2.9	32.5	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	6.1	5.0	20.0	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.9	1.6	16.5	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1843424) - continued									
EM1812173-011	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.9	4.1	18.8	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.5	2.1	16.1	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.6	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.2	2.7	16.1	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843425)									
EM1812173-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	280	230	18.7	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	210	200	8.88	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	490	430	13.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1812173-011	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843425)									
EM1812173-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812173-011	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	440	380	15.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	540	380	34.8	0% - 50%
EP080: BTEXN (QC Lot: 1843360)									
EM1812173-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1812173-011	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080: BTEXN (QC Lot: 1843360) - continued									
EM1812173-011	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1843751)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	87.5	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.7	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.3	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	99.7	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	100.0	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.7	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	84.3	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.5	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.1	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	87.8	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	90.2	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.0	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	86.1	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	93.4	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	94.2	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	95.6	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	92.2	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	93.9	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	92.7	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	97.5	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.6 mg/kg	96.5	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	92.1	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	96.9	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	87.6	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	86.2	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	91.9	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	81.5	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.8	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	84.6	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	88.0	68	127

Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.2	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	97.2	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	104	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	97.6	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	96.3	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	99.3	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	102	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	84.0	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1843360)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	101	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	103	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	108	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	108	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	106	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	96.3	66	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG005T: Total Metals by ICP-AES (QCLot: 1843751)							
EM1812173-007	Anonymous	EG005T: Barium	7440-39-3	50 mg/kg	112	71	135
		EG005T: Lead	7439-92-1	50 mg/kg	109	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Vanadium	7440-62-2	50 mg/kg	98.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	# 12.1	74	128
EM1812173-007	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	88.8	78	124
		EG005T: Beryllium	7440-41-7	50 mg/kg	94.6	85	125

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG005T: Total Metals by ICP-AES (QCLot: 1843751) - continued							
EM1812173-007	Anonymous	EG005T: Cadmium	7440-43-9	50 mg/kg	84.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	85.5	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	103	82	124
		EG005T: Nickel	7440-02-0	50 mg/kg	81.9	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	81.0	71	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843750)							
EM1812173-007	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.2	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1843424)							
EM1812173-003	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	94.4	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	105	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	71.3	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843425)							
EM1812173-002	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	94.8	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	100	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	97.6	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	71.6	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843425)							
EM1812173-002	Anonymous	EP071: >C10 - C16 Fraction	----	1160 mg/kg	96.5	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	99.3	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	93.8	44	126
EP080: BTEXN (QCLot: 1843360)							
EM1812173-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	79.1	50	136
		EP080: Toluene	108-88-3	2 mg/kg	86.2	56	139

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1812175**	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018
Site	: ----	Issue Date	: 06-Aug-2018
Sampler	: ----	No. of samples received	: 4
Order number	:	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

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Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	EM1812173--006	Anonymous	Lead	7439-92-1	69.9 %	0% - 20%	RPD exceeds LOR based limits
EG005T: Total Metals by ICP-AES	EM1812173--006	Anonymous	Zinc	7440-66-6	90.6 %	0% - 20%	RPD exceeds LOR based limits
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1812173--007	Anonymous	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG005T: Total Metals by ICP-AES	EM1812173--007	Anonymous	Zinc	7440-66-6	12.1 %	74-128%	Recovery less than lower data quality objective

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	25-Jul-2018	----	----	----	01-Aug-2018	08-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	25-Jul-2018	02-Aug-2018	21-Jan-2019	✓	02-Aug-2018	21-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	25-Jul-2018	02-Aug-2018	22-Aug-2018	✓	02-Aug-2018	22-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	25-Jul-2018	01-Aug-2018	08-Aug-2018	✓	01-Aug-2018	10-Sep-2018	✓

Page	: 3 of 5
Work Order	: EM1812175
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071) BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	**25-Jul-2018**	**01-Aug-2018**	08-Aug-2018	✓	**01-Aug-2018**	10-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	**25-Jul-2018**	**01-Aug-2018**	08-Aug-2018	✓	**03-Aug-2018**	08-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071) BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	**25-Jul-2018**	**01-Aug-2018**	08-Aug-2018	✓	**01-Aug-2018**	10-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	**25-Jul-2018**	**01-Aug-2018**	08-Aug-2018	✓	**03-Aug-2018**	08-Aug-2018	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) BH13 2.0-2.1, BH18 2.5-2.6,	BH18 0.5-0.6, BH18 3.1-3.2	**25-Jul-2018**	**01-Aug-2018**	08-Aug-2018	✓	**03-Aug-2018**	08-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	19	15.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	10.53	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house. Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house. Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection ($SnCl_2$) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by $SnCl_2$ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house. Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house. Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house. Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Preparation Methods	**Method**	**Matrix**	**Method Descriptions**
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house. Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house. Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house. Mechanical agitation (tumbler). 10g of sample, Na_2SO_4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1812116**	Page	: 1 of 11
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Road	Date Samples Received	: 31-Jul-2018
Order number	: 30 July 2018	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 03-Aug-2018
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 5		
No. of samples analysed	: 4		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1840106)									
EM1812116-003	BH20 0.5-0.6	EA055: Moisture Content	----	0.1	%	14.4	14.1	2.59	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1840334)									
EM1812066-028	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	50	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	20	19	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	12	12	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	6	7	0.00	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	38	27	32.5	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1812109-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	60	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	8	18.8	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	6	5	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	8	7	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	10	9	11.1	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	9	0.00	No Limit

Page : 2 of 11
Work Order : VM181L116
Client : GVO-V' 3HRO' MV' TAb AOb. TIO' A
Project : ' ew Town Road

Aut-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 1840334) - continued									
VM181L10K-001	Anonymous	VG005T: Manganese	U73K-KB-5	5	ng/kg	1K6	183	6.UL	0% - L0%
		VG005T: Aelenfun	UL8L-7K-L	5	ng/kg	<5	<5	0.00	o b/n't
		VG005T: 3anad'un	U770-6L-L	5	ng/kg	10	K	1L.7	o b/n't
		VG005T: _'nc	U770-66-6	5	ng/kg	L5	L5	0.00	o b/n't
		VG005T: Woron	U770-7L-8	50	ng/kg	<50	<50	0.00	o b/n't
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1840335)									
VM181L066-0L8	Anonymous	VG035T: Mercury	U73K-KU-6	0.1	ng/kg	<0.1	<0.1	0.00	o b/n't
VM181L10K-001	Anonymous	VG035T: Mercury	U73K-KU-6	0.1	ng/kg	<0.1	<0.1	0.00	o b/n't
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840323)									
VM181L10K-001	Anonymous	VPOL5(AKM): ' a\dtdalene	K1-L0-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Acena\dtdylene	L08-K8-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Acena\dtdene	83-3L-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Fluorene	86-L8-U	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Pdenantdrene	85-01-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Antdracene	1L0-1L-U	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Fluorantdene	L06-77-0	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Pyrene	1LK-00-0	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenz(a)antdracene	56-55-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Cdrysene	L18-01-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(t+j)fluorantdene	L05-KK-L L05-8L-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(k)fluorantdene	L0U08-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(a)\yrene	50-3L-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): I6deno(1.L.3.cd)\yrene	1K3-3K-5	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Mtenz(a.d)antdracene	53-L0-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(g.d.f)\erylene	1K1-L7-L	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
VM181L105-011	Anonymous	VPOL5(AKM): ' a\dtdalene	K1-L0-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Acena\dtdylene	L08-K8-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Acena\dtdene	83-3L-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Fluorene	86-L8-U	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Pdenantdrene	85-01-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Antdracene	1L0-1L-U	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Fluorantdene	L06-77-0	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Pyrene	1LK-00-0	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenz(a)antdracene	56-55-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Cdrysene	L18-01-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(t+j)fluorantdene	L05-KK-L L05-8L-3	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(k)fluorantdene	L0U08-K	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't
		VPOL5(AKM): Wenzo(a)\yrene	50-3L-8	0.5	ng/kg	<0.5	<0.5	0.00	o b/n't

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

ALS

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840323) - continued									
EM1812105-011	Anonymous	EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1840010)									
EM1812105-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1812118-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1840322)									
EM1812109-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812105-011	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840010)									
EM1812105-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1812118-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840322)									
EM1812109-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1812105-011	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1840010)									
EM1812105-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1812118-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Page	5 of 11
I ork Order	VM181L116
Clfent	GVO-V' 3IRO' MV' TAb AOb. TIO' A
Project	' ew Town Road

Aut -Matrfx: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 1840010) - continued									
VM181L116-001	Anonyn ous	VP080: neta- & vara-Xylene	108-38-3 106-7L-3	0.5	ng/kg	<0.5	<0.5	0.00	' o b'n't
		VP080: ortdo-Xylene	K5-7U6	0.5	ng/kg	<0.5	<0.5	0.00	' o b'n't
		VP080: ' aydtdalene	K1-L0-3	1	ng/kg	<1	<1	0.00	' o b'n't
Aut -Matrfx: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 1842761)									
VM1811U83-001	Anonyn ous	VG0L0A-T: Cadn'un	U770-73-K	0.0001	ng/b	<0.0001	<0.0001	0.00	' o b'n't
		VG0L0A-T: Arsenfc	U770-38-L	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Weryllfun	U770-71-U	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Warfun	U770-3K-3	0.001	ng/b	0.017	0.013	UK1	0% - 50%
		VG0L0A-T: Cdron'un	U770-7U3	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Cot alt	U770-78-7	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Covver	U770-50-8	0.001	ng/b	0.00L	0.00L	0.00	' o b'n't
		VG0L0A-T: bead	U73K-KL-1	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Manganese	U73K-K8-5	0.001	ng/b	0.003	0.003	0.00	' o b'n't
		VG0L0A-T: ' 'ckel	U770-0L-0	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: _'nc	U770-66-6	0.005	ng/b	0.00U	0.006	0.00	' o b'n't
		VG0L0A-T: Aelen'un	UUBL-7K-L	0.01	ng/b	<0.01	<0.01	0.00	' o b'n't
		VG0L0A-T: 3 anad'un	U770-6L-L	0.01	ng/b	<0.01	<0.01	0.00	' o b'n't
		VG0L0A-T: Woron	U770-7L-8	0.05	ng/b	<0.05	<0.05	0.00	' o b'n't
VM1811U83-011	Anonyn ous	VG0L0A-T: Cadn'un	U770-73-K	0.0001	ng/b	<0.0001	<0.0001	0.00	' o b'n't
		VG0L0A-T: Arsenfc	U770-38-L	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Weryllfun	U770-71-U	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Warfun	U770-3K-3	0.001	ng/b	0.016	0.015	0.00	0% - 50%
		VG0L0A-T: Cdron'un	U770-7U3	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Cot alt	U770-78-7	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Covver	U770-50-8	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: bead	U73K-KL-1	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: Manganese	U73K-K8-5	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: ' 'ckel	U770-0L-0	0.001	ng/b	<0.001	<0.001	0.00	' o b'n't
		VG0L0A-T: _'nc	U770-66-6	0.005	ng/b	<0.005	<0.005	0.00	' o b'n't
		VG0L0A-T: Aelen'un	UUBL-7K-L	0.01	ng/b	<0.01	<0.01	0.00	' o b'n't
		VG0L0A-T: 3 anad'un	U770-6L-L	0.01	ng/b	<0.01	<0.01	0.00	' o b'n't
		VG0L0A-T: Woron	U770-7L-8	0.05	ng/b	<0.05	<0.05	0.00	' o b'n't
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1843471)									
VM181L00L-0U8	Anonyn ous	VG035T: Mercury	U73K-KU6	0.0001	ng/b	<0.0001	<0.0001	0.00	' o b'n't
VM181L153-001	Anonyn ous	VG035T: Mercury	U73K-KU6	0.0001	ng/b	<0.0001	<0.0001	0.00	' o b'n't
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1842749)									
VM1811KL3-0L8	Anonyn ous	VP080: C6 - CK Fractfon	—	L0	µg/b	<L0	<L0	0.00	' o b'n't

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1842749) - continued									
EM1812132-006	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1842749)									
EM1811923-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1812132-006	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1842749)									
EM1811923-028	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1812132-006	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

Tde qualíty control tern Metdod / bat oratory Wank refers to an analyte free natríx to wdícd all reagents are added ín tde sane nolunes or \ro\ortíons as used ín standard san\le \re\eratíon. Tde \ur\ose of tdís QC \araneter ís to nonítor \otentíal lat oratory contanínatíon. Tde qualíty control tern bat oratory Control A\íke (bCA) refers to a certífíed reference naterialU or a known ínterference free natríx s\íked wítd target analytes. Tde \ur\ose of tdís QC \araneter ís to nonítor netdod \recísíon and accuracy índe\endent of san\le natríx. Mynanic Reconery bínits are t ased on statístícal emluatíon of \rocessed bCA.

Aut-Matríx: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1840334)								
VG005T: Arseníc	U770-38-L	5	ng/kg	<5	L1.Ung/kg	K3.8	UK	113
VG005T: Váríun	U770-3K-3	10	ng/kg	<10	173 ng/kg	K8.8	UK	110
VG005T: Véryllíun	U770-71-U	1	ng/kg	<1	5.63 ng/kg	K5.U	85	1L0
VG005T: Woron	U770-7L-8	50	ng/kg	<50	33.L ng/kg	101	8L	1L8
VG005T: Cadníun	U770-73-K	1	ng/kg	<1	7.67 ng/kg	85.8	85	10K
VG005T: Cdroníun	U770-7U-3	L	ng/kg	<L	73.K ng/kg	K8.U	83	10K
VG005T: Cot alt	U770-78-7	L	ng/kg	<L	16 ng/kg	K0.1	U8	11L
VG005T: Co\\er	U770-50-8	5	ng/kg	<5	3L ng/kg	K7.6	U8	108
VG005T: bead	U73K-KL-1	5	ng/kg	<5	70 ng/kg	K1.K	U8	106
VG005T: Manganese	U73K-K6-5	5	ng/kg	<5	130 ng/kg	K5.0	8L	10U
VG005T: ' íckel	U770-0L-0	L	ng/kg	<L	55 ng/kg	K6.K	8L	111
VG005T: Aelení un	UU8L-7K-L	5	ng/kg	<5	5.3Ung/kg	101	K3	10K
VG005T: 3anadíun	U770-6L-L	5	ng/kg	<5	LK6 ng/kg	K5.0	80	10K
VG005T: _ínc	U770-66-6	5	ng/kg	<5	60.8 ng/kg	K6.L	8L	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1840335)								
VG035T: Mercury	U73K-KU-6	0.1	ng/kg	<0.1	L.5Ung/kg	K5.6	UU	107
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840323)								
VP0U5(AKM): ' a\dtdalene	K1-L0-3	0.5	ng/kg	<0.5	3 ng/kg	KU8	U5	131
VP0U5(AKM): Acena\dtdylene	L08-K6-8	0.5	ng/kg	<0.5	3 ng/kg	K3.0	U0	13L
VP0U5(AKM): Acena\dtdene	83-3L-K	0.5	ng/kg	<0.5	3 ng/kg	K6.U	80	1L8
VP0U5(AKM): Fluorene	86-U3-U	0.5	ng/kg	<0.5	3 ng/kg	K6.K	U0	1L8
VP0U5(AKM): Pdenantdrene	85-01-8	0.5	ng/kg	<0.5	3 ng/kg	10L	80	1L8
VP0U5(AKM): Antdracene	1L0-1L-U	0.5	ng/kg	<0.5	1.6 ng/kg	KKL	UL	1L6
VP0U5(AKM): Fluorantdene	L06-77-0	0.5	ng/kg	<0.5	3 ng/kg	K7.7	U0	1L8
VP0U5(AKM): Pyrene	1LK-00-0	0.5	ng/kg	<0.5	3 ng/kg	K8.K	80	1L5
VP0U5(AKM): Wenz(a)antdracene	56-55-3	0.5	ng/kg	<0.5	3 ng/kg	K0.L	U0	130
VP0U5(AKM): Cdrysene	L18-01-K	0.5	ng/kg	<0.5	3 ng/kg	K7.U	80	1L6
VP0U5(AKM): Wenzo(t +j)fluorantdene	L05-KK-L L05-8L-3	0.5	ng/kg	<0.5	3 ng/kg	K3.L	U1	1L7
VP0U5(AKM): Wenzo(k)fluorantdene	L0U-08-K	0.5	ng/kg	<0.5	3 ng/kg	101	U5	1L5
VP0U5(AKM): Wenzo(a)\yrene	50-3L-8	0.5	ng/kg	<0.5	3 ng/kg	88.8	U0	1L5
VP0U5(AKM): Ikdeno(1.L.3.cd)\yrene	1K3-3K-5	0.5	ng/kg	<0.5	3 ng/kg	K7.6	U1	1L8
VP0U5(AKM): Mt enz(a.d)antdracene	53-U0-3	0.5	ng/kg	<0.5	3 ng/kg	KU0	UL	1L6
VP0U5(AKM): Wenzo(g.d.í)\erylene	1K1-L7-L	0.5	ng/kg	<0.5	3 ng/kg	K6.6	68	1LU

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840010)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	82.5	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840322)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	92.8	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	99.0	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	93.0	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840010)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	79.2	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840322)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	95.2	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	96.9	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	79.7	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1840010)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	76.2	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	85.6	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	83.4	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	93.2	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	97.2	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	85.8	66	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1842761)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.9	90	110
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	96.4	88	113
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	98.1	88	112
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.0	86	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	93.1	87	109
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.0	88	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	92.6	87	108
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.8	88	109
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.1	88	111
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.2	87	111
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	92.6	85	113
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	94.0	88	112
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.0	87	113

ALS

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1842761) - continued								
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.9	88	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843471)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	105	81	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840424)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	61.3	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	63.5	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	65.5	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	69.4	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	70.8	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	72.3	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	73.9	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	73.6	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	70.9	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	76.0	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	76.8	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	82.8	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	79.6	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	75.1	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	74.5	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	75.7	53	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840423)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	79.8	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	86.8	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	84.8	54	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1842749)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	108	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840423)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	89.3	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	85.1	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	77.5	58	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1842749)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	106	66	123
EP080: BTEXN (QCLot: 1842749)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	106	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	109	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	107	73	126

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080: BTEXN (QCLot: 1842749) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	110	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	108	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	98.6	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG005T: Total Metals by ICP-AES (QCLot: 1840334)							
EM1812066-030	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.6	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	106	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	101	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.7	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	98.0	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	94.7	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	90.6	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	108	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	93.8	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	84.0	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	98.3	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	102	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1840335)							
EM1812066-030	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	110	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840323)							
EM1811915-049	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	91.7	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	95.9	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840010)							
EM1812105-007	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	60.8	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840322)							
EM1811915-049	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	92.6	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	98.1	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	92.6	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840010)							

Page	: 11 of 11
I ork Order	: VM181L116
Cl'ent	: GVO-V' 3HRO' MV' TAb AOb. TIO' A
Project	: ' ew Town Road

Aut-Matr'x: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840010) - continued							
VM181L105-00U	Anonymous	VP080: C6 - C10 Fract'on	C6ZC10	33 ng/kg	5KU	3K	1LK
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840322)							
VM1811K15-07K	Anonymous	VP0U1: >C10 - C16 Fract'on	----	1160 ng/kg	K7.5	66	1L3
		VP0U1: >C16 - C37 Fract'on	----	3KU8 ng/kg	K8.1	6U	1L1
		VP0U1: >C37 - C70 Fract'on	----	313 ng/kg	83.7	77	1L6
EP080: BTEXN (QCLot: 1840010)							
VM181L105-00U	Anonymous	VP080: Wenzene	U1-73-L	L ng/kg	6UK	50	136
		VP080: Toluene	108-88-3	L ng/kg	U5.6	56	13K

Aut-Matr'x: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 1842761)							
VM1811U83-001	Anonymous	VG0L0A-T: Arsen'c	U770-38-L	1 ng/b	K3.3	8L	118
		VG0L0A-T: Weryll'un	U770-71-U	1 ng/b	K8.6	UK	1L1
		VG0L0A-T: Wa'un	U770-3K-3	1 ng/b	K7.5	80	117
		VG0L0A-T: Cadn'un	U770-73-K	0.L5 ng/b	KL.6	U5	1LK
		VG0L0A-T: Cdron'un	U770-7U-3	1 ng/b	K3.L	80	118
		VG0L0A-T: Cot alt	U770-78-7	1 ng/b	86.U	8L	1L0
		VG0L0A-T: Co\/\/er	U770-50-8	1 ng/b	K1.1	81	115
		VG0L0A-T: bead	U73K-KL-1	1 ng/b	88.8	83	1L1
		VG0L0A-T: Manganese	U73K-K6-5	1 ng/b	K3.K	U8	1L3
		VG0L0A-T: ' 'ckel	U770-0L-0	1 ng/b	K1.6	80	118
		VG0L0A-T: 3 anad'un	U770-6L-L	1 ng/b	KL.8	81	11K
		VG0L0A-T: _'nc	U770-66-6	1 ng/b	K1.8	U7	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1843471)							
VM181L105-03K	Anonymous	VG035T: Mercury	U73K-KU-6	0.01 ng/b	101	U0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1842749)							
VM1811KKL-011	Anonymous	VP080: C6 - CK Fract'on	----	L80 µg/b	87.5	73	1L5
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1842749)							
VM1811KKL-011	Anonymous	VP080: C6 - C10 Fract'on	C6ZC10	330 µg/b	80.8	77	1LL
EP080: BTEXN (QCLot: 1842749)							
VM1811KKL-011	Anonymous	VP080: Wenzene	U1-73-L	L0 µg/b	100	68	130
		VP080: Toluene	108-88-3	L0 µg/b	105	UL	13L

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1812116	Page	: 1 of 7
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: New Town Road	Date Samples Received	: 31-Jul-2018
Site	: ----	Issue Date	: 03-Aug-2018
Sampler	: SJ	No. of samples received	: 5
Order number	: 30 July 2018	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Page	: 2 of 7
Work Order	: EM1812116
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Road

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	2	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	----	----	----	31-Jul-2018	13-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	01-Aug-2018	26-Jan-2019	✓	01-Aug-2018	26-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	01-Aug-2018	27-Aug-2018	✓	02-Aug-2018	27-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	31-Jul-2018	09-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	02-Aug-2018	13-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP071) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	31-Jul-2018	09-Sep-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	02-Aug-2018	13-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP071) BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	31-Jul-2018	09-Sep-2018	✓

Matrix: SOIL

Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH20 0.5-0.6,	BH20 1.0-1.1	30-Jul-2018	31-Jul-2018	13-Aug-2018	✓	02-Aug-2018	13-Aug-2018	✓

Matrix: WATER

Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)								
Field Blank 4,	Rinsate 4	30-Jul-2018	01-Aug-2018	26-Jan-2019	✓	01-Aug-2018	26-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)								
Field Blank 4,	Rinsate 4	30-Jul-2018	----	----	----	01-Aug-2018	27-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
Field Blank 4,	Rinsate 4	30-Jul-2018	31-Jul-2018	06-Aug-2018	✓	01-Aug-2018	09-Sep-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 4,	Rinsate 4	30-Jul-2018	31-Jul-2018	06-Aug-2018	✓	01-Aug-2018	09-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 4,	Rinsate 4	30-Jul-2018	01-Aug-2018	13-Aug-2018	✓	01-Aug-2018	13-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
Field Blank 4,	Rinsate 4	30-Jul-2018	31-Jul-2018	06-Aug-2018	✓	01-Aug-2018	09-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 4,	Rinsate 4	30-Jul-2018	01-Aug-2018	13-Aug-2018	✓	01-Aug-2018	13-Aug-2018	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
Field Blank 4,	Rinsate 4	30-Jul-2018	01-Aug-2018	13-Aug-2018	✓	01-Aug-2018	13-Aug-2018	✓

Page : 4 of 7
Work Order : EM1812116
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	2	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page : 5 of 7
Work Order : EM1812116
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Mercury by FIMS	EG035T	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	2	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house. A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A. The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1814666**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 13-Sep-2018
Order number	:	Date Analysis Commenced	: 13-Sep-2018
C-O-C number	: ----	Issue Date	: 17-Sep-2018
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1929583)									
EM1814560-006	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0026	0.0019	29.1	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.100	0.090	11.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.039	0.036	6.94	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.025	<0.025	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.25	<0.25	0.00	No Limit
EM1814553-011	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0004	0.0005	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.010	0.010	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.134	0.132	1.74	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	6.72	6.55	2.52	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.143	0.143	0.00	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	1.67	1.65	1.04	0% - 20%

Page	: 3 of 6
Work Order	: EM1814666
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Rd

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1929583) - continued									
EM1814553-011	Anonymous	EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.53	0.51	4.05	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1929585)									
EM1814666-001	MW1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1929689)									
EM1814586-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1929689)									
EM1814586-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1929689)									
EM1814586-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1929583)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	91.5	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	99.2	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	92.4	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.4	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.2	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	92.0	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	90.4	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.0	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	93.2	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	93.5	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	99.1	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	102	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 1929585)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	88.2	81	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1930069)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	87.6	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	89.9	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	92.9	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	93.8	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	96.2	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	96.7	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	94.4	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	93.1	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	92.5	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	96.3	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	99.8	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	101	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	101	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	97.2	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	96.5	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	97.4	53	125

Work Order : EM1814666
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Rd

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1929689)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	73.8	68	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1930070)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	79.1	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	78.9	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	79.2	54	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1929689)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	72.6	66	123
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1930070)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	77.5	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	81.0	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	82.1	58	137
EP080: BTEXN (QCLot: 1929689)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	78.9	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	81.4	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	84.3	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	86.5	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	93.7	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	99.0	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1929583)							
EM1814553-011	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	90.8	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	102	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	92.9	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	91.4	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	95.0	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	87.1	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	89.4	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	92.8	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	# Not Determined	64	134

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1929583) - continued							
EM1814553-011	Anonymous	EG020A-F: Nickel	7440-02-0	0.2 mg/L	91.4	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	99.0	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	# Not Determined	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 1929585)							
EM1814666-002	DUPLICATE	EG035F: Mercury	7439-97-6	0.01 mg/L	83.5	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1929689)							
EM1814586-002	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	68.6	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1929689)							
EM1814586-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	66.2	44	122
EP080: BTEXN (QCLot: 1929689)							
EM1814586-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	77.9	68	130
		EP080: Toluene	108-88-3	20 µg/L	83.5	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1814666	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 13-Sep-2018
Site	: ----	Issue Date	: 17-Sep-2018
Sampler	: AARON PLUMMER	No. of samples received	: 3
Order number	:	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	EM1814553--011	Anonymous	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG020F: Dissolved Metals by ICP-MS	EM1814553--011	Anonymous	Zinc	7440-66-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	5	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	5	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW1,	DUPLICATE	11-Sep-2018	----	----	----	13-Sep-2018	10-Mar-2019	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW1,	DUPLICATE	11-Sep-2018	----	----	----	14-Sep-2018	09-Oct-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM)) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	18-Sep-2018	✓	14-Sep-2018	23-Oct-2018	✓

Matrix: **WATER**

Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	18-Sep-2018	✓	14-Sep-2018	23-Oct-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	25-Sep-2018	✓	14-Sep-2018	25-Sep-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	18-Sep-2018	✓	14-Sep-2018	23-Oct-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	25-Sep-2018	✓	14-Sep-2018	25-Sep-2018	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) MW1, FIELD BLANK	DUPLICATE,	11-Sep-2018	13-Sep-2018	25-Sep-2018	✓	14-Sep-2018	25-Sep-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	1	2	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	5	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	5	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1827248**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 14-Sep-2018
Order number	:	Date Analysis Commenced	: 14-Sep-2018
C-O-C number	: ----	Issue Date	: 18-Sep-2018
Sampler	: A. Plummer		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1933929)									
ES1827107-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.012	0.011	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
ES1827080-014	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.019	0.019	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.011	0.013	17.4	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1933929) - continued									
ES1827080-014	Anonymous	EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.16	0.16	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1933926)									
ES1826970-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1827080-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1934107)									
ES1827115-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1827115-015	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1934107)									
ES1827115-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1827115-015	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1934107)									
ES1827115-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1827115-015	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1933929)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	89.3	85	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	88.1	85	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	88.9	82	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	89.0	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.2	85	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	91.2	82	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.1	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.9	83	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	91.1	82	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	89.1	82	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	85.5	85	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	90.5	83	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	86.5	81	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	86.8	85	115
EG035F: Dissolved Mercury by FIMS (QCLot: 1933926)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.5	83	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1932010)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	73.0	50	94
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	89.1	64	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	84.2	62	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	96.5	64	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	98.1	63	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	94.8	64	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	101	64	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	104	63	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	86.2	64	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	85.4	63	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	89.3	62	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	86.6	63	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	95.8	63	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	93.1	60	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	98.5	61	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	90.1	59	118

Sub-Matrix: WATER

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1932009)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	83.6	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	93.5	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	83.7	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1934107)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	113	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1932009)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	93.8	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	96.9	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	95.8	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1934107)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	116	75	127
EP080: BTEXN (QCLot: 1934107)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	106	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	105	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	103	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	99.0	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	103	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	70	120

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1933929)							
ES1827080-012	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	96.0	70	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	93.3	70	130
		EG020A-F: Barium	7440-39-3	1 mg/L	93.0	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	92.1	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	92.8	70	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	94.1	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	90.7	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	91.9	70	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	91.0	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	92.0	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1933929) - continued							
ES1827080-012	Anonymous	EG020A-F: Vanadium	7440-62-2	1 mg/L	93.9	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	92.2	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1933926)							
ES1826926-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	74.8	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1934107)							
ES1827115-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	105	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1934107)							
ES1827115-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	106	70	130
EP080: BTEXN (QCLot: 1934107)							
ES1827115-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	100	70	130
		EP080: Toluene	108-88-3	25 µg/L	106	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	106	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	105	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	107	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	105	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1827248	Page	: 1 of 4
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 14-Sep-2018
Site	: ----	Issue Date	: 18-Sep-2018
Sampler	: A. Plummer	No. of samples received	: 1
Order number	:	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

RIGHT SOLUTIONS | RIGHT PARTNER

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	5	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	5	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	5	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	5	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-F) TRIPLICATE	11-Sep-2018	----	----	----	17-Sep-2018	10-Mar-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035F) TRIPLICATE	11-Sep-2018	----	----	----	17-Sep-2018	25-Sep-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) TRIPLICATE	11-Sep-2018	14-Sep-2018	18-Sep-2018	✓	15-Sep-2018	24-Oct-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) TRIPLICATE	11-Sep-2018	14-Sep-2018	18-Sep-2018	✓	14-Sep-2018	24-Oct-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) TRIPLICATE	11-Sep-2018	17-Sep-2018	25-Sep-2018	✓	17-Sep-2018	25-Sep-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) TRIPLICATE	11-Sep-2018	14-Sep-2018	18-Sep-2018	✓	14-Sep-2018	24-Oct-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) TRIPLICATE	11-Sep-2018	17-Sep-2018	25-Sep-2018	✓	17-Sep-2018	25-Sep-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) TRIPLICATE	11-Sep-2018	17-Sep-2018	25-Sep-2018	✓	17-Sep-2018	25-Sep-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	5	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	5	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	5	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	5	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 4 of 4
Work Order	: ES1827248
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Rd

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1816786**	Page	: 1 of 5
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: New Town Road	Date Samples Received	: 18-Oct-2018
Order number	:	Date Analysis Commenced	: 19-Oct-2018
C-O-C number	: ----	Issue Date	: 24-Oct-2018
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to higt

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1990701)									
EM1816784-003	Anonymous	EA055: Moisture Content	----	0.1	%	12.2	12.3	0.00	0% - 50%
EM1816785-005	Anonymous	EA055: Moisture Content	----	0.1	%	4.2	5.1	19.9	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1990935)									
EM1816790-041	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1816790-005	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1990935) - continued									
EM1816790-005	Anonymous	EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Page	: 4 of 5
Work Order	: EM1816786
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Road

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1990935)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	100	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	94.8	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	99.9	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	98.9	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	102	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	104	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	101	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	103	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	97.5	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	104	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	86.0	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	104	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	85.8	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	90.0	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	92.5	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	92.6	68	127

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1996114)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	63.6	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	67.7	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	66.9	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	68.7	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	70.2	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	70.1	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	70.8	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	69.3	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	71.3	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	70.9	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	69.4	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	71.4	57	126

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1996114) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	71.6	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	68.2	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	67.2	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	68.5	53	125

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1990935)							
EM1816786-002	GT01	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	91.8	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	# Not Determined	52	148

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1816786	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: New Town Road	Date Samples Received	: 18-Oct-2018
Site	: ----	Issue Date	: 24-Oct-2018
Sampler	: SJ	No. of samples received	: 3
Order number	:	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1816786--002	GT01	**Pyrene**	129-00-0	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) GT02, GT03	GT01,	**17-Oct-2018**	----	----	----	**19-Oct-2018**	31-Oct-2018	✓
EN33: TCLP Leach								
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a) GT02, GT03	GT01,	**17-Oct-2018**	**22-Oct-2018**	31-Oct-2018	✓	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) GT02, GT03	GT01,	**17-Oct-2018**	**19-Oct-2018**	31-Oct-2018	✓	**19-Oct-2018**	28-Nov-2018	✓

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) GT02, GT01, GT03	**22-Oct-2018**	**23-Oct-2018**	29-Oct-2018	✓	**23-Oct-2018**	02-Dec-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	4	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	4	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard

Work Order : EM1816786
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)

Preparation Methods	Method	Matrix	Method Descriptions
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: EM1817421	Page	: 1 of 16
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 30-Oct-2018
Order number	:	Date Analysis Commenced	: 30-Oct-2018
C-O-C number	: ----	Issue Date	: 05-Nov-2018
Sampler	: GM		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 28		
No. of samples analysed	: 28		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Andrew Lu	VOC Section Supervisor	Melbourne Organics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Steven McGrath	Technical Manager	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 16
Work Order	: EM1817421
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to higl

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2010996)									
EM1817397-012	Anonymous	EA055: Moisture Content	----	0.1	%	5.6	3.8	38.3	No Limit
EM1817415-017	Anonymous	EA055: Moisture Content	----	0.1	%	29.9	29.1	2.80	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2010997)									
EM1817421-009	BH22 2.5-2.6	EA055: Moisture Content	----	0.1	%	17.4	17.7	1.69	0% - 50%
EM1817421-019	BH24 2.5-2.6	EA055: Moisture Content	----	0.1	%	12.6	10.6	17.2	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 2011178)									
EM1817359-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	60	60	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	7	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	4	5	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	11	12	11.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	12	10	17.3	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	18	13.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	15	18	16.8	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	63	98	43.0	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	14	14	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	59	66	11.9	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817415-015	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	60	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	44	46	3.27	0% - 20%

ALS

Sub-Matrix: **SOIL** — Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 2011178) - continued									
EM1817415-015	Anonymous	EG005T: Cobalt	7440-48-4	2	mg/kg	11	11	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	30	30	0.00	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	8	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	15	7.73	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	12	13.9	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	80	87	8.52	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	52	53	3.37	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	38	44	14.1	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2011180)									
EM1817421-009	BH22 2.5-2.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	90	80	12.7	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	25	20	23.1	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	23	15	38.8	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	24	18	27.0	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	58	50	14.0	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	358	354	1.28	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	119	102	15.4	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	37	34	9.48	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817421-018	BH24 1.5-1.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	160	180	11.1	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	19	18	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	9	12	24.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	12	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	16	7.30	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	31	45	35.5	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	222	206	7.28	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	47	55	15.4	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	51	56	8.78	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2011179)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2011179) - continued									
EM1817359-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1817415-015	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2011181)									
EM1817421-009	BH22 2.5-2.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1817421-018	BH24 1.5-1.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2011381)									
EM1817421-001	BH21 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.5	1.6	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	0.7	0.6	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	0.9	1.1	15.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	12.8	12.9	0.00	0% - 20%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	3.6	3.0	18.8	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	26.9	# 20.1	28.9	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	25.2	# 19.2	27.0	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	10.6	# 7.2	38.4	0% - 20%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	10.1	# 6.9	37.6	0% - 20%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	16.3	# 10.8	40.7	0% - 20%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	5.8	4.2	32.0	0% - 50%
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	14.3	# 9.4	41.8	0% - 20%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	8.6	6.2	31.4	0% - 50%
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.7	1.1	39.2	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	11.5	# 8.2	33.7	0% - 20%
EM1817421-011	BH23 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.2	<0.5	84.4	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	0.6	<0.5	22.4	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	0.9	<0.5	57.1	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	8.7	# 4.0	74.2	0% - 50%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	2.2	0.9	81.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	13.0	# 6.4	69.0	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	12.9	# 6.4	66.9	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	5.1	# 2.3	75.9	0% - 50%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	5.0	2.2	75.9	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	8.0	# 3.5	77.3	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.9	1.2	85.8	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	6.7	# 2.9	78.9	0% - 50%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	4.1	1.7	81.8	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.0	<0.5	64.8	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	5.4	# 2.3	81.0	0% - 50%

Sub-Matrix: **SOIL**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2013363)									
EM1817421-021	BH25 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	3.4	0.7	128	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.8	<0.5	42.7	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	3.1	1.3	85.4	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	3.0	1.4	74.5	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	<0.5	57.1	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.0	<0.5	64.8	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.1	0.5	71.2	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.9	<0.5	53.2	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.6	<0.5	21.9	No Limit
EM1817535-004	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2009686)									
EM1817421-001	BH21 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1817421-011	BH23 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2011114)									
EM1817421-021	BH25 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2011382)									

Page	: 6 of 16
Work Order	: EM1817421
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2011382) - continued									
EM1817421-001	BH21 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	480	370	26.2	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	400	310	24.7	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	880	680	25.6	0% - 50%
EM1817421-011	BH23 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	330	130	87.4	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	300	120	83.5	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	630	# 250	86.4	0% - 50%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2013364)									
EM1817421-021	BH25 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817535-004	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2009686)									
EM1817421-001	BH21 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1817421-011	BH23 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2011114)									
EM1817421-021	BH25 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2011382)									
EM1817421-001	BH21 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	760	580	26.2	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	230	190	20.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	990	770	25.0	0% - 50%
EM1817421-011	BH23 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	540	220	85.5	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	180	<100	55.4	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	720	# 220	106	0% - 50%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2013364)									
EM1817421-021	BH25 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817535-004	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit

Sub-Matrix: **SOIL** — Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2013364) - continued									
EM1817535-004	Anonymous	EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 2009686)									
EM1817421-001	BH21 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1817421-011	BH23 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 2011114)									
EM1817421-021	BH25 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER** — Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2009520)									
EM1817404-009	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.007	0.006	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.203	0.179	12.7	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.022	0.020	10.2	0% - 20%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.003	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.058	0.052	11.8	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.159	0.136	15.5	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.175	0.153	13.5	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	0.03	0.02	0.00	No Limit

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Page : 8 of 16
Work Order : EM1817421
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2009520) - continued									
EM1817404-009	Anonymous	EG020A-F: Boron	7440-42-8	0.05	mg/L	1.86	1.80	3.19	0% - 20%
EM1817421-028	Rinsate Blank	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2009516)									
EM1817286-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1817286-010	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2009924)									
EM1817404-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1817422-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2009924)									
EM1817404-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1817422-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 2009924)									
EM1817404-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1817422-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2011178)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	91.1	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	87.5	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	98.2	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	109	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	85.7	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	87.0	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	87.0	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.3	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	86.2	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	89.4	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	92.0	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.2	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	88.4	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	93.8	79	110
EG005T: Total Metals by ICP-AES (QCLot: 2011180)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	91.1	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	85.6	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	94.0	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	108	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	83.9	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	83.7	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	84.7	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	84.9	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	85.1	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	87.8	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	89.6	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	97.4	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	86.5	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	89.1	79	110
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2011179)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	91.8	77	104
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2011181)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	84.8	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2011381)								

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2011381) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	116	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	121	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	110	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	110	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	113	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	121	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	126	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	120	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	118	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	120	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	111	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	123	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	109	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	106	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	108	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	103	68	127
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2013363)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	107	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	92.6	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	98.1	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	94.3	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	101	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	104	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	99.0	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	104	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	91.7	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	106	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	89.2	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	108	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	88.0	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	84.4	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	82.2	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	84.9	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2009686)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	92.7	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011114)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011114) - continued								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	73.8	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011382)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	82.6	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	92.4	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	84.6	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2013364)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	92.4	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	97.7	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	92.7	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2009686)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	89.4	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2011114)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	70.3	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2011382)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	84.0	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	87.4	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	79.6	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2013364)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	93.1	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	96.4	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	88.2	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 2009686)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	90.0	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	105	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	105	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	108	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	106	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	106	66	130
EP080: BTEXN (QCLot: 2011114)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	79.6	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	86.1	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	79.8	73	125

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 2011114) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	81.9	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	85.6	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	82.2	66	130

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2009520)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	94.2	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	103	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.9	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	95.3	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.4	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.7	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.2	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.8	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	103	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	95.8	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.2	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	98.3	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 2009516)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	105	76	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2009411)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	75.0	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	82.4	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	76.3	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	79.9	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	88.4	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	89.0	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	91.2	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	89.1	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	88.6	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	87.7	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	101	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	103	59	124

Page : 13 of 16
Work Order : EM1817421
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2009411) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	102	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	89.4	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	88.8	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	89.5	56	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2009412)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	128	51	136
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	134	58	139
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	131	57	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2009924)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	111	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2009412)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	129	55	134
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	133	58	135
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	134	57	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2009924)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	108	66	123
EP080: BTEXN (QCLot: 2009924)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	105	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	106	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	110	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	114	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	114	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	108	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2011178)							
EM1817384-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	111	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	125	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	105	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.5	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	112	79	121

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2011178) - continued							
EM1817384-001	Anonymous	EG005T: Copper	7440-50-8	50 mg/kg	99.4	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	98.1	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	92.0	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	109	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	88.1	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	101	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	115	74	128
EG005T: Total Metals by ICP-AES (QCLot: 2011180)							
EM1817421-010	BH22 3.4-3.5	EG005T: Lead	7439-92-1	50 mg/kg	84.5	76	124
EM1817421-010	BH22 3.4-3.5	EG005T: Arsenic	7440-38-2	50 mg/kg	94.0	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	117	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	94.2	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	85.0	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	90.3	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	98.6	82	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	94.2	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	80.6	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	110	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	93.3	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2011179)							
EM1817384-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.9	76	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2011181)							
EM1817421-010	BH22 3.4-3.5	EG035T: Mercury	7439-97-6	5 mg/kg	92.1	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2011381)							
EM1817421-002	BH21 1.5-1.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	103	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	118	52	148
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2013363)							
EM1817421-022	BH25 1.5-1.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	98.6	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	101	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2009686)							
EM1817421-002	BH21 1.5-1.6	EP080: C6 - C9 Fraction	----	28 mg/kg	77.7	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011114)							
EM1817421-022	BH25 1.5-1.6	EP080: C6 - C9 Fraction	----	28 mg/kg	84.2	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011382)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2011382) - continued							
EM1817421-003	BH21 2.5-2.6	EP071: C10 - C14 Fraction	----	806 mg/kg	81.2	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	92.8	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	84.5	64	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2013364)							
EM1817421-023	BH25 2.5-2.6	EP071: C10 - C14 Fraction	----	806 mg/kg	92.4	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	96.0	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	91.4	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2009686)							
EM1817421-002	BH21 1.5-1.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	74.2	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2011114)							
EM1817421-022	BH25 1.5-1.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	83.4	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2011382)							
EM1817421-003	BH21 2.5-2.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	81.2	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	87.8	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	75.3	44	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2013364)							
EM1817421-023	BH25 2.5-2.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	92.1	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	94.8	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	91.5	44	126
EP080: BTEXN (QCLot: 2009686)							
EM1817421-002	BH21 1.5-1.6	EP080: Benzene	71-43-2	2 mg/kg	91.9	50	136
		EP080: Toluene	108-88-3	2 mg/kg	103	56	139
EP080: BTEXN (QCLot: 2011114)							
EM1817421-022	BH25 1.5-1.6	EP080: Benzene	71-43-2	2 mg/kg	89.1	50	136
		EP080: Toluene	108-88-3	2 mg/kg	94.3	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2009520)							
EM1817404-009	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	119	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	99.2	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	90.2	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	90.1	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	100.0	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	91.1	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	99.9	76	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2009520) - continued							
EM1817404-009	Anonymous	EG020A-F: Lead	7439-92-1	0.2 mg/L	92.0	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	74.2	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	93.3	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	93.0	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	93.6	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 2009516)							
EM1817286-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	107	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2009924)							
EM1817404-002	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	68.6	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2009924)							
EM1817404-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	66.3	44	122
EP080: BTEXN (QCLot: 2009924)							
EM1817404-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	88.9	68	130
		EP080: Toluene	108-88-3	20 µg/L	92.4	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1817421	Page	: 1 of 12
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 30-Oct-2018
Site	: ----	Issue Date	: 05-Nov-2018
Sampler	: GM	No. of samples received	: 28
Order number	:	No. of samples analysed	: 28

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

RIGHT SOLUTIONS | RIGHT PARTNER

Page	2 of 12
Work Order	EM1817421
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	48-52

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Phenanthrene	85-01-8	74.2 %	0% - 50%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Fluoranthene	206-44-0	28.9 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Fluoranthene	206-44-0	69.0 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Pyrene	129-00-0	27.0 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Pyrene	129-00-0	66.9 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Benz(a)anthracene	56-55-3	38.4 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Benz(a)anthracene	56-55-3	75.9 %	0% - 50%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Chrysene	218-01-9	37.6 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Benzo(b+j)fluoranthene	205-99-2 205-82-3	40.7 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Benzo(b+j)fluoranthene	205-99-2 205-82-3	77.3 %	0% - 50%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Benzo(a)pyrene	50-32-8	41.8 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Benzo(a)pyrene	50-32-8	78.9 %	0% - 50%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--001	BH21 0.5-0.6	Benzo(g.h.i)perylene	191-24-2	33.7 %	0% - 20%	RPD exceeds LOR based limits
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817421--011	BH23 0.5-0.6	Benzo(g.h.i)perylene	191-24-2	81.0 %	0% - 50%	RPD exceeds LOR based limits
EP080/071: Total Petroleum Hydrocarbons	EM1817421--011	BH23 0.5-0.6	C10 - C36 Fraction (sum)	----	86.4 %	0% - 50%	RPD exceeds LOR based limits
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	EM1817421--011	BH23 0.5-0.6	>C10 - C40 Fraction (sum)	----	106 %	0% - 50%	RPD exceeds LOR based limits
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1817421--010	BH22 3.4-3.5	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP075(SIM)T: PAH Surrogates	EM1817421-008	BH22 1.5-1.6	4-Terphenyl-d14	1718-51-0	135 %	67-133 %	Recovery greater than upper data quality objective

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS) - Continued					
TRH - Semivolatile Fraction	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	----	----	----	**31-Oct-2018**	07-Nov-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	**31-Oct-2018**	22-Apr-2019	✓	**01-Nov-2018**	22-Apr-2019	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	**31-Oct-2018**	21-Nov-2018	✓	**01-Nov-2018**	21-Nov-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	**01-Nov-2018**	07-Nov-2018	✓	**01-Nov-2018**	11-Dec-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	**01-Nov-2018**	07-Nov-2018	✓	**01-Nov-2018**	11-Dec-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								
Soil Glass Jar - Unpreserved (EP080)								
BH25 0.5-0.6,	BH25 1.5-1.6,	**24-Oct-2018**	**31-Oct-2018**	07-Nov-2018	✓	**01-Nov-2018**	07-Nov-2018	✓
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								
Soil Glass Jar - Unpreserved (EP080)								
BH21 0.5-0.6,	BH21 1.5-1.6,	**24-Oct-2018**	**31-Oct-2018**	07-Nov-2018	✓	**31-Oct-2018**	07-Nov-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071)								
BH21 0.5-0.6,	BH21 1.5-1.6,	24-Oct-2018	01-Nov-2018	07-Nov-2018	✓	01-Nov-2018	11-Dec-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4,							
BH25 0.5-0.6,	BH25 1.5-1.6,							
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								
Soil Glass Jar - Unpreserved (EP080)								
BH25 0.5-0.6,	BH25 1.5-1.6,	24-Oct-2018	31-Oct-2018	07-Nov-2018	✓	01-Nov-2018	07-Nov-2018	✓
BH25 2.5-2.6,	BH25 3.5-3.6,							
BH25 4.5-4.6,	BH25 5.5-5.6,							
DUPLICATE 1								
Soil Glass Jar - Unpreserved (EP080)								
BH21 0.5-0.6,	BH21 1.5-1.6,	24-Oct-2018	31-Oct-2018	07-Nov-2018	✓	31-Oct-2018	07-Nov-2018	✓
BH21 2.5-2.6,	BH21 3.5-3.6,							
BH21 4.5-4.6,	BH21 5.5-5.6,							
BH22 0.5-0.6,	BH22 1.5-1.6,							
BH22 2.5-2.6,	BH22 3.4-3.5,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH24 1.5-1.6,							
BH24 2.5-2.6,	BH24 3.3-3.4							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) BH25 0.5-0.6, BH25 1.5-1.6, BH25 2.5-2.6, BH25 3.5-3.6, BH25 4.5-4.6, BH25 5.5-5.6, DUPLICATE 1	24-Oct-2018	31-Oct-2018	07-Nov-2018	✓	01-Nov-2018	07-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH21 0.5-0.6, BH21 1.5-1.6, BH21 2.5-2.6, BH21 3.5-3.6, BH21 4.5-4.6, BH21 5.5-5.6, BH22 0.5-0.6, BH22 1.5-1.6, BH22 2.5-2.6, BH22 3.4-3.5, BH23 0.5-0.6, BH23 1.5-1.6, BH23 2.5-2.6, BH23 3.5-3.6, BH23 4.5-4.6, BH23 5.5-5.6, BH24 0.5-0.6, BH24 1.5-1.6, BH24 2.5-2.6, BH24 3.3-3.4	24-Oct-2018	31-Oct-2018	07-Nov-2018	✓	31-Oct-2018	07-Nov-2018	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) Rinsate Blank	24-Oct-2018	----	----	----	31-Oct-2018	22-Apr-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) Rinsate Blank	24-Oct-2018	----	----	----	31-Oct-2018	21-Nov-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) Rinsate Blank	24-Oct-2018	30-Oct-2018	31-Oct-2018	✓	31-Oct-2018	09-Dec-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) Rinsate Blank	24-Oct-2018	30-Oct-2018	31-Oct-2018	✓	31-Oct-2018	09-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate Blank	24-Oct-2018	30-Oct-2018	07-Nov-2018	✓	31-Oct-2018	07-Nov-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) Rinsate Blank	24-Oct-2018	30-Oct-2018	31-Oct-2018	✓	31-Oct-2018	09-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate Blank	24-Oct-2018	30-Oct-2018	07-Nov-2018	✓	31-Oct-2018	07-Nov-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate Blank	24-Oct-2018	30-Oct-2018	07-Nov-2018	✓	31-Oct-2018	07-Nov-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	38	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	38	7.89	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✘ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	4	0.00	5.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 11 of 12
Work Order	: EM1817421
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection ($SnCl_2$) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by $SnCl_2$ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection ($SnCl_2$)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by $SnCl_2$ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Preparation Methods	**Method**	**Matrix**	**Method Descriptions**
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1817821**	Page	: 1 of 3
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 30-Oct-2018
Order number	:	Date Analysis Commenced	: 07-Nov-2018
C-O-C number	: ----	Issue Date	: 09-Nov-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 13		

NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 3
Work Order	: EM1817821
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005C: Leachable Metals by ICPAES (QC Lot: 2025425)									
EM1817571-004	Anonymous	EG005C: Barium	7440-39-3	0.1	mg/L	0.2	0.2	0.00	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.00	No Limit
EM1817548-001	Anonymous	EG005C: Barium	7440-39-3	0.1	mg/L	0.1	0.1	0.00	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 2025425)								
EG005C: Barium	7440-39-3	0.1	mg/L	<0.1	1 mg/L	96.6	85	112
EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	1 mg/L	94.6	88	115
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2025353)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	85.2	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	87.5	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	83.7	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	84.8	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	87.8	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	88.9	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	88.6	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	87.8	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	86.9	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	89.7	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	97.9	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	99.3	59	124
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	97.8	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	87.4	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	86.8	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	88.8	56	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 2025425)							
EM1817548-002	Anonymous	EG005C: Barium	7440-39-3	1 mg/L	98.5	87	119
		EG005C: Copper	7440-50-8	1 mg/L	104	91	121

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1817821**	Page	: 1 of 5
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 30-Oct-2018
Site	: ----	Issue Date	: 09-Nov-2018
Sampler	: ----	No. of samples received	: 13
Order number	:	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	13	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	13	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EN33: TCLP Leach								
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)								
BH21 0.5-0.6,	BH21 4.5-4.6,	**24-Oct-2018**	**07-Nov-2018**	07-Nov-2018	✓	----	----	----
BH21 5.5-5.6,	BH22 0.5-0.6,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH25 3.5-3.6,							
BH25 4.5-4.6								

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG005C: Leachable Metals by ICPAES							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG005C)							
BH23 3.5-3.6	**07-Nov-2018**	**08-Nov-2018**	06-May-2019	✓	**08-Nov-2018**	06-May-2019	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
BH21 0.5-0.6,	BH21 4.5-4.6,	**07-Nov-2018**	**08-Nov-2018**	14-Nov-2018	✓	**08-Nov-2018**	18-Dec-2018	✓
BH21 5.5-5.6,	BH22 0.5-0.6,							
BH23 0.5-0.6,	BH23 1.5-1.6,							
BH23 2.5-2.6,	BH23 3.5-3.6,							
BH23 4.5-4.6,	BH23 5.5-5.6,							
BH24 0.5-0.6,	BH25 3.5-3.6,							
BH25 4.5-4.6								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Leachable Metals by ICPAES	EG005C	2	7	28.57	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	13	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Leachable Metals by ICPAES	EG005C	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Leachable Metals by ICPAES	EG005C	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Leachable Metals by ICPAES	EG005C	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	13	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard

Page	5 of 5
Work Order	EM1817821
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	48-52

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Leachable Metals by ICPAES	EG005C	SOIL	In house: referenced to APHA 3120; USEPA SW 846 - 6010: The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1817564**	Page	: 1 of 19
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018
Order number	:	Date Analysis Commenced	: 01-Nov-2018
C-O-C number	: ----	Issue Date	: 09-Nov-2018
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 43		
No. of samples analysed	: 43		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

Page	: 2 of 19
Work Order	: EM1817564
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
\# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2016235)									
EM1817503-001	Anonymous	EA055: Moisture Content	----	0.1	%	1.4	1.4	0.00	No Limit
EM1817555-001	Anonymous	EA055: Moisture Content	----	0.1	%	14.0	16.2	14.2	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2016236)									
EM1817564-005	BH27 1.0-1.1	EA055: Moisture Content	----	0.1	%	19.4	19.9	2.22	0% - 50%
EM1817564-015	BH30 0.3-0.4	EA055: Moisture Content	----	0.1	%	14.3	16.2	13.1	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2016237)									
EM1817564-028	BH37 0.5-0.6	EA055: Moisture Content	----	0.1	%	11.5	9.1	23.4	0% - 50%
EM1817564-038	BH40 0.5-0.6	EA055: Moisture Content	----	0.1	%	5.7	7.7	30.1	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2016191)									
EM1817564-001	BH26 0.1-0.2	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	30	40	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	4	4	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	23	32	32.5	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	14	16	10.6	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	56	57	0.00	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	33	30	12.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	30	33	9.31	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817564-010	BH28 1.0-1.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 2016191) - continued									
EM1817564-010	BH28 1.0-1.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	30	50	48.2	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	13	13.9	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	2	5	77.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	8	39.4	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	14	95.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	12	34	97.8	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	124	116	6.56	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	28	36	23.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	43	49	11.9	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2016193)									
EM1817564-021	BH35 0.5-0.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	140	130	10.8	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	12	11	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	11	13	19.1	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	12	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	32	38	15.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	152	136	11.5	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	267	267	0.00	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	40	36	9.08	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	163	162	0.693	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817564-033	BH38 1.5-1.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	170	120	35.9	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	9	7	22.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	17	23	30.7	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	13	17	27.7	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	11	24.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	89	94	5.18	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	174	164	6.40	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	17	14	21.8	No Limit

Page : 4 of 19
Work Order : EM1817564
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 2016193) - continued									
EM1817564-033	BH38 1.5-1.6	EG005T: Zinc	7440-66-6	5	mg/kg	108	93	14.6	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2016192)									
EM1817564-001	BH26 0.1-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1817564-010	BH28 1.0-1.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2016194)									
EM1817564-021	BH35 0.5-0.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.00	No Limit
EM1817564-033	BH38 1.5-1.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2014835)									
EM1817564-001	BH26 0.1-0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1817564-011	BH28 1.2-1.3	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.1	0.6	67.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	1.1	1.1	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	8.7	7.5	14.9	0% - 50%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	3.4	2.6	27.8	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	15.6	# 10.8	36.7	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	17.0	# 11.7	36.9	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	8.0	5.0	45.6	0% - 50%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	7.2	4.5	46.9	0% - 50%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	7.6	4.8	44.3	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.0	1.9	46.7	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	7.3	4.7	43.9	0% - 50%

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2014835) - continued									
EM1817564-011	BH28 1.2-1.3	EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	3.3	2.0	45.7	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.9	<0.5	57.8	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	4.2	2.6	47.3	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2014838)									
EM1817564-021	BH35 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	2.8	3.6	27.1	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.8	1.2	34.7	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	5.0	5.4	7.99	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	5.1	5.4	5.08	0% - 50%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	2.3	2.2	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	2.1	2.0	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	3.1	2.9	5.46	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.0	0.9	13.7	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	2.7	2.6	7.05	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.6	1.3	20.9	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.1	1.7	20.4	No Limit
EM1817564-034	BH38 2.5-2.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2014557)									
EM1817564-001	BH26 0.1-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2014557) - continued									
EM1817564-011	BH28 1.2-1.3	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2014561)									
EM1817564-021	BH35 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1817564-034	BH38 2.5-2.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2014836)									
EM1817564-001	BH26 0.1-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817564-011	BH28 1.2-1.3	EP071: C15 - C28 Fraction	----	100	mg/kg	350	250	33.5	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	200	150	29.1	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	550	400	31.6	0% - 50%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2014839)									
EM1817564-021	BH35 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	130	150	14.3	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	140	120	19.1	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	270	270	0.00	No Limit
EM1817564-034	BH38 2.5-2.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2014557)									
EM1817564-001	BH26 0.1-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1817564-011	BH28 1.2-1.3	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2014561)									
EM1817564-021	BH35 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1817564-034	BH38 2.5-2.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2014836)									
EM1817564-001	BH26 0.1-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817564-011	BH28 1.2-1.3	EP071: >C16 - C34 Fraction	----	100	mg/kg	480	350	31.9	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	480	350	31.3	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2014839)									
EM1817564-021	BH35 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	230	230	0.00	No Limit

ALS

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2014839) - continued									
EM1817564-021	BH35 0.5-0.6	EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	230	230	0.00	No Limit
EM1817564-034	BH38 2.5-2.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 2014557)									
EM1817564-001	BH26 0.1-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1817564-011	BH28 1.2-1.3	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 2014561)									
EM1817564-021	BH35 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1817564-034	BH38 2.5-2.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Laboratory Duplicate (DUP) Report

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2015070)									

Laboratory Duplicate (DUP) Report

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2015070) - continued									
EM1817519-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.019	0.018	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.019	0.018	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.10	0.10	0.00	No Limit
EM1817530-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.045	0.047	4.78	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.015	0.014	0.00	0% - 50%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.005	0.005	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.150	0.146	2.98	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.049	0.047	3.56	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.038	0.036	4.54	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	0.01	0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.27	0.25	7.34	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2015073)									
EM1817564-026	Rinsate 4	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit

Page : 9 of 19
Work Order : EM1817564
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2015073) - continued									
EM1817564-026	Rinsate 4	EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EM1817591-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.028	0.030	5.36	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.069	0.068	2.28	0% - 20%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.128	0.130	1.37	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.157	0.156	1.04	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	5.13	5.52	7.30	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 2015072)									
EM1817530-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1817530-010	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2015114)									
EM1817591-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1817591-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2015114)									
EM1817591-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1817591-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 2015114)									
EM1817591-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1817591-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 2015114) - continued									
EM1817591-004	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2016191)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	88.8	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.2	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.3	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	102	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	85.5	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	94.0	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	88.4	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	87.8	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	85.8	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	96.1	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	93.0	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	99.6	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	90.9	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	90.6	79	110
EG005T: Total Metals by ICP-AES (QCLot: 2016193)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	89.2	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	96.2	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	97.6	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	103	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	86.3	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	94.5	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	88.9	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	88.4	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	86.7	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	97.0	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	93.5	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	98.7	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	91.4	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	90.6	79	110
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2016192)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	83.3	77	104
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2016194)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	83.4	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014835)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014835) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	97.0	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	95.2	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	89.9	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	87.3	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	90.2	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	93.8	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	91.4	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	96.1	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	89.5	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	94.7	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	90.0	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	103	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	92.1	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	83.7	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	82.9	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	84.3	68	127
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014838)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	100	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	100	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	97.8	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	97.4	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	98.3	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	105	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	102	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	102	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	99.0	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	104	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	90.1	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	105	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	94.5	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	94.6	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	94.9	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	93.4	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014557)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	78.7	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014561)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014561) - continued								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	78.1	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014836)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	87.6	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	103	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	91.5	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014839)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	93.2	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	103	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	93.8	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014557)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	76.4	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014561)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	75.6	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014836)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	97.6	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	96.7	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	74.0	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014839)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	97.4	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	95.5	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	82.6	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 2014557)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	77.3	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	83.5	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	78.9	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	85.9	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	87.6	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	86.5	66	130
EP080: BTEXN (QCLot: 2014561)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	78.0	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	84.7	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	81.1	73	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 2014561) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	85.9	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	88.4	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	85.7	66	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2015070)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	91.8	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	102	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.3	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.4	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	101	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.0	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.7	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.0	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	98.4	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	100	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.8	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	96.2	84	116
EG020F: Dissolved Metals by ICP-MS (QCLot: 2015073)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	99.0	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	100.0	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.8	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.8	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	100	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.3	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	103	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.6	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	98.5	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	98.2	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	103	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	101	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 2015072)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 2015072) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	88.6	76	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014424)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	49.1	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	59.9	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	57.5	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	71.0	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	86.7	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	87.3	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	94.4	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	93.4	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	93.5	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	90.8	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	102	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	106	59	124
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	104	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	91.1	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	90.7	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	91.4	56	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014422)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	80.8	51	136
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	88.0	58	139
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	89.1	57	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2015114)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	105	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014422)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	82.7	55	134
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	89.7	58	135
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	89.7	57	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2015114)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	103	66	123
EP080: BTEXN (QCLot: 2015114)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	108	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	109	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	105	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	111	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	110	74	131

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 2015114) - continued								
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	112	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2016191)							
EM1817564-002	BH26 0.5-0.6	EG005T: Barium	7440-39-3	50 mg/kg	# Not Determined	71	135
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
EM1817564-002	BH26 0.5-0.6	EG005T: Arsenic	7440-38-2	50 mg/kg	96.5	78	124
		EG005T: Beryllium	7440-41-7	50 mg/kg	105	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	97.1	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	97.8	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	93.2	76	124
		EG005T: Nickel	7440-02-0	50 mg/kg	86.0	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	95.1	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	89.3	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	87.1	74	128
EG005T: Total Metals by ICP-AES (QCLot: 2016193)							
EM1817564-022	BH35 1.5-1.6	EG005T: Copper	7440-50-8	50 mg/kg	# 269	82	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	98.4	78	120
EM1817564-022	BH35 1.5-1.6	EG005T: Arsenic	7440-38-2	50 mg/kg	99.1	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	71.0	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	90.3	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	98.0	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	104	79	121
		EG005T: Lead	7439-92-1	50 mg/kg	98.5	76	124
		EG005T: Selenium	7782-49-2	50 mg/kg	73.2	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	85.8	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	97.9	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2016192)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2016192) - continued							
EM1817564-002	BH26 0.5-0.6	EG035T: Mercury	7439-97-6	5 mg/kg	76.8	76	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2016194)							
EM1817564-022	BH35 1.5-1.6	EG035T: Mercury	7439-97-6	5 mg/kg	81.9	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014835)							
EM1817564-002	BH26 0.5-0.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	88.3	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	94.9	52	148
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2014838)							
EM1817564-022	BH35 1.5-1.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	90.5	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	52.0	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014557)							
EM1817564-002	BH26 0.5-0.6	EP080: C6 - C9 Fraction	----	28 mg/kg	63.8	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014561)							
EM1817564-022	BH35 1.5-1.6	EP080: C6 - C9 Fraction	----	28 mg/kg	57.5	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014836)							
EM1817564-003	BH27 0.1-0.2	EP071: C10 - C14 Fraction	----	806 mg/kg	87.7	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	103	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	92.1	64	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2014839)							
EM1817564-023	Duplicate 2	EP071: C10 - C14 Fraction	----	806 mg/kg	95.4	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	94.4	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	86.0	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014557)							
EM1817564-002	BH26 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	60.3	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014561)							
EM1817564-022	BH35 1.5-1.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	54.8	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014836)							
EM1817564-003	BH27 0.1-0.2	EP071: >C10 - C16 Fraction	----	1160 mg/kg	96.9	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	96.6	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	75.0	44	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2014839)							
EM1817564-023	Duplicate 2	EP071: >C10 - C16 Fraction	----	1160 mg/kg	98.0	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	87.4	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	57.6	44	126
EP080: BTEXN (QCLot: 2014557)							
EM1817564-002	BH26 0.5-0.6	EP080: Benzene	71-43-2	2 mg/kg	84.8	50	136

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080: BTEXN (QCLot: 2014557) - continued							
EM1817564-002	BH26 0.5-0.6	EP080: Toluene	108-88-3	2 mg/kg	90.4	56	139
EP080: BTEXN (QCLot: 2014561)							
EM1817564-022	BH35 1.5-1.6	EP080: Benzene	71-43-2	2 mg/kg	80.5	50	136
		EP080: Toluene	108-88-3	2 mg/kg	88.1	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2015070)							
EM1817519-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	103	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	92.2	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	99.5	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	87.5	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	96.3	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	105	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	97.1	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	95.3	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	94.0	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	98.4	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	99.9	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	97.6	75	131
EG020F: Dissolved Metals by ICP-MS (QCLot: 2015073)							
EM1817564-026	Rinsate 4	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	96.2	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	100	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	95.0	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	91.0	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	94.6	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	97.6	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	95.1	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	101	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	101	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	96.4	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	98.6	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	100	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 2015072)							
EM1817530-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	77.6	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2015114)							
EM1817547-002	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	84.4	43	125

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2015114)							
EM1817547-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	83.6	44	122
EP080: BTEXN (QCLot: 2015114)							
EM1817547-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	98.1	68	130
		EP080: Toluene	108-88-3	20 µg/L	85.2	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1817564	Page	: 1 of 16
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018
Site	: ----	Issue Date	: 09-Nov-2018
Sampler	: AARON PLUMMER	No. of samples received	: 43
Order number	:	No. of samples analysed	: 43

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817564--011	BH28 1.2-1.3	**Fluoranthene**	206-44-0	36.7 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817564--011	BH28 1.2-1.3	**Pyrene**	129-00-0	36.9 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1817564--002	BH26 0.5-0.6	**Barium**	7440-39-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EM1817564--022	BH35 1.5-1.6	**Copper**	7440-50-8	269 %	82-124%	**Recovery greater than upper data quality objective**
EG005T: Total Metals by ICP-AES	EM1817564--002	BH26 0.5-0.6	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EM1817564--022	BH35 1.5-1.6	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	18	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH26 0.1-0.2,	BH26 0.5-0.6,	29-Oct-2018	----	----	----	02-Nov-2018	12-Nov-2018	✓
BH27 0.1-0.2,	BH27 0.5-0.6,							
BH27 1.0-1.1,	BH27 1.5-1.6,							
BH27 1.9-2.0,	BH28 0.1-0.2,							
BH28 0.5-0.6,	BH28 1.0-1.1,							
BH28 1.2-1.3								
Soil Glass Jar - Unpreserved (EA055)								
BH29 0.5-0.6,	BH29 1.5-1.6,	30-Oct-2018	----	----	----	02-Nov-2018	13-Nov-2018	✓
BH29 2.1-2.2,	BH30 0.3-0.4,							
BH31 0.5-0.6,	BH31 1.5-1.6,							
BH32 0.5-0.6,	BH33 0.5-0.6,							
BH34 0.5-0.6,	BH35 0.5-0.6,							
BH35 1.5-1.6,	Duplicate 2							
Soil Glass Jar - Unpreserved (EA055)								
BH36 0.5-0.6,	BH37 0.5-0.6,	31-Oct-2018	----	----	----	02-Nov-2018	14-Nov-2018	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH26 0.1-0.2,	BH26 0.5-0.6,	**29-Oct-2018**	**05-Nov-2018**	27-Apr-2019	✓	**05-Nov-2018**	27-Apr-2019	✓
BH27 0.1-0.2,	BH27 0.5-0.6,							
BH27 1.0-1.1,	BH27 1.5-1.6,							
BH27 1.9-2.0,	BH28 0.1-0.2,							
BH28 0.5-0.6,	BH28 1.0-1.1,							
BH28 1.2-1.3								
Soil Glass Jar - Unpreserved (EG005T)								
BH29 0.5-0.6,	BH29 1.5-1.6,	**30-Oct-2018**	**05-Nov-2018**	28-Apr-2019	✓	**05-Nov-2018**	28-Apr-2019	✓
BH29 2.1-2.2,	BH30 0.3-0.4,							
BH31 0.5-0.6,	BH31 1.5-1.6,							
BH32 0.5-0.6,	BH33 0.5-0.6,							
BH34 0.5-0.6,	BH35 0.5-0.6,							
BH35 1.5-1.6,	Duplicate 2							
Soil Glass Jar - Unpreserved (EG005T)								
BH36 0.5-0.6,	BH37 0.5-0.6,	**31-Oct-2018**	**05-Nov-2018**	29-Apr-2019	✓	**05-Nov-2018**	29-Apr-2019	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH26 0.1-0.2,	BH26 0.5-0.6,	29-Oct-2018	05-Nov-2018	26-Nov-2018	✓	05-Nov-2018	26-Nov-2018	✓
BH27 0.1-0.2,	BH27 0.5-0.6,							
BH27 1.0-1.1,	BH27 1.5-1.6,							
BH27 1.9-2.0,	BH28 0.1-0.2,							
BH28 0.5-0.6,	BH28 1.0-1.1,							
BH28 1.2-1.3								
Soil Glass Jar - Unpreserved (EG035T)								
BH29 0.5-0.6,	BH29 1.5-1.6,	30-Oct-2018	05-Nov-2018	27-Nov-2018	✓	05-Nov-2018	27-Nov-2018	✓
BH29 2.1-2.2,	BH30 0.3-0.4,							
BH31 0.5-0.6,	BH31 1.5-1.6,							
BH32 0.5-0.6,	BH33 0.5-0.6,							
BH34 0.5-0.6,	BH35 0.5-0.6,							
BH35 1.5-1.6,	Duplicate 2							
Soil Glass Jar - Unpreserved (EG035T)								
BH36 0.5-0.6,	BH37 0.5-0.6,	31-Oct-2018	05-Nov-2018	28-Nov-2018	✓	05-Nov-2018	28-Nov-2018	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								

Page	: 6 of 16
Work Order	: EM1817564
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH26 0.1-0.2,	BH26 0.5-0.6,	29-Oct-2018	05-Nov-2018	12-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
BH27 0.1-0.2,	BH27 0.5-0.6,							
BH27 1.0-1.1,	BH27 1.5-1.6,							
BH27 1.9-2.0,	BH28 0.1-0.2,							
BH28 0.5-0.6,	BH28 1.0-1.1,							
BH28 1.2-1.3								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH29 0.5-0.6,	BH29 1.5-1.6,	30-Oct-2018	05-Nov-2018	13-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
BH29 2.1-2.2,	BH30 0.3-0.4,							
BH31 0.5-0.6,	BH31 1.5-1.6,							
BH32 0.5-0.6,	BH33 0.5-0.6,							
BH34 0.5-0.6,	BH35 0.5-0.6,							
BH35 1.5-1.6,	Duplicate 2							
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH36 0.5-0.6,	BH37 0.5-0.6,	31-Oct-2018	05-Nov-2018	14-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
BH26 0.1-0.2, BH27 0.1-0.2, BH27 1.0-1.1, BH27 1.9-2.0, BH28 0.5-0.6, BH28 1.2-1.3	BH26 0.5-0.6, BH27 0.5-0.6, BH27 1.5-1.6, BH28 0.1-0.2, BH28 1.0-1.1,	29-Oct-2018	01-Nov-2018	12-Nov-2018	✓	02-Nov-2018	12-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								
BH26 0.1-0.2, BH27 0.1-0.2, BH27 1.0-1.1, BH27 1.9-2.0, BH28 0.5-0.6, BH28 1.2-1.3	BH26 0.5-0.6, BH27 0.5-0.6, BH27 1.5-1.6, BH28 0.1-0.2, BH28 1.0-1.1,	29-Oct-2018	05-Nov-2018	12-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
BH29 0.5-0.6, BH29 2.1-2.2, BH31 0.5-0.6, BH32 0.5-0.6, BH34 0.5-0.6, BH35 1.5-1.6,	BH29 1.5-1.6, BH30 0.3-0.4, BH31 1.5-1.6, BH33 0.5-0.6, BH35 0.5-0.6, Duplicate 2	30-Oct-2018	01-Nov-2018	13-Nov-2018	✓	02-Nov-2018	13-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								
BH29 0.5-0.6, BH29 2.1-2.2, BH31 0.5-0.6, BH32 0.5-0.6, BH34 0.5-0.6, BH35 1.5-1.6,	BH29 1.5-1.6, BH30 0.3-0.4, BH31 1.5-1.6, BH33 0.5-0.6, BH35 0.5-0.6, Duplicate 2	30-Oct-2018	05-Nov-2018	13-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
BH36 0.5-0.6, BH37 1.5-1.6, BH37 3.5-3.6, BH38 1.5-1.6, BH39 0.5-0.6, BH39 2.5-2.6, BH40 1.5-1.6, BH40 3.5-3.6, Duplicate 4	BH37 0.5-0.6, BH37 2.5-2.6, BH38 0.5-0.6, BH38 2.5-2.6, BH39 1.5-1.6, BH40 0.5-0.6, BH40 2.5-2.6, Duplicate 3,	31-Oct-2018	01-Nov-2018	14-Nov-2018	✓	02-Nov-2018	14-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons - Continued								
BH36 0.5-0.6, BH37 1.5-1.6, BH37 3.5-3.6, BH38 1.5-1.6, BH39 0.5-0.6, BH39 2.5-2.6, BH40 1.5-1.6, BH40 3.5-3.6, Duplicate 4	BH37 0.5-0.6, BH37 2.5-2.6, BH38 0.5-0.6, BH38 2.5-2.6, BH39 1.5-1.6, BH40 0.5-0.6, BH40 2.5-2.6, Duplicate 3,	31-Oct-2018	05-Nov-2018	14-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓

Page	9 of 16
Work Order	EM1817564
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	48-52

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation Date extracted	Due for extraction	Evaluation	Analysis Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080)								
BH26 0.1-0.2, BH27 0.1-0.2, BH27 1.0-1.1, BH27 1.9-2.0, BH28 0.5-0.6, BH28 1.2-1.3	BH26 0.5-0.6, BH27 0.5-0.6, BH27 1.5-1.6, BH28 0.1-0.2, BH28 1.0-1.1,	29-Oct-2018	01-Nov-2018	12-Nov-2018	✓	02-Nov-2018	12-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								
BH26 0.1-0.2, BH27 0.1-0.2, BH27 1.0-1.1, BH27 1.9-2.0, BH28 0.5-0.6, BH28 1.2-1.3	BH26 0.5-0.6, BH27 0.5-0.6, BH27 1.5-1.6, BH28 0.1-0.2, BH28 1.0-1.1,	29-Oct-2018	05-Nov-2018	12-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
BH29 0.5-0.6, BH29 2.1-2.2, BH31 0.5-0.6, BH32 0.5-0.6, BH34 0.5-0.6, BH35 1.5-1.6,	BH29 1.5-1.6, BH30 0.3-0.4, BH31 1.5-1.6, BH33 0.5-0.6, BH35 0.5-0.6, Duplicate 2	30-Oct-2018	01-Nov-2018	13-Nov-2018	✓	02-Nov-2018	13-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								
BH29 0.5-0.6, BH29 2.1-2.2, BH31 0.5-0.6, BH32 0.5-0.6, BH34 0.5-0.6, BH35 1.5-1.6,	BH29 1.5-1.6, BH30 0.3-0.4, BH31 1.5-1.6, BH33 0.5-0.6, BH35 0.5-0.6, Duplicate 2	30-Oct-2018	05-Nov-2018	13-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
BH36 0.5-0.6, BH37 1.5-1.6, BH37 3.5-3.6, BH38 1.5-1.6, BH39 0.5-0.6, BH39 2.5-2.6, BH40 1.5-1.6, BH40 3.5-3.6, Duplicate 4	BH37 0.5-0.6, BH37 2.5-2.6, BH38 0.5-0.6, BH38 2.5-2.6, BH39 1.5-1.6, BH40 0.5-0.6, BH40 2.5-2.6, Duplicate 3,	31-Oct-2018	01-Nov-2018	14-Nov-2018	✓	02-Nov-2018	14-Nov-2018	✓
Soil Glass Jar - Unpreserved (EP071)								

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
BH36 0.5-0.6,	BH37 0.5-0.6,	31-Oct-2018	05-Nov-2018	14-Nov-2018	✓	05-Nov-2018	15-Dec-2018	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH26 0.1-0.2,	BH26 0.5-0.6,	29-Oct-2018	01-Nov-2018	12-Nov-2018	✓	02-Nov-2018	12-Nov-2018	✓
BH27 0.1-0.2,	BH27 0.5-0.6,							
BH27 1.0-1.1,	BH27 1.5-1.6,							
BH27 1.9-2.0,	BH28 0.1-0.2,							
BH28 0.5-0.6,	BH28 1.0-1.1,							
BH28 1.2-1.3								
Soil Glass Jar - Unpreserved (EP080)								
BH29 0.5-0.6,	BH29 1.5-1.6,	30-Oct-2018	01-Nov-2018	13-Nov-2018	✓	02-Nov-2018	13-Nov-2018	✓
BH29 2.1-2.2,	BH30 0.3-0.4,							
BH31 0.5-0.6,	BH31 1.5-1.6,							
BH32 0.5-0.6,	BH33 0.5-0.6,							
BH34 0.5-0.6,	BH35 0.5-0.6,							
BH35 1.5-1.6,	Duplicate 2							
Soil Glass Jar - Unpreserved (EP080)								
BH36 0.5-0.6,	BH37 0.5-0.6,	31-Oct-2018	01-Nov-2018	14-Nov-2018	✓	02-Nov-2018	14-Nov-2018	✓
BH37 1.5-1.6,	BH37 2.5-2.6,							
BH37 3.5-3.6,	BH38 0.5-0.6,							
BH38 1.5-1.6,	BH38 2.5-2.6,							
BH39 0.5-0.6,	BH39 1.5-1.6,							
BH39 2.5-2.6,	BH40 0.5-0.6,							
BH40 1.5-1.6,	BH40 2.5-2.6,							
BH40 3.5-3.6,	Duplicate 3,							
Duplicate 4								

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) Rinsate 2	29-Oct-2018	----	----	----	02-Nov-2018	27-Apr-2019	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) Rinsate 3	30-Oct-2018	----	----	----	02-Nov-2018	28-Apr-2019	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) Rinsate 4	31-Oct-2018	----	----	----	02-Nov-2018	29-Apr-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) Rinsate 2	29-Oct-2018	----	----	----	02-Nov-2018	26-Nov-2018	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) Rinsate 3	30-Oct-2018	----	----	----	02-Nov-2018	27-Nov-2018	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) Rinsate 4	31-Oct-2018	----	----	----	02-Nov-2018	28-Nov-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) Rinsate 2	29-Oct-2018	01-Nov-2018	05-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP075(SIM)) Rinsate 3	30-Oct-2018	01-Nov-2018	06-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP075(SIM)) Rinsate 4	31-Oct-2018	01-Nov-2018	07-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) Rinsate 2	29-Oct-2018	01-Nov-2018	05-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP071) Rinsate 3	30-Oct-2018	01-Nov-2018	06-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP071) Rinsate 4	31-Oct-2018	01-Nov-2018	07-Nov-2018	✓	02-Nov-2018	11-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 2	29-Oct-2018	02-Nov-2018	12-Nov-2018	✓	02-Nov-2018	12-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 3	30-Oct-2018	02-Nov-2018	13-Nov-2018	✓	02-Nov-2018	13-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 4	31-Oct-2018	02-Nov-2018	14-Nov-2018	✓	02-Nov-2018	14-Nov-2018	✓

Page	: 12 of 16
Work Order	: EM1817564
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) Rinsate 2	**29-Oct-2018**	**01-Nov-2018**	05-Nov-2018	✓	**02-Nov-2018**	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP071) Rinsate 3	**30-Oct-2018**	**01-Nov-2018**	06-Nov-2018	✓	**02-Nov-2018**	11-Dec-2018	✓
Amber Glass Bottle - Unpreserved (EP071) Rinsate 4	**31-Oct-2018**	**01-Nov-2018**	07-Nov-2018	✓	**02-Nov-2018**	11-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 2	**29-Oct-2018**	**02-Nov-2018**	12-Nov-2018	✓	**02-Nov-2018**	12-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 3	**30-Oct-2018**	**02-Nov-2018**	13-Nov-2018	✓	**02-Nov-2018**	13-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 4	**31-Oct-2018**	**02-Nov-2018**	14-Nov-2018	✓	**02-Nov-2018**	14-Nov-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 2	**29-Oct-2018**	**02-Nov-2018**	12-Nov-2018	✓	**02-Nov-2018**	12-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 3	**30-Oct-2018**	**02-Nov-2018**	13-Nov-2018	✓	**02-Nov-2018**	13-Nov-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate 4	**31-Oct-2018**	**02-Nov-2018**	14-Nov-2018	✓	**02-Nov-2018**	14-Nov-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	6	60	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	16	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	16	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection ($SnCl_2$) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by $SnCl_2$ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection ($SnCl_2$)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by $SnCl_2$ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1818156**	Page	: 1 of 3
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018
Order number	:	Date Analysis Commenced	: 13-Nov-2018
C-O-C number	: ----	Issue Date	: 15-Nov-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 13		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 3
Work Order	: EM1818156
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to higl

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2035435)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	75.6	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	81.3	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	70.6	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	72.6	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	72.2	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	72.6	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	72.5	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	73.0	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	72.1	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	68.1	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	81.4	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	84.4	59	124
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	85.4	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	73.0	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	71.8	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	73.0	56	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1818156	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018
Site	: ----	Issue Date	: 15-Nov-2018
Sampler	: ----	No. of samples received	: 13
Order number	:	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

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Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Due for extraction	Days overdue	Analysis: Date analysed	Due for analysis	Days overdue
EN33: TCLP Leach							
Non-Volatile Leach: 14 day HT(e.g. SV organics)							
BH27 1.0-1.1,	BH28 1.2-1.3	13-Nov-2018	12-Nov-2018	1	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Regular	Rate (%): Actual	Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	14	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EN33: TCLP Leach								
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)								
BH27 1.0-1.1,	BH28 1.2-1.3	29-Oct-2018	13-Nov-2018	12-Nov-2018	✖	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)								
BH29 0.5-0.6,	BH35 0.5-0.6	30-Oct-2018	13-Nov-2018	13-Nov-2018	✓	----	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)								
BH37 0.5-0.6,	BH37 1.5-1.6,	31-Oct-2018	13-Nov-2018	14-Nov-2018	✓	----	----	----
BH37 2.5-2.6,	BH37 3.5-3.6,							
BH39 1.5-1.6,	BH39 2.5-2.6,							
BH40 0.5-0.6,	BH40 1.5-1.6,							
BH40 3.5-3.6								

Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
BH27 1.0-1.1,	BH28 1.2-1.3,	**13-Nov-2018**	**14-Nov-2018**	20-Nov-2018	✓	**14-Nov-2018**	24-Dec-2018	✓
BH29 0.5-0.6,	BH35 0.5-0.6,							
BH37 0.5-0.6,	BH37 1.5-1.6,							
BH37 2.5-2.6,	BH37 3.5-3.6,							
BH39 1.5-1.6,	BH39 2.5-2.6,							
BH40 0.5-0.6,	BH40 1.5-1.6,							
BH40 3.5-3.6								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	14	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	14	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1817824**	Page	: 1 of 16
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018
Order number	:	Date Analysis Commenced	: 07-Nov-2018
C-O-C number	: ----	Issue Date	: 12-Nov-2018
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 29		
No. of samples analysed	: 29		

NATA
Accreditation No. 825
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

Page	: 2 of 16
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2023696)									
EM1817824-001	BH41 0.5-0.6	EA055: Moisture Content	----	0.1	%	14.8	16.2	8.68	0% - 50%
EM1817824-011	BH44 2.5-2.6	EA055: Moisture Content	----	0.1	%	13.2	12.8	3.65	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2023697)									
EM1817824-021	BH50 0.5-0.6	EA055: Moisture Content	----	0.1	%	16.6	16.8	1.27	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 2023270)									
EM1817786-002	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	90	80	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	28	26	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	20	19	6.13	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	6	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	30	29	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	25	25	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	508	430	16.6	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	38	37	2.84	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	164	159	2.90	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817786-023	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	70	80	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	24	24	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	7	7	0.00	No Limit

Page	: 3 of 16
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 2023270) - continued									
EM1817786-023	Anonymous	EG005T: Nickel	7440-02-0	2	mg/kg	12	12	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	15	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	25	26	5.38	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	263	272	3.34	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	34	35	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	39	41	3.84	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2023272)									
EM1817824-009	BH44 0.5-0.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	80	130	46.3	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	12	12	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	10	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	12	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	16	15	7.70	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	62	63	0.00	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	17	17	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	41	38	6.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1817824-018	BH48 1.5-1.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	130	140	0.00	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	10	10	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	9	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	13	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	59	63	6.40	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	180	213	16.7	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	232	245	5.32	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	36	30	17.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	254	270	5.90	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2023271)									
EM1817786-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2023271) - continued									
EM1817786-023	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2023273)									
EM1817824-009	BH44 0.5-0.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1817824-018	BH48 1.5-1.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.4	0.4	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2023773)									
EM1817824-001	BH41 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	0.7	1.2	51.8	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	4.2	6.8	48.8	0% - 50%
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	0.8	1.5	58.6	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	9.8	# 18.3	60.6	0% - 20%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	3.3	# 5.9	57.6	0% - 50%
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	22.8	# 38.7	51.6	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	26.8	# 44.7	49.9	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	14.5	# 24.2	50.0	0% - 20%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	13.4	# 22.5	50.9	0% - 20%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	23.0	# 38.4	50.4	0% - 20%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	7.3	# 12.0	49.4	0% - 20%
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	21.6	# 35.9	49.9	0% - 20%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	9.8	# 16.5	50.6	0% - 20%
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	2.5	4.4	53.4	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	12.1	# 20.0	49.4	0% - 20%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2025069)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2025069) - continued									
EM1817783-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1817785-003	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.7	1.7	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.6	0.6	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	3.2	3.3	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	3.5	3.6	3.50	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	2.6	2.6	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	2.5	2.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	4.9	5.3	8.07	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.8	1.9	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.2	4.7	10.4	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.6	2.8	5.48	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.6	0.7	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.2	3.3	3.26	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2023263)									
EM1817824-001	BH41 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2023513)									
EM1817824-021	BH50 0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2023774)									

Page	: 6 of 16
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2023774) - continued									
EM1817824-001	BH41 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP071: C15 - C28 Fraction	----	100	mg/kg	1000	620	47.6	0% - 50%
		EP071: C29 - C36 Fraction	----	100	mg/kg	680	430	43.7	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	1680	# 1050	46.2	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2025068)									
EM1817783-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817785-003	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	110	110	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	120	120	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	230	230	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2023263)									
EM1817824-001	BH41 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2023513)									
EM1817824-021	BH50 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2023774)									
EM1817824-001	BH41 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	1480	930	45.8	0% - 50%
		EP071: >C34 - C40 Fraction	----	100	mg/kg	320	210	42.3	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	1800	# 1140	44.9	0% - 20%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2025068)									
EM1817783-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1817785-003	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	200	210	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2025068) - continued									
EM1817785-003	Anonymous	EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	200	210	4.88	No Limit
EP080: BTEXN (QC Lot: 2023263)									
EM1817824-001	BH41 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1817824-011	BH44 2.5-2.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 2023513)									
EM1817824-021	BH50 0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2024852)									
EM1817721-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.017	0.018	10.0	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.014	0.014	0.00	0% - 50%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2024852) - continued									
EM1817721-004	Anonymous	EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EM1817825-007	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.012	0.012	0.00	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.007	0.008	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2024851)									
EM1817890-006	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1817665-024	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2023754)									
EM1817702-032	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EM1817702-043	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	900	890	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2023754)									
EM1817702-032	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1817702-043	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	760	770	1.78	No Limit
EP080: BTEXN (QC Lot: 2023754)									
EM1817702-032	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1817702-043	Anonymous	EP080: Benzene	71-43-2	1	µg/L	596	611	2.45	0% - 20%
		EP080: Toluene	108-88-3	2	µg/L	10	10	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	9	10	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	43	47	9.12	0% - 20%
		EP080: Naphthalene	91-20-3	5	µg/L	5	6	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2023270)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	93.6	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	92.8	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	105	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	110	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	87.6	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	95.8	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	92.3	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	93.3	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	92.6	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	98.9	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	96.1	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	101	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	94.2	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	101	79	110
EG005T: Total Metals by ICP-AES (QCLot: 2023272)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	93.3	78	107
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	94.2	76	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	102	84	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	111	84	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	85.9	76	108
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	88.4	78	110
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	88.6	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	96.5	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	92.7	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	97.0	81	110
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	92.4	80	109
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	101	92	110
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	92.1	78	106
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	95.2	79	110
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2023271)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	88.8	77	104
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2023273)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	83.2	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2023773)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2023773) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	100.0	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	99.5	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	91.3	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	90.7	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	93.2	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	96.8	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	93.2	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	94.7	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	90.4	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	93.2	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	97.7	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	101	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	94.9	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.7	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	86.4	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	86.1	68	127
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2025069)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	111	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	107	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	106	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	102	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	105	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	107	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	106	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	108	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	105	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	109	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	118	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	114	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	104	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	97.6	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	99.9	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	98.0	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023283)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.7	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023513)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023513) - continued								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	106	61	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023774)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	86.4	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	100	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	92.0	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2025068)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	81.3	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	92.5	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	84.0	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023263)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	99.8	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023513)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	100	60	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023774)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	86.6	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	97.2	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	75.7	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2025068)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	85.9	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	89.4	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	78.0	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 2023263)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	93.0	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	99.1	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	96.6	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	106	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	104	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	90.2	66	130
EP080: BTEXN (QCLot: 2023513)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	92.2	63	119
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	106	67	126
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	103	66	124

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080: BTEXN (QCLot: 2023513) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	116	68	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	115	73	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	91.0	61	123
Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 2024852)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.0	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	96.3	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	92.0	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.5	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.2	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	91.6	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.3	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.4	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	94.5	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.0	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	91.9	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	94.7	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	99.8	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.0	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 2024851)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	91.9	76	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2023666)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	67.8	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	72.0	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	68.2	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	70.4	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	72.7	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	72.9	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	72.9	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	72.6	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	72.2	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	73.2	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	82.2	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	80.4	59	124

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2023666) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	80.3	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	72.2	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	72.5	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	73.0	56	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023664)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	101	51	136
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	104	58	139
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	106	57	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023754)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	110	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023664)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	102	55	134
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	105	58	135
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	109	57	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023754)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	109	66	123
EP080: BTEXN (QCLot: 2023754)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	110	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	101	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	104	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	115	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	118	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	89.1	74	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2023270)							
EM1817786-004	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	93.7	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	83.5	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	100	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	87.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	90.2	79	121

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2023270) - continued							
EM1817786-004	Anonymous	EG005T: Copper	7440-50-8	50 mg/kg	99.0	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	91.3	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	88.9	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	82.1	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	86.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	101	74	128
EG005T: Total Metals by ICP-AES (QCLot: 2023272)							
EM1817824-010	BH44 1.5-1.6	EG005T: Arsenic	7440-38-2	50 mg/kg	93.4	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	89.7	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	96.8	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	84.6	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	86.3	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	94.0	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	87.4	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	83.5	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	82.8	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	81.6	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	88.4	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2023271)							
EM1817786-004	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	82.7	76	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2023273)							
EM1817824-010	BH44 1.5-1.6	EG035T: Mercury	7439-97-6	5 mg/kg	91.8	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2023773)							
EM1817824-002	BH42 0.5-0.6	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	91.3	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	# Not Determined	52	148
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2025069)							
EM1817783-010	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	102	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	105	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023263)							
EM1817824-002	BH42 0.5-0.6	EP080: C6 - C9 Fraction	----	28 mg/kg	91.5	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023513)							
EM1817824-022	BH50 1.5-1.6	EP080: C6 - C9 Fraction	----	28 mg/kg	90.6	42	131

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023774)							
EM1817824-003	BH42 1.5-1.6	EP071: C10 - C14 Fraction	----	806 mg/kg	91.3	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	98.6	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	92.0	64	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2025068)							
EM1817783-006	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	92.6	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	103	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	92.9	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023263)							
EM1817824-002	BH42 0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	90.2	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023513)							
EM1817824-022	BH50 1.5-1.6	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	85.6	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023774)							
EM1817824-003	BH42 1.5-1.6	EP071: >C10 - C16 Fraction	----	1160 mg/kg	90.5	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	96.4	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	85.4	44	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2025068)							
EM1817783-006	Anonymous	EP071: >C10 - C16 Fraction	----	1160 mg/kg	92.8	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	99.6	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	83.8	44	126
EP080: BTEXN (QCLot: 2023263)							
EM1817824-002	BH42 0.5-0.6	EP080: Benzene	71-43-2	2 mg/kg	119	50	136
		EP080: Toluene	108-88-3	2 mg/kg	122	56	139
EP080: BTEXN (QCLot: 2023513)							
EM1817824-022	BH50 1.5-1.6	EP080: Benzene	71-43-2	2 mg/kg	106	50	136
		EP080: Toluene	108-88-3	2 mg/kg	115	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2024852)							
EM1817721-004	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	103	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	101	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	95.4	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	99.5	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	94.4	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	97.9	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	102	76	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2024852) - continued							
EM1817721-004	Anonymous	EG020A-F: Lead	7439-92-1	0.2 mg/L	98.0	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	98.2	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	103	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	98.4	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	102	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 2024851)							
EM1817693-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	73.4	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2023754)							
EM1817702-033	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	79.2	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2023754)							
EM1817702-033	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	77.4	44	122
EP080: BTEXN (QCLot: 2023754)							
EM1817702-033	Anonymous	EP080: Benzene	71-43-2	20 µg/L	96.6	68	130
		EP080: Toluene	108-88-3	20 µg/L	90.0	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1817824**	Page	: 1 of 11
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018
Site	: ----	Issue Date	: 12-Nov-2018
Sampler	: AP	No. of samples received	: 29
Order number	:	No. of samples analysed	: 29

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Page	: 2 of 11
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Phenanthrene**	85-01-8	60.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Anthracene**	120-12-7	57.6 %	0% - 50%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Fluoranthene**	206-44-0	51.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Pyrene**	129-00-0	49.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Benz(a)anthracene**	56-55-3	50.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Chrysene**	218-01-9	50.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Benzo(b+j)fluoranthene**	205-99-2 205-82-3	50.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Benzo(k)fluoranthene**	207-08-9	49.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Benzo(a)pyrene**	50-32-8	49.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Indeno(1.2.3.cd)pyrene**	193-39-5	50.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**Benzo(g.h.i)perylene**	191-24-2	49.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP080/071: Total Petroleum Hydrocarbons	EM1817824--011	BH44 2.5-2.6	**C10 - C36 Fraction (sum)**	----	46.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	EM1817824--011	BH44 2.5-2.6	**>C10 - C40 Fraction (sum)**	----	44.9 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1817786--004	Anonymous	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EM1817824--010	BH44 1.5-1.6	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM1817824--002	BH42 0.5-0.6	**Pyrene**	129-00-0	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Page	: 3 of 11
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	----	----	----	**07-Nov-2018**	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6,							
BH50 0.5-0.6,	BH50 1.5-1.6,							
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	**08-Nov-2018**	04-May-2019	✓	**08-Nov-2018**	04-May-2019	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6,							
BH50 0.5-0.6,	BH50 1.5-1.6,							
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	**08-Nov-2018**	03-Dec-2018	✓	**08-Nov-2018**	03-Dec-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6,							
BH50 0.5-0.6,	BH50 1.5-1.6,							
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	**07-Nov-2018**	19-Nov-2018	✓	**08-Nov-2018**	17-Dec-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6							
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH50 0.5-0.6,	BH50 1.5-1.6,	**05-Nov-2018**	**08-Nov-2018**	19-Nov-2018	✓	**08-Nov-2018**	18-Dec-2018	✓
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							

Page : 5 of 11
Work Order : EM1817824
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
BH41 0.5-0.6,	BH42 0.5-0.6,	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	07-Nov-2018	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6							
Soil Glass Jar - Unpreserved (EP080)								
BH41 0.5-0.6,	BH42 0.5-0.6,	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	08-Nov-2018	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6,							
BH50 0.5-0.6,	BH50 1.5-1.6,							
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							
Soil Glass Jar - Unpreserved (EP071)								
BH50 0.5-0.6,	BH50 1.5-1.6,	05-Nov-2018	08-Nov-2018	19-Nov-2018	✓	08-Nov-2018	18-Dec-2018	✓
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							

Page	: 6 of 11
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080)								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	**07-Nov-2018**	19-Nov-2018	✓	**07-Nov-2018**	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6							
Soil Glass Jar - Unpreserved (EP080)								
BH41 0.5-0.6,	BH42 0.5-0.6,	**05-Nov-2018**	**07-Nov-2018**	19-Nov-2018	✓	**08-Nov-2018**	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6,							
BH50 0.5-0.6,	BH50 1.5-1.6,							
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							
Soil Glass Jar - Unpreserved (EP071)								
BH50 0.5-0.6,	BH50 1.5-1.6,	**05-Nov-2018**	**08-Nov-2018**	19-Nov-2018	✓	**08-Nov-2018**	18-Dec-2018	✓
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							

Matrix: **SOIL** Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH41 0.5-0.6,	BH42 0.5-0.6,	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	07-Nov-2018	19-Nov-2018	✓
BH42 1.5-1.6,	BH42 2.5-2.6,							
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH49 0.5-0.6,	BH49 1.5-1.6							
Soil Glass Jar - Unpreserved (EP080)								
BH50 0.5-0.6,	BH50 1.5-1.6,	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	08-Nov-2018	19-Nov-2018	✓
BH51 0.5-0.6,	BH51 1.5-1.6,							
BH52 0.5-0.6,	BH52 1.5-1.6,							
BH53 0.5-0.6,	BH53 1.5-1.6							

Matrix: **WATER** Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
Rinsate 5	05-Nov-2018	----	----	----	08-Nov-2018	04-May-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
Rinsate 5	05-Nov-2018	----	----	----	09-Nov-2018	03-Dec-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
Rinsate 5	05-Nov-2018	07-Nov-2018	12-Nov-2018	✓	08-Nov-2018	17-Dec-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate 5	05-Nov-2018	07-Nov-2018	12-Nov-2018	✓	08-Nov-2018	17-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate 5	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	07-Nov-2018	19-Nov-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate 5	05-Nov-2018	07-Nov-2018	12-Nov-2018	✓	08-Nov-2018	17-Dec-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate 5	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	07-Nov-2018	19-Nov-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate 5	05-Nov-2018	07-Nov-2018	19-Nov-2018	✓	07-Nov-2018	19-Nov-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	8	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	8	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Page	: 10 of 11
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1818266**	Page	: 1 of 3
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018
Order number	: ----	Date Analysis Commenced	: 16-Nov-2018
C-O-C number	: ----	Issue Date	: 19-Nov-2018
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 17		
No. of samples analysed	: 17		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2043178)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	70.6	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	79.3	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	70.9	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	72.9	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	72.2	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	72.3	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	73.8	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	70.6	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	70.0	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	68.6	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	82.6	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	78.2	59	124
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	80.0	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	78.6	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	78.7	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	78.8	56	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1818266	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018
Site	: ----	Issue Date	: 19-Nov-2018
Sampler	: ----	No. of samples received	: 17
Order number	: ----	No. of samples analysed	: 17

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EN33: TCLP Leach								
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)								
BH42 0.5-0.6,	BH42 1.5-1.6,	**05-Nov-2018**	**16-Nov-2018**	19-Nov-2018	✓	----	----	----
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH51 1.5-1.6								

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
BH42 0.5-0.6,	BH42 1.5-1.6,	**16-Nov-2018**	**19-Nov-2018**	23-Nov-2018	✓	**19-Nov-2018**	29-Dec-2018	✓
BH43 0.5-0.6,	BH43 1.5-1.6,							
BH43 2.5-2.6,	BH43 3.5-3.6,							
BH44 0.5-0.6,	BH44 1.5-1.6,							
BH44 2.5-2.6,	BH44 3.5-3.6,							
BH45 0.5-0.6,	BH46 0.5-0.6,							
BH47 0.5-0.6,	BH47 1.5-1.6,							
BH48 0.5-0.6,	BH48 1.5-1.6,							
BH51 1.5-1.6								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: ES1833261	Page	: 1 of 8
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48 - 52	Date Samples Received	: 08-Nov-2018
Order number	:	Date Analysis Commenced	: 09-Nov-2018
C-O-C number	: ----	Issue Date	: 12-Nov-2018
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

NATA Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
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ALS

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to higt

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2027113)									
ES1833209-003	Anonymous	EA055: Moisture Content	----	0.1	%	8.4	8.3	1.71	No Limit
ES1833253-001	Anonymous	EA055: Moisture Content	----	0.1	%	16.1	17.7	9.79	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 2027200)									
ES1832975-006	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	110	0.00	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	26	26	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	5	5	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	7	7	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	36	31	14.6	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	185	181	1.89	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	26	24	4.92	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	22	24	7.92	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
ES1833016-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	<10	<10	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 2027200) - continued									
ES1833016-001	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	5	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2027202)									
ES1833261-002	Triplicate 2 1.5-1.6	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	130	120	0.00	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	10	10	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	16	20	26.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	14	9	46.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	12	18.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	102	# 62	48.9	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	161	# 218	29.7	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	26	18	31.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	70	61	13.6	0% - 50%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2027201)									
ES1832996-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1833016-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2026485)									
ES1833261-001	Triplicate 1 0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.8	3.5	60.2	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.6	0.7	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	4.7	5.2	10.8	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	4.7	5.0	6.77	0% - 50%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	1.8	1.7	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.8	1.7	7.48	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.4	2.3	6.64	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.2	0.8	47.1	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	2.7	2.2	22.5	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.6	1.2	30.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2026485) - continued									
ES1833261-001	Triplicate 1 0.5-0.6	EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.4	1.5	45.6	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	25.7	25.8	0.388	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	3.4	2.8	19.4	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2026486)									
ES1833261-001	Triplicate 1 0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2028881)									
ES1831956-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2026486)									
ES1833261-001	Triplicate 1 0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	150	110	25.5	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2028881)									
ES1831956-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 2028881)									
ES1831956-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2027200)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	100	86	126
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	98.1	85	115
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	108	90	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	92.3	76	128
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	105	88	120
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	100	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.3	80	114
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	106	85	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	104	87	123
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	75.7	75	131
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	107	92	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	106	80	122
EG005T: Total Metals by ICP-AES (QCLot: 2027202)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	90.2	86	126
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	98.2	85	115
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	106	90	113
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	98.6	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	88.9	76	128
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	103	88	120
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	96.0	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	94.8	80	114
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	104	85	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.7	87	123
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	79.3	75	131
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	104	92	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	105	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2027201)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	80.9	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2026485)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	92.9	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	92.1	72	124

Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2026485) - continued								
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	95.6	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	92.6	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	96.2	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	98.6	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	96.9	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	100	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	87.1	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	90.5	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	86.6	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	91.2	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	90.0	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	86.8	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	89.4	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	84.2	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2026486)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	101	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	106	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	100	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2028881)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	101	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2026486)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	105	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	100	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	87.3	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2028881)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	107	68	128
EP080: BTEXN (QCLot: 2028881)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	82.8	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	82.9	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	82.0	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	99.3	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	90.9	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	96.8	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2027200)							
ES1832996-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.4	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	103	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	102	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	105	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	95.1	70	130
EG005T: Total Metals by ICP-AES (QCLot: 2027202)							
ES1833261-002	Triplicate 2 1.5-1.6	EG005T: Arsenic	7440-38-2	50 mg/kg	94.3	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	98.4	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	103	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.8	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	99.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	110	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2027201)							
ES1832996-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	95.3	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2026485)							
ES1833261-001	Triplicate 1 0.5-0.6	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	99.5	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	93.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2026486)							
ES1833261-001	Triplicate 1 0.5-0.6	EP071: C10 - C14 Fraction	----	523 mg/kg	97.0	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	116	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	115	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2028881)							
ES1831956-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	74.0	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2026486)							
ES1833261-001	Triplicate 1 0.5-0.6	EP071: >C10 - C16 Fraction	----	860 mg/kg	108	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	110	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	114	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2028881)							
ES1831956-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	71.5	70	130
EP080: BTEXN (QCLot: 2028881)							
ES1831956-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	70.0	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 2028881) - continued							
ES1831956-001	Anonymous	EP080: Toluene	108-88-3	2.5 mg/kg	71.7	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	73.2	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	71.4	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	80.0	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	87.8	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1833261	Page	: 1 of 4
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48 - 52	Date Samples Received	: 08-Nov-2018
Site	: ----	Issue Date	: 12-Nov-2018
Sampler	: AP	No. of samples received	: 2
Order number	:	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Page : 2 of 4
Work Order : ES1833261
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48 - 52

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	ES1833261--002	Triplicate 2 1.5-1.6	**Lead**	7439-92-1	48.9 %	0% - 20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES1833261--002	Triplicate 2 1.5-1.6	**Manganese**	7439-96-5	29.7 %	0% - 20%	**RPD exceeds LOR based limits**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	----	----	----	**09-Nov-2018**	19-Nov-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	04-May-2019	✓	**09-Nov-2018**	04-May-2019	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	03-Dec-2018	✓	**09-Nov-2018**	03-Dec-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	19-Nov-2018	✓	**09-Nov-2018**	19-Dec-2018	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	19-Nov-2018	✓	**09-Nov-2018**	19-Nov-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	19-Nov-2018	✓	**09-Nov-2018**	19-Nov-2018	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) Triplicate 1 0.5-0.6,	Triplicate 2 1.5-1.6	**05-Nov-2018**	**09-Nov-2018**	19-Nov-2018	✓	**09-Nov-2018**	19-Nov-2018	✓

Page	: 3 of 4
Work Order	: ES1833261
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48 - 52

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1819122**	Page	: 1 of 8
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 28-Nov-2018
Order number	:	Date Analysis Commenced	: 28-Nov-2018
C-O-C number	: ----	Issue Date	: 30-Nov-2018
Sampler	: MD		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2062390)									
EM1819010-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.018	0.019	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.003	<0.001	109	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.131	0.128	2.45	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.82	0.80	3.46	0% - 50%
EM1819078-008	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2062390) - continued									
EM1819078-008	Anonymous	EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2062392)									
EM1819122-002	MW2	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.037	0.039	4.36	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.165	0.168	1.55	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.002	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.07	0.07	0.00	No Limit
EM1819139-010	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.071	0.068	3.56	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.011	0.012	0.00	0% - 50%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	6.77	6.85	1.09	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.005	0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2062391)									
EM1819010-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	0.0002	0.0002	0.00	No Limit
EM1819078-008	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2062393)									
EM1819122-004	Duplicate	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2062129)									
EM1819068-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2062129) - continued									
EM1819122-004	Duplicate	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2062129)									
EM1819068-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1819122-004	Duplicate	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 2062129)									
EM1819068-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM1819122-004	Duplicate	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2062390)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	98.7	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	95.3	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	97.1	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.5	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.0	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.6	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.2	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.7	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.9	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.8	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	96.0	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	97.4	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.9	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.8	84	116
EG020F: Dissolved Metals by ICP-MS (QCLot: 2062392)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.8	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	90.9	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	96.8	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.2	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.7	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.4	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.0	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.2	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.2	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.1	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	93.6	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	95.9	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.3	85	109
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	98.1	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 2062391)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.2	76	114
EG035F: Dissolved Mercury by FIMS (QCLot: 2062393)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	88.2	76	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2061690)								

ALS

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2061690) - continued								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	81.6	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	77.6	50	117
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	80.8	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	79.4	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	83.5	59	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	95.3	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	85.8	61	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	81.9	56	120
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	93.4	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	96.5	57	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	93.8	56	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	94.1	59	124
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	101	54	124
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	80.7	55	124
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	82.7	54	124
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	85.7	56	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2061691)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4331 µg/L	76.6	51	136
EP071: C15 - C28 Fraction	----	100	µg/L	<100	16952 µg/L	80.7	58	139
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8695 µg/L	80.9	57	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2062129)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	115	65	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2061691)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6292 µg/L	76.6	55	134
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	22143 µg/L	81.8	58	135
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1677 µg/L	83.8	57	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2062129)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	113	64	124
EP080: BTEXN (QCLot: 2062129)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	109	69	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	104	73	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	106	71	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	116	72	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	112	76	129
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	94.2	70	125

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 2062390)							
EM1819010-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	96.4	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	92.1	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	95.8	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	86.4	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	94.2	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	93.4	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	91.9	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	90.4	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	90.4	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	91.8	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	94.5	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	93.9	75	131
EG020F: Dissolved Metals by ICP-MS (QCLot: 2062392)							
EM1819122-002	MW2	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	98.6	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	91.1	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	94.8	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	89.9	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	94.1	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	93.7	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	93.3	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	92.0	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	92.8	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	96.1	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	94.5	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	94.4	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 2062391)							
EM1819064-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	94.5	70	120
EG035F: Dissolved Mercury by FIMS (QCLot: 2062393)							
EM1819122-005	Rinsate	EG035F: Mercury	7439-97-6	0.01 mg/L	93.4	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2062129)							
EM1819068-002	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	73.5	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2062129)							
EM1819068-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	70.9	44	122

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 2062129)							
EM1819068-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	91.9	68	130
		EP080: Toluene	108-88-3	20 µg/L	94.6	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1819122	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 28-Nov-2018
Site	: ----	Issue Date	: 30-Nov-2018
Sampler	: MD	No. of samples received	: 5
Order number	:	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)								
MW1, MW3, Rinsate	MW2, Duplicate,	26-Nov-2018	----	----	----	29-Nov-2018	25-May-2019	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)								
MW1, MW3, Rinsate	MW2, Duplicate,	26-Nov-2018	----	----	----	30-Nov-2018	24-Dec-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
MW1, MW3, Rinsate	MW2, Duplicate,	26-Nov-2018	28-Nov-2018	03-Dec-2018	✓	29-Nov-2018	07-Jan-2019	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) MW1, MW2, MW3, Duplicate, Rinsate	26-Nov-2018	28-Nov-2018	03-Dec-2018	✓	29-Nov-2018	07-Jan-2019	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW1, MW2, MW3, Duplicate, Rinsate	26-Nov-2018	28-Nov-2018	10-Dec-2018	✓	28-Nov-2018	10-Dec-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) MW1, MW2, MW3, Duplicate, Rinsate	26-Nov-2018	28-Nov-2018	03-Dec-2018	✓	29-Nov-2018	07-Jan-2019	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW1, MW2, MW3, Duplicate, Rinsate	26-Nov-2018	28-Nov-2018	10-Dec-2018	✓	28-Nov-2018	10-Dec-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) MW1, MW2, MW3, Duplicate, Rinsate	26-Nov-2018	28-Nov-2018	10-Dec-2018	✓	28-Nov-2018	10-Dec-2018	✓

Page	: 4 of 5
Work Order	: EM1819122
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	3	22	13.64	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	6	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	2	22	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	2	22	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	2	22	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	6	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3). ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

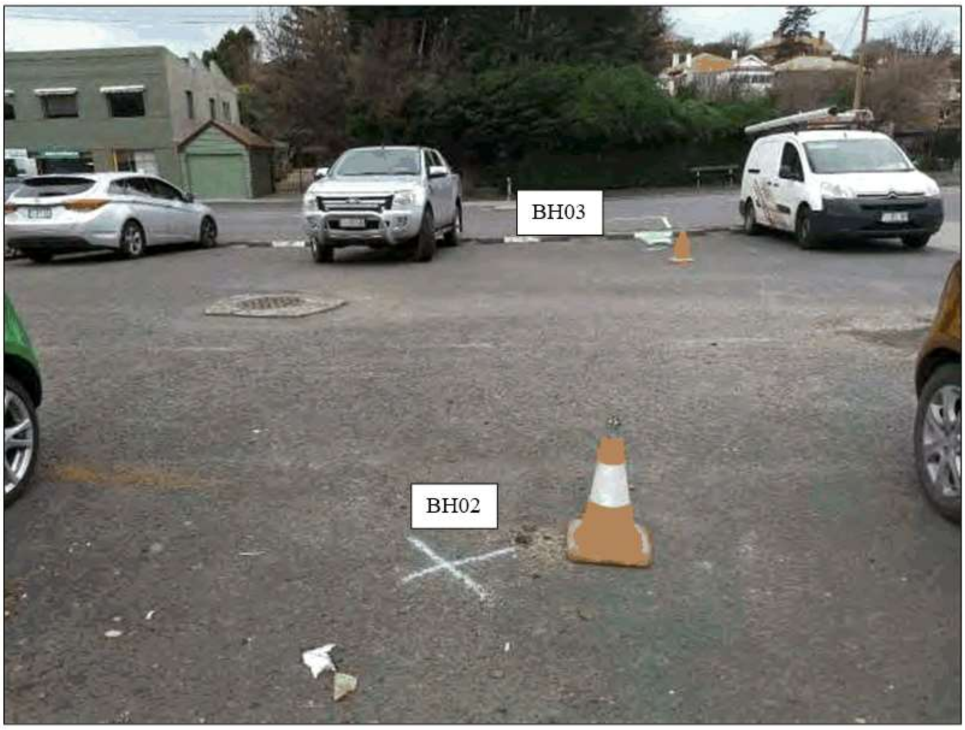
Groundwater – Triplicate QA/QC included in the COA section of the document 15481 - Envirolab

Appendix 9 Bore log images

BH01 Location

BH01 Core with analytical samples

BH01 Core with analytical samples – Close up



BH02 and BH03 Location

BH02 Core with analytical samples

BH03 Core with selected samples for analysis

BH03 Core

Location of BH04 , BH05 and BH07 (GT03)

BH04 Core

BH04 Core with selected samples for analysis

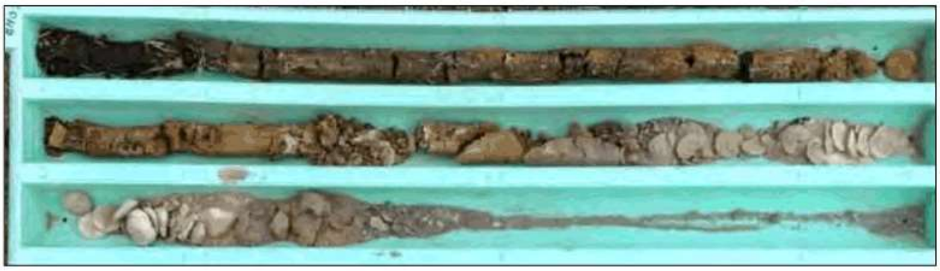
BH05 Location

BH05

BH05 close up of end of hole

BH06, BH07 (BH04 and BH05 in back ground)

BH06 – three attempts



BH07 Core

BH07 Core with samples selected for analysis

BH08 Core with analytical samples

BH09 and BH08 Locations

BH09 Core with analytical samples

BH10 location

BH10 core (Incomplete log)

BH10 Core with analytical samples

Location of BH11

BH11 Core

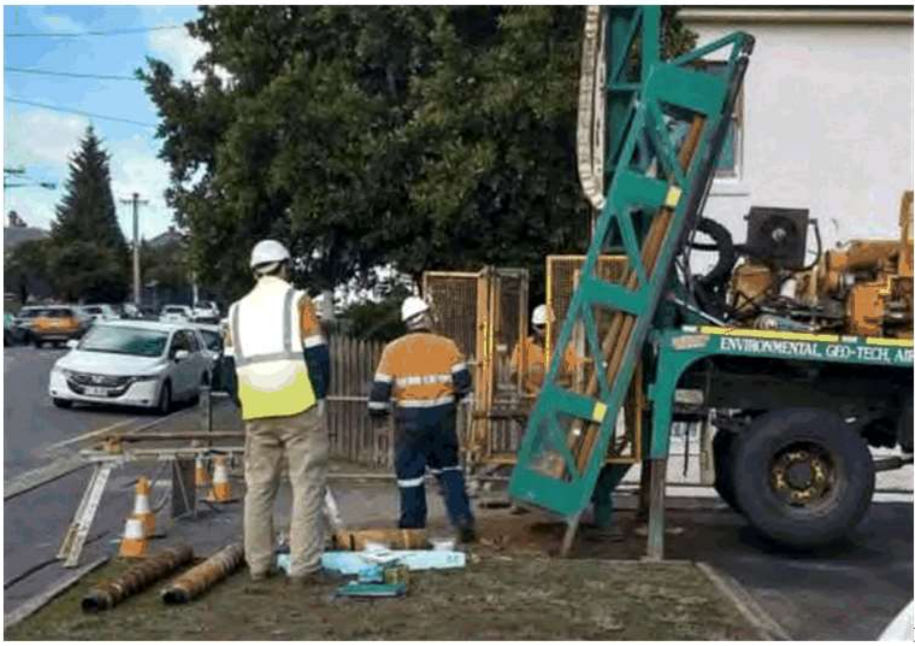
BH11 Core with samples selected for analysis

Location of BH12


BH12 core


Location of BH13

Concrete Core BH13



BH13 Location

BH13 Core


BH14 Location

BH14


BH15 Location

BH15 Core

BH16 Location

BH16 core

BH16 Core with samples selected for analysis

BH17

BH17

BH18 location

BH18 core

BH18 Core with select samples for analysis.

BH19 Location

BH19 Core with select samples for analysis.

BH19 core close-up, black staining.

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Appendix 10 Borehole Logs

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	Log of MW1	
CLIENT: Swanbury Penglase Architects	EASTING: 525389.311	GDA94
	NORTHING: 5254037.766	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 59.15	m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 11.5	
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 30/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	CONCRETE	FILL						59.0
	FILL: Silty sandy GRAVEL : Pale brown, medium dense, fine to coarse grained, sub-angular, moist, low plasticity. Gravels compri	FILL	GP				Casingpriteoutm	58.5
1.0	FILL: GRAVEL trace clay: Brown, medium dense, medium to coarse grained, sub-angular, dry, non-plastic	FILL	GC					58.0 / 57.5
2.0 – 3.0	FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite	FILL	CI					57.0 / 56.5
3.0	FILL GRAVELS AND COBBLES comprising dolerite	FILL	GP				▶3.4	56.0 / 55.5
4.0	FILL: Gravelly sandy CLAY : Dark brown, stiff, moist, medium plasticity. Gravel comprises dolerite.	FILL	CI					55.0 / 54.5
5.0 – 6.0	FILL: Gravelly sandy CLAY : Dark brown, stiff to very stiff, wet, medium plasticity. Gravel comprises dolerite.	FILL	CI					54.0 / 53.5 / 53.0
7.0	FILL: Dolerite GRAVEL, clay washed away	FILL	GP				ScreenSand	52.5 / 52.0 / 51.5
8.0 ✖	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered, carbon	Rv						51.0 / 50.5 / 50.0 / 49.5
10.0 – 11.0	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and light grey, low to medium strength, slightly weathered, carbo	Rv					End Cap	49.0 / 48.5 / 48.0
12.0								

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 [2] Level 2 [3] Level 3 ■ Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of MW2

EASTING:	525344.9	GDA94
NORTHING:	5254055	GDA94
ELEVATION AND DATUM:	57.68	m AHD
TOTAL DEPTH (m):	3.2	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania
DRILLING CONTRACTOR: Tasmanian Drilling Services
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY: A. Plummer
SAMPLING: Hollow Stem Auger DATE: 14/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	CONCRETE		P				Cement	
0.0–0.5	FILL: Sandy Gravelly CLAY brown, moist, stiff, medium plasticity. Contains gravels of siltstone, brick & charcoal fragments		GP				Grout	57.5
0.5–2.8	FILL: Sandy CLAY trace gravels: Dark brown, moist (wet at 3.2m), stiff, medium plasticity. Refusal on likely cobble	FILL	GC				BCasinge / Screen Sand	57.0, 56.5, 56.0, 55.5, 55.0
2.8–3.2	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered, carbon	Rv					Screen Sand; water level 2.8; End Cap	54.5

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

Note excavation in MW2 to 51mAHD

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of MW3

EASTING: 525370.9		GDA94
NORTHING: 5254002		GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 58.6	m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 15	
EQUIPMENT/METHOD: Drill Mac 500 — LOGGED BY A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger — DATE: 14/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	CONCRETE	FILL					Groutbme	58.5
	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC				0.5	58.0
1.0							Casing Bentonite	57.5
								57.0
2.0								56.5
								56.0
3.0								55.5
								55.0
4.0								54.5
								54.0
5.0								53.5
								53.0
6.0								52.5
								52.0
7.0								51.5
		Rv						51.0
8.0	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered,						and	50.5

IB105 analytes listed: Arsenic, Barium, Beryllium, Cadmium, Chromium III, Chromium VI, Cobalt, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of MW3**
CLIENT: Swanbury Penglase Architects	EASTING: 525370.9	GDA94
	NORTHING: 5254002	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 58.6	m AHD
DRILLING CONTRACTOR: Tasmanian Drilling Services	TOTAL DEPTH (m): 15	
EQUIPMENT/METHOD: Drill Mac 500 LOGGED BY A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 14/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride	MONITORING WELL	ELEVATION (metres)
9.0								50.0
								49.5
10.0								49.0
								48.5
11.0								48.0
								47.5
12.0								47.0
								46.5
13.0								46.0
								45.5
14.0								45.0
								44.5
15.0								44.0

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

Note: No Excavation in MW3

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH01**
CLIENT: Swanbury Penglase Architects	EASTING: 5254124.978	GDA94
	NORTHING: 525375.976	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 56.754 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4.5	
EQUIPMENT/METHOD: AMS 9110Ag Probe; LOGGED BY S. Joyce	NATURAL (m)	WATER TABLE (m)
SAMPLING: Direct Push; DATE: 23/07/2018		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Asphalt	FILL	
0.1–0.45	FILL: Gravelly silty SAND: Pale yellow brown, fine to coarse grained, medium dense, non-plastic, dry. Gravel comprises dolerite	FILL	SP
0.45–0.8	FILL: Sandy gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is rounded and angular siltstone, brick and cha	FILL	CL
0.8–3.0	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occasional fragments of ceramic an	FILL	CI
3.0–3.7	FILL: CLAY with gravel: Dark brown, stiff, moist, high plasticity. Contains gravels of dolerite, siltstone, brick, glass, charc	FILL	CH
3.7–4.5	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, moist. Gravel comprises angular dolerite. Refusal on likely	FILL	CI

Depth (m)	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
0.0		0.6	
0.5		0.0	
1.0–1.1	BH01 1.0-1.1	0.1	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1
1.5–1.6	BH01 1.5-1.6	0.5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2.0		0.1	
2.5–2.6	BH01 2.5-2.6	0.4	1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 1 1 1 1 1 1
3.0		0.0	
3.5–3.6	BH01 3.5-3.6	0.0	1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1
4.0		0.0	
4.4–4.5	BH01 4.4-4.5	0.1	1 1 1 1 1 1 1 1 2 2 1 1 1 3 1 2 1 1 1 1 1

ELEVATION (metres): 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0, 52.8, 52.6, 52.4

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH02

EASTING	525367.355	GDA94	
NORTHING	5254107.407	GDA94	
BORING LOCATION	New Town	ELEVATION AND DATUM	57.18 m AHD
DRILLING CONTRACTOR	Geo-Environmental Solutions P/L	TOTAL DEPTH (m)	4.1
EQUIPMENT/METHOD	AMS 9110Ag Probe; LOGGED BY S. Joyce	NATURAL (m)	WATER TABLE (m)
SAMPLING	Direct Push	DATE	23/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	ELEVATION (metres)
0.0–0.1	FILL: Asphalt	FILL			0.1		57.0
0.1–0.4	FILL: Sandy GRAVEL: Pale yellow brown, fine to coarse grained, medium dense, non-plastic, dry. Gravel comprises dolerite	FILL	SP				56.8
0.5–0.6	FILL: Sandy gravelly CLAY: Pale brown, moist, stiff, medium plasticity. Gravel is rounded and angular siltstone& dolerite, bric	FILL	CI	BH02 0.5-0.6	0.1	1 2 1 1 1 / 1 1 2 1 2 / 1 1 / 2 / 2 / 1 1 1 / 1 1 1 1	56.6
1.0–1.1				BH02 1.0-1.1	0.0	1 2 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 2 / 1 1 1 / 1 1 1 1	56.2
1.5					0.1		55.6
2.0–2.1				BH02 2.0-2.1	0.0	1 2 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1	55.2
2.8–2.9				BH02 2.8-2.9	0.1	1 2 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1	54.4
3.5					0.1		53.6
4.0–4.1				BH02 4.0-4.1	0.0	1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1	53.2

MONITORING WELL

Approximate groundfloor level marked at 1.4 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH03**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254105.348	GDA94
	NORTHING: 525380.051	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.054 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4	
EQUIPMENT/METHOD: AMS 9110Ag Probe; LOGGED BY S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 23/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
0.0–0.1	FILL: Asphalt	FILL			0.0	
0.1–1.0	FILL: Sandy gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is rounded and angular siltstone, brick and cha	FILL	CL	BH03 0.5-0.6	0.2	Level 2 exceedances
1.0–2.3	FILL: GRAVEL with Clay: brown/dark grey, slightly moist, dense. Contains fragments of Slate	FILL	GW	BH03 1.0-1.1	0.2	Level 2 exceedance
					0.1 (2.0 m)	
2.3–4.0	FILL: CLAY with gravel: Dark brown, stiff, moist, high plasticity. Contains gravels of dolerite, siltstone, brick, glass, charc	FILL		BH03 2.5-2.6	0.2	Level 3 exceedance
				BH03 3.0-3.1	0.3	Level 2 and Level 3 exceedances
					0.2 (3.6 m)	
				BH03 3.9-4.0		Level 3 exceedance

ELEVATION (metres): 57.0 at 0.0 m to 53.2 at 3.8 m. Approximate groundfloor level at 1.3 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1 | Level 2 | Level 3 | Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

Log of BH04

PROJECT	48-52 New Town Road ESA
CLIENT	Swanbury Penglase Architects
EASTING	5254104.766 GDA94
NORTHING	525361.385 GDA94
BORING LOCATION	New Town
ELEVATION AND DATUM	57.233 m AHD
DRILLING CONTRACTOR	Geo-Environmental Solutions P/L
TOTAL DEPTH (m)	4.6
EQUIPMENT/METHOD	AMS 9110Ag Probe
LOGGED BY	S. Joyce
NATURAL (m)	
WATER TABLE (m)	
SAMPLING	Direct Push
DATE	23/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Asphalt	FILL	
0.1–1.4	FILL: Gravelly sandy CLAY: brown/trace yellow, moist, stiff, medium plasticity. Gravel comprises angular dolerite & mudstone	FILL	CI
1.4–2.3	FILL: Clayey Sandy GRAVEL: grey/brown, dry, dense, brick fragments	FILL	GW
2.3–2.7	FILL: Sandy gravelly CLAY: Pale brown, moist, stiff, medium plasticity. Gravel is rounded and angular siltstone& dolerite, bric	FILL	CI
2.7–4.6	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, moist. Gravel comprises angular dolerite. Refusal on likely	FILL	CI

Field PID (ppm) readings of 0.0 were also recorded at 0.0, 1.0, 2.0 and 4.0 m.

Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
BH04 0.5-0.6	0.0	1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 2 / 3 / 1 1 1 / 1 1 1 1
BH04 1.5-1.6	0.0	1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 4 / 1 2 1 / 1 1 1 1
BH04 2.5-2.6	0.0	1 2 1 1 1 / 1 1 1 2 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1
BH04 3.0-3.1	0.0	1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 2 / 1 1 1 / 1 1 1 1
BH04 3.5-3.6	0.0	1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 2 / 1 1 1 / 1 1 1 1
BH04 4.5-4.6	0.0	1 1 1 1 1 / 1 1 1 2 1 / 1 1 / 1 / 2 / 1 1 1 / 1 1 1 1

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

MONITORING WELL

ELEVATION (metres): 57.2 – 52.8

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL (at 1.4 m / 55.8 m)

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH05**
CLIENT: Swanbury Penglase Architects	EASTING: 525356.395	GDA94
	NORTHING: 5254082.471	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.58 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4.6	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push	DATE: 23/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	ELEVATION (metres)
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		0.0		57.4
0.2–1.2	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occational gravels of dolerite, si	FILL	CI		0.0		57.2 – 56.6
1.0				BH05 1.0-1.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1	56.6
1.2–4.5	FILL: Gravelly sandy CLAY: Yellow-brown, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite & sandston	FILL	CI		0.0		56.4 – 53.2
1.8 ✕							55.8 ✕
2.0				BH05 2.0-2.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1	55.6
2.5					0.0		55.0
3.0				BH05 3.0-3.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 1 1 1 1 1 1	54.6
3.5					0.0		54.0
4.0				BH05 4.0-4.1	0.0	1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 1 1 1 1 1 1	53.6
4.5–4.6	FILL: Cobble - Sandstone: pale yellow-grey, dry, moderate rock	FILL	GP	BH05 4.5-4.6	0.2	1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1	53.0

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH06**
CLIENT: Swanbury Penglase Architects	EASTING: 5254075.47	**GDA94**
	NORTHING: 525341.576	**GDA94**
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.277 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.4	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 23/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0					0.1		
0.1	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC				57.2
0.2	FILL: Sandy CLAY with gravels: Dark brown, firm, moist, medium plasticity. Contains gravels of dolerite	FILL	CI	BH06 0.2-0.3			
0.3							57.0
0.4	FILL: GRAVEL: blue-grey, moist, dense to Refusal	FILL	GP		0.2		

IB105 Analyte IL Exceedances (sample BH06 0.2-0.3)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH07**
CLIENT: Swanbury Penglase Architects		EASTING: 5254072.05 GDA94
		NORTHING: 525342.579 GDA94
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.482 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 2.3
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 23/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		6.9			57.4
0.2–1.2	FILL: Sandy CLAY trace gravels: Dark brown, firm, moist, medium to high plasticity. Contains occational gravels of dolerite	FILL	CI	BH07 1.0-1.1	0.0; 2.2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.2 – 56.4
1.2–2.3	FILL: Clayey Sandy GRAVEL: grey, dry, dense to Refusal	FILL	GW	BH07 2.2-2.3	0.1; 0.2; 2.1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		56.2 – 55.2

Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

✖ Approximate groundfloor level at 1.7 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1 [2] Level 2 [3] Level 3 [4] Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH08

EASTING: 525386.867	GDA94	
NORTHING: 5254073.937	GDA94	
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.78 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4.6	
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): / WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.2	FILL: CLAYEY SAND: dark brown, moist, medium dense, trace gravels	FILL	SC		0.0
0.2–4.6	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite	FILL	CI		
0.5					0.0
1.0				BH08_1.0-1.1	0.0
1.5					0.0
2.0				BH08_2.0-2.1	0.0
2.5				BH08_2.5-2.6	0.0
3.0					0.0
3.5					0.0
4.0					0.0
4.5				BH08_4.5-4.6	0.0

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

MONITORING WELL

ELEVATION (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		Log of BH09
CLIENT: Swanbury Penglase Architects	EASTING: 5254043.755	GDA94
	NORTHING: 525388.559	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 58.83 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 6.4	
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete slab	FILL	P
0.1–4.6	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, stiff, medium plasticity, slightly moist. Gravel comprises angular dolerite	FILL	CI
4.6–6.2	FILL: Gravelly sandy CLAY : Dark brown, moist to wet, stiff, medium plasticity. Gravel comprises dolerite.	FILL	CI
6.2–6.3	Sandy SILTY CLAY: pale brown, moist, stiff, medium to high plasticity	Q	CH
6.3–6.4	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered.	Rk	

Laboratory Sample	Field PID (ppm)
	0.3
	0.0
BH09_1.0-1.1	5.8
	0.2
	0.0
BH09_2.5-2.6	0.0
	0.1
	0.1
	0.0
BH09_4.5-4.6	0.5
	0.1
BH09_6.0-6.1	0.2
	0.2

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium III, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Asbestos, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

MONITORING WELL | ELEVATION (metres)

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH10**
CLIENT: Swanbury Penglase Architects	EASTING: 525391.194 **GDA94**	NORTHING: 5254030.284 **GDA94**
BORING LOCATION: New Town		ELEVATION AND DATUM: 59.53 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 5.5
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/07/2018	

Material Description	Geology	USCS Lithology
FILL: Asphalt	FILL	F
FILL: Concrete slab	FILL	
FILL: Sandy Gravelly CLAY: Pale brown, moist, stiff, low to medium plasticity. Gravel is rounded and angular dolerite	FILL	CI
FILL: Sandy SILTY CLAY: pale brown, moist, stiff, medium plasticity	FILL	CI
FILL: Sandy CLAY trace gravels: Dark brown, moist, stiff, medium plasticity.	FILL	CI
Silty SANDY CLAY: pale brown, moist, stiff, medium plasticity	RV	CI
Sandy CLAYEY SILT: pale brown, wet, loose, 'puggy', fine grained sand	RV	ML
MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey and pale yellow brown, low strength, distinctly weathered,		

Depth (m)	Laboratory Sample	Field PID (ppm)
0.5		0.0
1.0	BH10_1.0-1.1	0.0
1.5		0.0
2.0		0.0
2.5		0.0
3.0	BH10_3.0-3.1	0.1
3.5		0.1
4.0		0.1
4.5		0.0
5.0	BH10_5.0-5.1	0.9

IB105 Analyte IL Exceedances

MONITORING WELL

ELEVATION (metres)

Tas EPA IB105 CLASSIFICATION: Level 1 | Level 2 | Level 3 | Level 4 | SAMPLE IN EXCAVATION | ✗ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH11

EASTING	5254019.694	GDA94
NORTHING	525386.54	GDA94
ELEVATION AND DATUM	59.837 m AHD	
TOTAL DEPTH (m)	3.4	
NATURAL (m)		WATER TABLE (m)

BORING LOCATION: New Town
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
EQUIPMENT/METHOD: AMS 9110Ag Probe
LOGGED BY: S. Joyce
SAMPLING: Direct Push
DATE: 24/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology
0.0–0.1	FILL: Concrete slab	FILL	P
0.1–0.4	FILL: CLAYEY GRAVEL: brown, moist, medium dense. Contains occasional gravels of dolerite, siltstone, charcoal fragments.	FILL	GC
0.4–3.2	FILL: Gravelly sandy CLAY: brown/yellow-brown/grey, slightly moist, stiff, medium plasticity. Contains gravels of siltstone, ch	FILL	CI
3.2–3.4	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered.	Rv	

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Depth	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances (as printed, left to right)
0.5		0.5	
1.0	BH11_1.0-1.1	0.6	1 1 1 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1
1.6		0.8	
2.0	BH11_2.0-2.1	0.8	1 1 2 1 1 1 1 1 1 1 1 1 1 3 1 1 1 1 1 1 1
2.5	BH11_2.5-2.6	1.0	1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 1 1 1 1 1 1
3.0		1.0	
3.3	BH11_3.3-3.4	0.9	1 1 2 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1

MONITORING WELL

ELEVATION (metres): 59.8, 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH12**
CLIENT: Swanbury Penglase Architects	EASTING: 5254028.704	**GDA94**
	NORTHING: 525384.995	**GDA94**
BORING LOCATION: New Town	ELEVATION AND DATUM: 59.565 **m AHD**	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 4.5	
EQUIPMENT/METHOD: AMS 9110Ag Probe — LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 24/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.2	FILL: Concrete slab		P		
0.6					3.3
1.0				BH12_1.0-1.1	2.0
1.6					0.5
0.2–3.5	FILL: Sandy Gravelly CLAY: brown, moist, stiff, medium plasticity. Contains gravels of siltstone, charcoal fragments.	FILL	CI		
2.0				BH12_2.0-2.1	1.6
2.5				BH12_2.5-2.6	1.6
3.0					1.5
3.5				BH12_3.5-3.6	1.5
3.5–4.4	Silty SANDY CLAY: pale brown, moist, stiff, medium plasticity	Rv	CI		
4.1					0.4
4.4–4.5	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength.				

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

MONITORING WELL

ELEVATION (metres): 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH13

EASTING:	5254008.024	GDA94
NORTHING:	525398.145	GDA94

BORING LOCATION: New Town
ELEVATION AND DATUM: 60.436 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
TOTAL DEPTH (m): 3.2
EQUIPMENT/METHOD: AMS 9110Ag Probe
LOGGED BY: S. Joyce
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 25/07/2018

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL: Asphalt	FILL						60.4
0.1–0.2	FILL: Concrete slab	FILL	P					60.2
0.2–0.8	FILL: Sandy clayey GRAVEL: Brown, medium dense, fine to coarse grained, moist, low plasticity.	FILL	GC		0.9			60.0 / 59.8
0.8–1.1	FILL: Layer of brick and concrete.	FILL		BH13 1.0-1.1	0.7	1 1 1 1 1 1 1 2 1 1 1 1 1 4 1 2 1 1 1 1 1		59.6 / 59.4
1.1–1.75	FILL: Sandy CLAY: Brown, firm becoming stiff, moist, high plasticity. Contains occasional fragments of brick.	FILL	CH	BH13 1.5-1.6	0.8	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		59.2 / 59.0 / 58.8
1.75–1.9	SILT: Pale brown, stiff, non-plastic, moist.	RW	ML					58.6
1.9–2.5	Silty CLAY: Pale brown mottled orange, stiff, medium to high plasticity, moist.	RW	CH	BH13 2.0-2.1	0.1	1 1 1 1 1 1 1 1 2 1 1 1 1 2 1 1 1 1 1 1 1		58.4 / 58.2 / 58.0
2.5–3.2	SANDSTONE INTERBEDDED WITH MUDSTONE: Fine to medium grained, pale grey brown, medium strength, slightly weathered.	RW						57.8 / 57.6 / 57.4

Tas EPA IB105 CLASSIFICATION: Level 1 | [2] Level 2 | [3] Level 3 | [4] Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS	PROJECT: 48-52 New Town Road ESA CLIENT: Swanbury Penglase Architects	**Log of BH14** EASTING: 5254002.799 **GDA94** NORTHING: 525363.871 **GDA94**
BORING LOCATION: New Town		ELEVATION AND DATUM: 57.758 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L		TOTAL DEPTH (m): 0.5
EQUIPMENT/METHOD: AMS 9110Ag Probe	LOGGED BY: S. Joyce	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 25/07/2018	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P					
0.1–0.4	FILL: CLAYEY GRAVEL: brown, moist, medium dense, Contains occasional gravels of dolerite, siltstone, charcoal fragments.	FILL	GC		1.3			57.6
0.4–0.5	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered.			BH14 0.4-0.5	3.3	1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 2 1 1 1 1 1		57.4

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✗ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH15

EASTING:	5254012.204	GDA94
NORTHING:	525357.875	GDA94

BORING LOCATION: New Town
ELEVATION AND DATUM: 57.707 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
TOTAL DEPTH (m): 0.65
EQUIPMENT/METHOD: AMS 9110Ag Probe
LOGGED BY: S. Joyce
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 25/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances (Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum(TEQ), PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab		P					57.6
0.2–0.5	FILL: CLAYEY GRAVEL: brown, moist, medium dense. Contains occational gravels of dolerite, siltstone, charcoal fragments.	FILL	GC		1.8			57.4
0.6	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered.			BH15 0.55-0.65	0.7	1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1		57.2

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH16

EASTING:	5254017.943	GDA94
NORTHING:	525350.1	GDA94

BORING LOCATION: New Town
ELEVATION AND DATUM: 57.704 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
TOTAL DEPTH (m): 0.4
EQUIPMENT/METHOD: AMS 9110Ag Probe
LOGGED BY: S. Joyce
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 25/07/2018

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P					57.6
0.2	FILL: GRAVEL: brown/grey, slightly moist, dense	FILL	GC		0.4			
0.3–0.4	FILL: CLAYEY GRAVEL: brown, moist, medium dense. Contains occational gravels of dolerite, siltstone, charcoal fragments	FILL	GC	BH16 0.3-0.4	1.2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.4

Tas EPA IB105 CLASSIFICATION: Level 1, [2] Level 2, [3] Level 3, [4] Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH17**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254042.699	GDA94
	NORTHING: 525330.158	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.587 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 25/07/2018		

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab		P					
0.1–0.5	FILL: Gravelly sandy CLAY: brown/grey, slightly moist, stiff, medium plasticity	FILL	CI		0.3			57.4, 57.2
0.5–1.1	Sandy SILTY CLAY: pale brown, moist, stiff, medium to high plasticity	CI	CH	BH17 0.5-0.6	0.6	1 1 1 1 1 1 1 1 1 1 1 1 1 4 1 2 1 1 1 1 1		57.0, 56.8, 56.6
					0.9			
1.1–1.2	SANDSTONE: Quartz rich, fine to medium grained, pale grey brown, medium strength, slightly weathered.	Rw		BH17 1.1-1.2	1.0	1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		56.4

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH18**
CLIENT: Swanbury Penglase Architects	EASTING: 5254054.073	**GDA94**
	NORTHING: 525344.624	**GDA94**
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.718 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 3.6	
EQUIPMENT/METHOD: AMS 9110Ag Probe; LOGGED BY: S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 25/07/2018		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P					57.6
0.5	FILL: Sandy Gravelly CLAY: brown, moist, stiff, medium plasticity. Contains gravels of siltstone, brick & charcoal fragments.	FILL	CI	BH18 0.5-0.6	0.8	1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		57.2
1.0					0.8			56.6
1.5	FILL: Sandy CLAY trace gravels: Dark brown, moist (wet at 3.2m), stiff, medium plasticity. Refusal on likely cobble	FILL	CI	BH18 1.5-1.6	1.1	1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 1 1 1 1 1 1		56.2
1.9 ✖								55.8 ✖
2.0					0.8			55.6
2.5				BH18 2.5-2.6	0.9	1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1		55.2
2.7				BH18 2.7-2.8	1.2	1 2 1 1 1 1 1 2 1 2 1 1 2 2 1 1 1 1 1 1 1		55.0
3.1				BH18 3.1-3.2	0.9	1 1 1 1 1 1 1 2 1 2 1 1 2 2 1 1 1 1 1 1 1		54.6
3.5				BH18 3.5-3.6	0.8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		54.2

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH19

EASTING	5254044.768	GDA94
NORTHING	525343.195	GDA94

BORING LOCATION: New Town
ELEVATION AND DATUM: 57.694 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
TOTAL DEPTH (m): 2.2
EQUIPMENT/METHOD: AMS 9110Ag Probe LOGGED BY S. Joyce
NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push DATE: 25/07/2018

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete slab		P					57.6
0.2–2.1	FILL: Sandy CLAY trace gravels: Dark brown, moist (perched water at 1.2m), stiff, medium plasticity	FILL	CI		0.8			
1.0–1.1				BH19 1.0-1.1	0.8	1		
1.6					0.8			
2.1–2.2	MUDSTONE INTERBEDDED WITH SILTSTONE: Fine grained, dark grey-brown, low strength, distinctly weathered.	R		BH19 2.1-2.2	1.1	1		55.6

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4; SAMPLE IN EXCAVATION; ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH20**
CLIENT: Swanbury Penglase Architects	EASTING: 5254035.024	GDA94
	NORTHING: 525338.362	GDA94
BORING LOCATION: New Town	ELEVATION AND DATUM: 57.732 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Tasmanian Drilling Services LOGGED BY S. Joyce	NATURAL (m):	WATER TABLE (m):
SAMPLING: Hollow Stem Auger DATE: 30/07/2018		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete slab	FILL	P				57.6
0.1–0.5	FILL: Gravelly sandy CLAY: Pale grey, firm, fine to medium grained, angular, moist to wet, high plasticity. Gravel comprises do	FILL	CH				57.4
0.5–1.2	FILL: Sandy CLAY with gravel: Dark brown, firm, moist, high plasticity. Contains fine to coarse angular gravels of brick, dole	FILL	CH	BH20 0.5-0.6; BH20 1.0-1.1			57.2–56.6
1.2–2.7	SANDSTONE: Fine grained, pale yellow brown, low to medium strength, slightly weathered.	Rv					56.4–55.0
2.7–3.0	SANDSTONE: Fine grained, pale yellow brown, low strength, distinctly weathered.						54.8

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9

Elevation scale: 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2, 55.0, 54.8

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH21**
CLIENT: Swanbury Penglase Architects		EASTING: 5254116.448 **GDA94**
		NORTHING: 525378.118 **GDA94**
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 56.821 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 4.2
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/10/18	

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Asphalt	FILL						56.8
0.1–0.8	FILL: Sandy Gravelly CLAY: Pale grey brown, firm, moist, low plasticity. Gravel is angular siltstone & Dolerite, brick and char	FILL	CL	BH21 0.5-0.6		1 1 1 1 1	1 1 1 1 1	1 1	1	2	1 1 2	1 1 1 1		
0.8–4.2	FILL: Gravelly Sandy CLAY: dark brown, firm to stiff, moist, medium to high plasticity. Gravel is angular siltstone & Dolerite.	FILL	CI	BH21 1.5-1.6		1 1 1 1 1	1 1 1 1 1	1 1	1	2	1 1 1	1 1 1 1		
				BH21 2.5-2.6		1 1 1 1 1	1 1 1 1 1	1 1	1	2	1 1 1	1 1 1 1		
				BH21 3.5-3.6		1 1 1 1 1	1 1 1 1 1	1 1	1	2	1 1 1	1 1 1 1		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 ✕, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1

Elevation scale: 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✕, 55.6, 55.4, 55.2, 55.0, 54.8, 54.6, 54.4, 54.2, 54.0, 53.8, 53.6, 53.4, 53.2, 53.0, 52.8

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH22**
CLIENT: Swanbury Penglase Architects		EASTING: 525369.105 GDA94
		NORTHING: 5254118.419 GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 56.94 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 3.7
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 24/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Asphalt	FILL						
0.1–1.0	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity. Gravel is angular siltstone & dolerite, brick fragments	FILL	CI	BH22 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		56.4
1.0–1.35	FILL: Sandy GRAVEL; pale yellow-brown, slightly moist to dry, dense, fine to course angular Dolerite gravel	FILL	GC					55.8
1.35–1.65	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm), lense of brick fragments at bas	FILL	CH	BH22 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		55.4
1.65–1.95	FILL: Sandy CLAY trace gravels; dark brown, moist, stiff, medium to high plasticity. Contains occational gravels of dolerite, s	FILL	CH					
1.95–3.7	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm) EOH	FILL	GC	BH22 2.5-2.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		54.4
				BH22 3.4-3.5		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		53.4

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH23

EASTING:	5254094.233	GDA94
NORTHING:	525368.937	GDA94
ELEVATION AND DATUM:	57.361 m AHD	
TOTAL DEPTH (m):	5.3	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania
DRILLING CONTRACTOR: Geo-Environmental Solutions
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer
SAMPLING: Direct Push DATE: 24/10/18

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum(TEQ), PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Asphalt	FILL						57.2
0.1–0.6	FILL: Gravelly Clayey SAND; brown, slightly moist, fine to coarse grained, medium dense, non-plastic, Gravel comprises dolerite	FILL	SW	BH23 0.5-0.6		1 1 1 1 1 · 1 1 1 1 1 · 1 1 · 1 · 2 · 1 1 2 · 1 1 1 1		57.0 – 56.8
0.6–1.1	FILL: Sandy Clayey GRAVEL; red/grey/brown, dry, dense, fine to medium angular gravel (2-10mm), brick fragments	FILL	GC					56.6 – 56.4
1.1–1.6	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity, Gravel is angular siltstone & dolerite, brick fragments	FILL	CI	BH23 1.5-1.6		1 1 1 1 1 · 1 1 1 1 1 · 1 1 · 2 · 2 · 1 1 2 · 1 1 1 1		56.2 – 55.8
1.6–2.4	FILL: Sandy Clayey GRAVEL; red/grey/brown, dry, dense, fine to medium angular gravel (2-10mm), brick fragments	FILL	GC					55.6 – 55.0
2.4–4.1	FILL: Gravelly Sandy CLAY; dark brown, firm to stiff, moist, medium to high plasticity. Gravel is angular siltstone & Dolerite.	FILL	CI	BH23 2.5-2.6; BH23 3.5-3.6		2.5-2.6: 1 1 1 1 1 · 1 1 1 1 1 · 1 1 · 1 · 2 · 1 3 2 · 1 1 1 1; 3.5-3.6: 1 2 1 1 1 · 1 1 1 1 1 · 1 1 · 2 · 2 · 1 1 2 · 1 1 1 1		54.8 – 53.4
4.1–5.3	FILL: Sandy Gravelly CLAY; Pale brown, moist, stiff, medium plasticity, Gravel is angular siltstone & dolerite. EOH	FILL	CI	BH23 4.5-4.6		1 1 1 1 1 · 1 1 1 2 1 · 1 1 · 1 · 2 · 1 1 2 · 1 1 1 1		53.2 – 52.2

Approximate groundfloor level marked at 1.6 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1 · [2] Level 2 · [3] Level 3 · [4] Level 4 · SAMPLE IN EXCAVATION · ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

Log of BH24

PROJECT	48-52 New Town Road ESA
CLIENT	Swanbury Penglase Architects
EASTING	5254096.239 GDA94
NORTHING	525357.19 GDA94
BORING LOCATION	New Town, Tasmania
ELEVATION AND DATUM	57.3 m AHD
DRILLING CONTRACTOR	Geo-Environmental Solutions
TOTAL DEPTH (m)	3.6
EQUIPMENT/METHOD	AMS 9110Ag
LOGGED BY	A. Plummer
NATURAL (m)	
WATER TABLE (m)	
SAMPLING	Direct Push
DATE	24/10/18

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Silty SAND; dark brown, trace fine grave, dry, meidum dense	FILL	SM					57.2
0.2–0.7	FILL: Sandy Clayey GRAVEL; grey/brown, dry, very dense, fine to coarse angular gravel (2-40mm)	FILL	GC	BH24 0.5-0.6		1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 2 / 1 1 2 / 1 1 1 1		56.8
0.7–1.7	FILL: Gravelly Sandy CLAY: pale yellow-brown, slightly moist, very stiff, medium plasticity. Gravel is angular siltstone & Dole	FILL	CI	BH24 1.5-1.6		1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1		55.8
1.7–3.6	FILL: Gravelly Sandy CLAY: grey/brown, slightly moist, very stiff, medium plasticity. Gravel is angular siltstone & Dolerite. E	FILL	CI	BH24 2.5-2.6		1 1 1 1 1 / 1 1 1 1 1 / 1 1 / 1 / 1 / 1 1 1 / 1 1 1 1		54.8
				BH24 3.3-3.4		1 1 1 1 1 / 1 1 1 2 1 / 1 1 / 2 / 2 / 1 1 1 / 1 1 1 1		54.0

✕ at 1.5 m depth (55.8 m elevation)

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH25

EASTING	5254080.711	GDA94
NORTHING	525350.801	GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 57.587 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 5.8

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 24/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample
0.0–0.2	FILL: Silty SAND; dark brown, trace fine grave, dry, meidum dense	FILL	SM	
0.2–1.2	FILL: Sandy Clayey GRAVEL; grey/brown/'pink', dry, very dense, fine to coarse angular gravel (2-40mm), red brick fragments	FILL	GC	BH25 0.5-0.6
1.2–4.1	FILL: Gravelly Sandy CLAY: grey/brown, slightly moist, very stiff, medium plasticity overall. Gravel is angular siltstone & Dol	FILL	CI	BH25 1.5-1.6; BH25 2.5-2.6; BH25 3.5-3.6
4.1–5.8	FILL: Mixed Gravelly Sandy CLAY: red/grey/dark brown, slightly moist, very stiff, medium plasticity overall. Gravel is angular	FILL	CI	BH25 4.5-4.6; BH25 5.5-5.6

Field PID (ppm)

IB105 Analyte IL Exceedances

MONITORING WELL

ELEVATION (metres)

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✘ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH26**
CLIENT: Swanbury Penglase Architects		EASTING: 5254037.771 **GDA94**
		NORTHING: 525329.284 **GDA94**
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.605 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 0.7
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m) WATER TABLE (m)
SAMPLING: Direct Push	DATE: 30/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL: Concrete		P					57.6
0.1–0.4	FILL: Clayey GRAVEL, dark orange-brown, slightly moist, very dense, fine to coarse angular Dolerite gravel	FILL	GC	BH26 0.1-0.2		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.4
0.4–0.6	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Q	CH	BH26 0.5-0.6		1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.2
0.6–0.7	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rm						57.0

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

Log of BH27

PROJECT: 48-52 New Town Road ESA		EASTING: 5254040.377	GDA94
CLIENT: Swanbury Penglase Architects		NORTHING: 525338.728	GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.729 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 2	
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push	DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P				
0.1–0.9	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH27 0.1-0.2; BH27 0.5-0.6			57.6, 57.4, 57.2, 57.0
0.9–1.0	FILL: Sandy GRAVEL; orange, slightly moist, dense	FILL	GW				56.8
1.0–1.3	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH27 1.0-1.1			56.6
1.3–1.4	Gravelly SILT: low plasticity, dark grey/black, moist, stiff		ML				56.4
1.4–1.9	Gravelly Silty CLAY: medium plasticity, pale brown-grey, moist, very stiff, gradual transition to	Q	CI	BH27 1.5-1.6			56.2, 56.0
1.9–2.0	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	RW		BH27 1.9-2.0			55.8

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH27 0.1-0.2	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	1		1	1	1	1		
BH27 0.5-0.6	2	1	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH27 1.0-1.1	1	1	1	1	1		1	1	1	1	1		1	1			1			2		1	1	2		1	1	1	1		
BH27 1.5-1.6	1	1	2	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		
BH27 1.9-2.0	1	1	1	1	1		1	1	1	2	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT	Log of BH28	
48-52 New Town Road ESA	EASTING: 5254047.014	GDA94
CLIENT: Swanbury Penglase Architects	NORTHING: 525333.614	GDA94

BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.992 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.4
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m): — WATER TABLE (m):
SAMPLING: Direct Push — DATE: 30/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P					
0.1–1.1	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH28 0.1-0.2		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.8
				BH28 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		57.4
				BH28 1.0-1.1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.0
1.1–1.2	FILL: Woodchips, black, moist, loose	FILL						
1.2–1.3	Gravelly SILT: low plasticity, dark grey/black, moist, stiff	Q	ML	BH28 1.2-1.3		1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 1 2 1 1 1 1		56.8
1.3–1.4	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	T						56.6

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH29**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254003.063	**GDA94**
	NORTHING: 525381.977	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 59.713 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 2.2	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 30/10/18		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P					
0.1–1.3	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH29 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		
1.3–1.6	FILL: Sandy CLAY; medium plasticity, dark brown/black, slightly moist, very stiff	FILL	CI	BH29 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
1.6–1.7	FILL: Brick fragments; red, dry, dense	FILL						
1.7–1.9	FILL: Sandy GRAVEL; orange, slightly moist, dense	FILL	GW					
1.9–2.1	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Cl	CH	BH29 2.1-2.2		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
2.1–2.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

Depth scale (m): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1

Elevation scale (m): 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 [2] Level 2 [3] Level 3 [4] Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

GES GEO-ENVIRONMENTAL SOLUTIONS	PROJECT: 48-52 New Town Road ESA CLIENT: Swanbury Penglase Architects	**Log of BH30** EASTING: 5254000.95 **GDA94** NORTHING: 525372.89 **GDA94**
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 58.412 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 0.4
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 30/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL: Concrete	FILL	P					58.4
0.1–0.3	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI					58.2
0.3–0.4	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	CI	CH	BH30 0.3-0.4		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
0.4	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCB's, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH31

EASTING:	5254015.916	GDA94
NORTHING:	525314.878	GDA94

BORING LOCATION: New Town, Tasmania
ELEVATION AND DATUM: 60.523 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions
TOTAL DEPTH (m): 1.9
EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 30/10/18

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum(TEQ), PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen							
0.1–1.0	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH31 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
1.0–1.8	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	RWl		BH31 1.5-1.6		1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8
Elevation scale: 60.4, 60.2, 60.0, 59.8, 59.6, 59.4, 59.2, 59.0, 58.8

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✘ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH32**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254009.27	GDA94
	NORTHING: 525321.543	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 60.816 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 30/10/18		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen							60.8
0.1–1.0	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH32 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		60.6, 60.4, 60.2, 60.0
1.0–1.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rwl						59.8

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH33

EASTING:	5254025.94	GDA94
NORTHING:	525321.493	GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 59.262 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 1

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen							59.2
0.1–0.5	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI					59.0
0.5–0.8	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Q	CH	BH33 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		58.8 / 58.6
0.8–1.0	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rwr						58.4

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6-C9, TPH C10-C36, PAH Sum(TEQ), PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH34**	
CLIENT: Swanbury Penglase Architects		EASTING: 525330.254	GDA94
		NORTHING: 5254019.551	GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 59.42 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push	DATE: 30/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Bitumen						59.4
0.1–0.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH34 0.5-0.6			59.2, 59.0
0.6–1.2	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff	Cl	CH				58.8, 58.6, 58.4
1.2	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered						

IB105 Analyte IL Exceedances (BH34 0.5-0.6)

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
1	2	1	1	1		1	1	1	1	1		1	1			1			1		1	1	1		1	1	1	1		

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT	48-52 New Town Road ESA
CLIENT	Swanbury Penglase Architects
Log of BH35	
EASTING	5254064.796 GDA94
NORTHING	525336.154 GDA94
BORING LOCATION	New Town, Tasmania
ELEVATION AND DATUM	57.373 m AHD
DRILLING CONTRACTOR	Geo-Environmental Solutions
TOTAL DEPTH (m)	2
EQUIPMENT/METHOD	AMS 9110Ag
LOGGED BY	A. Plummer
NATURAL (m)	
WATER TABLE (m)	
SAMPLING	Direct Push
DATE	30/10/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–1.9	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI					57.2 – 55.4
0.5–0.6				BH35 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		
1.5–1.6				BH35 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 ✕, 1.7, 1.8, 1.9

Elevation scale: 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8 ✕, 55.6, 55.4

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: ☐ Level 1, [2] Level 2, [3] Level 3, [4] Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH36**
CLIENT: Swanbury Penglase Architects	EASTING: 525343.65	GDA94
	NORTHING: 5254033.037	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.72	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1,3	
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m) / WATER TABLE (m)
SAMPLING: Direct Push	DATE: 31/10/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Bitumen		P					57.6
0.2–0.8	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH36 0.5-0.6		1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1		57.4, 57.2, 57.0
0.8–1.3	Sandy Silty CLAY; high plasticity, dark grey, moist, very stiff	Cl	CH					56.8, 56.6
1.3	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH37

EASTING	525355.025	GDA94
NORTHING	5254034.878	GDA94
ELEVATION AND DATUM	57.77	m AHD
TOTAL DEPTH (m)	3.6	
NATURAL (m)		WATER TABLE (m)

BORING LOCATION: New Town, Tasmania

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 31/10/18

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P					
0.1–2.8	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH37 0.5-0.6		1 1 1 1 1 1 1 1 1 2 1 1 2 2 1 1 2 1 1 1 1		
				BH37 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		
2.0 ✕								55.8 ✕
				BH37 2.5-2.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		
2.8–3.6	Silty Sandy CLAY; low plasticity, orange/yellow/pale brown, moist, firm to stiff, extremely weathered	CI	CL	BH37 3.5-3.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		

Depth scale: 0.0 – 3.5 m; Elevation scale: 57.6 – 54.2 m

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH38**	
CLIENT: Swanbury Penglase Architects	EASTING: 525366.493	GDA94
	NORTHING: 5254034.512	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.78 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 2.7	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 31/10/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances
0.0–0.1	FILL: Concrete		P			
0.1–2.4	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH38 0.5-0.6; BH38 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 (both samples)
2.4–2.5	Sandy Clayey SILT: low plasticity, dark grey, moist, soft	CI	ML			
2.5–2.6	Sandy Silty CLAY: high plasticity, dark grey, moist, very stiff		CH	BH38 2.5-2.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2.6–2.7	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered					

Elevation (metres): 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4; SAMPLE IN EXCAVATION; ✕ APPROXIMATE GROUNDFLOOR LEVEL (at 2.0 m)

GEO-ENVIRONMENTAL SOLUTIONS (GES)

PROJECT: 48-52 New Town Road ESA		**Log of BH39**
CLIENT: Swanbury Penglase Architects		EASTING: 5254035.33 GDA94
		NORTHING: 525378.498 GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 58.426 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 3.1
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 31/10/18	

IB105 Analyte IL Exceedances (columns): Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P					58.4
0.1–0.7	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH39 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		58.2 – 57.8
0.7–3.1	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH39 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1		57.6 – 55.4
				BH39 2.5-2.6		1 1 1 1 1 1 1 2 1 1 1 1 2 2 1 2 2 1 1 1 1		

Depth scale: 0.0 – 3.0 m; Elevation scale: 58.4 – 55.4 m. Approximate groundfloor level marked at 2.6 m depth (55.8 m).

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH40**
CLIENT: Swanbury Penglase Architects	EASTING: 5254036.898	GDA94
	NORTHING: 525385.824	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 59.048 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 4	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 31/10/18		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Copper, Cobalt, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Tin, Zinc, Aldrin+Dieldrin, DDT etc, Benzo(a)pyrene, Phenol, TPH C6 - C9, TPH C10 - C36, PAH Sum/TEQ, PCBs, Benzene, Toluene, Ethylbenzene, Total Xylenes, Cyanide, Fluoride

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P					59.0
0.1–4.0	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC					
0.5–0.6				BH40 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 3 2 1 1 1 1		
1.5–1.6				BH40 1.5-1.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 2 2 1 1 1 1		
2.5–2.6				BH40 2.5-2.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1		
3.2	✕							✕
3.5–3.6				BH40 3.5-3.6		1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 2 2 1 1 1 1		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9

Elevation scale: 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH41**
CLIENT: Swanbury Penglase Architects		EASTING: 525359.526 GDA94
		NORTHING: 5254017.36 GDA94
BORING LOCATION: New Town, Tasmania		ELEVATION AND DATUM: 57.75 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 0.8
EQUIPMENT/METHOD: AMS 9110Ag	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 1/11/18	

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P					
0.1–0.7	FILL: Sandy Clayey GRAVEL: dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH41 0.5-0.6		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		57.6, 57.4, 57.2, 57.0
0.8	Sandy MUDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered							

Tas EPA IB105 CLASSIFICATION: Level 1 Level 2 Level 3 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH42

EASTING:	5254020.873	GDA94
NORTHING:	525393.432	GDA94

BORING LOCATION: New Town, Tasmania
ELEVATION AND DATUM: 59.976 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions
TOTAL DEPTH (m): 3.1
EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL
0.0–0.1	FILL: Bitumen	FILL	F			
0.1–0.2	FILL: Concrete	FILL	P			
0.2–0.3	FILL: SAND; pale grey, slightly moist, loose	FILL	SP			
0.3–2.8	FILL: Gravelly Sandy CLAY: medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH42 0.5-0.6; BH42 1.5-1.6; BH42 2.5-2.6		
2.8–3.0	Silty Sandy CLAY: medium to high plasticity, grey/brown, moist, stiff	Cl	CH			
3.0–3.1	SANDSTONE: fine grained, yellow/pale brown/orange, slightly moist, low strength, extremely weathered	Rw				

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0

ELEVATION (metres): 59.8, 59.6, 59.4, 59.2, 59.0, 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6-C9	TPH C10-C36	PAH Sum/TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH42 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH42 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH42 2.5-2.6	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH43

EASTING: 5254061.419	GDA94
NORTHING: 525385.491	GDA94
ELEVATION AND DATUM: 58.43	m AHD
TOTAL DEPTH (m): 4.1	
NATURAL (m):	WATER TABLE (m):

BORING LOCATION: New Town, Tasmania
DRILLING CONTRACTOR: Geo-Environmental Solutions
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer
SAMPLING: Direct Push DATE: 1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P					58.4
0.1–0.3	FILL: SAND; pale grey, slightly moist, loose	FILL	SP					58.2
0.3–4.1	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH43 0.5-0.6; BH43 1.5-1.6; BH43 2.5-2.6; BH43 3.5-3.6				58.0 – 54.4

IB105 Analyte IL Exceedances:

Analyte	BH43 0.5-0.6	BH43 1.5-1.6	BH43 2.5-2.6	BH43 3.5-3.6
Arsenic	1	1	1	1
Barium	1	1	1	1
Beryllium	1	1	1	1
Cadmium	1	1	1	1
Chromium	1	1	1	1
Chromium VI	1	1	1	1
Copper	1	1	1	1
Cobalt	1	1	1	1
Lead	1	1	1	1
Manganese	1	1	1	1
Mercury	1	1	1	1
Molybdenum	1	1	1	1
Nickel	1	1	1	1
Selenium	1	1	1	1
Silver	1	1	1	1
Tin	1	1	1	1
Zinc	1	1	1	1
Aldrin+Dieldrin	1	1	1	1
DDT etc	1	1	1	1
Benzo(a)pyrene	2	2	2	2
Phenol	1	1	1	1
TPH C6 - C9	1	1	1	1
TPH C10 - C36	1	1	1	1
PAH Sum/TEQ	2	2	2	2
PCBs	1	1	1	1
Benzene	1	1	1	1
Toluene	1	1	1	1
EthylBenzene	1	1	1	1
Total Xylenes	1	1	1	1
Cyanide	1	1	1	1
Fluoride	1	1	1	1

Approximate groundfloor level marked at 2.6 m depth (55.8 m elevation).

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH44

PROJECT	48-52 New Town Road ESA
CLIENT	Swanbury Penglase Architects
EASTING	5254075.885 GDA94
NORTHING	525383.3 GDA94
BORING LOCATION	New Town, Tasmania
ELEVATION AND DATUM	58.908 m AHD
DRILLING CONTRACTOR	Geo-Environmental Solutions
TOTAL DEPTH (m)	3.9
EQUIPMENT/METHOD	AMS 9110Ag
LOGGED BY	A. Plummer
NATURAL (m)	
WATER TABLE (m)	
SAMPLING	Direct Push
DATE	1/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0–0.1	FILL: Concrete	FILL	P		
0.1–0.7	FILL: Gravelly Sandy CLAY; medium plasticity, pale brown/grey, slightly moist, stiff, fine to coarse angular gravel	FILL	CI	BH44 0.5-0.6	
0.7–3.8	FILL: Sandy Clayey GRAVEL; dark brown/black, slightly moist, medium dense, assorted debris including metal fragments	FILL	GC	BH44 1.5-1.6; BH44 2.5-2.6; BH44 3.5-3.6	

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6-C9	TPH C10-C36	PAH Sum/TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH44 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH44 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH44 2.5-2.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1
BH44 3.5-3.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1

MONITORING WELL

ELEVATION (metres): 58.8, 58.6, 58.4, 58.2, 58.0, 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4, 56.2, 56.0, 55.8, 55.6, 55.4, 55.2

Depth scale (metres): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1 ✕, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8

Tas EPA IB105 CLASSIFICATION: 1 Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH45**	
CLIENT: Swanbury Penglase Architects	EASTING: 5254068.651	**GDA94**
	NORTHING: 525353.053	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.763 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.6	
EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 1/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Gravelly Sandy SILT; low plasticity, dark grey/brown, dry to slightly moist, stiff	FILL	ML				57.6
0.2–0.5	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI				57.4
0.5–0.6				BH45 0.5-0.6			57.2

IB105 Analyte IL Exceedances (sample BH45 0.5-0.6):

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum/TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH46**
CLIENT: Swanbury Penglase Architects	EASTING: 5254071.27	**GDA94**
	NORTHING: 525364.124	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.763 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 1/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.3	FILL: Gravelly Sandy SILT; low plasticity, dark grey/brown, dry to slightly moist, stiff	FILL	ML				57.6
0.3–0.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH46 0.5-0.6			57.4, 57.2
0.7–1.0							57.0, 56.8

IB105 Analyte IL Exceedances (sample BH46 0.5-0.6):

Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6-C9	TPH C10-C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH47**	
CLIENT: Swanbury Penglase Architects	EASTING: 525348.989	GDA94
	NORTHING: 5254050.965	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.87 m AHD	
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.6	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 5/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete	FILL	P					57.8
0.1–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH47 0.5-0.6		see below		57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4
				BH47 1.5-1.6		see below		

IB105 Analyte IL Exceedances:

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH47 0.5-0.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1
BH47 1.5-1.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH48

EASTING:	525350.219	GDA94
NORTHING:	5254044.577	GDA94

BORING LOCATION: New Town, Tasmania

ELEVATION AND DATUM: 57.87 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 1.6

EQUIPMENT/METHOD: AMS 9110Ag

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P					57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH48 0.5-0.6; BH48 1.5-1.6				57.6–56.4

Tas EPA IB105 CLASSIFICATION: Level 1, Level 2, Level 3, Level 4, SAMPLE IN EXCAVATION, APPROXIMATE GROUNDFLOOR LEVEL

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA	**Log of BH49**	
CLIENT: Swanbury Penglase Architects	EASTING: 525354.935	**GDA94**
	NORTHING: 5254047.511	**GDA94**
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.87	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.6	
EQUIPMENT/METHOD: AMS 9110Ag — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push — DATE: 5/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P					57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH49 0.5-0.6		see below		
				BH49 1.5-1.6		see below		

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5

Elevation scale: 57.8, 57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances:

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH49 0.5-0.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
BH49 1.5-1.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1, 2 Level 2, 3 Level 3, 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA		**Log of BH50**
CLIENT: Swanbury Penglase Architects	EASTING: 525360.123	GDA94
	NORTHING: 5254046.508	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.87	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.6	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 5/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P					57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH50 0.5-0.6; BH50 1.5-1.6		see below		57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH50 0.5-0.6	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH50 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA

CLIENT: Swanbury Penglase Architects

Log of BH51

EASTING:	525358.911	GDA94
NORTHING:	5254052.724	GDA94
ELEVATION AND DATUM:	57.87	m AHD
TOTAL DEPTH (m):	1.6	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: New Town, Tasmania

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: AMS 9110Ag LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL: Concrete		P					57.8
0.2–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH51 0.5-0.6; BH51 1.5-1.6		see below		57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

IB105 Analyte IL Exceedances:

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH51 0.5-0.6	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
BH51 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 [2] Level 2 [3] Level 3 [4] Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH52

PROJECT: 48-52 New Town Road ESA	EASTING: 525358.911	GDA94
CLIENT: Swanbury Penglase Architects	NORTHING: 5254052.724	GDA94
BORING LOCATION: New Town, Tasmania	ELEVATION AND DATUM: 57.87	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.6	
EQUIPMENT/METHOD: AMS 9110Ag; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 5/11/18		

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P			57.8
0.1–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH52 0.5-0.6; BH52 1.5-1.6		57.6, 57.4, 57.2, 57.0, 56.8, 56.6, 56.4

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5

MONITORING WELL

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Copper	Cobalt	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc	Aldrin+Dieldrin	DDT etc	Benzo(a)pyrene	Phenol	TPH C6 - C9	TPH C10 - C36	PAH Sum TEQ	PCBs	Benzene	Toluene	Ethylbenzene	Total Xylenes	Cyanide	Fluoride
BH52 0.5-0.6	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BH52 1.5-1.6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tas EPA IB105 CLASSIFICATION: 1 Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: 48-52 New Town Road ESA
CLIENT: Swanbury Penglase Architects

Log of BH53

EASTING:	525360.123	GDA94
NORTHING:	5254046.508	GDA94

BORING LOCATION: New Town, Tasmania
ELEVATION AND DATUM: 57.87 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions
TOTAL DEPTH (m): 1.6
EQUIPMENT/METHOD: AMS 9110Ag
LOGGED BY: A. Plummer
NATURAL (m):
WATER TABLE (m):
SAMPLING: Direct Push
DATE: 5/11/18

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL: Concrete		P				57.8
0.1–1.6	FILL: Gravelly Silty CLAY; medium plasticity, grey/brown/black, moist, stiff	FILL	CI	BH53 0.5-0.6; BH53 1.5-1.6			57.6 – 56.4

IB105 Analyte IL Exceedances

Analyte	BH53 0.5-0.6	BH53 1.5-1.6
Arsenic	1	1
Barium	1	1
Beryllium	2	1
Cadmium	1	1
Chromium	1	1
Chromium VI	1	1
Copper	1	1
Cobalt	1	1
Lead	1	1
Manganese	2	1
Mercury	1	1
Molybdenum	1	1
Nickel	1	1
Selenium	1	1
Silver	1	1
Tin	1	1
Zinc	1	1
Aldrin+Dieldrin	1	1
DDT etc	1	1
Benzo(a)pyrene	1	1
Phenol	1	1
TPH C6 - C9	1	1
TPH C10 - C36	1	1
PAH Sum TEQ	1	1
PCBs	1	1
Benzene	1	1
Toluene	1	1
Ethylbenzene	1	1
Total Xylenes	1	1
Cyanide	1	1
Fluoride	1	1

Tas EPA IB105 CLASSIFICATION: Level 1 | 2 Level 2 | 3 Level 3 | 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

Appendix 11 Groundwater Gauging Forms

iES ENVIRONMENTAL SOLUTIONS

GROUNDWATER MONITORING LOG

NEW TOWN RD

Client:
Date/Time:
Job No:
Sampled by:

Borehole No:	MW 1 0	Easting:		Northing:	
Surface RL (m):		Estimated Bore Yield (l/m):		Weather Conditions:	Showers
Hole Depth RL (m):	0	Height of Collar (mm):		Temperature:	13 degrees
dwater Depth RL (m):		Diameter of Bore (mm):		Rainfall 7 Days (mm):	2.2mm
			(50mm/65mm)	Station:	Brighton

ments from top of collar:

Borehole Depth (m): 8.43 A
undwater Depth (m): 3.33 B
ater Column Volume: 5.1 (A-B) x F 10.2 x3 =
50mm: F=2 / 65mm: F=x3.3

Bore Water Purging:

Purging Method: 0
Sampling Method: 0
Volume to be Purged (L): 30.6
(Min. x3 Water Volume)

Cycles:	Cycle 1	Cycle 2	Cycle 3	
Start Time	3.00	3.15		DRY @ 20L+.
Finish Time	3.10	3.30		
Minutes	10	15		
Volume (L)	10	10		Total Volume Purged (L):
covery Time Minutes	5			Recovery Rate (L/m):

ter Quality Measurements:				Calibration	Comments:
Temperature (oC)	16.2	15.4			
pH (units)	7.18	8.56			
Redox Potential (mV)	208.4	181.6			
Conductivity (uS/cm)	1595	1737			
Salinity (mg/L)					
Dissolved Oxygen (%)					
Dissolved Oxygen (mg/L)					
Turbidity	very	—			
Odour	slight	—			
Colour	br	—			
Sheen	slight	—			

g Details:

Sample Number:
Sampling Time:
Sample Bottles: Total No.

1000mL plastic (non-pres)	x1 Green	250mL plastic (Cd Nitrate)	x1 Blue /Add NaOH
500mL amber glass (non-pres)	x1 Orange	125mL plastic (sulph acid)	x1 Purple
40mL amber glass (sulph acid)	x2 Maroon	60mL plastic (non-pres)	x2 Red/Green
40mL amber glass (sulph acid)	x1 Purple	600mL plastic (Na bisulph)	x1 Grey

General Comments:

cate Sample Collected
cate Sample Collected
led for natural attenuation

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

GES — GROUNDWATER EXTRA PURGES LOG — 26-11-15

MW1 — 48-52 New Town Rd

5.43 well
3.22 TOC

Well No		10.4 x 3 =	31		
Cycle No					

Purging Cycles:					
Start Time	12.00	12.14			
Finish Time	12.12	12.19			
Minutes	2	2			
Volume (L)	10.5	6.5			
Recovery Time Minutes					
Site Water Quality Measurements:					
Temperature (oC)	15.4	15.8			
pH (units)	7.0	7.4			
Redox Potential (mV)	60	60			
Conductivity (uS/cm)	2730	2458			
Salinity (mg/L)					
Dissolved Oxygen (%)					
Dissolved Oxygen (mg/L)					
Turbidity	Y	Y	Very	Very Turbid	
Odour	Y	Y	Y		
Colour	Y	Y	Y	Brown/Grey	
Sheen	SL	Heavy	Y		

Sampling Details:

General Comments: Dry @ 11L recharge is very turbid

GES — GROUNDWATER MONITORING LOG — 26-11-15

MW2 — 3.37 depth
TOC 2.39

0.98 × 1.6 × 3 = 4.8

Purging Cycles:			
Start Time	13.22	13.24	
Finish Time	13.23	13.26	
Minutes	1	2	
Volume (L)	1.6		
Recovery Time Minutes			
Site Water Quality Measurements:			**Comments**
Temperature (oC)	14.4	14.4	
pH (units)	8.5	8.0	
Redox Potential (mV)	60	60	
Conductivity (uS/cm)	1290	1870	
Salinity (mg/L)	12901		
Dissolved Oxygen (%)			
Dissolved Oxygen (mg/L)			
Turbidity	Y	Y	
Odour	N	N	
Colour	Y	Y	yellowish Brown
Sheen	N	N	

Sampling Details:

General Comments: Dry @ 3L Dupe + Triplicate

GES — GROUNDWATER MONITORING LOG

Project: 45 52

Well Depth: 7.2 m
Groundwater Depth: 0

Measurements from top of casing:
Borehole Depth (m): 7.2
Groundwater Depth (m): 0
Water Column Volume: 7.2 (4.0) × 1.6 = 11.5
Volume to be Purged (L): 43.5

Purging Cycles:	Cycle 1	Cycle 2	Cycle 3
Start Time	12.15	12.22	12.29
Finish Time	12.19	12.27	12.35
Minutes	4	5	6
Volume (L)	15	15	15
Recovery Time Minutes			

Total Volume Purged (L): 45 L

Site Water Quality Measurements:				**Comments**
Temperature (oC)	15.4	15.2	15.1	
pH (units)	6.8	7.1	7.2	
Redox Potential (mV)	80	75	70	
Conductivity (uS/cm)	2760	2620	2730	
Salinity (mg/L)				
Dissolved Oxygen (%)				
Dissolved Oxygen (mg/L)				
Turbidity	Y	Y	Y	
Odour	N	N	N	
Colour	Y	Y	Y	yellowish Grey
Sheen	Y	SL	Y	

Sampling Details:

General Comments:

Appendix 12 Soil Analytical Results - Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1811858**	Page	: 1 of 21
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 26-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018 15:12
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 59		
No. of samples analysed	: 23		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.0-1.1	BH01 2.5-2.6	BH01 4.4-4.5	BH02 1.0-1.1	BH02 2.8-2.9
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-003	EM1811858-006	EM1811858-010	EM1811858-013	EM1811858-016
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.3	13.5	13.3	12.3	17.7
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	6	<5	<5
Barium	7440-39-3	10	mg/kg	50	30	50	440	730
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	10	6	10	16
Cobalt	7440-48-4	2	mg/kg	5	5	11	13	13
Copper	7440-50-8	5	mg/kg	8	15	54	46	12
Lead	7439-92-1	5	mg/kg	35	25	52	162	56
Manganese	7439-96-5	5	mg/kg	82	25	846	236	63
Nickel	7440-02-0	2	mg/kg	7	8	12	13	12
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	21	39	51	19	28
Zinc	7440-66-6	5	mg/kg	45	1100	66	132	71
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	1.0	0.4	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	1.2	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	1.5	4.0	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	0.8	0.6	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	0.9	9.7	7.9	0.8	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	2.6	2.9	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	1.5	14.9	20.8	1.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	1.6	15.0	25.1	1.6	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	0.7	6.8	14.7	0.7	<0.5
Chrysene	218-01-9	0.5	mg/kg	0.6	6.2	14.4	0.7	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	6.2	19.6	0.9	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	2.9	6.2	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.6	5.1	17.4	0.6	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	2.5	7.0	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	0.7	2.0	<0.5	<0.5

Page	4 of 21
Work Order	EM1811858
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.0-1.1	BH01 2.5-2.6	BH01 4.4-4.5	BH02 1.0-1.1	BH02 2.8-2.9
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-003	EM1811858-006	EM1811858-010	EM1811858-013	EM1811858-016
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	2.9	8.3	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	6.7	77.8	152	6.8	<0.5
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	0.8	7.7	24.4	0.8	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	1.0	7.7	24.4	1.1	0.6
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	1.4	7.7	24.4	1.4	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	<100	260	700	<100	<100
C29 - C36 Fraction	—	100	mg/kg	<100	160	470	<100	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	<50	420	1170	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	<100	370	1030	<100	<100
>C34 - C40 Fraction	—	100	mg/kg	<100	<100	200	<100	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	<50	370	1230	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.5	81.3	82.6	90.8	89.4
2-Chlorophenol-D4	93951-73-6	0.5	%	95.6	86.8	90.0	94.7	91.8
2.4.6-Tribromophenol	118-79-6	0.5	%	52.6	46.1	57.2	52.8	50.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.0-1.1	BH01 2.5-2.6	BH01 4.4-4.5	BH02 1.0-1.1	BH02 2.8-2.9
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-003	EM1811858-006	EM1811858-010	EM1811858-013	EM1811858-016
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	81.5	88.9	116	117	96.4
Anthracene-d10	1719-06-8	0.5	%	103	96.9	104	108	111
4-Terphenyl-d14	1718-51-0	0.5	%	104	103	99.8	104	110
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	79.1	78.1	73.2	77.3	91.7
Toluene-D8	2037-26-5	0.2	%	76.6	71.8	70.7	71.9	85.7
4-Bromofluorobenzene	460-00-4	0.2	%	96.6	90.3	90.0	93.8	112

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH02 4.0-4.1	BH03 0.5-0.6	BH03 2.5-2.6	BH03 3.9-4.0	BH04 1.5-1.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-018	EM1811858-020	EM1811858-024	EM1811858-027	EM1811858-031
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	21.6	18.0	8.6	14.7	10.3
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	220	140	260	70	130
Beryllium	7440-41-7	1	mg/kg	1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	22	13	3	12	14
Cobalt	7440-48-4	2	mg/kg	26	14	10	11	10
Copper	7440-50-8	5	mg/kg	54	24	28	25	35
Lead	7439-92-1	5	mg/kg	7	502	12	14	128
Manganese	7439-96-5	5	mg/kg	99	378	105	261	301
Nickel	7440-02-0	2	mg/kg	22	16	7	16	14
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	103	41	43	42	43
Zinc	7440-66-6	5	mg/kg	35	118	40	44	113
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	<0.1	<0.1	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	0.6	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	2.1	3.2	2.1
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	2.3
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	1.3	3.4
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	1.3	5.7	16.7	37.0
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	2.1	4.4	10.7
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3.4	13.5	18.8	55.9
Pyrene	129-00-0	0.5	mg/kg	<0.5	3.7	15.4	21.1	52.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	1.7	8.0	10.6	20.2
Chrysene	218-01-9	0.5	mg/kg	<0.5	1.4	7.5	9.8	18.8
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	1.6	8.9	9.8	28.8
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	0.7	3.2	3.5	9.6
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	1.4	7.8	8.9	25.6
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	0.8	3.7	4.0	15.6
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	1.1	1.2	3.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH02 4.0-4.1	BH03 0.5-0.6	BH03 2.5-2.6	BH03 3.9-4.0	BH04 1.5-1.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
				EM1811858-018	EM1811858-020	EM1811858-024	EM1811858-027	EM1811858-031
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	1.0	4.7	5.0	20.0
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	<0.5	17.0	83.7	119	306
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	<0.5	1.9	11.4	13.0	36.8
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	0.6	2.2	11.4	13.0	36.8
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	1.2	2.4	11.4	13.0	36.8
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	<100	<100	340	530	810
C29 - C36 Fraction	—	100	mg/kg	<100	<100	200	250	550
^ C10 - C36 Fraction (sum)	—	50	mg/kg	<50	<50	540	780	1360
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	<100	<100	480	700	1190
>C34 - C40 Fraction	—	100	mg/kg	<100	<100	<100	100	300
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	<50	<50	480	800	1490
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.0	81.5	85.0	87.7	84.5
2-Chlorophenol-D4	93951-73-6	0.5	%	90.0	85.4	89.1	94.5	90.1
2.4.6-Tribromophenol	118-79-6	0.5	%	46.5	39.4	50.4	58.4	56.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH02 4.0-4.1	BH03 0.5-0.6	BH03 2.5-2.6	BH03 3.9-4.0	BH04 1.5-1.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-018	EM1811858-020	EM1811858-024	EM1811858-027	EM1811858-031
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	99.7	81.6	97.3	101	93.7
Anthracene-d10	1719-06-8	0.5	%	107	104	104	105	91.7
4-Terphenyl-d14	1718-51-0	0.5	%	108	97.8	100	104	94.3
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	75.3	73.7	78.7	69.9	78.3
Toluene-D8	2037-26-5	0.2	%	74.3	73.6	86.0	68.8	74.2
4-Bromofluorobenzene	460-00-4	0.2	%	92.0	93.0	108	85.5	87.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH04 3.0-3.1	BH04 4.5-4.6	BH05 1.0-1.1	BH05 3.0-3.1	BH05 4.5-4.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-034	EM1811858-037	EM1811858-040	EM1811858-044	EM1811858-047
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	6.1	10.0	19.9	11.1	15.0
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	170	180	60	120	100
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	2	<1
Chromium	7440-47-3	2	mg/kg	14	12	8	15	8
Cobalt	7440-48-4	2	mg/kg	11	14	7	21	17
Copper	7440-50-8	5	mg/kg	35	28	7	44	32
Lead	7439-92-1	5	mg/kg	217	136	21	94	122
Manganese	7439-96-5	5	mg/kg	224	1040	78	179	199
Nickel	7440-02-0	2	mg/kg	14	27	11	22	14
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	30	14	16	23	54
Zinc	7440-66-6	5	mg/kg	127	184	244	322	102
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.1	0.1	<0.1	0.1	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	0.6
Phenanthrene	85-01-8	0.5	mg/kg	2.2	1.1	<0.5	1.7	8.1
Anthracene	120-12-7	0.5	mg/kg	0.6	<0.5	<0.5	0.6	2.5
Fluoranthene	206-44-0	0.5	mg/kg	3.9	2.8	0.9	3.9	11.7
Pyrene	129-00-0	0.5	mg/kg	3.9	3.2	1.1	4.3	11.2
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.5	1.6	0.5	2.2	4.2
Chrysene	218-01-9	0.5	mg/kg	1.4	1.4	<0.5	2.0	3.8
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.1	1.8	0.6	2.1	4.7
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.7	0.7	<0.5	1.1	1.7
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.7	1.5	<0.5	1.9	3.9
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.1	0.9	<0.5	1.0	2.3
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH04 3.0-3.1	BH04 4.5-4.6	BH05 1.0-1.1	BH05 3.0-3.1	BH05 4.5-4.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
				EM1811858-034	EM1811858-037	EM1811858-040	EM1811858-044	EM1811858-047
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.6	1.1	<0.5	1.2	3.0
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	20.7	16.1	3.1	22.0	58.2
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	2.3	2.0	<0.5	2.6	5.2
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	2.5	2.3	0.7	2.8	5.5
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	2.8	2.5	1.2	3.1	5.8
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	<100	<100	<100	<100	110
C29 - C36 Fraction	—	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	<50	<50	<50	<50	110
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	<100	<100	<100	120	170
>C34 - C40 Fraction	—	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	<50	<50	<50	120	170
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.7	91.4	88.1	93.9	89.2
2-Chlorophenol-D4	93951-73-6	0.5	%	94.4	97.0	92.3	97.9	94.2
2.4.6-Tribromophenol	118-79-6	0.5	%	63.9	56.5	54.8	57.6	55.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH04 3.0-3.1	BH04 4.5-4.6	BH05 1.0-1.1	BH05 3.0-3.1	BH05 4.5-4.6
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-034	EM1811858-037	EM1811858-040	EM1811858-044	EM1811858-047
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	98.9	102	98.9	104	102
Anthracene-d10	1719-06-8	0.5	%	104	109	111	108	103
4-Terphenyl-d14	1718-51-0	0.5	%	102	111	114	104	100
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	77.3	73.8	71.7	77.6	71.8
Toluene-D8	2037-26-5	0.2	%	72.7	71.1	69.1	75.9	85.5
4-Bromofluorobenzene	460-00-4	0.2	%	87.7	89.3	89.5	96.1	111

Page : 12 of 21
Work Order : EM1811858
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH06 0.2-0.3	BH07 1.0-1.1	BH07 2.2-2.3	Duplicate 1	Duplicate 2
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-049	EM1811858-052	EM1811858-055	EM1811858-056	EM1811858-057
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.9	16.6	9.1	8.8	18.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	150	230	260	140	300
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	10	11	8	12	11
Cobalt	7440-48-4	2	mg/kg	10	11	9	10	10
Copper	7440-50-8	5	mg/kg	30	20	17	37	20
Lead	7439-92-1	5	mg/kg	174	80	120	116	48
Manganese	7439-96-5	5	mg/kg	253	173	309	216	134
Nickel	7440-02-0	2	mg/kg	12	13	7	13	13
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	27	25	25	42	24
Zinc	7440-66-6	5	mg/kg	168	161	70	111	262
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.4	0.1	0.4	0.2	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	0.8	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	2.8	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	3.3	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	2.5	<0.5	<0.5	29.6	<0.5
Anthracene	120-12-7	0.5	mg/kg	0.7	<0.5	<0.5	7.6	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	4.2	1.0	<0.5	31.6	<0.5
Pyrene	129-00-0	0.5	mg/kg	4.5	1.1	<0.5	29.3	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.9	0.5	<0.5	10.9	<0.5
Chrysene	218-01-9	0.5	mg/kg	1.8	<0.5	<0.5	10.1	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.1	0.6	<0.5	12.7	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.9	<0.5	<0.5	5.3	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.7	<0.5	<0.5	11.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.9	<0.5	<0.5	6.7	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	1.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH06 0.2-0.3	BH07 1.0-1.1	BH07 2.2-2.3	Duplicate 1	Duplicate 2
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811858-049	EM1811858-052	EM1811858-055	EM1811858-056	EM1811858-057
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.2	<0.5	<0.5	8.6	<0.5
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	22.4	3.2	<0.5	172	<0.5
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	2.3	<0.5	<0.5	16.7	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	2.6	0.7	0.6	16.7	0.6
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	2.8	1.2	1.2	16.7	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	<100	<100	<100	410	<100
C29 - C36 Fraction	—	100	mg/kg	<100	<100	<100	270	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	<50	<50	<50	680	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	120	<100	<100	600	<100
>C34 - C40 Fraction	—	100	mg/kg	<100	<100	<100	150	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	120	<50	<50	750	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.4	91.0	89.6	79.0	88.5
2-Chlorophenol-D4	93951-73-6	0.5	%	94.4	98.0	96.2	84.3	94.1
2.4.6-Tribromophenol	118-79-6	0.5	%	57.2	54.4	50.2	48.8	49.6

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH06 0.2-0.3	BH07 1.0-1.1	BH07 2.2-2.3	Duplicate 1	Duplicate 2
Client sampling date / time				23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
				EM1811858-049	EM1811858-052	EM1811858-055	EM1811858-056	EM1811858-057
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	100	101	103	80.9	101
Anthracene-d10	1719-06-8	0.5	%	109	113	109	93.8	110
4-Terphenyl-d14	1718-51-0	0.5	%	102	109	112	93.0	111
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	70.6	76.9	69.3	74.5	74.1
Toluene-D8	2037-26-5	0.2	%	72.0	77.2	65.9	69.7	74.3
4-Bromofluorobenzene	460-00-4	0.2	%	89.1	86.5	87.2	87.2	88.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate 3	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-060	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	23.0	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Barium	7440-39-3	10	mg/kg	140	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	20	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	25	----	----	----	----
Copper	7440-50-8	5	mg/kg	40	----	----	----	----
Lead	7439-92-1	5	mg/kg	57	----	----	----	----
Manganese	7439-96-5	5	mg/kg	443	----	----	----	----
Nickel	7440-02-0	2	mg/kg	19	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	98	----	----	----	----
Zinc	7440-66-6	5	mg/kg	130	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate 3	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-060	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	101	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	105	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	96.0	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate 3	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-060	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	102	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	111	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	106	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	73.1	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	65.4	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	87.3	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank	Rinsate Blank	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-058	EM1811858-059	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	----	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	----	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	----	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	----	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	----	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	----	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	----	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	----	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	----	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	----	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	----	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	----	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank	Rinsate Blank	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-058	EM1811858-059	-------	-------	-------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank	Rinsate Blank	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811858-058	EM1811858-059	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN - Continued								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	18.2	22.9	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	33.6	55.7	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	31.0	50.8	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	53.3	63.6	----	----	----
Anthracene-d10	1719-06-8	1.0	%	52.0	75.5	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	54.0	83.6	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	98.0	99.1	----	----	----
Toluene-D8	2037-26-5	2	%	95.7	93.8	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	102	102	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	38	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: ES1822218	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 27-Jul-2018 10:00
Order number	:	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 02-Aug-2018 16:06
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

NATA Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP071: Results of sample Triplicate 1 have been confirmed by re-extraction and re-analysis.
- EG005: Poor precision was obtained for Zinc on sample ES1822292 #002. Results have been confirmed by re-extraction and reanalysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Page : 3 of 6
Work Order : ES1822218
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1	Triplicate 2	Triplicate 3	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1822218-001	ES1822218-002	ES1822218-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	10.1	19.4	22.0	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Barium	7440-39-3	10	mg/kg	120	100	120	----	----
Beryllium	7440-41-7	1	mg/kg	<1	2	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	14	8	17	----	----
Cobalt	7440-48-4	2	mg/kg	10	16	23	----	----
Copper	7440-50-8	5	mg/kg	28	18	34	----	----
Lead	7439-92-1	5	mg/kg	122	73	85	----	----
Manganese	7439-96-5	5	mg/kg	231	150	500	----	----
Nickel	7440-02-0	2	mg/kg	12	23	17	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	39	18	93	----	----
Zinc	7440-66-6	5	mg/kg	99	346	288	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.2	0.3	0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	2.0	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	0.9	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	1.4	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	13.1	0.7	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	3.6	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	22.2	1.0	0.6	----	----
Pyrene	129-00-0	0.5	mg/kg	20.7	0.9	0.6	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	8.4	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	7.8	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	10.6	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.8	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	10.0	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	5.7	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.1	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1	Triplicate 2	Triplicate 3	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1822218-001	ES1822218-002	ES1822218-003	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	8.4	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	120	2.6	1.2	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	14.1	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	14.1	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	14.1	1.2	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	610	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	370	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	980	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	900	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	310	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	1210	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	83.0	87.0	81.5	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	100	81.0	82.7	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	99.6	68.5	60.7	----	----

Page : 5 of 6
Work Order : ES1822218
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1	Triplicate 2	Triplicate 3	----	----
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1822218-001	ES1822218-002	ES1822218-003	--------	--------
				Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	87.3	86.8	81.9	----	----
Anthracene-d10	1719-06-8	0.5	%	99.2	89.2	90.0	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	94.5	82.0	81.3	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	93.9	90.4	84.1	----	----
Toluene-D8	2037-26-5	0.2	%	95.4	90.5	90.0	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	95.3	91.8	88.9	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1812173**	Page	: 1 of 12
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 25-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018 16:42
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 11		
No. of samples analysed	: 11		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T: EM1812173_006 Poor duplicate precision for lead and zinc due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EG005T: EM1812173_007 Poor matrix spike recovery for zinc due to sample matrix. Confirmed by re-extraction and re-analysis.
- This is a rebatch of EM1811858.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Page : 3 of 12
Work Order : EM1812173
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.5-1.6	BH01 3.5-3.6	BH02 0.5-0.6	BH02 2.0-2.1	BH03 1.0-1.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-001	EM1812173-002	EM1812173-003	EM1812173-004	EM1812173-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.1	17.6	14.3	16.9	22.1
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	5	<5	5	<5	6
Barium	7440-39-3	10	mg/kg	40	20	1880	340	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	15	8	24	12	19
Cobalt	7440-48-4	2	mg/kg	9	14	10	16	16
Copper	7440-50-8	5	mg/kg	8	29	37	11	44
Lead	7439-92-1	5	mg/kg	28	23	349	82	93
Manganese	7439-96-5	5	mg/kg	223	277	297	125	308
Nickel	7440-02-0	2	mg/kg	12	12	12	13	17
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	25	31	40	22	63
Zinc	7440-66-6	5	mg/kg	64	60	221	62	176
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	1.2	0.2	0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.7	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3.1	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	0.9	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	12.2	0.9	<0.5	0.6
Anthracene	120-12-7	0.5	mg/kg	<0.5	3.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	20.0	2.4	<0.5	1.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	22.6	2.8	<0.5	1.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	11.9	1.7	<0.5	1.0
Chrysene	218-01-9	0.5	mg/kg	<0.5	10.2	1.2	<0.5	0.7
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	14.2	2.0	<0.5	1.1
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4.2	0.8	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	12.7	1.8	<0.5	0.9
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	5.8	1.0	<0.5	0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	1.8	<0.5	<0.5	<0.5

Page : 4 of 12
Work Order : EM1812173
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.5-1.6	BH01 3.5-3.6	BH02 0.5-0.6	BH02 2.0-2.1	BH03 1.0-1.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-001	EM1812173-002	EM1812173-003	EM1812173-004	EM1812173-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	7.3	1.2	<0.5	0.7
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	131	15.8	<0.5	8.6
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	18.3	2.4	<0.5	1.2
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	18.3	2.6	0.6	1.4
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	18.3	2.9	1.2	1.7
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	540	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	280	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	820	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	740	120	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	740	120	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.7	95.2	93.1	94.6	91.7
2-Chlorophenol-D4	93951-73-6	0.5	%	86.8	87.5	86.6	88.2	83.6
2.4.6-Tribromophenol	118-79-6	0.5	%	65.4	79.1	75.0	71.8	71.4

Page : 5 of 12
Work Order : EM1812173
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 1.5-1.6	BH01 3.5-3.6	BH02 0.5-0.6	BH02 2.0-2.1	BH03 1.0-1.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-001	EM1812173-002	EM1812173-003	EM1812173-004	EM1812173-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	88.2	90.0	88.0	89.7	85.7
Anthracene-d10	1719-06-8	0.5	%	91.3	90.3	90.9	93.6	88.4
4-Terphenyl-d14	1718-51-0	0.5	%	91.0	86.4	90.7	90.0	86.8
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	66.2	77.7	73.9	74.2	72.8
Toluene-D8	2037-26-5	0.2	%	55.2	72.8	69.5	68.8	70.5
4-Bromofluorobenzene	460-00-4	0.2	%	94.8	108	105	99.6	102

Page : 6 of 12
Work Order : EM1812173
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH03 3.0-3.1	BH04 0.5-0.6	BH04 2.5-2.6	BH04 3.5-3.6	BH05 2.0-2.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-006	EM1812173-007	EM1812173-008	EM1812173-009	EM1812173-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	7.2	13.8	14.1	10.3	12.3
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	80	110	320	140	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	5	14	12	10	12
Cobalt	7440-48-4	2	mg/kg	10	18	24	17	19
Copper	7440-50-8	5	mg/kg	52	35	25	26	36
Lead	7439-92-1	5	mg/kg	218	56	37	76	120
Manganese	7439-96-5	5	mg/kg	263	276	576	441	206
Nickel	7440-02-0	2	mg/kg	9	17	50	23	14
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	59	39	52	11	43
Zinc	7440-66-6	5	mg/kg	573	236	74	130	111
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	<0.1	<0.1	0.3
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	1.3	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	6.7	1.0	<0.5	<0.5	1.0
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	1.9	0.6	<0.5	<0.5	0.5
Phenanthrene	85-01-8	0.5	mg/kg	23.3	7.4	<0.5	0.8	8.6
Anthracene	120-12-7	0.5	mg/kg	5.8	1.9	<0.5	<0.5	1.7
Fluoranthene	206-44-0	0.5	mg/kg	34.8	11.6	<0.5	1.8	11.0
Pyrene	129-00-0	0.5	mg/kg	35.6	11.4	<0.5	1.9	10.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	18.1	5.1	<0.5	1.1	4.6
Chrysene	218-01-9	0.5	mg/kg	14.6	3.7	<0.5	0.7	3.1
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	19.2	5.5	<0.5	1.1	5.0
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	6.3	1.8	<0.5	<0.5	1.6
Benzo(a)pyrene	50-32-8	0.5	mg/kg	17.5	4.7	<0.5	1.0	4.3
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	7.8	2.3	<0.5	<0.5	2.2
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	2.5	0.6	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH03 3.0-3.1	BH04 0.5-0.6	BH04 2.5-2.6	BH04 3.5-3.6	BH05 2.0-2.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-006	EM1812173-007	EM1812173-008	EM1812173-009	EM1812173-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	9.3	2.9	<0.5	0.6	3.0
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	205	60.5	<0.5	9.0	57.2
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	25.4	6.8	<0.5	1.2	5.7
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	25.4	6.8	0.6	1.5	6.0
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	25.4	6.8	1.2	1.8	6.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	820	200	<100	<100	160
C29 - C36 Fraction	—	100	mg/kg	410	110	<100	<100	110
^ C10 - C36 Fraction (sum)	—	50	mg/kg	1230	310	<50	<50	270
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	1110	280	<100	<100	240
>C34 - C40 Fraction	—	100	mg/kg	150	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	1260	280	<50	<50	240
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	93.0	91.5	91.4	92.7	93.7
2-Chlorophenol-D4	93951-73-6	0.5	%	85.2	90.0	89.4	88.5	85.5
2.4.6-Tribromophenol	118-79-6	0.5	%	83.1	82.9	74.1	73.2	74.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH03 3.0-3.1	BH04 0.5-0.6	BH04 2.5-2.6	BH04 3.5-3.6	BH05 2.0-2.1
			Client sampling date / time	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00	23-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1812173-006	EM1812173-007	EM1812173-008	EM1812173-009	EM1812173-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	87.8	90.5	89.6	89.5	86.2
Anthracene-d10	1719-06-8	0.5	%	86.3	91.1	93.9	93.1	86.9
4-Terphenyl-d14	1718-51-0	0.5	%	80.7	88.6	89.9	89.7	84.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	80.2	75.5	69.9	68.6	73.0
Toluene-D8	2037-26-5	0.2	%	76.3	89.3	66.8	60.4	65.1
4-Bromofluorobenzene	460-00-4	0.2	%	109	101	97.2	89.8	94.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH05 4.0-4.1	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1812173-011	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.2	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Barium	7440-39-3	10	mg/kg	150	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	9	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	12	----	----	----	----
Copper	7440-50-8	5	mg/kg	40	----	----	----	----
Lead	7439-92-1	5	mg/kg	221	----	----	----	----
Manganese	7439-96-5	5	mg/kg	269	----	----	----	----
Nickel	7440-02-0	2	mg/kg	13	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	26	----	----	----	----
Zinc	7440-66-6	5	mg/kg	280	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.3	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	1.3	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	4.9	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	1.4	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	9.4	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	9.7	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	4.7	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	4.1	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	6.1	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.9	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.9	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH05 4.0-4.1	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1812173-011	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.2	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	54.7	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	7.1	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	7.1	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	7.1	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	280	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	210	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	490	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	440	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	540	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.6	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	86.6	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	78.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH05 4.0-4.1	----	----	----	----
			Client sampling date / time	23-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1812173-011	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	87.0	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	88.7	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	86.8	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	66.3	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	56.7	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	89.1	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EPB92(SIM)S: Pᴾei oᴾu Coi ƒow d Swrrobᵢ Ueo			
Pmei or8d6	13127-88-3	54	125
H3Cnrorof mei or8D5	93951-73-6	65	123
H5/63TrV8rol of mei on	118-79-6	34	122
EPB92(SIM)T: PA^ Swrrobᵢ Ueo			
H3FnorosV mei cn	321-60-8	61	125
Ai Urrt uei e3d1B	1719-06-8	62	130
53Terf mei cr8d15	1718-51-0	67	133
EPB8BS: TP^(G)1 TEX Swrrobᵢ Ueo			
1/H3DVamroeUrt i e3D5	17060-07-0	51	125
Tonwei e3D8	2037-26-5	55	125
53 rol oawrosei zei e	460-00-4	56	124

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1811913**	Page	: 1 of 18
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 27-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018 13:07
Sampler	: SARAH JOYCE		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 53		
No. of samples analysed	: 19		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075(SIM): Poor duplicate precision for (EM1811913_003) due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Page : 3 of 18
Work Order : EM1811913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_1.0-1.1	BH08_2.5-2.6	BH08_4.5-4.6	BH09_1.0-1.1	BH09_2.5-2.6
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-003	EM1811913-006	EM1811913-010	EM1811913-013	EM1811913-016
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.3	15.9	20.0	7.9	9.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	5	<5	<5
Barium	7440-39-3	10	mg/kg	50	80	90	50	50
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	13	11	7	7
Cobalt	7440-48-4	2	mg/kg	8	13	39	8	7
Copper	7440-50-8	5	mg/kg	40	30	<5	33	20
Lead	7439-92-1	5	mg/kg	25	29	13	16	24
Manganese	7439-96-5	5	mg/kg	211	210	171	257	377
Nickel	7440-02-0	2	mg/kg	9	12	14	10	10
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	32	84	17	23	23
Zinc	7440-66-6	5	mg/kg	42	20	31	40	30
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	1.1	<0.5	<0.5	1.0	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	8.7	<0.5	<0.5	4.6	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	3.1	<0.5	<0.5	0.7	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	39.3	<0.5	<0.5	11.4	1.4
Anthracene	120-12-7	0.5	mg/kg	9.3	<0.5	<0.5	4.1	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	45.6	<0.5	<0.5	23.2	1.8
Pyrene	129-00-0	0.5	mg/kg	50.7	<0.5	<0.5	25.4	2.0
Benz(a)anthracene	56-55-3	0.5	mg/kg	24.8	<0.5	<0.5	15.3	1.0
Chrysene	218-01-9	0.5	mg/kg	26.6	<0.5	<0.5	14.3	1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	26.3	<0.5	<0.5	16.8	1.2
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	9.1	<0.5	<0.5	6.7	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	25.5	<0.5	<0.5	16.6	1.0
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	12.0	<0.5	<0.5	8.1	0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	3.3	<0.5	<0.5	2.3	<0.5

Page	: 4 of 18
Work Order	: EM1811913
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_1.0-1.1	BH08_2.5-2.6	BH08_4.5-4.6	BH09_1.0-1.1	BH09_2.5-2.6
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-003	EM1811913-006	EM1811913-010	EM1811913-013	EM1811913-016
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	14.9	<0.5	<0.5	10.1	0.6
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	301	<0.5	<0.5	161	10.5
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	36.4	<0.5	<0.5	23.8	1.3
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	36.4	0.6	0.6	23.8	1.6
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	36.4	1.2	1.2	23.8	1.8
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	1370	<100	<100	980	<100
C29 - C36 Fraction	—	100	mg/kg	710	<100	<100	630	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	2080	<50	<50	1610	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	1840	<100	<100	1420	<100
>C34 - C40 Fraction	—	100	mg/kg	300	<100	<100	280	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	2140	<50	<50	1700	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.0	94.2	87.8	91.3	85.9
2-Chlorophenol-D4	93951-73-6	0.5	%	94.0	97.5	90.9	95.0	88.5
2.4.6-Tribromophenol	118-79-6	0.5	%	81.0	82.5	76.2	86.0	73.2

Page : 5 of 18
Work Order : EM1811913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_1.0-1.1	BH08_2.5-2.6	BH08_4.5-4.6	BH09_1.0-1.1	BH09_2.5-2.6
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-003	EM1811913-006	EM1811913-010	EM1811913-013	EM1811913-016
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	91.8	95.6	90.5	92.2	88.1
Anthracene-d10	1719-06-8	0.5	%	100	112	105	98.2	100
4-Terphenyl-d14	1718-51-0	0.5	%	99.3	104	102	96.3	94.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	76.0	72.6	69.8	73.3	66.8
Toluene-D8	2037-26-5	0.2	%	77.9	76.1	75.8	82.8	72.3
4-Bromofluorobenzene	460-00-4	0.2	%	104	98.6	101	106	89.0

Page : 6 of 18
Work Order : EM1811913
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH09_4.5-4.6	BH09_6.0-6.1	Duplicate 4	BH10_1.0-1.1	BH10_3.0-3.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-020	EM1811913-022	EM1811913-024	EM1811913-026	EM1811913-030
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.9	21.1	15.3	19.4	21.2
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	6	<5	<5	<5
Barium	7440-39-3	10	mg/kg	40	120	40	140	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	4	13	4	<2	9
Cobalt	7440-48-4	2	mg/kg	7	11	8	30	9
Copper	7440-50-8	5	mg/kg	31	29	45	56	90
Lead	7439-92-1	5	mg/kg	15	289	13	37	114
Manganese	7439-96-5	5	mg/kg	92	120	137	408	462
Nickel	7440-02-0	2	mg/kg	5	15	8	13	11
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	49	24	35	67	32
Zinc	7440-66-6	5	mg/kg	23	170	26	47	123
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.7	<0.1	<0.1	0.6
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	2.8	<0.5	2.8	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	7.8	<0.5	8.6	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	0.9	<0.5	0.9	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	5.9	<0.5	6.0	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	38.7	1.7	39.0	<0.5	0.6
Anthracene	120-12-7	0.5	mg/kg	11.6	0.5	11.8	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	38.6	1.6	40.7	<0.5	1.4
Pyrene	129-00-0	0.5	mg/kg	41.9	1.7	44.2	<0.5	1.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	21.1	0.8	22.6	<0.5	0.9
Chrysene	218-01-9	0.5	mg/kg	19.6	0.7	21.9	<0.5	0.9
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	22.3	0.8	26.7	<0.5	1.2
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	7.4	<0.5	9.7	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	22.8	0.7	25.9	<0.5	1.0
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	10.4	<0.5	12.1	<0.5	0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	2.9	<0.5	3.3	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH09_4.5-4.6	BH09_6.0-6.1	Duplicate 4	BH10_1.0-1.1	BH10_3.0-3.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-020	EM1811913-022	EM1811913-024	EM1811913-026	EM1811913-030
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	13.1	<0.5	15.0	<0.5	0.7
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	268	8.5	291	<0.5	8.8
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	32.1	0.9	36.7	<0.5	1.3
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	32.1	1.2	36.7	0.6	1.6
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	32.1	1.5	36.7	1.2	1.8
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	990	<100	1130	<100	<100
C29 - C36 Fraction	—	100	mg/kg	480	<100	580	<100	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	1470	<50	1710	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	1300	<100	1500	<100	<100
>C34 - C40 Fraction	—	100	mg/kg	190	<100	270	<100	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	1490	<50	1770	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.0	90.2	90.7	88.0	82.7
2-Chlorophenol-D4	93951-73-6	0.5	%	91.1	94.3	94.7	91.2	87.1
2.4.6-Tribromophenol	118-79-6	0.5	%	81.4	75.0	83.7	73.9	72.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH09_4.5-4.6	BH09_6.0-6.1	Duplicate 4	BH10_1.0-1.1	BH10_3.0-3.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-020	EM1811913-022	EM1811913-024	EM1811913-026	EM1811913-030
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	90.1	90.2	91.2	89.7	86.6
Anthracene-d10	1719-06-8	0.5	%	94.5	106	94.6	113	105
4-Terphenyl-d14	1718-51-0	0.5	%	92.9	99.3	93.4	100	98.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	74.3	74.3	77.7	70.4	73.0
Toluene-D8	2037-26-5	0.2	%	73.6	79.8	71.4	74.3	74.5
4-Bromofluorobenzene	460-00-4	0.2	%	95.9	103	98.4	97.3	94.2

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH10_5.0-5.1	BH11_1.0-1.1	BH11_2.5-2.6	BH11_3.3-3.4	BH12_1.0-1.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
				EM1811913-034	EM1811913-037	EM1811913-040	EM1811913-042	EM1811913-044
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	17.6	22.3	27.4	19.0	19.9
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	7	<5	13	<5
Barium	7440-39-3	10	mg/kg	70	120	180	160	110
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	2	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	8	11	17	9
Cobalt	7440-48-4	2	mg/kg	16	12	7	42	9
Copper	7440-50-8	5	mg/kg	7	55	84	7	26
Lead	7439-92-1	5	mg/kg	14	60	256	15	49
Manganese	7439-96-5	5	mg/kg	325	202	310	1630	116
Nickel	7440-02-0	2	mg/kg	12	11	10	47	9
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	19	39	32	30	17
Zinc	7440-66-6	5	mg/kg	34	105	321	44	125
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.8	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	0.7	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	2.7	0.8	<0.5	1.8
Anthracene	120-12-7	0.5	mg/kg	<0.5	0.8	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	7.0	2.4	<0.5	2.9
Pyrene	129-00-0	0.5	mg/kg	<0.5	7.4	2.7	<0.5	3.0
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3.6	1.6	<0.5	1.2
Chrysene	218-01-9	0.5	mg/kg	<0.5	3.7	1.6	<0.5	1.3
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	4.8	2.4	<0.5	1.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	1.5	0.8	<0.5	0.6
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4.0	1.9	<0.5	1.2
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	2.4	1.0	<0.5	0.6
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

			Client sample ID	BH10_5.0-5.1	BH11_1.0-1.1	BH11_2.5-2.6	BH11_3.3-3.4	BH12_1.0-1.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-034	EM1811913-037	EM1811913-040	EM1811913-042	EM1811913-044
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3.0	1.3	<0.5	0.7
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	42.2	16.5	<0.5	14.7
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	5.9	2.5	<0.5	1.6
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	5.9	2.8	0.6	1.8
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	5.9	3.0	1.2	2.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	280	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	280	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	560	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	480	120	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	150	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	630	120	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.6	89.7	88.8	92.5	86.2
2-Chlorophenol-D4	93951-73-6	0.5	%	94.3	93.6	93.5	96.1	89.4
2.4.6-Tribromophenol	118-79-6	0.5	%	69.5	76.1	75.3	72.0	71.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH10_5.0-5.1	BH11_1.0-1.1	BH11_2.5-2.6	BH11_3.3-3.4	BH12_1.0-1.1
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811913-034	EM1811913-037	EM1811913-040	EM1811913-042	EM1811913-044
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	90.6	90.8	90.7	92.3	87.8
Anthracene-d10	1719-06-8	0.5	%	116	102	104	116	100
4-Terphenyl-d14	1718-51-0	0.5	%	101	97.1	98.6	104	96.2
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	68.6	77.4	69.1	70.6	62.9
Toluene-D8	2037-26-5	0.2	%	71.7	78.1	73.9	73.7	65.1
4-Bromofluorobenzene	460-00-4	0.2	%	91.3	99.7	88.3	91.5	93.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH12_2.5-2.6	BH12_3.5-3.6	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-047	EM1811913-049	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.8	21.6	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	120	90	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	3	7	----	----	----
Cobalt	7440-48-4	2	mg/kg	43	8	----	----	----
Copper	7440-50-8	5	mg/kg	77	33	----	----	----
Lead	7439-92-1	5	mg/kg	9	72	----	----	----
Manganese	7439-96-5	5	mg/kg	281	236	----	----	----
Nickel	7440-02-0	2	mg/kg	7	9	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	147	31	----	----	----
Zinc	7440-66-6	5	mg/kg	32	50	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH12_2.5-2.6	BH12_3.5-3.6	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-047	EM1811913-049	----	----	----
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	84.6	88.0	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	86.7	92.3	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	68.7	69.9	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH12_2.5-2.6	BH12_3.5-3.6	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-047	EM1811913-049	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	88.7	88.6	----	----	----
Anthracene-d10	1719-06-8	0.5	%	117	108	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	102	99.7	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	66.9	64.0	----	----	----
Toluene-D8	2037-26-5	0.2	%	69.8	68.7	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	87.7	91.0	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 2	Rinsate 2	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-052	EM1811913-053	-------	-------	-------
				Result	Result	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 2	Rinsate 2	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-052	EM1811913-053	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	30.2	35.8	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	69.6	82.1	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	57.4	67.0	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	79.2	93.7	----	----	----
Anthracene-d10	1719-06-8	1.0	%	91.7	98.8	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	99.2	112	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 2	Rinsate 2	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811913-052	EM1811913-053	--------	--------	--------
				Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	100	92.9	----	----	----
Toluene-D8	2037-26-5	2	%	103	95.5	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	127	118	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1822455**	Page	: 1 of 6
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 31-Jul-2018 23:30
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018 10:06
Sampler	: SARAH JOYCE		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP071: Results of sample Triplicate 4 have been confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: SOIL
^Matrix: SOIL(

Compound	CAS Number	LOR	Unit	TrMrMt Ue B	555	555	555	555
			Client sampling date / time	24-Jul-2018 00:00	----	----	----	----
				ES1822B009)) 1	555555	555555	555555	555555
				Result	----	----	----	----
EA)00: - oMiUwe Coi Uei U'DrMd @ 1) 05!1) *C(								
- oMiUwe Coi Uei U	----	1.0	%	21/2	555	555	555	555
E4))0T: ToUn- eUrp sc IC65AES								
Arpei M	7440-38-2	5	mg/kg	<5	555	555	555	555
9trNM	7440-39-3	10	mg/kg	0)	555	555	555	555
9ercnNM	7440-41-7	1	mg/kg	<1	555	555	555	555
9oroi	7440-42-8	50	mg/kg	<50	555	555	555	555
Ctdl NM	7440-43-9	1	mg/kg	<1	555	555	555	555
Cmrol NM	7440-47-3	2	mg/kg	3	555	555	555	555
CostrU	7440-48-4	2	mg/kg	12	555	555	555	555
Cof f er	7440-50-8	5	mg/kg	3)	555	555	555	555
Letd	7439-92-1	5	mg/kg	13	555	555	555	555
- ti bti epe	7439-96-5	5	mg/kg	P1	555	555	555	555
NMken	7440-02-0	2	mg/kg	P	555	555	555	555
Serei NM	7782-49-2	5	mg/kg	<5	555	555	555	555
Gtitd NM	7440-62-2	5	mg/kg	77	555	555	555	555
ZMu	7440-66-6	5	mg/kg	. P	555	555	555	555
E4).0T: TolinReuo, ert sre - eruwrc sc FI- S								
- eruwrc	7439-97-6	0.1	mg/kg	)/1	555	555	555	555
E6)70^SI- (9: 6orci wuretr Arol tUM Hodrout rsoi p								
Ntf mUrt rei e	91-20-3	0.5	mg/kg	B/1	555	555	555	555
Auei tf mUrcrei e	208-96-8	0.5	mg/kg	1)/3	555	555	555	555
Auei tf mUrei e	83-32-9	0.5	mg/kg	1/3	555	555	555	555
Fmorei e	86-73-7	0.5	mg/kg	12/)	555	555	555	555
6mei ti Umei e	85-01-8	0.5	mg/kg	3)/3	555	555	555	555
Ai Umt uei e	120-12-7	0.5	mg/kg	17/3	555	555	555	555
Fmorti Urei e	206-44-0	0.5	mg/kg	B0/1	555	555	555	555
6crei e	129-00-0	0.5	mg/kg	B8/8	555	555	555	555
9ei z^t(ti Umt uei e	56-55-3	0.5	mg/kg	2B/8	555	555	555	555
Cmrcpei e	218-01-9	0.5	mg/kg	21/8	555	555	555	555
9ei zo^s+j(amorti Urei e	205-99-2 205-82-3	0.5	mg/kg	2B/1	555	555	555	555
9ei zo^k(amorti Urei e	207-08-9	0.5	mg/kg	3/8	555	555	555	555
9ei zo^t(f crei e	50-32-8	0.5	mg/kg	2)/3	555	555	555	555
Ii dei o^1/2/. /ud(f crei e	193-39-5	0.5	mg/kg	8/7	555	555	555	555
DMei z^t/m(ti Umt uei e	53-70-3	0.5	mg/kg	2/.	555	555	555	555

Page : 4 of 6
Work Order : ES1822455
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 4	----	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1822455-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	11.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	320	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	29.7	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	29.7	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	29.7	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	770	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	390	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	1160	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	60	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	990	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	280	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	1330	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	10	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	80.7	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	79.6	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	72.2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 4	----	----	----	----
			Client sampling date / time	24-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1822455-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	92.1	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	87.9	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	79.6	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	84.7	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	108	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	112	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1812174**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018 16:48
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T: EM1812173_006 Poor duplicate precision for lead and zinc due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EG005T: EM1812173_007 Poor matrix spike recovery for zinc due to sample matrix. Confirmed by re-extraction and re-analysis.
- This is a rebatch of EM1811913.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Page : 3 of 6
Work Order : EM1812174
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_2.0-2.1	BH11_2.0-2.1	BH12_2.0-2.1	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1812174-001	EM1812174-002	EM1812174-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	13.3	17.4	19.3	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Barium	7440-39-3	10	mg/kg	60	100	100	----	----
Beryllium	7440-41-7	1	mg/kg	<1	2	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	10	8	11	----	----
Cobalt	7440-48-4	2	mg/kg	6	27	12	----	----
Copper	7440-50-8	5	mg/kg	18	17	24	----	----
Lead	7439-92-1	5	mg/kg	7	14	24	----	----
Manganese	7439-96-5	5	mg/kg	69	294	448	----	----
Nickel	7440-02-0	2	mg/kg	7	20	13	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	41	19	34	----	----
Zinc	7440-66-6	5	mg/kg	12	61	50	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	0.9	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	1.1	5.0	0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	1.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	2.1	11.5	1.0	----	----
Pyrene	129-00-0	0.5	mg/kg	2.5	12.3	1.0	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.6	5.8	0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	1.1	5.0	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.8	6.5	0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.5	1.9	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.5	5.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.7	2.4	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	0.7	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_2.0-2.1	BH11_2.0-2.1	BH12_2.0-2.1	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1812174-001	EM1812174-002	EM1812174-003	-------	-------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.9	3.0	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	13.8	62.0	3.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	2.0	7.9	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	2.2	7.9	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	2.5	7.9	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	320	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	200	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	520	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	480	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	480	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	93.7	88.3	104	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	86.5	85.3	95.1	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	78.9	80.1	80.9	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH08_2.0-2.1	BH11_2.0-2.1	BH12_2.0-2.1	----	----
			Client sampling date / time	24-Jul-2018 00:00	24-Jul-2018 00:00	24-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1812174-001	EM1812174-002	EM1812174-003	--------	--------
				Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	86.8	85.3	98.2	----	----
Anthracene-d10	1719-06-8	0.5	%	91.9	88.5	99.4	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	89.3	85.6	97.8	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	68.4	67.8	71.0	----	----
Toluene-D8	2037-26-5	0.2	%	57.8	57.8	55.1	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	92.0	91.3	90.7	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1811891**	Page	: 1 of 15
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 26-Jul-2018
C-O-C number	: ----	Issue Date	: 31-Jul-2018 13:44
Sampler	: SARAH JOYCE		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 27		
No. of samples analysed	: 14		

NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T: EM1811891 #21, the results for Manganese have been confirmed by re-preparation and re-analysis. A variation in the results was noticed whereby the inital results obtained were 242 mg/L and 178 mg/L, and the subsequent results 398 mg/L and 286 mg/L.
- EG005T: EM1811891 #23, poor matrix spike recovery for Lead and Zinc due to sample matrix effects. This has been confirmed by re-preparation and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH14 0.4-0.5	BH15 0.55-0.65	BH16 0.3-0.4	BH13 1.0-1.1	BH13 1.5-1.6
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811891-002	EM1811891-004	EM1811891-005	EM1811891-007	EM1811891-008
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	13.8	9.8	11.0	8.8	12.4
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	5	6	<5	5	<5
Barium	7440-39-3	10	mg/kg	100	20	20	80	90
Beryllium	7440-41-7	1	mg/kg	<1	1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	14	7	11	8
Cobalt	7440-48-4	2	mg/kg	11	28	11	10	10
Copper	7440-50-8	5	mg/kg	10	17	69	51	44
Lead	7439-92-1	5	mg/kg	16	14	7	779	128
Manganese	7439-96-5	5	mg/kg	1030	830	381	296	252
Nickel	7440-02-0	2	mg/kg	11	42	10	11	12
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	18	20	53	40	46
Zinc	7440-66-6	5	mg/kg	32	82	42	44	41
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	0.4	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	4.0	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	16.8	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	2.2	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	8.6	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	101	1.8
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	22.0	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	80.3	1.9
Pyrene	129-00-0	0.5	mg/kg	0.5	<0.5	<0.5	83.6	2.0
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	37.5	0.9
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	34.5	0.8
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	34.8	1.0
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	10.0	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	29.8	0.8
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	12.3	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	4.3	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH14 0.4-0.5	BH15 0.55-0.65	BH16 0.3-0.4	BH13 1.0-1.1	BH13 1.5-1.6
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811891-002	EM1811891-004	EM1811891-005	EM1811891-007	EM1811891-008
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	14.7	<0.5
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	0.5	<0.5	<0.5	496	9.2
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	<0.5	<0.5	<0.5	44.0	1.0
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	0.6	0.6	0.6	44.0	1.3
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	1.2	1.2	1.2	44.0	1.6
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	120	<50	<50	60	<50
C15 - C28 Fraction	—	100	mg/kg	1420	<100	<100	2350	<100
C29 - C36 Fraction	—	100	mg/kg	1680	<100	<100	850	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	3220	<50	<50	3260	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	140	<50	<50	220	<50
>C16 - C34 Fraction	—	100	mg/kg	2710	<100	<100	2760	<100
>C34 - C40 Fraction	—	100	mg/kg	760	<100	<100	410	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	3610	<50	<50	3390	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	140	<50	<50	220	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	2	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	94.9	90.6	91.9	87.6	95.1
2-Chlorophenol-D4	93951-73-6	0.5	%	98.3	94.4	96.4	91.6	99.4
2.4.6-Tribromophenol	118-79-6	0.5	%	88.4	77.5	77.9	84.0	83.1

Page : 5 of 15
Work Order : EM1811891
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH14 0.4-0.5	BH15 0.55-0.65	BH16 0.3-0.4	BH13 1.0-1.1	BH13 1.5-1.6
Client sampling date / time				25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
				EM1811891-002	EM1811891-004	EM1811891-005	EM1811891-007	EM1811891-008
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	97.1	92.0	92.7	90.2	97.1
Anthracene-d10	1719-06-8	0.5	%	104	106	110	109	105
4-Terphenyl-d14	1718-51-0	0.5	%	102	101	104	98.4	105
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	62.1	76.4	77.9	70.1	82.6
Toluene-D8	2037-26-5	0.2	%	62.9	74.5	79.8	69.6	69.4
4-Bromofluorobenzene	460-00-4	0.2	%	68.6	79.6	83.1	72.6	92.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 0.5-0.6	BH17 1.1-1.2	BH18 1.5-1.6	BH18 2.7-2.8	BH18 3.5-3.6
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811891-011	EM1811891-013	EM1811891-016	EM1811891-019	EM1811891-021
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	22.3	9.4	19.4	29.5	18.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	12	5	<5	6
Barium	7440-39-3	10	mg/kg	100	1620	170	310	130
Beryllium	7440-41-7	1	mg/kg	<1	1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	12	15	17	11
Cobalt	7440-48-4	2	mg/kg	9	18	18	12	18
Copper	7440-50-8	5	mg/kg	40	9	35	136	<5
Lead	7439-92-1	5	mg/kg	62	17	123	1160	11
Manganese	7439-96-5	5	mg/kg	167	111	242	199	256
Nickel	7440-02-0	2	mg/kg	14	33	22	23	19
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	37	15	36	54	24
Zinc	7440-66-6	5	mg/kg	107	57	242	593	27
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.4	4.5	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	1.8	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	3.4	<0.5	0.6	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	24.4	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	31.8	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	218	<0.5	2.9	0.9	<0.5
Anthracene	120-12-7	0.5	mg/kg	63.4	<0.5	0.9	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	250	<0.5	5.8	2.3	<0.5
Pyrene	129-00-0	0.5	mg/kg	216	<0.5	6.0	2.6	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	76.3	<0.5	2.6	1.3	<0.5
Chrysene	218-01-9	0.5	mg/kg	68.3	<0.5	2.5	1.2	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	100	<0.5	3.9	2.0	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	30.0	<0.5	1.1	0.7	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	89.1	<0.5	3.4	1.6	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	49.6	<0.5	2.1	1.0	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	11.4	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 0.5-0.6	BH17 1.1-1.2	BH18 1.5-1.6	BH18 2.7-2.8	BH18 3.5-3.6
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811891-011	EM1811891-013	EM1811891-016	EM1811891-019	EM1811891-021
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	57.4	<0.5	2.6	1.2	<0.5
^ Sum of polycyclic aromatic hydrocarbons	—	0.5	mg/kg	1290	<0.5	34.4	14.8	<0.5
^ Benzo(a)pyrene TEQ (zero)	—	0.5	mg/kg	127	<0.5	4.4	2.1	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	—	0.5	mg/kg	127	0.6	4.7	2.4	0.6
^ Benzo(a)pyrene TEQ (LOR)	—	0.5	mg/kg	127	1.2	4.9	2.6	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	—	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	—	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	—	100	mg/kg	3000	<100	230	100	<100
C29 - C36 Fraction	—	100	mg/kg	1870	<100	230	110	<100
^ C10 - C36 Fraction (sum)	—	50	mg/kg	4870	<50	460	210	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	—	50	mg/kg	160	<50	<50	<50	<50
>C16 - C34 Fraction	—	100	mg/kg	4160	<100	400	180	<100
>C34 - C40 Fraction	—	100	mg/kg	1070	<100	120	<100	<100
^ >C10 - C40 Fraction (sum)	—	50	mg/kg	5390	<50	520	180	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	—	50	mg/kg	160	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	—	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	—	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	96.2	97.8	89.6	88.4	93.3
2-Chlorophenol-D4	93951-73-6	0.5	%	101	102	94.3	90.9	97.0
2.4.6-Tribromophenol	118-79-6	0.5	%	88.0	87.4	81.5	82.1	83.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 0.5-0.6	BH17 1.1-1.2	BH18 1.5-1.6	BH18 2.7-2.8	BH18 3.5-3.6
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	EM1811891-011	EM1811891-013	EM1811891-016	EM1811891-019	EM1811891-021
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	96.9	99.1	89.7	89.0	102
Anthracene-d10	1719-06-8	0.5	%	101	111	99.2	102	111
4-Terphenyl-d14	1718-51-0	0.5	%	102	105	96.2	99.0	105
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	79.0	71.8	74.8	88.2	72.8
Toluene-D8	2037-26-5	0.2	%	78.0	69.8	74.4	84.0	70.7
4-Bromofluorobenzene	460-00-4	0.2	%	78.9	84.9	77.4	109	74.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH19 1.0-1.1	BH19 2.1-2.2	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-023	EM1811891-025	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.8	17.0	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	6	----	----	----
Barium	7440-39-3	10	mg/kg	150	80	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	4	15	----	----	----
Cobalt	7440-48-4	2	mg/kg	11	14	----	----	----
Copper	7440-50-8	5	mg/kg	58	10	----	----	----
Lead	7439-92-1	5	mg/kg	56	10	----	----	----
Manganese	7439-96-5	5	mg/kg	179	109	----	----	----
Nickel	7440-02-0	2	mg/kg	5	19	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	70	24	----	----	----
Zinc	7440-66-6	5	mg/kg	66	33	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	0.6	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	0.7	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Page : 10 of 15
Work Order : EM1811891
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH19 1.0-1.1	BH19 2.1-2.2	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-023	EM1811891-025	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	1.3	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	91.8	90.9	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	96.2	94.5	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	78.2	77.1	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH19 1.0-1.1	BH19 2.1-2.2	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-023	EM1811891-025	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	91.9	90.3	----	----	----
Anthracene-d10	1719-06-8	0.5	%	109	107	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	102	102	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	79.6	72.8	----	----	----
Toluene-D8	2037-26-5	0.2	%	78.1	72.2	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	98.7	75.6	----	----	----

Page : 12 of 15
Work Order : EM1811891
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 3	Rinsate 3	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-026	EM1811891-027	----	----	----
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 3	Rinsate 3	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-026	EM1811891-027	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	21.4	31.9	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	36.2	78.7	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	36.8	78.9	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	55.2	83.8	----	----	----
Anthracene-d10	1719-06-8	1.0	%	56.1	94.0	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	49.2	94.3	----	----	----

Page : 14 of 15
Work Order : EM1811891
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Newtown Rd

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 3	Rinsate 3	----	----	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1811891-026	EM1811891-027	--------	--------	--------
				Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	97.8	98.8	----	----	----
Toluene-D8	2037-26-5	2	%	95.7	92.9	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	102	98.8	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1812175**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Newtown Rd	Date Samples Received	: 26-Jul-2018 09:05
Order number	:	Date Analysis Commenced	: 01-Aug-2018
C-O-C number	: ----	Issue Date	: 06-Aug-2018 16:42
Sampler	: ----		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T: EM1812173_006 Poor duplicate precision for lead and zinc due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EG005T: EM1812173_007 Poor matrix spike recovery for zinc due to sample matrix. Confirmed by re-extraction and re-analysis.
- This is a rebatch of EM1811891.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH13 2.0-2.1	BH18 0.5-0.6	BH18 2.5-2.6	BH18 3.1-3.2	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	----
Compound	CAS Number	LOR	Unit	EM1812175-001	EM1812175-002	EM1812175-003	EM1812175-004	-------
				Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.8	16.6	32.9	22.7	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	11	<5	<5	5	----
Barium	7440-39-3	10	mg/kg	100	120	80	180	----
Beryllium	7440-41-7	1	mg/kg	1	<1	<1	<1	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	22	14	34	16	----
Cobalt	7440-48-4	2	mg/kg	16	13	29	10	----
Copper	7440-50-8	5	mg/kg	9	22	60	96	----
Lead	7439-92-1	5	mg/kg	30	46	7	479	----
Manganese	7439-96-5	5	mg/kg	552	239	517	194	----
Nickel	7440-02-0	2	mg/kg	13	14	28	15	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	----
Vanadium	7440-62-2	5	mg/kg	28	38	113	39	----
Zinc	7440-66-6	5	mg/kg	33	72	103	293	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	1.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	2.0	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	2.0	0.9	<0.5	1.8	----
Pyrene	129-00-0	0.5	mg/kg	2.2	1.0	<0.5	2.0	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.0	0.6	<0.5	1.3	----
Chrysene	218-01-9	0.5	mg/kg	0.8	<0.5	<0.5	0.8	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.0	0.6	<0.5	1.6	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	0.6	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.8	0.5	<0.5	1.3	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	0.7	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH13 2.0-2.1	BH18 0.5-0.6	BH18 2.5-2.6	BH18 3.1-3.2	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	----
Compound	CAS Number	LOR	Unit	EM1812175-001	EM1812175-002	EM1812175-003	EM1812175-004	--------
				Result	Result	Result	Result	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.5	<0.5	<0.5	1.0	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	10.3	3.6	<0.5	11.1	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.0	0.6	<0.5	1.7	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	1.3	0.9	0.6	2.0	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.6	1.2	1.2	2.2	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	120	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	120	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	93.0	94.3	96.7	89.2	----
2-Chlorophenol-D4	93951-73-6	0.5	%	85.3	86.2	88.2	85.4	----
2.4.6-Tribromophenol	118-79-6	0.5	%	74.0	72.1	75.0	73.7	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH13 2.0-2.1	BH18 0.5-0.6	BH18 2.5-2.6	BH18 3.1-3.2	----
			Client sampling date / time	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	25-Jul-2018 00:00	----
Compound	CAS Number	LOR	Unit	EM1812175-001	EM1812175-002	EM1812175-003	EM1812175-004	--------
				Result	Result	Result	Result	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	87.3	89.4	90.8	87.6	----
Anthracene-d10	1719-06-8	0.5	%	86.8	90.6	91.8	87.0	----
4-Terphenyl-d14	1718-51-0	0.5	%	86.4	88.7	90.5	87.6	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	73.0	78.0	65.5	68.8	----
Toluene-D8	2037-26-5	0.2	%	70.3	77.1	57.3	57.0	----
4-Bromofluorobenzene	460-00-4	0.2	%	98.2	104	91.2	90.1	----

Surrogate Control Limits

Sub-Matrix: SOIL

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM1812116	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Road	Date Samples Received	: 31-Jul-2018 09:25
Order number	: 30 July 2018	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 03-Aug-2018 15:22
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 5		
No. of samples analysed	: 4		

NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

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- Analytical Results
- Surrogate Control Limits

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

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Where moisture determination has been performed, results are reported on a dry weight basis.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Page : 3 of 9
Work Order : EM1812116
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0.5-0.6	BH20 1.0-1.1	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-003	EM1812116-004	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.4	19.8	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	40	120	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	9	13	----	----	----
Cobalt	7440-48-4	2	mg/kg	4	9	----	----	----
Copper	7440-50-8	5	mg/kg	23	25	----	----	----
Lead	7439-92-1	5	mg/kg	18	114	----	----	----
Manganese	7439-96-5	5	mg/kg	91	212	----	----	----
Nickel	7440-02-0	2	mg/kg	7	11	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	33	34	----	----	----
Zinc	7440-66-6	5	mg/kg	40	117	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	0.8	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	1.8	0.8	----	----	----
Pyrene	129-00-0	0.5	mg/kg	2.0	0.8	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.0	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	1.0	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.3	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.1	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Page : 4 of 9
Work Order : EM1812116
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0.5-0.6	BH20 1.0-1.1	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-003	EM1812116-004	----	----	----
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.7	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	10.2	1.6	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.4	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	1.7	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.9	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	120	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	120	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	85.1	82.9	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	89.3	84.5	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	82.9	86.9	----	----	----

Page : 5 of 9
Work Order : EM1812116
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Road

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0.5-0.6	BH20 1.0-1.1	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-003	EM1812116-004	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	91.2	86.3	----	----	----
Anthracene-d10	1719-06-8	0.5	%	99.6	97.1	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	101	94.3	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	67.4	70.5	----	----	----
Toluene-D8	2037-26-5	0.2	%	64.5	69.4	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	92.2	97.0	----	----	----

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Page	: 6 of 9
Work Order	: EM1812116
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Road

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 4	Rinsate 4	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-001	EM1812116-002	--------	--------	--------
				Result	Result	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 4	Rinsate 4	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-001	EM1812116-002	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	22.7	20.8	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	54.5	48.1	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	54.1	47.4	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	65.7	59.8	----	----	----
Anthracene-d10	1719-06-8	1.0	%	70.8	68.8	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	70.8	67.9	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Field Blank 4	Rinsate 4	----	----	----
			Client sampling date / time	30-Jul-2018 00:00	30-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1812116-001	EM1812116-002	--------	--------	--------
				Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	98.1	99.7	----	----	----
Toluene-D8	2037-26-5	2	%	95.4	96.3	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	102	105	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	38	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1816786**	Page	: 1 of 6
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: New Town Road	Date Samples Received	: 18-Oct-2018 09:10
Order number	:	Date Analysis Commenced	: 19-Oct-2018
C-O-C number	: ----	Issue Date	: 24-Oct-2018 17:11
Sampler	: SJ		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
* = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075(SIM): Sample EM1816786-002 required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly.
- EP075(SIM): Matrix spike recovery not determined for sample EM1816786-002 due to the presence of high level contaminants.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	GT02	GT01	GT03	----	----
			Client sampling date / time	17-Oct-2018 00:00	17-Oct-2018 00:00	17-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1816786-001	EM1816786-002	EM1816786-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	8.2	15.4	10.1	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	8.2	9.0	9.4	----	----
After HCl pH	----	0.1	pH Unit	1.1	1.2	1.2	----	----
Extraction Fluid Number	----	1	-	1	1	1	----	----
Final pH	----	0.1	pH Unit	5.0	5.1	5.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	0.8	1.8	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.6	0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	0.9	1.3	----	----
Phenanthrene	85-01-8	0.5	mg/kg	1.1	15.9	17.4	----	----
Anthracene	120-12-7	0.5	mg/kg	1.1	2.9	4.2	----	----
Fluoranthene	206-44-0	0.5	mg/kg	2.3	20.1	22.8	----	----
Pyrene	129-00-0	0.5	mg/kg	2.3	19.3	22.0	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	7.0	8.9	----	----
Chrysene	218-01-9	0.5	mg/kg	0.9	6.9	8.2	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.1	7.9	13.7	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.5	2.4	14.6	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	6.7	9.1	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	4.1	5.2	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	0.9	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.8	5.6	6.4	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	12.5	101	136	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.3	9.9	13.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	1.6	9.9	13.7	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.8	9.9	14.0	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	81.6	93.2	95.3	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	80.9	93.1	96.4	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	60.9	76.2	87.7	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	85.8	87.8	102	----	----
Anthracene-d10	1719-06-8	0.5	%	97.0	106	112	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	GT02	GT01	GT03	----	----
			Client sampling date / time	17-Oct-2018 00:00	17-Oct-2018 00:00	17-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1816786-001	EM1816786-002	EM1816786-003	--------	--------
				Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates - Continued								
4-Terphenyl-d14	1718-51-0	0.5	%	96.7	96.7	107	----	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	GT02	GT01	GT03	----	----
			Client sampling date / time	17-Oct-2018 00:00	17-Oct-2018 00:00	17-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1816786-001	EM1816786-002	EM1816786-003	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	2.5	3.5	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	1.3	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	2.5	5.8	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.4	26.6	28.3	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	65.1	55.1	61.0	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	73.6	70.0	72.8	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	73.8	65.0	69.9	----	----
Anthracene-d10	1719-06-8	1.0	%	76.6	71.5	75.8	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	76.9	74.1	77.1	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133

Sub-Matrix: **TCLP LEACHATE**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1817421**	Page	: 1 of 24
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
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Project	: 48-52	Date Samples Received	: 30-Oct-2018 09:40
Order number	:	Date Analysis Commenced	: 30-Oct-2018
C-O-C number	: ----	Issue Date	: 05-Nov-2018 16:53
Sampler	: GM		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 28		
No. of samples analysed	: 28		

NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Andrew Lu	VOC Section Supervisor	Melbourne Organics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Steven McGrath	Technical Manager	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075(SIM): Poor duplicate precision for samples EM1817421-001 & -011 due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH21 0.5-0.6	BH21 1.5-1.6	BH21 2.5-2.6	BH21 3.5-3.6	BH21 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-001	EM1817421-002	EM1817421-003	EM1817421-004	EM1817421-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.2	18.4	9.7	15.3	21.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	50	70	50	40	70
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	15	8	<2	4	9
Cobalt	7440-48-4	2	mg/kg	11	6	19	19	26
Copper	7440-50-8	5	mg/kg	172	11	94	78	82
Lead	7439-92-1	5	mg/kg	27	77	11	5	17
Manganese	7439-96-5	5	mg/kg	168	128	465	436	478
Nickel	7440-02-0	2	mg/kg	16	7	6	12	15
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	47	18	69	128	115
Zinc	7440-66-6	5	mg/kg	41	57	42	32	46
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	1.5	<0.5	<0.5	<0.5	0.9
Acenaphthene	83-32-9	0.5	mg/kg	0.7	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	0.9	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	12.8	<0.5	0.6	<0.5	0.7
Anthracene	120-12-7	0.5	mg/kg	3.6	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	26.9	1.2	2.0	0.6	5.2
Pyrene	129-00-0	0.5	mg/kg	25.2	1.4	2.6	0.9	7.0
Benz(a)anthracene	56-55-3	0.5	mg/kg	10.6	0.6	1.5	<0.5	3.9
Chrysene	218-01-9	0.5	mg/kg	10.1	0.6	1.4	<0.5	3.9
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	16.3	0.9	2.1	0.6	6.0
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	5.8	<0.5	0.7	<0.5	2.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	14.3	0.8	1.9	0.6	6.1
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	8.6	<0.5	0.9	<0.5	2.8
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.7	<0.5	<0.5	<0.5	0.9

Page	: 4 of 24
Work Order	: EM1817421
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH21 0.5-0.6	BH21 1.5-1.6	BH21 2.5-2.6	BH21 3.5-3.6	BH21 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-001	EM1817421-002	EM1817421-003	EM1817421-004	EM1817421-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	11.5	0.6	1.2	<0.5	3.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	150	6.1	14.9	2.7	43.4
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	20.3	1.0	2.4	0.7	8.6
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	20.3	1.3	2.7	1.0	8.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	20.3	1.6	2.9	1.3	8.6
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	480	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	400	190	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	880	190	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	760	230	<100	<100	170
>C34 - C40 Fraction	----	100	mg/kg	230	130	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	990	360	<50	<50	170
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	74.3	91.0	94.1	91.3	91.3
2-Chlorophenol-D4	93951-73-6	0.5	%	86.2	104	106	105	104
2.4.6-Tribromophenol	118-79-6	0.5	%	75.2	95.9	88.9	87.7	86.8

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH21 0.5-0.6	BH21 1.5-1.6	BH21 2.5-2.6	BH21 3.5-3.6	BH21 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-001	EM1817421-002	EM1817421-003	EM1817421-004	EM1817421-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	99.3	124	123	120	122
Anthracene-d10	1719-06-8	0.5	%	99.4	116	120	117	116
4-Terphenyl-d14	1718-51-0	0.5	%	93.3	122	123	124	113
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	86.2	74.3	83.7	75.9	74.5
Toluene-D8	2037-26-5	0.2	%	89.4	78.8	83.5	80.6	81.0
4-Bromofluorobenzene	460-00-4	0.2	%	110	98.9	106	105	103

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH21 5.5-5.6	BH22 0.5-0.6	BH22 1.5-1.6	BH22 2.5-2.6	BH22 3.4-3.5
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-006	EM1817421-007	EM1817421-008	EM1817421-009	EM1817421-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.8	10.6	19.9	17.4	13.0
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	60	150	90	90	80
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	12	14	25	24
Cobalt	7440-48-4	2	mg/kg	17	20	24	23	18
Copper	7440-50-8	5	mg/kg	70	30	48	58	57
Lead	7439-92-1	5	mg/kg	32	90	32	<5	12
Manganese	7439-96-5	5	mg/kg	355	243	256	358	428
Nickel	7440-02-0	2	mg/kg	10	20	16	24	25
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	71	44	89	119	87
Zinc	7440-66-6	5	mg/kg	81	122	48	37	44
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	0.2	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	0.8	0.7	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	2.7	3.9	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	0.9	1.0	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	6.4	7.9	<0.5	<0.5	0.9
Pyrene	129-00-0	0.5	mg/kg	7.4	8.0	0.5	<0.5	1.0
Benz(a)anthracene	56-55-3	0.5	mg/kg	3.7	3.4	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	3.7	3.1	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	5.1	4.7	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.1	1.8	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	4.6	4.1	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.1	2.3	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.7	0.6	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH21 5.5-5.6	BH22 0.5-0.6	BH22 1.5-1.6	BH22 2.5-2.6	BH22 3.4-3.5
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-006	EM1817421-007	EM1817421-008	EM1817421-009	EM1817421-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.7	3.0	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	42.9	44.5	0.5	<0.5	1.9
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	6.7	6.0	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	6.7	6.0	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	6.7	6.0	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	120	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	120	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	160	180	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	160	180	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	91.4	89.4	92.2	86.4	90.1
2-Chlorophenol-D4	93951-73-6	0.5	%	104	100.0	103	97.6	102
2.4.6-Tribromophenol	118-79-6	0.5	%	92.5	75.9	75.7	64.2	67.6

Analytical Results

Sub-Matrix: **SALT** (Matrix: **SOIL**)			Client sample ID	BH21 5.5-5.6	BH22 0.5-0.6	BH22 1.5-1.6	BH22 2.5-2.6	BH22 3.4-3.5
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-006	EM1817421-007	EM1817421-008	EM1817421-009	EM1817421-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	121	123	124	120	124
Anthracene-d10	1719-06-8	0.5	%	114	108	119	113	119
4-Terphenyl-d14	1718-51-0	0.5	%	114	113	135	125	127
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	79.5	74.2	77.6	76.4	81.9
Toluene-D8	2037-26-5	0.2	%	79.4	80.3	81.0	79.6	81.9
4-Bromofluorobenzene	460-00-4	0.2	%	103	103	106	97.1	109

Page : 9 of 24
Work Order : EM1817421
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH23 0.5-0.6	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-011	EM1817421-012	EM1817421-013	EM1817421-014	EM1817421-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.6	11.7	10.8	26.1	12.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	6	<5	<5	<5	5
Barium	7440-39-3	10	mg/kg	130	150	100	3730	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	16	17	10	10	11
Cobalt	7440-48-4	2	mg/kg	12	12	10	21	18
Copper	7440-50-8	5	mg/kg	56	41	39	2410	18
Lead	7439-92-1	5	mg/kg	141	175	220	186	16
Manganese	7439-96-5	5	mg/kg	298	310	180	405	1090
Nickel	7440-02-0	2	mg/kg	24	22	11	13	21
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	41	27	34	92	22
Zinc	7440-66-6	5	mg/kg	116	302	123	208	63
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.1	0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<2.4	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	1.2	<0.5	9.1	0.6	0.6
Acenaphthene	83-32-9	0.5	mg/kg	0.6	0.6	32.2	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	0.9	0.6	29.0	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	8.7	6.0	295	2.4	1.4
Anthracene	120-12-7	0.5	mg/kg	2.2	1.6	132	0.6	0.5
Fluoranthene	206-44-0	0.5	mg/kg	13.0	7.7	360	4.8	3.6
Pyrene	129-00-0	0.5	mg/kg	12.9	7.5	334	4.8	4.2
Benz(a)anthracene	56-55-3	0.5	mg/kg	5.1	3.1	133	1.9	2.1
Chrysene	218-01-9	0.5	mg/kg	5.0	2.8	127	2.0	2.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	8.0	4.4	186	3.0	2.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.9	1.5	75.2	1.2	1.0
Benzo(a)pyrene	50-32-8	0.5	mg/kg	6.7	3.8	166	2.5	2.2
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	4.1	2.1	81.9	1.4	1.0
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.0	0.6	19.3	<0.5	<0.5

Page	: 10 of 24
Work Order	: EM1817421
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH23 0.5-0.6	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
				EM1817421-011	EM1817421-012	EM1817421-013	EM1817421-014	EM1817421-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	5.4	2.7	100	1.8	1.2
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	77.7	45.0	2080	27.0	22.2
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	9.8	5.6	235	3.3	2.9
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	9.8	5.6	235	3.5	3.1
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	9.8	5.6	235	3.8	3.4
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	330	<100	4010	370	<100
C29 - C36 Fraction	----	100	mg/kg	300	<100	1780	160	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	630	<50	5790	530	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	190	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	540	150	5070	470	<100
>C34 - C40 Fraction	----	100	mg/kg	180	<100	760	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	720	150	6020	470	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	190	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	72.8	88.8	84.3	89.3	91.3
2-Chlorophenol-D4	93951-73-6	0.5	%	82.7	101	93.1	103	103
2.4.6-Tribromophenol	118-79-6	0.5	%	68.6	80.3	67.6	85.3	87.1

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH23 0.5-0.6	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-011	EM1817421-012	EM1817421-013	EM1817421-014	EM1817421-015
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	101	123	116	123	124
Anthracene-d10	1719-06-8	0.5	%	101	110	105	115	118
4-Terphenyl-d14	1718-51-0	0.5	%	94.1	114	122	113	119
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	71.3	78.1	74.4	68.4	81.9
Toluene-D8	2037-26-5	0.2	%	73.7	77.4	76.2	72.2	86.4
4-Bromofluorobenzene	460-00-4	0.2	%	96.1	102	94.8	91.0	110

Page : 12 of 24
Work Order : EM1817421
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SALT
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH23 5.5-5.6	BH24 0.5-0.6	BH24 1.5-1.6	BH24 2.5-2.6	BH24 3.3-3.4
			Client sample ID	BH23 5.5-5.6	BH24 0.5-0.6	BH24 1.5-1.6	BH24 2.5-2.6	BH24 3.3-3.4
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
				EM1817421-016	EM1817421-017	EM1817421-018	EM1817421-019	EM1817421-020
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.4	8.9	10.7	12.6	11.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	9	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	80	100	160	170	200
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	11	12	19	24	17
Cobalt	7440-48-4	2	mg/kg	13	11	9	14	19
Copper	7440-50-8	5	mg/kg	39	21	15	16	42
Lead	7439-92-1	5	mg/kg	42	70	31	22	212
Manganese	7439-96-5	5	mg/kg	630	227	222	455	518
Nickel	7440-02-0	2	mg/kg	16	16	13	20	22
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	35	28	47	56	29
Zinc	7440-66-6	5	mg/kg	134	120	51	56	220
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.1	0.1	<0.1	<0.1	0.6
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	2.6	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	10.5	1.0	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	2.2	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	5.3	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	58.0	6.0	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	20.3	1.6	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	70.6	9.2	<0.5	<0.5	1.2
Pyrene	129-00-0	0.5	mg/kg	73.8	9.1	0.6	<0.5	1.3
Benz(a)anthracene	56-55-3	0.5	mg/kg	34.6	4.2	<0.5	<0.5	0.6
Chrysene	218-01-9	0.5	mg/kg	36.4	3.9	<0.5	<0.5	0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	49.5	5.2	<0.5	<0.5	0.8
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	17.1	2.2	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	45.2	4.8	<0.5	<0.5	0.7
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	17.6	2.3	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	6.2	0.6	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH23 5.5-5.6	BH24 0.5-0.6	BH24 1.5-1.6	BH24 2.5-2.6	BH24 3.3-3.4
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-016	EM1817421-017	EM1817421-018	EM1817421-019	EM1817421-020
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**22.3**	**2.8**	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**472**	**52.9**	**0.6**	<0.5	**5.1**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**63.9**	**6.8**	<0.5	<0.5	**0.8**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**63.9**	**6.8**	**0.6**	**0.6**	**1.1**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**63.9**	**6.8**	**1.2**	**1.2**	**1.4**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**1640**	**150**	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	**870**	**110**	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**2510**	**260**	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	**60**	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**2170**	**220**	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	**410**	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**2640**	**220**	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	**60**	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**90.1**	**93.3**	**80.3**	**92.0**	**90.9**
2-Chlorophenol-D4	93951-73-6	0.5	%	**102**	**106**	**89.7**	**104**	**102**
2.4.6-Tribromophenol	118-79-6	0.5	%	**83.8**	**92.5**	**73.0**	**76.8**	**77.1**

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH23 5.5-5.6	BH24 0.5-0.6	BH24 1.5-1.6	BH24 2.5-2.6	BH24 3.3-3.4
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-016	EM1817421-017	EM1817421-018	EM1817421-019	EM1817421-020
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	123	123	110	124	123
Anthracene-d10	1719-06-8	0.5	%	108	114	108	119	120
4-Terphenyl-d14	1718-51-0	0.5	%	114	115	115	131	129
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	75.6	78.2	75.4	77.8	83.8
Toluene-D8	2037-26-5	0.2	%	77.6	80.3	74.4	77.8	85.2
4-Bromofluorobenzene	460-00-4	0.2	%	96.6	104	98.3	99.7	108

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 0.5-0.6	BH25 1.5-1.6	BH25 2.5-2.6	BH25 3.5-3.6	BH25 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-021	EM1817421-022	EM1817421-023	EM1817421-024	EM1817421-025
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.3	17.2	15.0	12.7	15.2
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	210	80	160	160	170
Beryllium	7440-41-7	1	mg/kg	<1	<1	2	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	16	8	12	12
Cobalt	7440-48-4	2	mg/kg	16	25	57	20	17
Copper	7440-50-8	5	mg/kg	25	40	29	26	43
Lead	7439-92-1	5	mg/kg	49	8	50	138	460
Manganese	7439-96-5	5	mg/kg	305	142	165	210	372
Nickel	7440-02-0	2	mg/kg	15	20	12	18	19
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	33	82	61	22	33
Zinc	7440-66-6	5	mg/kg	114	33	38	134	215
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.1	0.4	0.3
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	0.6	2.7
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.6
Phenanthrene	85-01-8	0.5	mg/kg	3.4	<0.5	<0.5	2.4	14.4
Anthracene	120-12-7	0.5	mg/kg	0.8	<0.5	<0.5	0.7	4.1
Fluoranthene	206-44-0	0.5	mg/kg	3.1	<0.5	<0.5	4.1	26.2
Pyrene	129-00-0	0.5	mg/kg	3.0	<0.5	<0.5	4.6	27.4
Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	<0.5	<0.5	2.2	12.9
Chrysene	218-01-9	0.5	mg/kg	1.0	<0.5	<0.5	2.0	11.4
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.1	<0.5	<0.5	2.6	16.0
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.5	<0.5	<0.5	1.2	5.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.9	<0.5	<0.5	2.2	14.9
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	1.0	5.9
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.2

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 0.5-0.6	BH25 1.5-1.6	BH25 2.5-2.6	BH25 3.5-3.6	BH25 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-021	EM1817421-022	EM1817421-023	EM1817421-024	EM1817421-025
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.6	<0.5	<0.5	1.2	7.4
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	15.3	<0.5	<0.5	24.8	153
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.2	<0.5	<0.5	2.9	20.3
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	1.4	0.6	0.6	3.2	20.3
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.7	1.2	1.2	3.4	20.3
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	140	480
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	140	290
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	280	770
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	250	690
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	130
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	250	820
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	94.2	94.3	93.1	95.0	93.1
2-Chlorophenol-D4	93951-73-6	0.5	%	88.0	87.5	86.8	88.5	87.5
2.4.6-Tribromophenol	118-79-6	0.5	%	65.9	61.5	65.6	69.5	80.0

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 0.5-0.6	BH25 1.5-1.6	BH25 2.5-2.6	BH25 3.5-3.6	BH25 4.5-4.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817421-021	EM1817421-022	EM1817421-023	EM1817421-024	EM1817421-025
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	94.4	93.6	101	103	96.0
Anthracene-d10	1719-06-8	0.5	%	102	107	106	102	96.4
4-Terphenyl-d14	1718-51-0	0.5	%	99.8	100	102	99.4	95.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	75.8	84.4	88.8	76.0	81.1
Toluene-D8	2037-26-5	0.2	%	70.4	76.5	79.6	68.9	67.6
4-Bromofluorobenzene	460-00-4	0.2	%	80.2	88.9	96.1	79.2	83.0

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 5.5-5.6	DUPLICATE 1	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-026	EM1817421-027	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.7	17.2	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	20	90	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	4	29	----	----	----
Cobalt	7440-48-4	2	mg/kg	<2	21	----	----	----
Copper	7440-50-8	5	mg/kg	<5	60	----	----	----
Lead	7439-92-1	5	mg/kg	6	<5	----	----	----
Manganese	7439-96-5	5	mg/kg	28	364	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	25	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	<5	127	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	40	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 5.5-5.6	DUPLICATE 1	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-026	EM1817421-027	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	96.0	93.6	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	90.5	88.1	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	79.4	72.2	----	----	----

Analytical Results

Sub-Matrix: SALT (Matrix: SOIL)			Client sample ID	BH25 5.5-5.6	DUPLICATE 1	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-026	EM1817421-027	----	----	----
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	106	94.9	----	----	----
Anthracene-d10	1719-06-8	0.5	%	107	105	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	100	97.5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	85.8	83.8	----	----	----
Toluene-D8	2037-26-5	0.2	%	72.6	69.3	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	90.9	88.0	----	----	----

Page : 21 of 24
Work Order : EM1817421
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate Blank	----	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-028	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate Blank	----	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-028	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.9	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	72.2	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	60.5	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	84.4	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	88.1	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	90.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate Blank	----	----	----	----
			Client sampling date / time	24-Oct-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817421-028	--------	--------	--------	--------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	97.9	----	----	----	----
Toluene-D8	2037-26-5	2	%	91.8	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	109	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SALT**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM1817821	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 30-Oct-2018 09:40
Order number	:	Date Analysis Commenced	: 07-Nov-2018
C-O-C number	: ----	Issue Date	: 09-Nov-2018 15:18
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 13		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 9
Work Order	: EM1817821
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- This is a rebatch of EM1817421
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH21 0.5-0.6	BH21 4.5-4.6	BH21 5.5-5.6	BH22 0.5-0.6	BH23 0.5-0.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817821-001	EM1817821-002	EM1817821-003	EM1817821-004	EM1817821-005
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.2	8.3	8.9	9.2	9.6
After HCl pH	----	0.1	pH Unit	1.5	1.4	1.5	1.5	1.6
Extraction Fluid Number	----	1	-	1	1	1	1	1
Final pH	----	0.1	pH Unit	5.4	5.0	5.3	5.4	5.5

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6	BH23 5.5-5.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
				EM1817821-006	EM1817821-007	EM1817821-008	EM1817821-009	EM1817821-010
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.6	9.5	8.2	8.4	8.8
After HCl pH	----	0.1	pH Unit	1.6	1.8	1.5	1.6	1.5
Extraction Fluid Number	----	1	-	1	1	1	1	1
Final pH	----	0.1	pH Unit	5.9	6.6	7.0	5.3	5.1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH24 0.5-0.6	BH25 3.5-3.6	BH25 4.5-4.6	----	----
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817821-011	EM1817821-012	EM1817821-013	--------	--------
				Result	Result	Result	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.3	9.2	9.2	----	----
After HCl pH	----	0.1	pH Unit	1.5	1.6	1.6	----	----
Extraction Fluid Number	----	1	-	1	1	1	----	----
Final pH	----	0.1	pH Unit	5.2	5.3	5.6	----	----

Page : 6 of 9
Work Order : EM1817821
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BH21 0.5-0.6	BH21 4.5-4.6	BH21 5.5-5.6	BH22 0.5-0.6	BH23 0.5-0.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817821-001	EM1817821-002	EM1817821-003	EM1817821-004	EM1817821-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	1.1	<1.0	<1.0	<1.0	1.7
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	2.5
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	2.1
Phenanthrene	85-01-8	1.0	µg/L	2.0	3.0	1.2	<1.0	9.3
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	1.7
Fluoranthene	206-44-0	1.0	µg/L	<1.0	1.1	<1.0	<1.0	2.4
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	1.8
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	3.1	4.1	1.2	<0.5	21.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	24.2	26.8	23.6	27.9	30.7
2-Chlorophenol-D4	93951-73-6	1.0	%	53.3	64.8	56.4	65.9	70.7
2.4.6-Tribromophenol	118-79-6	1.0	%	58.0	73.0	63.4	77.8	85.4
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	69.2	83.8	73.4	87.2	95.6
Anthracene-d10	1719-06-8	1.0	%	66.0	79.4	70.2	82.2	88.9
4-Terphenyl-d14	1718-51-0	1.0	%	64.4	80.4	68.0	82.9	89.3

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)			Client sample ID	BH23 1.5-1.6	BH23 2.5-2.6	BH23 3.5-3.6	BH23 4.5-4.6	BH23 5.5-5.6
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817821-006	EM1817821-007	EM1817821-008	EM1817821-009	EM1817821-010
				Result	Result	Result	Result	Result
EG005C: Leachable Metals by ICPAES								
Barium	7440-39-3	0.1	mg/L	----	----	0.8	----	----
Copper	7440-50-8	0.1	mg/L	----	----	2.9	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	3.0	<1.0	<1.0	3.4
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	1.7	<1.0	<1.0	9.1
Acenaphthene	83-32-9	1.0	µg/L	<1.0	25.7	<1.0	<1.0	7.2
Fluorene	86-73-7	1.0	µg/L	<1.0	15.0	<1.0	<1.0	9.2
Phenanthrene	85-01-8	1.0	µg/L	1.4	58.6	1.7	1.8	43.2
Anthracene	120-12-7	1.0	µg/L	<1.0	12.6	<1.0	<1.0	6.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	14.8	<1.0	<1.0	6.6
Pyrene	129-00-0	1.0	µg/L	<1.0	11.0	<1.0	<1.0	5.4
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	1.4	142	1.7	1.8	90.1
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	28.0	25.4	32.1	28.4	28.3
2-Chlorophenol-D4	93951-73-6	1.0	%	68.3	60.2	76.8	63.1	66.7
2.4.6-Tribromophenol	118-79-6	1.0	%	76.9	65.2	86.4	74.9	82.3
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	85.6	76.4	101	80.9	83.4
Anthracene-d10	1719-06-8	1.0	%	81.5	64.8	96.3	79.7	73.1
4-Terphenyl-d14	1718-51-0	1.0	%	82.4	64.6	99.1	78.0	72.9

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BH24 0.5-0.6	BH25 3.5-3.6	BH25 4.5-4.6	----	----
			Client sampling date / time	24-Oct-2018 00:00	24-Oct-2018 00:00	24-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817821-011	EM1817821-012	EM1817821-013	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	1.1	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	1.2	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	2.5	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	1.0	1.8	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	4.8	4.4	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	1.3	1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	8.3	10.8	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.0	30.7	26.5	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	66.5	71.2	61.7	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	80.0	83.3	73.5	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	82.7	86.4	79.1	----	----
Anthracene-d10	1719-06-8	1.0	%	78.0	82.1	76.4	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	70.3	78.7	74.8	----	----

Surrogate Control Limits

Sub-Matrix: TCLP LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM1817564	Page	: 1 of 30
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018 09:40
Order number	:	Date Analysis Commenced	: 01-Nov-2018
C-O-C number	: ----	Issue Date	: 09-Nov-2018 16:39
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 43		
No. of samples analysed	: 43		

NATA Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Particular sample EM1817564_29 shows positive hit for Napthalene. Confirmed by re-analysis.
- EG005T:EM1817564_023 and 042 have been confirmed for metals by re-preparation and re-analysis.
- EP075SIM: Sample EM1817564_11 Poor duplicate precision due to sample heterogeneity. Confirmed by visual inspection.
- EG005T: EM1817564_022 Poor matrix spike recovery for Copper due to sample matrix. Confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH26 0.1-0.2	BH26 0.5-0.6	BH27 0.1-0.2	BH27 0.5-0.6	BH27 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-001	EM1817564-002	EM1817564-003	EM1817564-004	EM1817564-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	13.3	10.8	14.0	19.9	19.4
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	16	<5	21	<5
Barium	7440-39-3	10	mg/kg	30	310	90	100	120
Beryllium	7440-41-7	1	mg/kg	<1	2	<1	1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	16	6	17	9
Cobalt	7440-48-4	2	mg/kg	4	31	10	16	16
Copper	7440-50-8	5	mg/kg	23	11	46	21	38
Lead	7439-92-1	5	mg/kg	14	17	28	43	278
Manganese	7439-96-5	5	mg/kg	56	221	255	194	215
Nickel	7440-02-0	2	mg/kg	4	42	6	15	18
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	33	30	42	32	25
Zinc	7440-66-6	5	mg/kg	30	52	59	80	75
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	2.2	<0.5	1.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	0.6
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	2.5	<0.5	2.9
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	2.8	<0.5	3.7
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	1.2	<0.5	3.0
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	1.1	<0.5	2.7
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	1.2	<0.5	5.6
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.9
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	1.1	<0.5	5.6
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	3.0
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	0.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH26 0.1-0.2	BH26 0.5-0.6	BH27 0.1-0.2	BH27 0.5-0.6	BH27 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-001	EM1817564-002	EM1817564-003	EM1817564-004	EM1817564-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.6	<0.5	4.1
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	12.7	<0.5	35.4
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	1.4	<0.5	7.8
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	1.6	0.6	7.8
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	2.0	1.2	7.8
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	150
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	170
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	320
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	280
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	280
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	86.2	83.7	88.6	87.7	86.4
2-Chlorophenol-D4	93951-73-6	0.5	%	87.6	85.5	90.9	90.4	89.4
2.4.6-Tribromophenol	118-79-6	0.5	%	68.4	65.9	73.6	69.0	73.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH26 0.1-0.2	BH26 0.5-0.6	BH27 0.1-0.2	BH27 0.5-0.6	BH27 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-001	EM1817564-002	EM1817564-003	EM1817564-004	EM1817564-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	94.4	98.3	103	102	103
Anthracene-d10	1719-06-8	0.5	%	100	100	98.7	104	99.0
4-Terphenyl-d14	1718-51-0	0.5	%	93.1	91.6	94.8	96.6	94.5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	70.8	73.3	75.0	70.9	71.8
Toluene-D8	2037-26-5	0.2	%	62.4	70.4	68.2	67.1	68.4
4-Bromofluorobenzene	460-00-4	0.2	%	72.9	78.1	80.0	75.9	78.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH27 1.5-1.6	BH27 1.9-2.0	BH28 0.1-0.2	BH28 0.5-0.6	BH28 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-006	EM1817564-007	EM1817564-008	EM1817564-009	EM1817564-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.6	9.7	13.9	15.6	17.0
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	14	14	<5	<5	<5
Barium	7440-39-3	10	mg/kg	30	40	30	80	30
Beryllium	7440-41-7	1	mg/kg	2	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	14	20	8	18	12
Cobalt	7440-48-4	2	mg/kg	23	22	<2	16	2
Copper	7440-50-8	5	mg/kg	6	7	<5	21	<5
Lead	7439-92-1	5	mg/kg	10	12	6	34	12
Manganese	7439-96-5	5	mg/kg	422	1500	30	314	124
Nickel	7440-02-0	2	mg/kg	34	38	3	20	6
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	18	26	21	36	28
Zinc	7440-66-6	5	mg/kg	32	53	12	72	43
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	1.1	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	2.2	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	2.3	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	0.9	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	0.8	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	1.3	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	1.2	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	0.6	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Page : 7 of 30
Work Order : EM1817564
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH27 1.5-1.6	BH27 1.9-2.0	BH28 0.1-0.2	BH28 0.5-0.6	BH28 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-006	EM1817564-007	EM1817564-008	EM1817564-009	EM1817564-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	0.8	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	11.2	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	1.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	1.8	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	2.0	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	88.4	85.6	88.4	86.5	85.0
2-Chlorophenol-D4	93951-73-6	0.5	%	89.4	87.0	91.0	88.5	87.6
2.4.6-Tribromophenol	118-79-6	0.5	%	71.6	67.3	69.4	73.3	66.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH27 1.5-1.6	BH27 1.9-2.0	BH28 0.1-0.2	BH28 0.5-0.6	BH28 1.0-1.1
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00	29-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-006	EM1817564-007	EM1817564-008	EM1817564-009	EM1817564-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	102	98.4	102	96.1	93.4
Anthracene-d10	1719-06-8	0.5	%	103	102	106	99.6	101
4-Terphenyl-d14	1718-51-0	0.5	%	95.1	92.5	96.3	94.1	93.6
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	67.6	72.9	73.1	73.0	72.7
Toluene-D8	2037-26-5	0.2	%	62.2	71.0	68.2	75.2	70.7
4-Bromofluorobenzene	460-00-4	0.2	%	75.8	78.2	79.7	84.0	79.4

Page	: 9 of 30
Work Order	: EM1817564
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH28 1.2-1.3	BH29 0.5-0.6	BH29 1.5-1.6	BH29 2.1-2.2	BH30 0.3-0.4
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
				EM1817564-011	EM1817564-012	EM1817564-013	EM1817564-014	EM1817564-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	24.9	13.5	14.2	15.3	14.3
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	80	100	110	70	100
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	8	11	10	12
Cobalt	7440-48-4	2	mg/kg	11	13	9	12	12
Copper	7440-50-8	5	mg/kg	18	43	25	6	23
Lead	7439-92-1	5	mg/kg	81	70	78	10	53
Manganese	7439-96-5	5	mg/kg	190	345	249	150	316
Nickel	7440-02-0	2	mg/kg	9	14	10	11	16
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	25	42	36	22	28
Zinc	7440-66-6	5	mg/kg	456	112	86	23	100
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.4	<0.1	0.3	<0.1	0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	1.1	1.1	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	1.1	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	8.7	5.8	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	3.4	1.4	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	15.6	8.7	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	17.0	9.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	8.0	4.1	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	7.2	3.6	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	7.6	5.0	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.0	1.6	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	7.3	4.6	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	3.3	2.3	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.9	0.6	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH28 1.2-1.3	BH29 0.5-0.6	BH29 1.5-1.6	BH29 2.1-2.2	BH30 0.3-0.4
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-011	EM1817564-012	EM1817564-013	EM1817564-014	EM1817564-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	4.2	3.0	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	88.4	51.3	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	10.5	6.6	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	10.5	6.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	10.5	6.6	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	350	260	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	200	180	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	550	440	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	480	390	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	480	390	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.2	84.4	84.3	87.3	88.3
2-Chlorophenol-D4	93951-73-6	0.5	%	91.0	86.4	86.3	89.2	87.2
2.4.6-Tribromophenol	118-79-6	0.5	%	73.1	71.9	71.6	71.4	70.3

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH28 1.2-1.3	BH29 0.5-0.6	BH29 1.5-1.6	BH29 2.1-2.2	BH30 0.3-0.4
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-011	EM1817564-012	EM1817564-013	EM1817564-014	EM1817564-015
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	93.1	87.8	92.7	94.6	93.7
Anthracene-d10	1719-06-8	0.5	%	104	99.6	98.4	102	99.4
4-Terphenyl-d14	1718-51-0	0.5	%	95.6	89.2	92.5	94.9	93.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	70.4	75.5	74.5	72.8	73.2
Toluene-D8	2037-26-5	0.2	%	71.3	71.7	72.7	67.5	72.8
4-Bromofluorobenzene	460-00-4	0.2	%	76.5	79.8	80.5	79.0	81.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH31 0.5-0.6	BH31 1.5-1.6	BH32 0.5-0.6	BH33 0.5-0.6	BH34 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-016	EM1817564-017	EM1817564-018	EM1817564-019	EM1817564-020
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.8	10.5	15.6	16.8	13.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	6	<5	<5	<5
Barium	7440-39-3	10	mg/kg	70	100	90	80	380
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	13	14	9	15
Cobalt	7440-48-4	2	mg/kg	12	17	6	4	8
Copper	7440-50-8	5	mg/kg	9	7	13	6	6
Lead	7439-92-1	5	mg/kg	19	12	21	15	10
Manganese	7439-96-5	5	mg/kg	134	584	136	80	45
Nickel	7440-02-0	2	mg/kg	13	28	13	6	10
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	25	18	25	21	31
Zinc	7440-66-6	5	mg/kg	61	58	36	20	16
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	1.4	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	1.7	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	1.0	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	1.0	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	1.2	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	1.1	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH31 0.5-0.6	BH31 1.5-1.6	BH32 0.5-0.6	BH33 0.5-0.6	BH34 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-016	EM1817564-017	EM1817564-018	EM1817564-019	EM1817564-020
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.6	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	8.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	1.4	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	1.7	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.9	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	83.6	91.0	84.3	97.0	90.8
2-Chlorophenol-D4	93951-73-6	0.5	%	86.0	93.1	86.5	98.9	92.0
2.4.6-Tribromophenol	118-79-6	0.5	%	68.1	72.6	75.0	81.0	75.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH31 0.5-0.6	BH31 1.5-1.6	BH32 0.5-0.6	BH33 0.5-0.6	BH34 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-016	EM1817564-017	EM1817564-018	EM1817564-019	EM1817564-020
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	92.4	94.0	87.3	104	98.2
Anthracene-d10	1719-06-8	0.5	%	100	107	97.9	116	109
4-Terphenyl-d14	1718-51-0	0.5	%	91.8	98.9	90.4	106	99.5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	75.9	69.9	70.1	69.8	77.7
Toluene-D8	2037-26-5	0.2	%	75.0	71.0	68.0	69.8	76.6
4-Bromofluorobenzene	460-00-4	0.2	%	82.7	77.7	79.8	77.5	83.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH35 0.5-0.6	BH35 1.5-1.6	Duplicate 2	BH36 0.5-0.6	BH37 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-021	EM1817564-022	EM1817564-023	EM1817564-027	EM1817564-028
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.8	15.0	11.4	22.7	11.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	13
Barium	7440-39-3	10	mg/kg	140	180	90	100	160
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	11	9	17	13
Cobalt	7440-48-4	2	mg/kg	11	15	14	19	12
Copper	7440-50-8	5	mg/kg	32	44	51	40	67
Lead	7439-92-1	5	mg/kg	152	82	88	10	231
Manganese	7439-96-5	5	mg/kg	267	346	322	624	295
Nickel	7440-02-0	2	mg/kg	12	17	13	17	14
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	40	37	50	68	30
Zinc	7440-66-6	5	mg/kg	163	130	104	40	367
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	<0.1	<0.1	1.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	0.5	<0.5	3.3	<0.5	1.2
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	1.8	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	4.9	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	2.8	2.3	49.2	<0.5	5.4
Anthracene	120-12-7	0.5	mg/kg	0.8	0.5	9.8	<0.5	1.3
Fluoranthene	206-44-0	0.5	mg/kg	5.0	3.6	57.9	<0.5	10.1
Pyrene	129-00-0	0.5	mg/kg	5.1	3.6	51.0	<0.5	10.3
Benz(a)anthracene	56-55-3	0.5	mg/kg	2.3	1.5	17.2	<0.5	5.0
Chrysene	218-01-9	0.5	mg/kg	2.1	1.3	15.1	<0.5	4.4
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	3.1	1.9	23.1	<0.5	7.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.0	0.6	8.0	<0.5	2.2
Benzo(a)pyrene	50-32-8	0.5	mg/kg	2.7	1.6	21.6	<0.5	6.8
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.6	0.9	11.7	<0.5	3.8
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	2.5	<0.5	1.0

Page : 16 of 30
Work Order : EM1817564
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH35 0.5-0.6	BH35 1.5-1.6	Duplicate 2	BH36 0.5-0.6	BH37 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-021	EM1817564-022	EM1817564-023	EM1817564-027	EM1817564-028
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.1	1.2	14.6	<0.5	4.9
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	29.1	19.0	292	<0.5	63.8
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	3.5	2.1	30.4	<0.5	9.7
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	3.8	2.4	30.4	0.6	9.7
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	4.0	2.6	30.4	1.2	9.7
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	130	<100	600	<100	260
C29 - C36 Fraction	----	100	mg/kg	140	<100	370	<100	210
^ C10 - C36 Fraction (sum)	----	50	mg/kg	270	<50	970	<50	470
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	230	130	820	<100	400
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	190	<100	100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	230	130	1010	<50	500
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	96.0	87.8	87.9	84.3	87.3
2-Chlorophenol-D4	93951-73-6	0.5	%	97.1	92.7	92.4	88.7	91.5
2.4.6-Tribromophenol	118-79-6	0.5	%	88.6	81.0	86.2	76.7	82.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH35 0.5-0.6	BH35 1.5-1.6	Duplicate 2	BH36 0.5-0.6	BH37 0.5-0.6
			Client sampling date / time	30-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-021	EM1817564-022	EM1817564-023	EM1817564-027	EM1817564-028
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	99.0	96.6	96.0	93.8	93.4
Anthracene-d10	1719-06-8	0.5	%	101	108	90.4	116	99.0
4-Terphenyl-d14	1718-51-0	0.5	%	95.7	96.1	83.4	98.3	90.5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	68.8	72.1	71.3	63.4	79.5
Toluene-D8	2037-26-5	0.2	%	61.3	65.2	67.8	59.0	76.6
4-Bromofluorobenzene	460-00-4	0.2	%	74.2	75.1	76.3	76.8	84.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH37 1.5-1.6	BH37 2.5-2.6	BH37 3.5-3.6	BH38 0.5-0.6	BH38 1.5-1.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-029	EM1817564-030	EM1817564-031	EM1817564-032	EM1817564-033
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.8	14.4	15.3	16.6	20.1
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	9	<5	<5	<5
Barium	7440-39-3	10	mg/kg	40	240	20	70	170
Beryllium	7440-41-7	1	mg/kg	<1	1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	14	25	15	14	9
Cobalt	7440-48-4	2	mg/kg	12	11	12	15	17
Copper	7440-50-8	5	mg/kg	30	9	11	13	14
Lead	7439-92-1	5	mg/kg	42	53	18	57	89
Manganese	7439-96-5	5	mg/kg	112	350	238	356	174
Nickel	7440-02-0	2	mg/kg	11	16	15	13	13
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	46	61	29	30	17
Zinc	7440-66-6	5	mg/kg	73	40	44	45	108
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	0.9	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	1.7	0.6	0.7	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	18.6	5.4	7.4	0.7	<0.5
Anthracene	120-12-7	0.5	mg/kg	3.6	1.0	1.4	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	20.8	6.1	8.7	1.9	1.2
Pyrene	129-00-0	0.5	mg/kg	18.7	5.6	8.0	2.2	1.3
Benz(a)anthracene	56-55-3	0.5	mg/kg	5.8	1.8	2.5	1.2	0.6
Chrysene	218-01-9	0.5	mg/kg	5.2	1.5	2.2	1.1	0.6
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	8.3	2.2	3.3	1.5	0.8
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.3	0.8	1.2	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	7.4	2.0	3.0	1.3	0.7
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	4.2	1.1	1.7	0.6	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.9	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH37 1.5-1.6	BH37 2.5-2.6	BH37 3.5-3.6	BH38 0.5-0.6	BH38 1.5-1.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-029	EM1817564-030	EM1817564-031	EM1817564-032	EM1817564-033
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	5.6	1.4	2.2	0.8	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	105	29.5	42.3	11.3	5.2
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	10.5	2.6	3.9	1.6	0.8
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	10.5	2.9	4.2	1.9	1.1
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	10.5	3.1	4.4	2.2	1.4
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	260	110	120	<100	<100
C29 - C36 Fraction	----	100	mg/kg	170	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	430	110	120	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	370	160	160	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	370	160	160	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	2	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	86.7	85.4	90.0	84.4	74.3
2-Chlorophenol-D4	93951-73-6	0.5	%	91.1	89.2	94.5	89.3	78.4
2.4.6-Tribromophenol	118-79-6	0.5	%	84.3	80.5	82.2	76.0	68.6

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	BH37 1.5-1.6	BH37 2.5-2.6	BH37 3.5-3.6	BH38 0.5-0.6	BH38 1.5-1.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-029	EM1817564-030	EM1817564-031	EM1817564-032	EM1817564-033
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	95.2	93.3	98.1	92.2	80.0
Anthracene-d10	1719-06-8	0.5	%	96.3	102	105	107	94.6
4-Terphenyl-d14	1718-51-0	0.5	%	90.1	92.1	95.6	93.4	83.0
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	74.5	72.2	75.7	68.7	69.4
Toluene-D8	2037-26-5	0.2	%	78.3	70.4	70.5	64.3	63.8
4-Bromofluorobenzene	460-00-4	0.2	%	87.6	79.6	78.6	76.8	73.8

Page : 21 of 30
Work Order : EM1817564
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH38 2.5-2.6	BH39 0.5-0.6	BH39 1.5-1.6	BH39 2.5-2.6	BH40 0.5-0.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-034	EM1817564-035	EM1817564-036	EM1817564-037	EM1817564-038
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.2	17.8	17.8	7.4	5.7
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	70	60	80	50	30
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	1	<1
Chromium	7440-47-3	2	mg/kg	14	13	15	8	6
Cobalt	7440-48-4	2	mg/kg	11	10	7	8	10
Copper	7440-50-8	5	mg/kg	14	18	24	198	60
Lead	7439-92-1	5	mg/kg	14	42	36	359	12
Manganese	7439-96-5	5	mg/kg	165	301	146	176	267
Nickel	7440-02-0	2	mg/kg	14	16	9	10	12
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	28	24	38	39	44
Zinc	7440-66-6	5	mg/kg	40	47	71	227	34
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	1.4	4.2
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	2.5	24.2
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	1.1	1.2
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	2.6	3.2
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	3.8	30.2	50.7
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.9	6.0	18.6
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	5.6	43.6	179
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	5.4	39.0	200
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	2.1	14.3	93.0
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	2.0	13.6	83.4
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	2.5	21.2	158
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	1.1	7.3	29.0
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	2.2	19.0	76.6
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	1.1	10.8	54.7
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	2.4	18.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH38 2.5-2.6	BH39 0.5-0.6	BH39 1.5-1.6	BH39 2.5-2.6	BH40 0.5-0.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-034	EM1817564-035	EM1817564-036	EM1817564-037	EM1817564-038
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	1.5	14.2	63.6
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	28.2	229	1060
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	2.9	27.0	130
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	3.2	27.0	130
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	3.4	27.0	130
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	90
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	660	4390
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	460	2890
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	1120	7370
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	270
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	110	960	6330
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	220	1050
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	110	1180	7650
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	270
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.0	87.9	85.2	82.8	82.6
2-Chlorophenol-D4	93951-73-6	0.5	%	91.8	91.1	89.4	87.2	87.2
2.4.6-Tribromophenol	118-79-6	0.5	%	80.2	76.8	77.0	79.4	84.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH38 2.5-2.6	BH39 0.5-0.6	BH39 1.5-1.6	BH39 2.5-2.6	BH40 0.5-0.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-034	EM1817564-035	EM1817564-036	EM1817564-037	EM1817564-038
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	96.5	94.5	91.6	90.5	90.2
Anthracene-d10	1719-06-8	0.5	%	114	116	103	97.4	92.0
4-Terphenyl-d14	1718-51-0	0.5	%	102	99.5	91.8	85.2	83.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	74.2	72.0	70.6	73.2	80.9
Toluene-D8	2037-26-5	0.2	%	69.2	69.5	68.8	68.2	74.0
4-Bromofluorobenzene	460-00-4	0.2	%	81.0	78.8	83.4	80.3	84.4

Page	: 24 of 30
Work Order	: EM1817564
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH40 1.5-1.6	BH40 2.5-2.6	BH40 3.5-3.6	Duplicate 3	Duplicate 4
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-039	EM1817564-040	EM1817564-041	EM1817564-042	EM1817564-043
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	8.0	10.6	8.6	17.8	7.4
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	10	<5
Barium	7440-39-3	10	mg/kg	50	60	40	80	40
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	9	9	17	9
Cobalt	7440-48-4	2	mg/kg	18	13	14	18	17
Copper	7440-50-8	5	mg/kg	70	14	51	50	55
Lead	7439-92-1	5	mg/kg	46	15	22	69	28
Manganese	7439-96-5	5	mg/kg	353	183	272	481	270
Nickel	7440-02-0	2	mg/kg	14	17	14	16	16
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	60	12	40	91	42
Zinc	7440-66-6	5	mg/kg	62	60	51	175	60
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	1.4	<0.5	2.4	<0.5	2.2
Acenaphthylene	208-96-8	0.5	mg/kg	8.2	<0.5	14.0	0.8	11.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	1.7	0.5	1.2
Fluorene	86-73-7	0.5	mg/kg	1.2	<0.5	5.1	0.7	4.0
Phenanthrene	85-01-8	0.5	mg/kg	27.4	1.0	66.7	11.2	50.0
Anthracene	120-12-7	0.5	mg/kg	9.2	<0.5	18.9	2.4	14.3
Fluoranthene	206-44-0	0.5	mg/kg	59.3	2.3	99.5	12.5	79.7
Pyrene	129-00-0	0.5	mg/kg	61.1	2.6	94.7	12.0	78.4
Benz(a)anthracene	56-55-3	0.5	mg/kg	32.7	1.4	50.7	4.8	42.4
Chrysene	218-01-9	0.5	mg/kg	28.9	1.2	44.4	4.5	38.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	43.9	1.8	68.2	5.6	58.6
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	12.6	0.6	22.0	1.6	15.8
Benzo(a)pyrene	50-32-8	0.5	mg/kg	37.4	1.6	59.6	4.7	49.0
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	18.9	0.8	29.1	2.3	24.0
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	6.1	<0.5	9.6	0.7	8.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH40 1.5-1.6	BH40 2.5-2.6	BH40 3.5-3.6	Duplicate 3	Duplicate 4
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-039	EM1817564-040	EM1817564-041	EM1817564-042	EM1817564-043
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	22.8	1.0	34.7	2.8	27.8
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	371	14.3	621	67.1	505
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	54.8	2.1	87.0	6.9	71.7
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	54.8	2.3	87.0	6.9	71.7
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	54.8	2.6	87.0	6.9	71.7
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	50	<50	50
C15 - C28 Fraction	----	100	mg/kg	1510	<100	2620	280	2510
C29 - C36 Fraction	----	100	mg/kg	960	<100	1610	200	1520
^ C10 - C36 Fraction (sum)	----	50	mg/kg	2470	<50	4280	480	4080
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	100	<50	180	<50	180
>C16 - C34 Fraction	----	100	mg/kg	2120	140	3640	400	3470
>C34 - C40 Fraction	----	100	mg/kg	400	<100	640	110	590
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	2620	140	4460	510	4240
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	100	<50	180	<50	180
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	93.1	92.0	87.5	89.9	75.0
2-Chlorophenol-D4	93951-73-6	0.5	%	96.5	95.7	90.8	93.7	77.6
2.4.6-Tribromophenol	118-79-6	0.5	%	85.4	78.6	79.8	82.9	69.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH40 1.5-1.6	BH40 2.5-2.6	BH40 3.5-3.6	Duplicate 3	Duplicate 4
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817564-039	EM1817564-040	EM1817564-041	EM1817564-042	EM1817564-043
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	96.4	95.2	89.8	93.7	76.1
Anthracene-d10	1719-06-8	0.5	%	102	106	88.8	98.2	78.2
4-Terphenyl-d14	1718-51-0	0.5	%	91.6	95.3	81.6	94.5	70.9
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	72.5	80.3	74.7	68.9	71.5
Toluene-D8	2037-26-5	0.2	%	63.0	78.4	69.7	61.7	66.8
4-Bromofluorobenzene	460-00-4	0.2	%	77.8	85.3	79.5	75.7	75.5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 2	Rinsate 3	Rinsate 4	----	----
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817564-024	EM1817564-025	EM1817564-026	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 2	Rinsate 3	Rinsate 4	----	----
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817564-024	EM1817564-025	EM1817564-026	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	31.0	13.6	28.2	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	70.1	29.6	62.7	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	58.4	43.1	56.1	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	89.2	37.9	79.0	----	----
Anthracene-d10	1719-06-8	1.0	%	87.7	70.0	80.5	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	87.1	82.1	80.5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 2	Rinsate 3	Rinsate 4	----	----
			Client sampling date / time	29-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817564-024	EM1817564-025	EM1817564-026	--------	--------
				Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	98.0	99.5	94.2	----	----
Toluene-D8	2037-26-5	2	%	89.7	87.4	83.6	----	----
4-Bromofluorobenzene	460-00-4	2	%	104	102	101	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EM1818156	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 01-Nov-2018 09:40
Order number	:	Date Analysis Commenced	: 13-Nov-2018
C-O-C number	: ----	Issue Date	: 15-Nov-2018 12:13
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 13		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- This is a rebatch of EM1817564
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: **TCLP LEACHATE**
(Matrix: **WATER**)

			Client sample ID	BH27 1.0-1.1	BH28 1.2-1.3	BH29 0.5-0.6	BH35 0.5-0.6	BH37 0.5-0.6
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818156-001	EM1818156-002	EM1818156-003	EM1818156-004	EM1818156-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	7.3
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	1.5	1.1	<1.0	2.4
Fluorene	86-73-7	1.0	µg/L	<1.0	2.1	1.4	<1.0	5.8
Phenanthrene	85-01-8	1.0	µg/L	<1.0	4.3	6.8	<1.0	13.8
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	1.8
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	1.7	<1.0	1.8
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	1.2	<1.0	1.2
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	7.9	12.2	<0.5	34.1
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	34.5	32.6	32.4	34.0	31.6
2-Chlorophenol-D4	93951-73-6	1.0	%	83.0	79.1	75.5	74.6	77.5
2.4.6-Tribromophenol	118-79-6	1.0	%	100	98.8	89.3	91.8	91.4
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	100	97.0	91.0	91.8	93.9
Anthracene-d10	1719-06-8	1.0	%	92.5	87.9	82.9	85.9	84.8
4-Terphenyl-d14	1718-51-0	1.0	%	88.3	83.5	81.4	80.3	80.9

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)			Client sample ID	BH37 1.5-1.6	BH37 2.5-2.6	BH37 3.5-3.6	BH39 1.5-1.6	BH39 2.5-2.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818156-006	EM1818156-007	EM1818156-008	EM1818156-009	EM1818156-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	8.6	3.8	<1.0	<1.0	4.7
Acenaphthylene	208-96-8	1.0	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	4.4	2.6	<1.0	<1.0	1.6
Fluorene	86-73-7	1.0	µg/L	8.1	4.2	1.4	<1.0	2.5
Phenanthrene	85-01-8	1.0	µg/L	24.0	16.0	9.6	3.8	8.6
Anthracene	120-12-7	1.0	µg/L	3.1	2.4	1.4	<1.0	1.2
Fluoranthene	206-44-0	1.0	µg/L	3.9	3.8	3.9	<1.0	1.8
Pyrene	129-00-0	1.0	µg/L	2.7	2.7	3.0	<1.0	1.3
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	55.8	35.5	19.3	3.8	21.7
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	33.0	30.0	22.0	23.4	20.0
2-Chlorophenol-D4	93951-73-6	1.0	%	77.0	71.0	54.2	56.9	48.6
2.4.6-Tribromophenol	118-79-6	1.0	%	91.1	87.7	64.7	69.2	53.8
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	91.6	86.4	71.8	74.4	58.4
Anthracene-d10	1719-06-8	1.0	%	81.0	78.1	63.6	69.9	51.7
4-Terphenyl-d14	1718-51-0	1.0	%	77.1	74.2	64.2	72.0	50.5

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BH40 0.5-0.6	BH40 1.5-1.6	BH40 3.5-3.6	----	----
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1818156-011	EM1818156-012	EM1818156-013	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	3.1	<1.0	3.4	----	----
Acenaphthylene	208-96-8	1.0	µg/L	4.8	1.8	5.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	2.1	<1.0	2.8	----	----
Fluorene	86-73-7	1.0	µg/L	3.0	1.3	4.8	----	----
Phenanthrene	85-01-8	1.0	µg/L	21.5	11.8	22.2	----	----
Anthracene	120-12-7	1.0	µg/L	3.6	2.0	3.6	----	----
Fluoranthene	206-44-0	1.0	µg/L	6.8	3.9	5.3	----	----
Pyrene	129-00-0	1.0	µg/L	5.9	3.1	4.1	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	50.8	23.9	51.2	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	25.2	25.2	20.5	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	60.8	61.6	51.8	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	73.3	74.6	61.9	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	79.5	79.3	67.2	----	----
Anthracene-d10	1719-06-8	1.0	%	69.3	70.4	58.5	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	67.9	69.1	57.7	----	----

Page : 6 of 9
Work Order : EM1818156
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: TCLP (Matrix: SOIL)			Client sample ID	BH27 1.0-1.1	BH28 1.2-1.3	BH29 0.5-0.6	BH35 0.5-0.6	BH37 0.5-0.6
			Client sampling date / time	29-Oct-2018 00:00	29-Oct-2018 00:00	30-Oct-2018 00:00	30-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818156-001	EM1818156-002	EM1818156-003	EM1818156-004	EM1818156-005
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.5	9.2	9.0	9.2	8.9
After HCl pH	----	0.1	pH Unit	1.2	1.1	1.2	1.1	1.1
Extraction Fluid Number	----	1	-	5	5	5	5	5
Final pH	----	0.1	pH Unit	5.7	5.3	6.1	5.3	5.3

Analytical Results

Sub-Matrix: **TCLP** (Matrix: **SOIL**)			Client sample ID	BH37 1.5-1.6	BH37 2.5-2.6	BH37 3.5-3.6	BH39 1.5-1.6	BH39 2.5-2.6
			Client sampling date / time	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818156-006	EM1818156-007	EM1818156-008	EM1818156-009	EM1818156-010
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	8.6	8.8	9.9	8.4	8.3
After HCl pH	----	0.1	pH Unit	1.0	1.3	1.1	1.1	1.1
Extraction Fluid Number	----	1	-	5	5	5	5	5
Final pH	----	0.1	pH Unit	5.1	5.1	5.1	5.5	5.2

Work Order : EM1818156
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: TCLP
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH40 0.5-0.6	BH40 1.5-1.6	BH40 3.5-3.6	----	----
Client sampling date / time				31-Oct-2018 00:00	31-Oct-2018 00:00	31-Oct-2018 00:00	----	----
				EM1818156-011	EM1818156-012	EM1818156-013	--------	--------
				Result	Result	Result	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	8.9	8.7	9.0	----	----
After HCl pH	----	0.1	pH Unit	1.1	1.0	1.0	----	----
Extraction Fluid Number	----	1	-	5	5	5	----	----
Final pH	----	0.1	pH Unit	5.1	5.1	5.1	----	----

Surrogate Control Limits

Sub-Matrix: TCLP LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1817824**	Page	: 1 of 24
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018 09:15
Order number	:	Date Analysis Commenced	: 07-Nov-2018
C-O-C number	: ----	Issue Date	: 12-Nov-2018 15:52
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 29		
No. of samples analysed	: 29		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Particular sample EM-1817824-007 shows minor BTEX hits. Confirmed by re-analysis.
- EP075SIM: Particular sample EM1817824_2 required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly.
- EP075(SIM): Poor duplicate precision for sample EM1817824-011 due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

ALS

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH41 0.5-0.6	BH42 0.5-0.6	BH42 1.5-1.6	BH42 2.5-2.6	BH43 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
				EM1817824-001	EM1817824-002	EM1817824-003	EM1817824-004	EM1817824-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.8	9.3	8.7	30.4	14.7
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	30	50	30	120	90
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	7	6	8	6
Cobalt	7440-48-4	2	mg/kg	20	11	25	6	10
Copper	7440-50-8	5	mg/kg	75	38	45	30	35
Lead	7439-92-1	5	mg/kg	9	17	13	84	67
Manganese	7439-96-5	5	mg/kg	319	188	354	379	196
Nickel	7440-02-0	2	mg/kg	15	13	18	12	7
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	43	34	31	17	62
Zinc	7440-66-6	5	mg/kg	32	39	62	45	95
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	1.0	0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<1.1	2.9	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	5.4	19.5	<0.5	0.9
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<1.1	1.3	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	1.1	5.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	16.3	65.9	<0.5	5.3
Anthracene	120-12-7	0.5	mg/kg	<0.5	4.9	18.5	<0.5	1.1
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	27.7	95.8	<0.5	7.1
Pyrene	129-00-0	0.5	mg/kg	<0.5	32.7	109	<0.5	7.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	16.0	53.4	<0.5	3.6
Chrysene	218-01-9	0.5	mg/kg	<0.5	14.4	49.0	<0.5	3.2
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	21.3	75.1	<0.5	4.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6.5	18.7	<0.5	1.4
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	18.9	66.4	<0.5	3.8
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	8.0	27.2	<0.5	1.7
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	2.4	8.2	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH41 0.5-0.6	BH42 0.5-0.6	BH42 1.5-1.6	BH42 2.5-2.6	BH43 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-001	EM1817824-002	EM1817824-003	EM1817824-004	EM1817824-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	9.6	32.1	<0.5	2.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	185	648	<0.5	42.1
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	26.7	92.8	<0.5	5.0
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	26.7	92.8	0.6	5.2
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	26.7	92.8	1.2	5.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	830	2250	<100	110
C29 - C36 Fraction	----	100	mg/kg	<100	470	1180	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	1300	3430	<50	110
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	60	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	1150	3020	<100	170
>C34 - C40 Fraction	----	100	mg/kg	<100	220	570	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	1370	3650	<50	170
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	60	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	96.2	94.5	93.4	94.0	96.0
2-Chlorophenol-D4	93951-73-6	0.5	%	96.3	94.8	93.5	93.7	95.5
2.4.6-Tribromophenol	118-79-6	0.5	%	83.1	81.8	83.3	83.0	87.5

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH41 0.5-0.6	BH42 0.5-0.6	BH42 1.5-1.6	BH42 2.5-2.6	BH43 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-001	EM1817824-002	EM1817824-003	EM1817824-004	EM1817824-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	106	106	104	105	106
Anthracene-d10	1719-06-8	0.5	%	99.2	112	103	98.1	97.7
4-Terphenyl-d14	1718-51-0	0.5	%	96.1	94.8	92.0	95.2	91.5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	91.4	85.4	80.8	70.9	82.5
Toluene-D8	2037-26-5	0.2	%	96.2	89.7	81.1	72.2	85.2
4-Bromofluorobenzene	460-00-4	0.2	%	106	103	95.9	77.2	96.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH43 1.5-1.6	BH43 2.5-2.6	BH43 3.5-3.6	BH44 0.5-0.6	BH44 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-006	EM1817824-007	EM1817824-008	EM1817824-009	EM1817824-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	10.4	14.6	12.3	17.7	7.2
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	110	90	50	80	40
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	9	9	4	12	5
Cobalt	7440-48-4	2	mg/kg	11	12	15	10	12
Copper	7440-50-8	5	mg/kg	21	21	78	6	68
Lead	7439-92-1	5	mg/kg	11	110	23	16	18
Manganese	7439-96-5	5	mg/kg	291	239	351	62	263
Nickel	7440-02-0	2	mg/kg	13	12	10	12	11
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	38	35	76	17	49
Zinc	7440-66-6	5	mg/kg	36	37	53	41	39
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.4
Acenaphthylene	208-96-8	0.5	mg/kg	2.4	1.0	2.2	<0.5	7.3
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	1.0	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	0.7	0.7	0.9	1.6
Phenanthrene	85-01-8	0.5	mg/kg	8.5	6.3	8.8	8.1	23.3
Anthracene	120-12-7	0.5	mg/kg	2.5	1.3	2.5	2.7	6.7
Fluoranthene	206-44-0	0.5	mg/kg	15.8	7.4	17.4	12.0	38.4
Pyrene	129-00-0	0.5	mg/kg	18.5	8.1	19.3	11.1	43.4
Benz(a)anthracene	56-55-3	0.5	mg/kg	9.6	3.6	10.0	4.6	23.6
Chrysene	218-01-9	0.5	mg/kg	8.8	3.2	9.2	4.3	21.6
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	14.1	4.3	13.5	5.9	36.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	5.3	1.6	4.3	1.8	10.2
Benzo(a)pyrene	50-32-8	0.5	mg/kg	13.4	4.1	12.0	5.1	33.0
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	6.2	1.6	5.1	2.3	14.8
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	1.6	<0.5	1.4	0.5	4.1

Page : 7 of 24
Work Order : EM1817824
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH43 1.5-1.6	BH43 2.5-2.6	BH43 3.5-3.6	BH44 0.5-0.6	BH44 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-006	EM1817824-007	EM1817824-008	EM1817824-009	EM1817824-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	7.8	2.0	5.9	2.8	18.3
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	114	45.2	112	63.1	284
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	18.7	5.3	16.8	7.1	46.0
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	18.7	5.5	16.8	7.1	46.0
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	18.7	5.8	16.8	7.1	46.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	390	140	330	230	1050
C29 - C36 Fraction	----	100	mg/kg	260	<100	190	140	660
^ C10 - C36 Fraction (sum)	----	50	mg/kg	650	140	520	370	1710
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	580	190	470	330	1500
>C34 - C40 Fraction	----	100	mg/kg	120	<100	<100	<100	320
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	700	190	470	330	1820
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	3	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.7	85.1	94.8	93.8	93.7
2-Chlorophenol-D4	93951-73-6	0.5	%	90.3	85.8	94.9	93.0	93.8
2.4.6-Tribromophenol	118-79-6	0.5	%	81.1	73.8	84.2	83.3	84.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH43 1.5-1.6	BH43 2.5-2.6	BH43 3.5-3.6	BH44 0.5-0.6	BH44 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-006	EM1817824-007	EM1817824-008	EM1817824-009	EM1817824-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	101	96.0	105	104	104
Anthracene-d10	1719-06-8	0.5	%	94.7	93.2	100	101	97.1
4-Terphenyl-d14	1718-51-0	0.5	%	86.6	85.2	90.9	92.9	88.2
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	81.1	79.2	82.2	85.4	78.4
Toluene-D8	2037-26-5	0.2	%	84.3	89.5	80.6	81.0	77.5
4-Bromofluorobenzene	460-00-4	0.2	%	94.8	113	97.3	98.1	93.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH44 2.5-2.6	BH44 3.5-3.6	BH45 0.5-0.6	BH46 0.5-0.6	BH47 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-011	EM1817824-012	EM1817824-013	EM1817824-014	EM1817824-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	13.2	10.0	15.0	13.0	13.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	7	<5
Barium	7440-39-3	10	mg/kg	40	50	100	170	200
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	5	6	11	17	9
Cobalt	7440-48-4	2	mg/kg	11	12	9	13	35
Copper	7440-50-8	5	mg/kg	61	52	66	187	41
Lead	7439-92-1	5	mg/kg	29	34	83	223	179
Manganese	7439-96-5	5	mg/kg	218	230	216	294	242
Nickel	7440-02-0	2	mg/kg	10	10	13	20	18
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	48	46	32	38	34
Zinc	7440-66-6	5	mg/kg	33	43	134	221	373
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.2	0.3	0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	0.7	3.1	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	4.2	14.8	2.5	0.7	1.2
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	1.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	0.8	5.1	1.0	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	9.8	80.1	15.2	3.8	3.2
Anthracene	120-12-7	0.5	mg/kg	3.3	19.3	4.8	0.8	0.9
Fluoranthene	206-44-0	0.5	mg/kg	22.8	105	16.9	7.0	8.1
Pyrene	129-00-0	0.5	mg/kg	26.8	107	15.9	6.9	8.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	14.5	49.6	6.9	2.6	3.8
Chrysene	218-01-9	0.5	mg/kg	13.4	43.9	6.0	2.4	3.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	23.0	66.5	9.2	4.2	6.4
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	7.3	20.9	3.1	1.4	2.3
Benzo(a)pyrene	50-32-8	0.5	mg/kg	21.6	60.3	8.2	3.7	6.0
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	9.8	25.7	3.7	1.9	3.1
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	2.5	7.0	0.9	<0.5	0.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH44 2.5-2.6	BH44 3.5-3.6	BH45 0.5-0.6	BH46 0.5-0.6	BH47 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-011	EM1817824-012	EM1817824-013	EM1817824-014	EM1817824-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	12.1	29.6	4.3	2.4	3.8
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	173	639	98.6	37.8	51.6
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	29.8	84.3	11.5	4.8	8.3
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	29.8	84.3	11.5	5.0	8.3
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	29.8	84.3	11.5	5.2	8.3
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	1000	2280	250	120	200
C29 - C36 Fraction	----	100	mg/kg	680	1120	150	120	200
^ C10 - C36 Fraction (sum)	----	50	mg/kg	1680	3400	400	240	400
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	60	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	1480	2990	350	220	350
>C34 - C40 Fraction	----	100	mg/kg	320	530	<100	<100	110
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	1800	3580	350	220	460
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	60	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	84.2	94.2	96.4	98.8	89.1
2-Chlorophenol-D4	93951-73-6	0.5	%	84.3	95.1	95.7	98.3	88.5
2.4.6-Tribromophenol	118-79-6	0.5	%	76.9	85.4	88.9	89.6	77.9

Page	: 11 of 24
Work Order	: EM1817824
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH44 2.5-2.6	BH44 3.5-3.6	BH45 0.5-0.6	BH46 0.5-0.6	BH47 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-011	EM1817824-012	EM1817824-013	EM1817824-014	EM1817824-015
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	93.8	105	105	109	99.2
Anthracene-d10	1719-06-8	0.5	%	89.6	105	96.2	101	95.9
4-Terphenyl-d14	1718-51-0	0.5	%	80.8	91.1	90.1	94.8	87.5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	78.0	82.6	75.4	85.2	80.3
Toluene-D8	2037-26-5	0.2	%	80.6	82.1	72.1	82.1	75.9
4-Bromofluorobenzene	460-00-4	0.2	%	94.1	97.7	88.2	97.1	93.6

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH47 1.5-1.6	BH48 0.5-0.6	BH48 1.5-1.6	BH49 0.5-0.6	BH49 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-016	EM1817824-017	EM1817824-018	EM1817824-019	EM1817824-020
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.1	19.9	18.2	19.2	20.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	8	<5
Barium	7440-39-3	10	mg/kg	80	140	130	60	220
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	16	7	10	38	12
Cobalt	7440-48-4	2	mg/kg	16	26	9	13	28
Copper	7440-50-8	5	mg/kg	50	95	59	39	11
Lead	7439-92-1	5	mg/kg	24	154	180	26	22
Manganese	7439-96-5	5	mg/kg	540	344	232	923	1070
Nickel	7440-02-0	2	mg/kg	20	17	12	23	25
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	67	113	36	78	20
Zinc	7440-66-6	5	mg/kg	77	265	254	65	77
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	0.4	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	1.3	1.6	3.1	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	0.8	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	1.1	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	12.4	3.8	4.8	<0.5	0.5
Anthracene	120-12-7	0.5	mg/kg	3.4	1.2	1.8	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	16.7	10.0	13.2	0.7	1.1
Pyrene	129-00-0	0.5	mg/kg	17.1	10.6	15.0	0.8	1.3
Benz(a)anthracene	56-55-3	0.5	mg/kg	7.1	5.0	8.2	<0.5	0.7
Chrysene	218-01-9	0.5	mg/kg	6.3	4.6	7.7	<0.5	0.7
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	9.1	8.2	14.7	1.1	1.1
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.5	3.2	5.4	0.6	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	8.3	7.7	14.3	1.1	0.9
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	4.0	4.3	7.4	0.7	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.9	0.9	1.7	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH47 1.5-1.6	BH48 0.5-0.6	BH48 1.5-1.6	BH49 0.5-0.6	BH49 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-016	EM1817824-017	EM1817824-018	EM1817824-019	EM1817824-020
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	5.2	5.5	9.6	0.9	0.6
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	97.2	66.6	107	5.9	6.9
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	11.7	10.8	19.7	1.3	1.1
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	11.7	10.8	19.7	1.6	1.4
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	11.7	10.8	19.7	1.9	1.7
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	430	260	640	<100	<100
C29 - C36 Fraction	----	100	mg/kg	250	260	730	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	680	520	1370	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	610	450	1150	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	120	150	450	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	730	600	1600	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.0	93.4	90.5	107	97.5
2-Chlorophenol-D4	93951-73-6	0.5	%	91.1	94.7	91.6	109	98.5
2.4.6-Tribromophenol	118-79-6	0.5	%	80.6	83.0	79.7	99.0	86.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH47 1.5-1.6	BH48 0.5-0.6	BH48 1.5-1.6	BH49 0.5-0.6	BH49 1.5-1.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-016	EM1817824-017	EM1817824-018	EM1817824-019	EM1817824-020
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	102	106	102	121	110
Anthracene-d10	1719-06-8	0.5	%	96.3	102	97.2	113	102
4-Terphenyl-d14	1718-51-0	0.5	%	90.0	93.6	89.8	109	97.9
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	76.8	80.2	75.6	77.6	72.5
Toluene-D8	2037-26-5	0.2	%	76.7	77.7	75.4	74.4	71.1
4-Bromofluorobenzene	460-00-4	0.2	%	90.4	90.2	88.8	88.8	85.9

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH50 0.5-0.6	BH50 1.5-1.6	BH51 0.5-0.6	BH51 1.5-1.6	BH52 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-021	EM1817824-022	EM1817824-023	EM1817824-024	EM1817824-025
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.6	17.0	18.4	15.6	16.9
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	5	<5	<5	6
Barium	7440-39-3	10	mg/kg	60	80	640	100	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	19	10	12	9	32
Cobalt	7440-48-4	2	mg/kg	23	13	19	9	12
Copper	7440-50-8	5	mg/kg	20	13	10	20	21
Lead	7439-92-1	5	mg/kg	25	17	31	101	18
Manganese	7439-96-5	5	mg/kg	591	350	112	167	868
Nickel	7440-02-0	2	mg/kg	22	16	15	11	26
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	35	22	24	20	29
Zinc	7440-66-6	5	mg/kg	67	47	51	76	61
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	1.3	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	1.6	2.9	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	1.2	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	2.8	11.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	2.8	13.1	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	1.0	7.9	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	1.0	7.9	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	1.5	11.4	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.5	3.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	1.3	9.4	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.6	4.3	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	1.2	<0.5

Page : 16 of 24
Work Order : EM1817824
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

			Client sample ID	BH50 0.5-0.6	BH50 1.5-1.6	BH51 0.5-0.6	BH51 1.5-1.6	BH52 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-021	EM1817824-022	EM1817824-023	EM1817824-024	EM1817824-025
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.9	5.3	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	14.0	80.9	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	1.7	13.4	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	1.9	13.4	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	2.2	13.4	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	230	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	180	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	410	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	370	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	370	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	92.2	97.6	94.7	86.0	91.6
2-Chlorophenol-D4	93951-73-6	0.5	%	92.4	94.9	94.8	86.5	92.5
2.4.6-Tribromophenol	118-79-6	0.5	%	77.6	78.1	77.8	67.3	73.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH50 0.5-0.6	BH50 1.5-1.6	BH51 0.5-0.6	BH51 1.5-1.6	BH52 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1817824-021	EM1817824-022	EM1817824-023	EM1817824-024	EM1817824-025
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	102	107	105	97.4	99.8
Anthracene-d10	1719-06-8	0.5	%	108	111	106	102	104
4-Terphenyl-d14	1718-51-0	0.5	%	104	106	103	95.0	101
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	78.9	71.1	82.3	66.8	66.4
Toluene-D8	2037-26-5	0.2	%	83.3	75.0	86.9	69.9	68.1
4-Bromofluorobenzene	460-00-4	0.2	%	118	108	124	104	103

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH52 1.5-1.6	BH53 0.5-0.6	BH53 1.5-1.6	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817824-026	EM1817824-027	EM1817824-028	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.4	20.0	14.6	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	6	<5	<5	----	----
Barium	7440-39-3	10	mg/kg	120	200	30	----	----
Beryllium	7440-41-7	1	mg/kg	<1	2	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	15	16	12	----	----
Cobalt	7440-48-4	2	mg/kg	11	24	5	----	----
Copper	7440-50-8	5	mg/kg	17	28	16	----	----
Lead	7439-92-1	5	mg/kg	18	25	49	----	----
Manganese	7439-96-5	5	mg/kg	406	510	122	----	----
Nickel	7440-02-0	2	mg/kg	17	32	7	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	29	28	56	----	----
Zinc	7440-66-6	5	mg/kg	57	70	30	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	0.8	0.8	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	0.8	0.9	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH52 1.5-1.6	BH53 0.5-0.6	BH53 1.5-1.6	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817824-026	EM1817824-027	EM1817824-028	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	1.6	2.2	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	90.1	69.0	82.0	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	87.7	67.5	83.6	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	61.3	46.1	58.9	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH52 1.5-1.6	BH53 0.5-0.6	BH53 1.5-1.6	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1817824-026	EM1817824-027	EM1817824-028	--------	--------
				Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	105	74.4	92.7	----	----
Anthracene-d10	1719-06-8	0.5	%	107	89.1	104	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	96.9	75.4	92.2	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	67.8	71.3	74.4	----	----
Toluene-D8	2037-26-5	0.2	%	69.0	74.2	71.9	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	104	109	112	----	----

Page : 21 of 24
Work Order : EM1817824
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 5	----	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817824-029	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 5	----	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817824-029	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	**23.0**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	**53.5**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	**56.2**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	**63.8**	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	**66.9**	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	**67.0**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate 5	----	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1817824-029	--------	--------	--------	--------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	88.6	----	----	----	----
Toluene-D8	2037-26-5	2	%	79.1	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	105	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1818266**	Page	: 1 of 11
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 07-Nov-2018 09:15
Order number	: ----	Date Analysis Commenced	: 16-Nov-2018
C-O-C number	: ----	Issue Date	: 19-Nov-2018 17:44
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 17		
No. of samples analysed	: 17		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- This is a rebatch of EM1817824.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH42 0.5-0.6	BH42 1.5-1.6	BH43 0.5-0.6	BH43 1.5-1.6	BH43 2.5-2.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818266-001	EM1818266-002	EM1818266-003	EM1818266-004	EM1818266-005
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	8.4	9.0	8.0	9.0	9.6
After HCl pH	----	0.1	pH Unit	1.3	1.3	1.2	1.3	1.3
Extraction Fluid Number	----	1	-	1	1	1	1	1
Final pH	----	0.1	pH Unit	5.1	5.1	5.1	5.1	6.1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH43 3.5-3.6	BH44 0.5-0.6	BH44 1.5-1.6	BH44 2.5-2.6	BH44 3.5-3.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818266-006	EM1818266-007	EM1818266-008	EM1818266-009	EM1818266-010
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.4	8.6	9.2	9.5	9.0
After HCl pH	----	0.1	pH Unit	1.3	1.3	1.3	1.4	1.4
Extraction Fluid Number	----	1	-	1	1	1	1	1
Final pH	----	0.1	pH Unit	5.2	5.1	5.1	5.3	5.1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH45 0.5-0.6	BH46 0.5-0.6	BH47 0.5-0.6	BH47 1.5-1.6	BH48 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818266-011	EM1818266-012	EM1818266-013	EM1818266-014	EM1818266-015
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	7.7	8.8	8.9	8.3	8.9
After HCl pH	----	0.1	pH Unit	1.3	1.4	1.4	1.3	1.4
Extraction Fluid Number	----	1	-	1	1	1	1	1
Final pH	----	0.1	pH Unit	5.1	5.2	5.4	5.3	5.4

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH48 1.5-1.6	BH51 1.5-1.6	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1818266-016	EM1818266-017	--------	--------	--------
				Result	Result	----	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	9.3	8.6	----	----	----
After HCl pH	----	0.1	pH Unit	1.6	1.4	----	----	----
Extraction Fluid Number	----	1	-	1	1	----	----	----
Final pH	----	0.1	pH Unit	6.4	5.2	----	----	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BH42 0.5-0.6	BH42 1.5-1.6	BH43 0.5-0.6	BH43 1.5-1.6	BH43 2.5-2.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818266-001	EM1818266-002	EM1818266-003	EM1818266-004	EM1818266-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	1.6	2.9	<1.0	<1.0	1.8
Acenaphthylene	208-96-8	1.0	µg/L	3.0	9.1	<1.0	<1.0	1.4
Acenaphthene	83-32-9	1.0	µg/L	<1.0	2.2	<1.0	<1.0	1.0
Fluorene	86-73-7	1.0	µg/L	2.6	5.3	<1.0	<1.0	2.1
Phenanthrene	85-01-8	1.0	µg/L	17.2	28.8	<1.0	<1.0	9.5
Anthracene	120-12-7	1.0	µg/L	2.5	4.0	<1.0	<1.0	1.2
Fluoranthene	206-44-0	1.0	µg/L	3.1	6.2	<1.0	<1.0	1.8
Pyrene	129-00-0	1.0	µg/L	2.6	5.2	<1.0	<1.0	1.5
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	32.6	63.7	<0.5	<0.5	20.3
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	18.6	19.1	30.1	23.0	25.2
2-Chlorophenol-D4	93951-73-6	1.0	%	41.4	48.2	67.9	48.1	62.2
2.4.6-Tribromophenol	118-79-6	1.0	%	59.0	62.6	73.4	60.7	69.6
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	59.8	63.9	87.9	65.2	82.5
Anthracene-d10	1719-06-8	1.0	%	55.0	55.4	72.2	63.1	66.4
4-Terphenyl-d14	1718-51-0	1.0	%	52.2	62.8	72.8	64.6	68.9

Analytical Results

Sub-Matrix: **TCLP LEACHATE**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	BH43 3.5-3.6	BH44 0.5-0.6	BH44 1.5-1.6	BH44 2.5-2.6	BH44 3.5-3.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
				EM1818266-006	EM1818266-007	EM1818266-008	EM1818266-009	EM1818266-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	3.5	1.9	3.2
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	6.8	9.7	7.8
Acenaphthene	83-32-9	1.0	µg/L	<1.0	3.0	<1.0	2.1	1.5
Fluorene	86-73-7	1.0	µg/L	<1.0	1.9	3.2	6.1	5.1
Phenanthrene	85-01-8	1.0	µg/L	2.1	6.8	16.4	21.2	21.0
Anthracene	120-12-7	1.0	µg/L	<1.0	1.4	2.4	3.5	3.4
Fluoranthene	206-44-0	1.0	µg/L	<1.0	1.3	3.2	4.5	5.2
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	2.8	3.9	4.4
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	2.1	14.4	38.3	52.9	51.6
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	11.8	28.9	23.4	20.6	22.4
2-Chlorophenol-D4	93951-73-6	1.0	%	26.7	51.6	49.2	46.8	49.3
2.4.6-Tribromophenol	118-79-6	1.0	%	59.4	67.9	65.2	72.2	79.4
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	43.1	74.7	73.2	64.4	65.9
Anthracene-d10	1719-06-8	1.0	%	60.1	62.0	59.4	56.4	61.5
4-Terphenyl-d14	1718-51-0	1.0	%	67.4	63.5	63.7	56.0	62.7

Page : 9 of 11
Work Order : EM1818266
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48-52

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)			Client sample ID	BH45 0.5-0.6	BH46 0.5-0.6	BH47 0.5-0.6	BH47 1.5-1.6	BH48 0.5-0.6
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00	05-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1818266-011	EM1818266-012	EM1818266-013	EM1818266-014	EM1818266-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	**3.8**	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	**4.2**	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	**4.1**	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	**1.5**	**1.5**	**12.4**	**3.5**
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	**1.9**	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	**2.2**	**1.2**
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	**1.5**	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	**1.5**	**1.5**	**30.1**	**4.7**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	**28.3**	**28.1**	**27.8**	**30.0**	**31.7**
2-Chlorophenol-D4	93951-73-6	1.0	%	**68.9**	**67.9**	**66.6**	**71.8**	**77.1**
2.4.6-Tribromophenol	118-79-6	1.0	%	**97.6**	**103**	**99.8**	**102**	**110**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	**89.7**	**91.3**	**89.2**	**92.2**	**101**
Anthracene-d10	1719-06-8	1.0	%	**81.0**	**86.7**	**83.8**	**81.6**	**89.3**
4-Terphenyl-d14	1718-51-0	1.0	%	**77.9**	**85.6**	**81.7**	**79.2**	**85.5**

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BH48 1.5-1.6	BH51 1.5-1.6	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1818266-016	EM1818266-017	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	32.4	34.0	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	74.0	80.6	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	97.9	108	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	92.6	106	----	----	----
Anthracene-d10	1719-06-8	1.0	%	83.0	95.6	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	83.4	90.5	----	----	----

Surrogate Control Limits

Sub-Matrix: **TCLP LEACHATE**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1833261**	Page	: 1 of 6
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Sydney
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48 - 52	Date Samples Received	: 08-Nov-2018 09:00
Order number	:	Date Analysis Commenced	: 09-Nov-2018
C-O-C number	: ----	Issue Date	: 12-Nov-2018 18:14
Sampler	: AP		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005: Poor precision was obtained for Lead on sample ES1833261-2. Results have been confirmed by re-extraction and reanalysis.
- EG005: Poor precision was obtained for Manganese on sample ES1833261-2. Results have been confirmed by re-extraction and reanalysis.
- EP071: Results of samples Triplicate 1 0.5-0.6 and Triplicate 2 1.5-1.6 have been confirmed by re-extraction and re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Page : 3 of 6
Work Order : ES1833261
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : 48 - 52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1 0.5-0.6	Triplicate 2 1.5-1.6	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1833261-001	ES1833261-002	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.2	17.3	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	140	130	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	15	10	----	----	----
Cobalt	7440-48-4	2	mg/kg	19	16	----	----	----
Copper	7440-50-8	5	mg/kg	34	15	----	----	----
Lead	7439-92-1	5	mg/kg	109	102	----	----	----
Manganese	7439-96-5	5	mg/kg	264	161	----	----	----
Nickel	7440-02-0	2	mg/kg	19	14	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	40	26	----	----	----
Zinc	7440-66-6	5	mg/kg	143	70	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	0.6	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	1.8	1.9	----	----	----
Anthracene	120-12-7	0.5	mg/kg	0.6	0.6	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	4.7	5.8	----	----	----
Pyrene	129-00-0	0.5	mg/kg	4.7	6.8	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.8	3.8	----	----	----
Chrysene	218-01-9	0.5	mg/kg	1.8	3.7	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.4	5.0	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.2	1.8	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	2.7	4.8	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.6	2.1	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	0.6	----	----	----

Page	: 4 of 6
Work Order	: ES1833261
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: 48 - 52

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1 0.5-0.6	Triplicate 2 1.5-1.6	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1833261-001	ES1833261-002	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.4	2.6	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	25.7	40.1	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	3.4	6.7	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	3.7	6.7	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	3.9	6.7	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	110	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	210	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	150	180	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	150	180	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	80.4	74.6	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	83.8	78.8	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	46.4	61.7	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Triplicate 1 0.5-0.6	Triplicate 2 1.5-1.6	----	----	----
			Client sampling date / time	05-Nov-2018 00:00	05-Nov-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1833261-001	ES1833261-002	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	81.1	81.1	----	----	----
Anthracene-d10	1719-06-8	0.5	%	95.4	83.8	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	87.6	75.4	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	96.8	82.7	----	----	----
Toluene-D8	2037-26-5	0.2	%	90.8	89.8	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	94.2	89.0	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Appendix 13 Groundwater Analytical Results - Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1814666**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 13-Sep-2018 09:25
Order number	:	Date Analysis Commenced	: 13-Sep-2018
C-O-C number	: ----	Issue Date	: 17-Sep-2018 15:55
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Particular samples EM1814666_[01, 02] shows positive hits. Confirmed by re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Work Order : EM1814666
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Rd

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW1	DUPLICATE	FIELD BLANK	----	----
			Client sampling date / time	11-Sep-2018 00:00	11-Sep-2018 00:00	11-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1814666-001	EM1814666-002	EM1814666-004	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	0.068	0.076	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.476	0.512	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.003	0.003	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	112	104	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	339	315	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	43.0	34.4	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	157	121	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	1070	983	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	464	426	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	1390	1260	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	1540	1390	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	678	593	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	571	556	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	910	872	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	264	241	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	875	779	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	393	352	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	145	118	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	464	408	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	9420	8550	<0.5	----	----

Page : 4 of 6
Work Order : EM1814666
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Rd

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW1	DUPLICATE	FIELD BLANK	----	----
			Client sampling date / time	11-Sep-2018 00:00	11-Sep-2018 00:00	11-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1814666-001	EM1814666-002	EM1814666-004	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	1250	1110	<0.5	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	1400	1050	<50	----	----
C15 - C28 Fraction	----	100	µg/L	43200	31800	<100	----	----
C29 - C36 Fraction	----	50	µg/L	26700	20200	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	71300	53000	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	2540	1890	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	62300	46200	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	13200	10400	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	78000	58500	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	2530	1880	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	6	7	<5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	26.6	28.9	25.7	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	68.4	77.7	59.3	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	90.4	94.2	59.2	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	99.3	93.5	69.7	----	----
Anthracene-d10	1719-06-8	1.0	%	96.5	90.7	75.5	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	109	101	65.9	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW1	DUPLICATE	FIELD BLANK	----	----
			Client sampling date / time	11-Sep-2018 00:00	11-Sep-2018 00:00	11-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	EM1814666-001	EM1814666-002	EM1814666-004	--------	--------
				Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	87.0	74.9	89.2	----	----
Toluene-D8	2037-26-5	2	%	77.5	71.0	79.3	----	----
4-Bromofluorobenzene	460-00-4	2	%	95.7	79.7	104	----	----

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: ES1827248	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Sydney
Contact	: SARAH JOYCE	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: New Town Rd	Date Samples Received	: 14-Sep-2018 09:00
Order number	:	Date Analysis Commenced	: 14-Sep-2018
C-O-C number	: ----	Issue Date	: 18-Sep-2018 20:26
Sampler	: A. Plummer		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 6
Work Order	: ES1827248
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: New Town Rd

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075(SIM):Particular sample required dilution due to sample matrix interferences. LOR values have been adjusted accordingly.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	TRIPLICATE	----	----	----	----
			Client sampling date / time	11-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1827248-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.059	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.407	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.003	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	39.3	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	101	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<19.2	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	35.5	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	292	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	132	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	349	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	399	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	120	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	105	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	96.7	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	48.1	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	136	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	65.9	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	20.7	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	80.2	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	2020	----	----	----	----

Page : 4 of 6
Work Order : ES1827248
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : New Town Rd

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	TRIPLICATE	----	----	----	----
			Client sampling date / time	11-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1827248-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	192	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	80	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	8440	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	5350	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	13900	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	320	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	11800	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	3200	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	15300	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	320	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.2	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	50.3	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	48.1	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	82.6	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	73.8	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	86.0	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	TRIPLICATE	----	----	----	----
			Client sampling date / time	11-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1827248-001	--------	--------	--------	--------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	116	----	----	----	----
Toluene-D8	2037-26-5	2	%	106	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	106	----	----	----	----

Surrogate Control Limits

Sub-Matrix: WATER

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1819122**	Page	: 1 of 5
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9630
Project	: 48-52	Date Samples Received	: 28-Nov-2018 09:50
Order number	:	Date Analysis Commenced	: 28-Nov-2018
C-O-C number	: ----	Issue Date	: 30-Nov-2018 17:17
Sampler	: MD		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Particular sample EM1819122_01 shows positive hit of C6-C9/C6-C10 bands due to 2-Butanone (MEK). Confirmed by re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW1	MW2	MW3	Duplicate	Rinsate
			Client sampling date / time	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1819122-001	EM1819122-002	EM1819122-003	EM1819122-004	EM1819122-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.002**	<0.001	**0.002**	<0.001
Boron	7440-42-8	0.05	mg/L	**0.07**	**0.07**	<0.05	**0.07**	<0.05
Barium	7440-39-3	0.001	mg/L	**0.125**	**0.037**	**0.039**	**0.040**	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	<0.001	**0.002**	<0.001
Copper	7440-50-8	0.001	mg/L	**0.001**	**0.003**	<0.001	**0.003**	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.883**	**0.165**	**0.167**	**0.167**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.001**	<0.001	**0.002**	<0.001
Lead	7439-92-1	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	**27.5**	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	**56.3**	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	**8.4**	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	**32.3**	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	**265**	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	**105**	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	**386**	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	**459**	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	**197**	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	**176**	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	**205**	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	**66.6**	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	**186**	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	**77.6**	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	**23.7**	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	**96.8**	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	**2370**	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW1	MW2	MW3	Duplicate	Rinsate
			Client sampling date / time	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	EM1819122-001	EM1819122-002	EM1819122-003	EM1819122-004	EM1819122-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	**267**	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	**30**	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	**150**	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	**7920**	<100	**2390**	<100	<100
C29 - C36 Fraction	----	50	µg/L	**4710**	<50	**500**	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	**12800**	<50	**2890**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	**20**	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	**20**	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	**470**	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	**11100**	<100	**2730**	<100	<100
>C34 - C40 Fraction	----	100	µg/L	**2450**	<100	**230**	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**14000**	<100	**2960**	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	**470**	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	**76.2**	**89.5**	**74.9**	**89.8**	**79.3**
Anthracene-d10	1719-06-8	1.0	%	**83.0**	**77.0**	**73.4**	**82.3**	**73.0**
4-Terphenyl-d14	1718-51-0	1.0	%	**93.3**	**113**	**76.2**	**102**	**89.4**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**104**	**94.4**	**100**	**93.9**	**103**
Toluene-D8	2037-26-5	2	%	**104**	**89.4**	**94.2**	**91.6**	**98.8**
4-Bromofluorobenzene	460-00-4	2	%	**109**	**93.3**	**99.8**	**97.2**	**105**

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

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CERTIFICATE OF ANALYSIS 15481

Client Details	
Client	Geo-Environmental Solutions Pty Ltd
Attention	S Joyce
Address	29 Kirksway place, BATTERY POINT, TAS, 7004

Sample Details	
Your Reference	**48-52 New Town Road**
Number of Samples	
Date samples received	28/11/2018
Date completed instructions received	28/11/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details	
Date results requested by	03/12/2018
Date of issue	03/12/2018

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Results Approved By
Chris De Luca, Senior Chemist

Authorised By
P.Adams.
Pamela Adams, Laboratory Manager

Client Reference: 48-52 New Town Road

vTRH(C6-C10)/BTEXN in Water		
Our Reference		15481-1
Your Reference	UNITS	Triplicate
Date Sampled		28/11/2018
Type of sample		Water
Date extracted	-	28/11/2018
Date analysed	-	28/11/2018
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	100
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	108

Client Reference: 48-52 New Town Road

TRH Water(C10-C40) NEPM		
Our Reference		15481-1
Your Reference	UNITS	[illegible]
Date Sampled		28/11/2018
Type of sample		Water
Date extracted	-	29/11/2018
Date analysed	-	30/11/2018
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Surrogate o-Terphenyl	%	67

Client Reference: 48-52 New Town Road

PAHs in Water		
Our Reference		15481-1
Your Reference	UNITS	[illegible]
Date Sampled		28/11/2018
Type of sample		Water
Date extracted	-	29/11/2018
Date analysed	-	02/12/2018
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	1
Pyrene	µg/L	1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j&k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Total +ve PAH's	µg/L	2
Benzo(a)pyrene TEQ	µg/L	<5
Surrogate p-Terphenyl-d_{14}	%	74

Client Reference: 48-52 New Town Road

HM in water - dissolved		
Our Reference		15481-1
Your Reference	UNITS	[illegible]
Date Sampled		26/11/2018
Type of sample		Water
Date prepared	-	30/11/2018
Date analysed	-	30/11/2018
Arsenic-Dissolved	µg/L	2
Boron-Dissolved	µg/L	60
Barium-Dissolved	µg/L	38
Beryllium-Dissolved	µg/L	<0.5
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	1
Cobalt-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	3
Manganese-Dissolved	µg/L	170
Nickel-Dissolved	µg/L	2
Lead-Dissolved	µg/L	<1
Selenium-Dissolved	µg/L	1
Vanadium-Dissolved	µg/L	5
Zinc-Dissolved	µg/L	3
Mercury-Dissolved	µg/L	<0.05

Client Reference: 48-52 New Town Road

Method ID	Methodology Summary
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

Client Reference: 48-52 New Town Road

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			26/11/2018					26/11/2018	
Date analysed	-			28/11/2018					28/11/2018	
TRH C_6 - C_9	µg/L	10	Org-016	<10					115	
TRH C_6 - C_{10}	µg/L	10	Org-016	<10					115	
Benzene	µg/L	1	Org-016	<1					111	
Toluene	µg/L	1	Org-016	<1					114	
Ethylbenzene	µg/L	1	Org-016	<1					115	
m+p-xylene	µg/L	2	Org-016	<2					118	
o-xylene	µg/L	1	Org-016	<1					118	
Naphthalene	µg/L	1	Org-014	<1					108	
Surrogate Dibromofluoromethane	%		Org-016	100					97	
Surrogate toluene-d8	%		Org-016	99					98	
Surrogate 4-BFB	%		Org-016	105					104	

Client Reference: 48-52 New Town Road

QUALITY CONTROL: TRH Water(C10-C40) NEPM					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/11/2018					29/11/2018	
Date analysed	-			29/11/2018					29/11/2018	
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50					84	
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100					105	
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100					107	
TRH $>C_{10}$ - C_{16}	µg/L	50	Org-003	<50					84	
TRH $>C_{16}$ - C_{34}	µg/L	100	Org-003	<100					105	
TRH $>C_{34}$ - C_{40}	µg/L	100	Org-003	<100					107	
Surrogate o-Terphenyl	%		Org-003	81					75	

Environmental Site Assessment – V3: 48-52 New Town Road, New Town, April 2019

Client Reference: 48-52 New Town Road

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/11/2018					29/11/2018	
Date analysed	-			02/12/2018					02/12/2018	
Naphthalene	µg/L	1	Org-012	<1					84	
Acenaphthylene	µg/L	1	Org-012	<1					94	
Acenaphthene	µg/L	1	Org-012	<1						
Fluorene	µg/L	1	Org-012	<1					78	
Phenanthrene	µg/L	1	Org-012	<1					96	
Anthracene	µg/L	1	Org-012	<1						
Fluoranthene	µg/L	1	Org-012	<1					92	
Pyrene	µg/L	1	Org-012	<1					98	
Benzo(a)anthracene	µg/L	1	Org-012	<1						
Chrysene	µg/L	1	Org-012	<1					108	
Benzo(b,j&k)fluoranthene	µg/L	2	Org-012	<2						
Benzo(a)pyrene	µg/L	1	Org-012	<1					112	
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1						
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1						
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1						
Surrogate p-Terphenyl-d14	%		Org-012	89					90	

Client Reference: 48-52 New Town Road

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			30/11/2018					30/11/2018	
Date analysed	-			30/11/2018					30/11/2018	
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					109	
Boron-Dissolved	µg/L	20	Metals-022 ICP-MS	<20					113	
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					100	
Beryllium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5					115	
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1					106	
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					103	
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					103	
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					106	
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5					111	
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					106	
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					104	
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					103	
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					107	
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1					109	
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05					102	

Client Reference: 48-52 New Town Road

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011

Client Reference: 48-52 New Town Road

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.