CITY OF HOBART

SUPPORTING INFORMATION
SUPPLEMENTARY ITEMS

CITY PLANNING COMMITTEE MEETING

OPEN PORTION OF THE MEETING

MONDAY, 14 OCTOBER 2019
AT 5:00 PM
VENUE: LADY OSBORNE ROOM, TOWN HALL

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BUSHFIRE HAZARD REPORT

21 LOT SUBDIVISION

306A LENAH VALLEY ROAD, LENAH VALLEY

FOR

S Gath & P Gore

PREPARED BY

N M CREESE

Accredited Bushfire Practitioner BFP-118

12th December 2018

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Disclaimer:

AS 3959-2009 cannot guarantee that a dwelling will survive a bushfire attack, however the implementation of the measures contained within AS 3959-2009, this report and accompanying plan will improve the likelihood of survival of the structure. This report and accompanying plan are based on the conditions prevailing at the time of assessment. No responsibility can be accepted to actions by the land owner, governmental or other agencies or other persons that compromise the effectiveness of this

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plan. The contents of this plan are based on the requirements of the legislation prevailing at the time of report.

This Bushfire Hazard Report has been prepared to support the development of a new 21 lot residential subdivision at 306a Lenah Valley Road, Lenah Valley. The site is subject to a bushfire prone areas overlay under the applicable planning scheme and is considered to be bushfire prone to due to its proximity to the areas of bushfire prone vegetation surrounding the site.

This report identifies the protective features and controls that must be incorporated into the design and construction works to ensure compliance with the standards. Fire management solutions are as defined in *AS 3959-2009 Construction of Buildings in Bushfire-Prone Areas and E1.0 Bushfire Prone Areas Code, Hobart Interim Planning Scheme 2015.*

All lots have been designed to achieve a bushfire attack level of (or lower) of AS 3959-2009 in accordance with E1.6.1, *Bushfire Prone Areas Code*. New dwellings on these lots are to be constructed to the assessed BAL specified for each lot with the establishment and maintenance of the specified Hazard Management Areas to ensure ongoing protection from the risk from bushfire attack.

Public road networks and private access is to be constructed in accordance with E1.6.2, *Bushfire Prone Areas Code*. A variation on the minimum turning radius of the turning head at the termination of the new road specified under Table E1(j) is permitted to no less than 18 metres diameter kerb to kerb with the installation of a mountable kerb and 1.8m wide trafficable footpath and load rating of 20 tonnes with an effective radius of 10.8 metres. Fire Hydrants are to be installed in accordance with E1.6.3 and Table E4.

Where staging of the development occurs, it is the responsibility of the developer to maintain sufficient area within the balance area in a reduced fuel condition to achieve the BAL applicable for each lot within a stage until such time as the development extends to its outer boundary.

The effectiveness of the measures and recommendations detailed in this report and *AS 3959-2009* are dependent on their implementation and maintenance for the life of the development or until the site characteristics that this assessment has been measured from alter from those identified. No liability can be accepted for actions by lot owners, Council or governmental agencies which compromise the effectiveness of this report.

This report has been prepared by Nick Creese, principal of Lark & Creese surveyors. Nick is a registered surveyor in Tasmania and is accredited by the Tasmania Fire Service to prepare bushfire hazard management plans.

Site survey was carried out on 6th October 2016.

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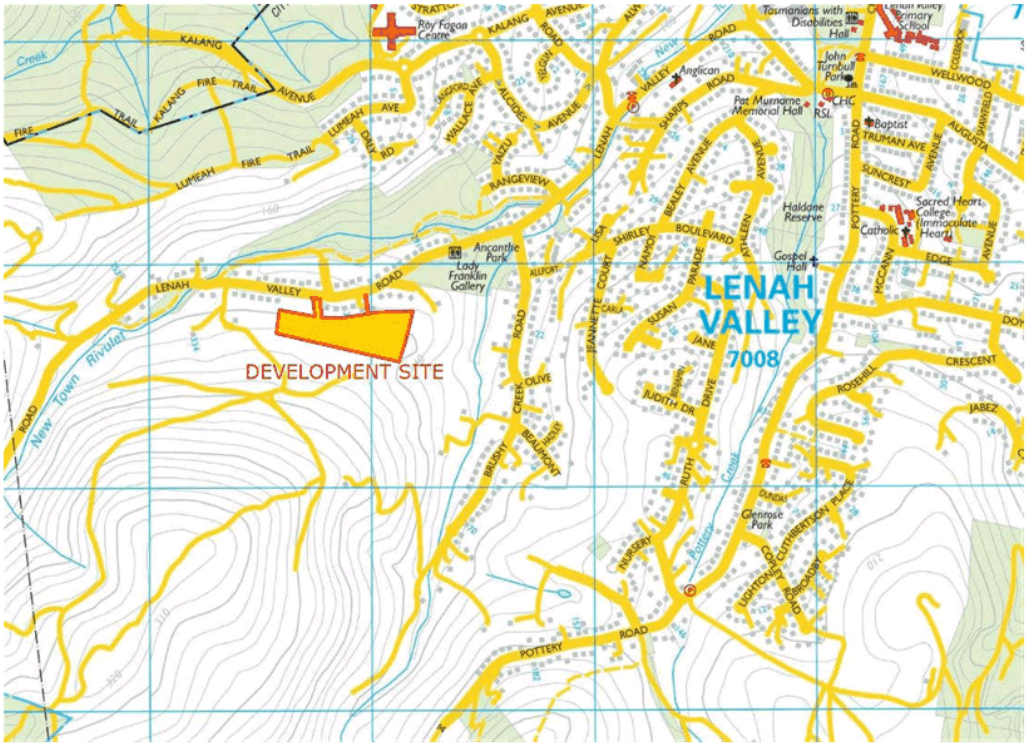
Property address:	306A Lenah Valley Road, Lenah Valley
Title owner:	S G Gath & P M Gore
Title reference:	C.T.162978-1
PID N°:	3142231
Title area:	2.3 ha approx.
Municipal area:	Hobart
Zone:	General Residential (Hobart Interim Planning Scheme 2015)



(Source: The LIST)

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The site is located off Lenah Valley Road, approximately 450 metres south west of the intersection of Brushy Creek Road and Lenah Valley Road, Lenah Valley. The site is situated at an elevation of approximately 150 AHD, with grades typically 15° to the north. A concrete driveway access services the property from Lenah Valley Road.

At the time of assessment, the site consisted of a mix of pasture area, pine trees, eucalypts, wattle and other native and non-native vegetation. A brick house and several sheds are positioned near the southern boundary .

Residential properties border the site to the north with dwellings, established garden and hardstand areas. To the north west, adjacent to proposed Lots 1, 2 & 4, vacant residential allotments are vegetated with grasses and regrowth shrubs. A new residential development is undergoing construction to the east, with new services and road alignments being installed. Pasture areas adjoin the site to the south, with an extensive area of native eucalypt bushland beyond. Properties to the west include larger residential sites with pasture and garden areas.

Reticulated water supply is available to the site with domestic water supply requirements reliant on TASWater mains.

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Planning controls are administered by the Hobart City Council under the *Hobart Interim Planning Scheme 2015*. The site is subject to a Bushfire Prone Areas overlay under E1.0, Bushfire Prone Areas Code and is zoned General Residential under Clause 10.0.

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From the Fire History overlay detailed within The LIST map imagery, a number of vegetation fires have occurred in this vicinity in the past 50 years. The most recent uncontrolled bushfires fires occurred to the north in 1980 (within 200 metres of the site) and 1984 (within 400 metres of the site). A number of controlled hazard reduction burns have been carried out in the same area over the last 30 years. Although not mapped as such, it is known that the site was impacted on by the 1967 bushfires, with the original house on the property being destroyed at that time.

Source: TheLIST

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A new 21 lot residential subdivision in two stages is proposed for the site, with a new road network extending from Lenah Valley Road to the north. Normal residential servicing is to be provided, with sealed roads and footpaths, sewer, stormwater and water, power and phone connections. Road corridors are typically 15 metres wide with a 3 metre wide footway to be provided from the new subdivision road to Lenah Valley Road between Lots 8 & 9. It is anticipated that the allotments will typically support a single dwelling although some sites may support multiple dwellings subject to Council approval. Provision has been made for a road network connection to the properties to the south to allow for future development.

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Fire Danger Index (FDI): The Fire Index Rating for Tasmania is adopted as 50.

Vegetation Classification:
From inspection of the site and consideration of the vegetation type, the current risk associated with, and future impacts of this vegetation, the predominant vegetation has been determined as Classification G(i):Grassland and Classification B:Woodland (both located to the south) as shown in Appendix 1 and described in the notes below.

Gradient under predominant vegetation:
Gradients under the predominant vegetation have been assessed from site inspection and analysis of existing topographical mapping and range from 9-13° down slope to the north, 0-18° to the east, 8-13° to the south and level to the west, and are as shown in Appendix 1. Gradients are averaged over 100 metres and does not necessarily represent the steepest gradient across the assessment area.

Notes on classification of predominant vegetation:
The properties to the north are well managed residential sites extending over a wide area. The nearest potential bushfire prone vegetation to the north is in excess of 100 metres from the site and has not been considered as being a measurable risk for the purpose of this assessment. The land to the east, is in the processing of being cleared and developed for residential purposes with the bulk of the vegetation now removed and roads and services being installed, and is expected to be completed prior to this site being developed. The land to the north and east has been assessed as in accordance with Part 2.2.3.2(e) & (f), AS 3959-2009. To the south, an area of short cropped pasture extends for 40 metres or more southwards to extensive areas of nature eucalypt bushland. The pasture areas are short cropped, apparently having recently been grazed. It is apparent however from historical aerial imagery that grass heights have exceeded 100mm in height at times, creating a potential increased risk from bushfire attack. These areas are assessed as . The native bushland beyond this area is sparse, with eucalypts and other native trees less than 10 metres high. Minimal understory vegetation exists within this area and has been assessed as . Although the vegetation classified as B:Woodland may be considered to be a greater bushfire threat in general, its increased separation from the lots, and the proximity of the vegetation classified as G(i):Grassland to the site dictates that this is considered the greatest bushfire threat to the lots. To the west, residential properties include a pasture area extending to developed residential allotments. It is understood that the pasture area is permanently grazed, with sheep apparent on site at the time of assessment with minimal ground cover. It is considered reasonable to expect that this area will be continually maintained in this manner and has been assessed as
in accordance with Part 2.2.3.2 (e) & (f), AS 3959-2009.

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Based on the predominant vegetation and the separation distances available between the predominant vegetation and the building areas as shown in Appendix 1, the BAL applicable for each lot has been determined from Table 2.4.4, AS 3959-2009 as follows:

LOT No.	BAL	Dist. to vegetation	Predominant Vegetation
1, 3, 5, 15, 16, 17, 18, 19, 20, 21	BAL-FZ	0 m	G(i):Grassland
2, 4, 6, 7 & 14	BAL-12.5	14-<50 m	G(i):Grassland
8, 9, 10, 11, 12 & 13	BAL-12.5	> 50 m	G(i):Grassland

With the establishment of appropriate hazard management areas, the BAL for lots determined to be BAL-FZ can be assessed as BAL-12.5 or BAL-19, subject to the creation of building areas providing for the minimum separation necessary as details in Table 2.4.4 as follows:

Note that the separation distance between Lots 8, 9, 10, 11, 12 & 13 and the vegetation assessed as G(i)): Grassland to the south exceeds the outer limit for BAL-12.5 (50m) and may be considered to be BAL-LOW. The proximity of the vegetation assessed as Classification B:Woodland to Lots 8 & 9 is less than 100 metres attracting a bushfire attack level of BAL-12.5 although its encroachment into Lot 9 is minimal (<5m). It may then be considered appropriate permit construction on Lots 9, 10, 11, 12 and 13 to BAL-LOW and hence no specific construction standards are warranted.

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The property to the east is currently undergoing development with new residential subdivision lots being created, vegetation cleared and associated road networks and servicing being installed. Although titles are yet to issue, it is understood that all lots within this subdivision are sold and issue of titles will occur in the near future. It is anticipated this will occur in advance of completion of this development with the continued management of the vegetation on these lots occurring.

The land to the south is zoned Environmental Living under the *Hobart Interim Planning Scheme 2015* and is subject to a Biodiversity Overlay, providing controls and protection on natural values across the site. The land incorporates areas of native vegetation and pasture grasses, with apparent management of the pasture areas occurring through grazing. It is expected that the extent of the pasture areas will remain in a form similar to their current condition, and that minimal intrusion of the bushland areas into this area will occur. Notwithstanding this risk, sufficient separation is currently available between the bushland areas and the development site to limit any increased risk resulting from an encroachment of the vegetation assessed as Classification B:Woodland towards the site.

Several lots have been assessed as BAL-LOW due to their separation from the classified vegetation to the south. Lots 10, 11, 12 & 13, and portions of Lots 8 and 9 exceed 100 metres from the vegetation assessed as Classification B:Woodland, and are in excess of 50 metres from the vegetation assessed as Classification G(i):Grassland and hence are outside the outer limits prescribed for hazard management areas for BAL-12.5. Lot 9 is only partially within 100 metres of the vegetation classified as B:Woodland (<5 metres) and is not considered to be impacted by the bushfire risk associated with the vegetation and is assessed as BAL-LOW. Lot 8 is more significantly impacted on by this vegetation and is assessed as BAL-12.5 .

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The site has been assessed as being within 100 metres of bushfire prone vegetation and compliance is assessed against the provisions of E1.6, Bushfire Prone Areas Code, *Hobart Interim Planning Scheme 2015* in the following manner:

This provision seeks to:

- *facilitate an integrated approach between subdivision and subsequent building on a lot;*
- *provide for sufficient separation of building areas from bushfire-prone vegetation to reduce the radiant heat levels, direct flame attack and ember attack at the building area; and*
- *provide protection for lots at any stage of a staged subdivision.*

In accordance with Acceptable Solution A1(b), all lots are assessed as being within a bushfire prone area and must comply with the provisions of this part as follows:

A1(b) i) The attached Bushfire Hazard Management Plan details all lots which are in, or partly within a bushfire-prone area.

A1(b) ii) Each lot contains a building area compliant with this part.

A1(b) iii) Each lot assessed as being subject the bushfire risk is provided with a hazard management area with a dimension equal to, or greater than that for BAL-19.

A1(b) iv) The attached Bushfire Hazard Management Plan details the location and extent of the Hazard Management Areas with a dimension equal to, or greater than that for BAL-19.

Several lots are assessed as BAL-LOW due to their separation from the classified vegetation to the south exceeding 50 metres (Classification (Gi):Grassland) and 100 metres (Classification B:Woodland).

Lots assessed as	are:

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A number of the lots within the bushfire prone area have been identified as being capable of compliance with the construction standards for BAL-12.5, due to their increased separation from the bushfire prone vegetation, and may be constructed to that level. No defined building area is necessary on these lots due to the separation provided by the neighbouring lots to the south.

Lots assessed as	are:

A number of lots are capable of compliance with a bushfire attack level of BAL-12.5, provided a separation distance of no less then 14 metres from the southern boundary is achieved:

Lots assessed as	are:

NOTE: Should the separation distance of 14 metres not be achieved, any new habitable building on these lots must be constructed to a bushfire attack level of BAL-19, with a reduced boundary setback of 10 metres to the southern boundary.

The remaining lots are assessed as BAL-19, and any new habitable building on these lots must be constructed to this standard:

Lots assessed as	are:

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Each lot subject to this assessment, and considered to be exposed to a risk of attack from bushfire is to be maintained in a manner to ensure the risk to any building on the lot, or to adjoining lots is minimised. This may be achieved, but is not necessarily limited to the following:

- Establishing non-flammable areas around the dwelling such as paths, patios, driveways, lawns etc.
- Locating dams, orchards, vegetable gardens, effluent disposal areas etc on the bushfire prone side of the building.
- Providing heat shields and ember traps on the bushfire prone side of the dwelling such as non-flammable fencing, hedges, separated garden shrubs and small trees. Avoid the use of highly flammable plants.
- Ensure flammable materials such as wood piles, fuels and rubbish heaps are stored away from the dwelling.
- Replace highly flammable plants with low flammability species.
- Provide horizontal separation between tree crowns and vertical separation between ground fuels and overhead branches.
- Regular slashing or mowing of grass to a height of less than 100mm.
- Removal of ground fuels such as leaves, bark, fallen branches etc on a regular basis.
- Ensuring no trees overhang the dwelling so that vegetation falls onto the roof.
- No non-habitable structures are to be constructed within the hazard management areas on Lots 1, 3, 5, 15, 16, 17, 18, 19, 20 & 21 that lie within 6 metres of the habitable building on the lot.

: Due to the likely staging of the development, any undeveloped portions of the site must be maintained in a reduced fuel condition to ensure no increased risk occurs prior to the completion of all stages. Where this is to occur the following management practices apply:

- Slash grasses regularly to less than 100mm.
- Remove dead and fallen branches, leaves and bark.
- store flammable materials such as fuels, fire wood and piles of vegetation away from the new lots.
- Remove selected trees to ensure separation between canopies and bushfire prone vegetation to the south.
- Trim lower braches of retained trees to provide minimum separation of 2 metres from ground level.

Should building works occur on the lots to the north of the site (including Lots 2, 4 and 9-14) which rely on the management of the lots to the south, and those lots to the south remain undeveloped and result in an unreasonable bushfire risk, due to lack of management, an abatement notice should be served on those lot owners to require removal of that risk in line with the expectations of the surrounding lot owners and in line with BHAN-01-2014.

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This provision seeks to:

- *allow safe access and egress for residents, firefighters and emergency service personnel;*
- *provide access to the bushfire-prone vegetation that enables both property to be defended when under bushfire attack and for hazard management works to be undertaken; -*
- *are designed and constructed to allow for fire appliances to be maneuvered;*
- *provide access to water supplies for fire appliances; and*
- *are designed to allow connectivity, and where needed, offering multiple evacuation points.*

The development requires the construction of new public road networks and private access to the site to provide safe access and egress for residents, fire fighters and emergency service personnel. These roads and private accesses are to comply with the requirements of Acceptable Solution A1(b)(i), Table E1 and Table E2.

A variation on the turning radius of the cul-de-sac at the end of the road is proposed to reduce excavation and visual impact of the new road formation in accordance with Performance Criteria P1. Table E1(j) requires a turning radius of 12 metres, with the design proposing 9 metres. In order to provide practical turning, a mountable kerb and 1.8 metre wide trafficable footpath are to be installed at the turning head with an effective turning radius of 10.8 metres and minimum load rating of 20 tonnes. Engineering design confirms this arrangement as being capable of providing a compliant turning area for a medium rigid vehicle. No signage or other road furniture is to be installed within the turning area or within 1 metre of the back of the footpath and no standing road markings are to be provided.

It is not considered necessary to provide alternative means of egress from the site due to the proximity of the lots to non-bushfire prone areas to the north, east and west, and the location of the new access road extending away from the bushfire prone vegetation towards Lenah Valley Road.

Private access is to be provided to each lot in accordance with Table E2 where appropriate. Most lots will require an access of less than 30 metres in length and as such, no specific construction standards apply in accordance with Element A, Table E3. Lots 1 & 3 will require an access in excess of 30 metres in length and must be provided in accordance with Element B, Table 4.3. The proposed access to Lot 3 is 3.60 metres wide, with a separate Right of Way 1.4m Wide being provided across Lot 2 to provide a combined access width of 5 metres to facilitate this access standard. A combined access width of 7.2 metres is available to Lot 1 by virtue of a reciprocal Right of Way arrangement with the access to Lot 2.

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Table E1: Standards for roads

Element		Requirement
A.	Roads	Unless the development standards in the zone require a higher standard, the following apply: (a) two-wheel drive, all-weather construction; (b) load capacity of at least 20t, including for bridges and culverts; (c) minimum carriageway width is 7m for a through road, or 5.5m for a dead-end or cul-de-sac road; (d) minimum vertical clearance of 4m; (e) minimum horizontal clearance of 2m from the edge of the carriageway; (f) cross falls of less than 3 degrees (1:20 or 5%); (g) maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; (h) curves have a minimum inner radius of 10m; (i) dead-end or cul-de-sac roads are not more than 200m in length unless the carriageway is 7 metres in width; (j) dead-end or cul-de-sac roads have a turning circle with a minimum 12m outer radius; and (k) carriageways less than 7m wide have 'No Parking' zones on one side, indicated by a road sign that complies with *Australian Standard AS1743-2001 Road signs-Specifications*.

Table E2 Standards for property access

Element		Requirement
A.	Property access length is less than 30m; or access is not required for a fire appliance to access a fire fighting water point.	There are no specified design and construction requirements.
B.	Property access length is 30m or greater; or access is required for a fire appliance to a fire fighting water point.	The following design and construction requirements apply to property access: (a) all-weather construction; (b) load capacity of at least 20t, including for bridges and culverts; (c) minimum carriageway width of 4m; (d) minimum vertical clearance of 4m; (e) minimum horizontal clearance of 0.5m from the edge of the carriageway; (f) cross falls of less than 3 degrees (1:20 or 5%); (g) dips less than 7 degrees (1:8 or 12.5%) entry and exit angle; (h) curves with a minimum inner radius of 10m; (i) maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; and (j) terminate with a turning area for fire appliances provided by one of the following: (i) a turning circle with a minimum outer radius of 10m; or (ii) a property access encircling the building; or (iii) a hammerhead "T" or "Y" turning head 4m wide and 8m long.

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This provision seeks to provide:
Adequate, accessible and reliable water supply for the purposes of fire fighting can be demonstrated at the subdivision stage and allow for the protection of life and property associated with the subsequent use and development of bushfire-prone areas.

The site is to be connected to reticulated water supply, including fire hydrants for a fire fighting supply of water. In accordance with A1 (c), the location of fire hydrants, and building areas detailed in the Bushfire Hazard Management Plan are compliant with Table E4.

Table E4 Reticulated water supply for fire fighting

Element		Requirement
A.	Distance between building area to be protected and water supply.	The following requirements apply: (a) the building area to be protected must be located within 120m of a fire hydrant; and (b) the distance must be measured as a hose lay, between the fire fighting water point and the furthest part of the building area.
B.	Design criteria for fire hydrants	The following requirements apply: (a) fire hydrant system must be designed and constructed in accordance with *TasWater Supplement to Water Supply Code of Australia WSA 03 – 2011-3.1 MRWA 2nd Edition*; and (b) fire hydrants are not installed in parking areas.
C.	Hardstand	A hardstand area for fire appliances must be: (a) no more than 3m from the hydrant, measured as a hose lay; (b) no closer than 6m from the building area to be protected; (c) a minimum width of 3m constructed to the same standard as the carriageway; and (d) connected to the property access by a carriageway equivalent to the standard of the property access.

Fire Hydrants are to be located at sufficient spacing to ensure compliance with E4 A above. The location of the fire hydrants located on the Bushfire Hazard Management Plan are indicative only to identify capacity for compliant with this provision only. Full engineering design of the reticulated water supply and location of fire hydrants may vary from the plan.

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This Bushfire Hazard Report and Bushfire Hazard Management Plan have been prepared to support design and construction of a new residential subdivision at 306A Lenah Valley Road, Lenah Valley. The report has reviewed the bushfire risks associated with the site, and determined the fire management strategies that must be carried out to ensure the development on the site is at reduced risk from bushfire attack.

Provided the elements detailed in this report are implemented, the development on the site is capable of compliance with *AS 3959-2009* and E1.6 *Bushfire Prone Areas Code* and any potential bushfire risk to the site is reduced.

The proposed lots have been assessed as compliant with bushfire attack levels (BAL) detailed in Table 3. The Council approval issued for the development should contain conditions requiring that the protective elements defined in this report and E1.6, *Bushfire Prone Areas Code* be implemented during the construction phase. Any new building required to comply with this assessment must be constructed to the bushfire attack level described in Table 3, within the prescribed building areas noted on the Bushfire Hazard Management Plan. Should the extent or classification of the bushfire prone vegetation surrounding the site alter from that assessed by this report, buildings on the lots affected by this variation may be constructed to a lower level subject to the preparation of a revised assessment.

Note that should a boundary setback of 14 metres from the southern boundary not be achieved or be possible, those lots subject to that limitation (Lots 1, 15, 16, 17, 18, 19 & 20) must be constructed to BAL-19, subject to a setback from the southern boundary of no less than 10 metres.

New road networks and private access, where necessary are to be constructed in accordance with E1.6.2 P1, *Bushfire Prone Areas Code*. The reduction of the radius of the turning head is permitted to no less than 9 metres, provided a mountable kerb and trafficable 1.8 metre wide footpath are installed. Private access is to be provided to the lots in accordance with Table E2.

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Lots 1 & 3 are to be provided with access in compliance with Element B, Table E2. No standards apply to the access for the remaining lots in accordance with Element A, Table E2. Fire hydrants are to be installed in compliance with Table E4, E1.6.3, *Bushfire Prone Areas Code*.

To ensure protection of lots developed under an individual stage, or multiple stages, the developer must ensure the undeveloped portions of the site are maintained in a reduced fuel condition until such time as the site is fully developed.

Although not mandatory, any increase in the construction standards above the assessed Bushfire Attack Level will afford improved protection from bushfire and this should be considered by the owner, designer and/or builder prior to construction commencing. Hazard Management Areas must be established and maintained in a minimal fuel condition in accordance with this plan and the TFS guidelines. It is the owner's responsibility to ensure the long term maintenance of the hazard management areas in accordance with the requirements of this report.

This report does not recommend or endorse the removal of any vegetation within, or adjoining the site for the purpose of bushfire protection without the explicit approval of the local authority.

N M Creese
Bushfire Management Practitioner BFP-118

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- *AS 3959-2009 - Construction of Buildings in Bushfire Prone Areas.*
- *Hobart Interim Planning Scheme 2015.*
- *Planning Directive 5.1, Bushfire Prone Areas Code* - Minister for Planning and Local Government
- *The LIST* - Department of Primary Industry Parks Water & Environment.
- *Bushfire Prone Areas Advisory Note BHAN 01-2014* - Tasmania Fire Service

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	Australian Standards AS 3959-2009 *Construction of buildings in bushfire-prone areas.*
	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire. The following BAL levels, based on heat flux exposure threshold are used within AS3959-2009; BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40, BAL-FZ.
	An unplanned fire burning vegetation.
	A plan showing means of protection from bushfire in a form approved in writing by the Chief Officer.
	An area that is subject to, or likely to be subject to, bushfire attack. Land that has been designated under legislation; or Has been identified under environmental planning instrument, development control plan or in the course of processing and determining a development application.
	The section of the road formation which is used by traffic, and includes all the area of the traffic lane pavement together with the formed shoulder.
	Vegetation that has been classified in accordance with Clause 2.2.3 of AS3959-2009.
	The chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both long- and short-term drought effects.
	The area between a habitable building or building area and bushfire-prone vegetation, which provides access to a fire front for fire fighting, which is maintained in a minimal fuel condition and in which there are no other hazards present which will significantly contribute to the spread of a bushfire.
	The distance between two points established by a fire hose laid out on the ground, inclusive of obstructions.
	The vegetation that poses the greatest bushfire threat to the development site.
	The slope of the ground under the classified vegetation.
	The distance between the building, or building area to the classified vegetation.
	The point where a fire appliance is able to connect to a water supply for fire fighting purposes. This includes a coupling in the case of a fire hydrant, offtake or outlet, or the minimum water level in the case of a static water body.
	An assembly installed on a branch from a water pipeline, which provides a valved outlet to permit a supply of water to be taken from the pipeline for fire fighting.
	Water stored on a tank, swimming pool, dam, or lake, that is available for fire fighting purposes at all times.

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APPENDIX 1: VEGETATION ASSESSMENT

LOT 1	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat - residential development, gardens, roads	0-100m Low threat - (Development site) short cropped grasses, trees, residential development	0-100m Grassland	0-100 m Low threat - short cropped grasses, residential development, gardens
SLOPE	12° down	Level	13° up	Level
BAL	LOW	LOW	FZ	LOW

LOT 2	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees, residential development	0-22 m Low threat (Development site) 22-100 m Grassland	0-30m Low threat (Development site) 30-100m Low threat Short cropped grasses, residential development, gardens
SLOPE	12° down	Level	13° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 3	NORTH	EAST	SOUTH	WEST
VEGETATION	0-30 m Low threat (Development Site) 30-100m Low Threat - residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees, residential development	0-100 m Grassland	0-30m Low threat (Development site) 30-100m Low threat Short cropped grasses, residential development, gardens
SLOPE	12° down	Level	13° up	Level
BAL	LOW	LOW	FZ	LOW

LOT 4	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees, residential development	0-22 m Low threat (Development site) 22-100 m Grassland	0-60m Low threat (Development site) 60-100m Low threat Short cropped grasses, residential development, gardens
SLOPE	12° down	Level	13° up	Level
BAL	LOW	LOW	12.5	LOW

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LOT 5	NORTH	EAST	SOUTH	WEST
VEGETATION	0-30 m Low threat (Development Site) 30-100m Low Threat - residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees, residential development	0-100 m Grassland	0-60m Low threat (Development site) 60-100m Low threat Short cropped grasses, residential development, gardens
SLOPE	12° down	Level	13° up	Level
BAL	LOW	LOW	FZ	LOW

LOT 6	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees & shrubs	0-40 m Low threat (Development site) 40-80 m Grassland 80-100 Woodland	0-100m Low threat (Development site)
SLOPE	10° down	Level	12° up	Level
BAL	LOW	LOW	12.5 Grassland 12.5 Woodland	LOW

LOT 7	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) short cropped grasses, trees & shrubs	0-45 m Low threat (Development site) 45-85 m Grassland 85-100 Woodland	0-100m Low threat (Development site)
SLOPE	10° down	Level	12° up	Level
BAL	LOW	LOW	12.5 Grassland 12.5 Woodland	LOW

LOT 8	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-90m Low threat (Development site) short cropped grasses, trees & shrubs 90-100m New neighbouring residential development.	0-50 m Low threat (Development site) 50-90 m Grassland 90-100 Woodland	0-100m Low threat (Development site)
SLOPE	9° down	Level	13° up	Level
BAL	LOW	LOW	12.5 Grassland 12.5 Woodland	LOW

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LOT 9	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-65m Low threat (Development site) short cropped grasses, trees & shrubs 65-100m New neighbouring residential development.	0-60 m Low threat (Development site) Residential development and gardens 60-100 m Grassland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	9° down	Level	10° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 10	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-45m Low threat (Development site) short cropped grasses, trees & shrubs 45-100m New neighbouring residential development.	0-65 m Low threat (Development site) Residential development, gardens and short cropped grass. 65-100 m Grassland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	9° down	Level (0-45m) 5° down (45-100m)	9° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 11	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-25m Low threat (Development site) short cropped grasses, trees & shrubs 25-100m New neighbouring residential development.	0-70 m Low threat (Development site) Residential development, gardens and short cropped grass. 70-100 m Grassland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	10° down	Level (0-25m) 5° down (25-100m)	9° up	Level
BAL	LOW	LOW	12.5	LOW

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LOT 12	NORTH	EAST	SOUTH	WEST
VEGETATION	0-100m Low Threat residential development, gardens, roads	0-100m Low threat New neighbouring residential development.	0-70 m Low threat (Development site) Residential development, gardens and short cropped grass. 70-100 m Grassland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	10° down	10° down	8° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 13	NORTH	EAST	SOUTH	WEST
VEGETATION	0-20m Low threat (Development Site) 20-100m Low Threat residential development, gardens, roads	0-100m Low threat New neighbouring residential development.	0-60 m Low threat (Development site) Residential development, gardens and short cropped grass. 60-100 m Grassland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	10° down	10° down	8° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 14	NORTH	EAST	SOUTH	WEST
VEGETATION	0-50m Low threat (Development Site) 50-100m Low Threat residential development, gardens, roads	0-100m Low threat New neighbouring residential development.	0-15 m Low threat (Development site) Residential development, gardens and short cropped grass. 15-100 m Grassland	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs
SLOPE	12° down	10° down	8° up	Level
BAL	LOW	LOW	12.5	LOW

LOT 15	NORTH	EAST	SOUTH	WEST
VEGETATION	0-60m Low threat (Development Site) 60-100m Low Threat residential development, gardens, roads	0-100m Low threat New neighbouring residential development.	0-100 m Grassland	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs
SLOPE	12° down	18° down	8° up	Level
BAL	LOW	LOW	FZ	LOW

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LOT 16	NORTH	EAST	SOUTH	WEST
VEGETATION	0-60m Low threat (Development Site) 60-100m Low Threat residential development, gardens, roads	0-25m Low threat (Development site) 25-100m Low threat New neighbouring residential development.	0-90 m Grassland 90-100 Woodland	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs
SLOPE	12° down	17° down	8° up	Level
BAL	LOW	LOW	FZ (Grassland) 12.5 (Woodland)	LOW

LOT 17	NORTH	EAST	SOUTH	WEST
VEGETATION	0-55m Low threat (Development Site) 55-100m Low Threat residential development, gardens, roads	0-45m Low threat (Development site) 45-100m New neighbouring residential development.	0-50 m Grassland 50-100m Woodland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	12° down	17° down	8° up	Level
BAL	LOW	LOW	FZ (Grassland) 12.5 (Woodland)	LOW

LOT 18	NORTH	EAST	SOUTH	WEST
VEGETATION	0-45m Low threat (Development Site) 45-100m Low Threat residential development, gardens, roads	0-80m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs 25-100m New neighbouring residential development.	0-35m Grassland 35-100m Woodland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	13° down	10° down	9° up	Level
BAL	LOW	LOW	FZ	LOW

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LOT 19	NORTH	EAST	SOUTH	WEST
VEGETATION	0-40m Low threat (Development Site) 40-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs	0-35m Grassland 35-100m Woodland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	13° down	10° down	9° up	Level
BAL	LOW	LOW	FZ	LOW

LOT 20	NORTH	EAST	SOUTH	WEST
VEGETATION	0-35m Low threat (Development Site) 35-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs	0-35m Grassland 35-100m Woodland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	13° down	Level	9° up	Level
BAL	LOW	LOW	FZ	LOW

LOT 21	NORTH	EAST	SOUTH	WEST
VEGETATION	0-35m Low threat (Development Site) 35-100m Low Threat residential development, gardens, roads	0-100m Low threat (Development site) Residential development, short cropped grasses, trees & shrubs	0-35m Grassland 35-100m Woodland	0-100m Low threat (Development site) short cropped grasses, trees & shrubs
SLOPE	13° down	Level	9° up	Level
BAL	LOW	LOW	FZ	LOW

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BUSHFIRE-PRONE AREAS CODE

CERTIFICATE[1] UNDER S51(2)(d) *LAND USE PLANNING AND APPROVALS ACT 1993*

1. Land to which certificate applies[2]

Land that is the Use or Development Site that is relied upon for bushfire hazard management or protection.

Name of planning scheme or instrument:	**HOBART INTERIM PLANNING SCHEME 2015**
Street address:	**306A LENAH VALLEY ROAD, LENAH VALLEY**
Certificate of Title / PID:	**C.T.162978/1 3142231**

Land that is not the Use or Development Site that is relied upon for bushfire hazard management or protection.

Street address:	
Certificate of Title / PID:	

2. Proposed Use or Development

Description of Use or Development:

SUBDIVISION OF 21 RESIDENTIAL LOTS OF 750-1837 m² WITH NEW ROAD ACCESS TO BE CONSTRUCTED FROM LENAH VALLEY ROAD

Code Clauses:

- ❑ **E1.4 Exempt Development**
- ❑ **E1.5.1 Vulnerable Use**
- ❑ **E1.5.2 Hazardous Use**
- X **E1.6.1 Subdivision**

[1] This document is the approved form of certification for this purpose, and must not be altered from its original form.

[2] If the certificate relates to bushfire management or protection measures that rely on land that is not in the same lot as the site for the use or development described, the details of all of the applicable land must be provided.

3. Documents relied upon

Documents, Plans and/or Specifications

Title:	SUBDIVISION PROPOSAL PLAN		
Author:	LEARY COX		
Date:	5/10/18	**Version:**	9446

Bushfire Hazard Report

Title:	BUSHFIRE HAZARD REPORT		
Author:	N M CREESE		
Date:	12/12/18	**Version:**	16331-05

Bushfire Hazard Management Plan

Title:	BUSHFIRE HAZARD MANAGEMENT PLAN		
Author:	N M CREESE		
Date:	13/7/18	**Version:**	16331-05

Other Documents

Title:	21 LOT RESIDENTIAL SUBDIVISION		
Author:	A D DESIGN & CONSULTING		
Date:		**Version:**	1707

4. Nature of Certificate

❑	E1.4 – Use or development exempt from this code		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.4 (a)	Insufficient increase in risk	

❑	E1.5.1 – Vulnerable Uses		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.5.1 P1	Residual risk is tolerable	
❑	E1.5.1 A2	Emergency management strategy	
❑	E1.5.1 A3	Bushfire hazard management plan	

❑	E1.5.2 – Hazardous Uses		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.5.2 P1	Residual risk is tolerable	
❑	E1.5.2 A2	Emergency management strategy	
❑	E1.5.2 A3	Bushfire hazard management plan	

❑	E1.6 – Development standards for subdivision		
	E1.6.1 Subdivision: Provision of hazard management areas		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.1 P1	Hazard Management Areas are sufficient to achieve tolerable risk	
❑	E1.6.1 A1 (a)	Insufficient increase in risk	
X	E1.6.1 A1 (b)	Provides BAL 19 for all lots	BUSHFIRE HAZARD REPORT 16331-05 BUSHFIRE HAZARD MANAGEMENT PLAN 16331-05
❑	E1.6.1 A1 (c)	Consent for Part 5 Agreement	

	E1.6.2 Subdivision: Public and fire fighting access		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.2 P1	Access is sufficient to mitigate risk	
❑	E1.6.2 A1 (a)	Insufficient increase in risk	
X	E1.6.2 A1 (b)	Access complies with Tables E1, E2 & E3	BUSHFIRE HAZARD REPORT 16331-05 BUSHFIRE HAZARD MANAGEMENT PLAN 16331-05

	E1.6.3 Subdivision: Provision of water supply for fire fighting purposes		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.3 A1 (a)	Insufficient increase in risk	
X	E1.6.3 A1 (b)	Reticulated water supply complies with Table E4	BUSHFIRE HAZARD REPORT 16331-05 BUSHFIRE HAZARD MANAGEMENT PLAN 16331-05
❑	E1.6.3 A1 (c)	Water supply consistent with the objective	
❑	E1.6.3 A2 (a)	Insufficient increase in risk	
❑	E1.6.3 A2 (b)	Static water supply complies with Table E5	
❑	E1.6.3 A2 (c)	Static water supply is consistent with the objective	

5. Bushfire Hazard Practitioner[3]

Name:	NICHOLAS MARK CREESE	**Phone No:**	6229 6563
Address:	62 CHANNEL HIGHWAY	**Fax No:**	
		Email Address:	nick@larkandcreese.com.au
	KINGSTON TAS 7050		
Accreditation No:	BFP – 118	**Scope:**	1, 2, 3A, 3B

6. Certification

I, certify that in accordance with the authority given under Part 4A of the Fire Service Act 1979 –

The use or development described in this certificate is exempt from application of Code E1 – Bushfire-Prone Areas in accordance with Clause E1.4 (a) because there is an insufficient increase in risk to the use or development from bushfire to warrant any specific bushfire protection measure in order to be consistent with the objectives for all the applicable standards identified in Section 4 of this Certificate.	❑

or

There is an insufficient increase in risk from bushfire to warrant the provision of specific measures for bushfire hazard management and/or bushfire protection in order for the use or development described to be consistent with the objective for each of the applicable standards identified in Section 4 of this Certificate.	❑

and/or

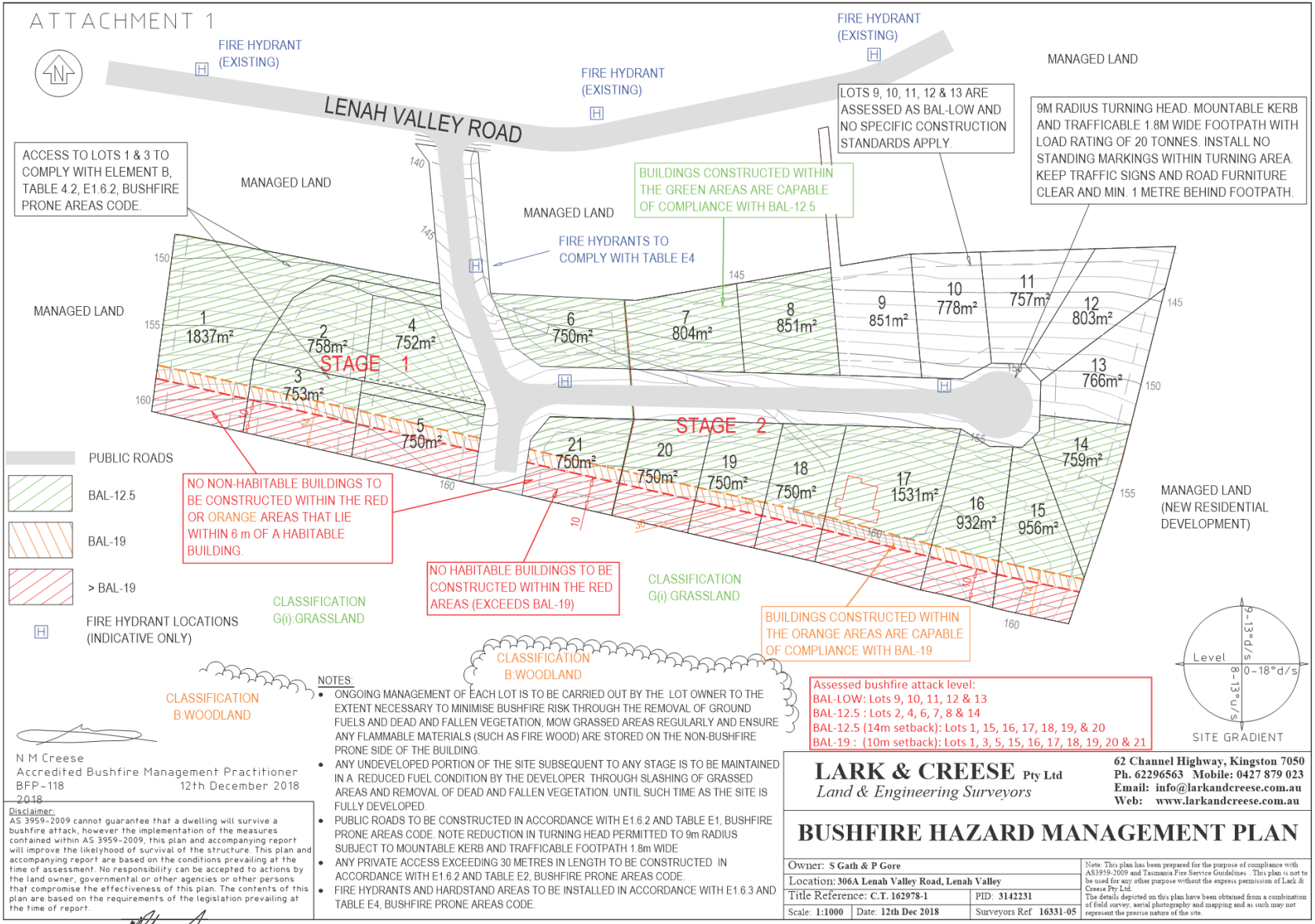
The Bushfire Hazard Management Plan/s identified in Section 3 of this certificate is/are in accordance with the Chief Officer's requirements and can deliver an outcome for the use or development described that is consistent with the objective and the relevant compliance test for each of the applicable standards identified in Section 4 of this Certificate.	X

Signed: *certifier*

Date: 12/1/2019 **Certificate No:** 16331-05

Mark Chladil, Fire Management Planning Officer, On behalf of the Chief Officer Tasmania Fire Service, January 12 2019

[3] A Bushfire Hazard Practitioner is a person accredited by the Chief Officer of the Tasmania Fire Service under Part IVA of *Fire Service Act 1979*. The list of practitioners and scope of work is found at www.fire.tas.gov.au.


ATTACHMENT 1
FIRE HYDRANT (EXISTING)
FIRE HYDRANT (EXISTING)
FIRE HYDRANT (EXISTING)
LENAH VALLEY ROAD
MANAGED LAND
LOTS 9, 10, 11, 12 & 13 ARE ASSESSED AS BAL-LOW AND NO SPECIFIC CONSTRUCTION STANDARDS APPLY.
9M RADIUS TURNING HEAD. MOUNTABLE KERB AND TRAFFICABLE 1.8M WIDE FOOTPATH WITH LOAD RATING OF 20 TONNES. INSTALL NO STANDING MARKINGS WITHIN TURNING AREA. KEEP TRAFFIC SIGNS AND ROAD FURNITURE CLEAR AND MIN. 1 METRE BEHIND FOOTPATH.
ACCESS TO LOTS 1 & 3 TO COMPLY WITH ELEMENT B, TABLE 4.2, E1.6.2, BUSHFIRE PRONE AREAS CODE.
MANAGED LAND
MANAGED LAND
BUILDINGS CONSTRUCTED WITHIN THE GREEN AREAS ARE CAPABLE OF COMPLIANCE WITH BAL-12.5
FIRE HYDRANTS TO COMPLY WITH TABLE E4
MANAGED LAND
1 1837m²
2 758m²
3 753m²
4 752m²
STAGE 1
5 750m²
6 750m²
7 804m²
8 851m²
9 851m²
10 778m²
11 757m²
12 803m²
13 766m²
STAGE 2
14 759m²
15 956m²
16 932m²
17 1531m²
18 750m²
19 750m²
20 750m²
21 750m²
PUBLIC ROADS
BAL-12.5
BAL-19
> BAL-19
FIRE HYDRANT LOCATIONS (INDICATIVE ONLY)
NO NON-HABITABLE BUILDINGS TO BE CONSTRUCTED WITHIN THE RED OR ORANGE AREAS THAT LIE WITHIN 6 m OF A HABITABLE BUILDING.
NO HABITABLE BUILDINGS TO BE CONSTRUCTED WITHIN THE RED AREAS (EXCEEDS BAL-19)
CLASSIFICATION G(i):GRASSLAND
CLASSIFICATION G(i):GRASSLAND
BUILDINGS CONSTRUCTED WITHIN THE ORANGE AREAS ARE CAPABLE OF COMPLIANCE WITH BAL-19
MANAGED LAND (NEW RESIDENTIAL DEVELOPMENT)
CLASSIFICATION B:WOODLAND
CLASSIFICATION B:WOODLAND
Level
0-18°d/s
8-13°u/s
8-13°d/s
SITE GRADIENT
NOTES:
ONGOING MANAGEMENT OF EACH LOT IS TO BE CARRIED OUT BY THE LOT OWNER TO THE EXTENT NECESSARY TO MINIMISE BUSHFIRE RISK THROUGH THE REMOVAL OF GROUND FUELS AND DEAD AND FALLEN VEGETATION, MOW GRASSED AREAS REGULARLY AND ENSURE ANY FLAMMABLE MATERIALS (SUCH AS FIRE WOOD) ARE STORED ON THE NON-BUSHFIRE PRONE SIDE OF THE BUILDING.
ANY UNDEVELOPED PORTION OF THE SITE SUBSEQUENT TO ANY STAGE IS TO BE MAINTAINED IN A REDUCED FUEL CONDITION BY THE DEVELOPER THROUGH SLASHING OF GRASSED AREAS AND REMOVAL OF DEAD AND FALLEN VEGETATION. UNTIL SUCH TIME AS THE SITE IS FULLY DEVELOPED.
PUBLIC ROADS TO BE CONSTRUCTED IN ACCORDANCE WITH E1.6.2 AND TABLE E1, BUSHFIRE PRONE AREAS CODE. NOTE REDUCTION IN TURNING HEAD PERMITTED TO 9m RADIUS SUBJECT TO MOUNTABLE KERB AND TRAFFICABLE FOOTPATH 1.8m WIDE
ANY PRIVATE ACCESS EXCEEDING 30 METRES IN LENGTH TO BE CONSTRUCTED IN ACCORDANCE WITH E1.6.2 AND TABLE E2, BUSHFIRE PRONE AREAS CODE.
FIRE HYDRANTS AND HARDSTAND AREAS TO BE INSTALLED IN ACCORDANCE WITH E1.6.3 AND TABLE E4, BUSHFIRE PRONE AREAS CODE.
Assessed bushfire attack level:
BAL-LOW: Lots 9, 10, 11, 12 & 13
BAL-12.5 : Lots 2, 4, 6, 7, 8 & 14
BAL-12.5 (14m setback): Lots 1, 15, 16, 17, 18, 19, & 20
BAL-19 : (10m setback): Lots 1, 3, 5, 15, 16, 17, 18, 19, 20 & 21
N M Creese
Accredited Bushfire Management Practitioner
BFP-118
12th December 2018
2018
Disclaimer:
AS 3959-2009 cannot guarantee that a dwelling will survive a bushfire attack, however the implementation of the measures contained within AS 3959-2009, this plan and accompanying report will improve the likelyhood of survival of the structure. This plan and accompanying report are based on the conditions prevailing at the time of assessment. No responsibility can be accepted to actions by the land owner, governmental or other agencies or other persons that compromise the effectiveness of this plan. The contents of this plan are based on the requirements of the legislation prevailing at the time of report.
Mark Chladil, Fire Management Planning Officer On behalf of the Chief Officer Tasmania Fire Service January 12 2019
LARK & CREESE Pty Ltd
Land & Engineering Surveyors
62 Channel Highway, Kingston 7050
Ph. 62296563 Mobile: 0427 879 023
Email: info@larkandcreese.com.au
Web: www.larkandcreese.com.au
BUSHFIRE HAZARD MANAGEMENT PLAN
Owner: S Gath & P Gore
Location: 306A Lenah Valley Road, Lenah Valley
Title Reference: C.T. 162978-1
PID: 3142231
Scale: 1:1000
Date: 12th Dec 2018
Surveyors Ref 16331-05
Note: This plan has been prepared for the purpose of compliance with AS3959-2009 and Tasmania Fire Service Guidelines . This plan is not to be used for any other purpose without the express permission of Lark & Creese Pty Ltd.
The details depicted on this plan have been obtained from a combination of field survey, aerial photography and mapping and as such may not represent the precise nature of the site.

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PO Box 136, Kingston Tas 7051
(03) 6229 6563
info@larkandcreese.com.au
www.larkandcreese.com.au

FLORA ASSESSMENT

PROPOSED STORMWATER OUTLET - NEW TOWN RIVULET LINER PARK, LENAH VALLEY

For

S.G. Gath & P.M. Gore

6th December 2018

D. Summers (BAppSc)

LARK & CREESE
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(03) 6229 6563
info@larkandcreese.com.au
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info@larkandcreese.com.au
www.larkandcreese.com.au

Summary

The following report contains information to support a development application to the City of Hobart for a new storm water outlet attached to an approved subdivision. Currently the proposed location of the outlet is within public Open Space that forms part of the New Town Rivulet Linear Park under the Hobart Interim Planning Scheme 2015 (HIPS2015). This report assesses the existing flora and potential impacts as a result of the development.

Flora

- Field surveys indicate the proposed site has been significantly modified and lacks native species consistent with dry/wet sclerophyll riparian vegetation communities surrounding the site
- Assessment indicates the proposed site is not consistent with TASVEG 3.0 classification threatened dry *Eucalyptus globulus* shrubby forest (DGL) (Vulnerable under Schedule 3A Tasmania's *Nature Conservation Act 2002*)
- No threatened flora species listed in Commonwealths' *Environment Protection and Biodiversity Conservation Act 1999* or Tasmania's *Threatened Species Act* has previously been recorded on site and none were recorded at time of recent survey.
- The proposed development site is within HIPS2015 Biodiversity Protection Area and Class 2 Waterways Protection Areas

Discussion

Assessment indicates the proposed location of the new storm water outlet will not require removal of important riparian and instream vegetation adjacent to the site. However the location and construction will impact the integrity of the stream bank and verge. Given the gradients from the source it is understood the outlet will have a flow suppressant or 'riffle' mechanism at the outlet to mitigate potential residual erosion issues. Providing protection mechanisms in accordance with Best Practice Guidelines set out in '*Wetlands and Waterways Works Manual'* are implemented prior to construction it is anticipated the small scale impact should be limited to disturbance only.

General recommendations include:

- Prior to commencement of works implement protection mechanisms for retained Eucalypts within construction areas in accordance with AS4970-2009: Protection of trees in development sites,
- Prior to commencement of works implement best practice hygiene management prescriptions to mitigate the accidental importation and exportation of weed seeds and plant material during the construction phase.
- Prior to commencement of works implement an appropriate Soil, Water and Erosion Management Plan in accordance with Best Practice Guidelines set out in DPIPWE '*Wetlands and Waterways Works Manual'*,
- Plan works to avoid unnecessary disturbance of substrate and limit movement of machinery to within the proposal footprint,
- Where appropriate remedial works including revegetation could be attached to the proposal to improve capacity for natural recruitment and overall biodiversity.

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Proposal and Site Description

This report has been undertaken as part of a development application primarily to assist City of Hobart, and where applicable State and Commonwealth agencies in the approval process to establish a new stormwater outlet from a proposed subdivision to the south (see Figure 1). The survey specifically focuses on flora, and where applicable fauna values assessing potential impacts, including remedial measures, on ecological functions of both the development site and surrounding vegetation communities. Survey methodology based on 'Site Examination for Threatened and Endangered Plant Species' [1] supported by methodology outlined in "Manual for Assessing Vegetation Condition in Tasmania" [2].

The proposed development site is currently zoned Open Space within Parks and City Amenity division [3]. Soils are derived from bedrock of Dolerite (tholeiitic) with locally developed granophyre [4]. A survey found no geomorphic conservation features or geoconservation sites within the property [4] nor any Aboriginal or cultural heritage sites have been documented within the study site [4]. Research also indicted no documented cases of Phytophthora cinnamomi (Pc) were found within the property [4].

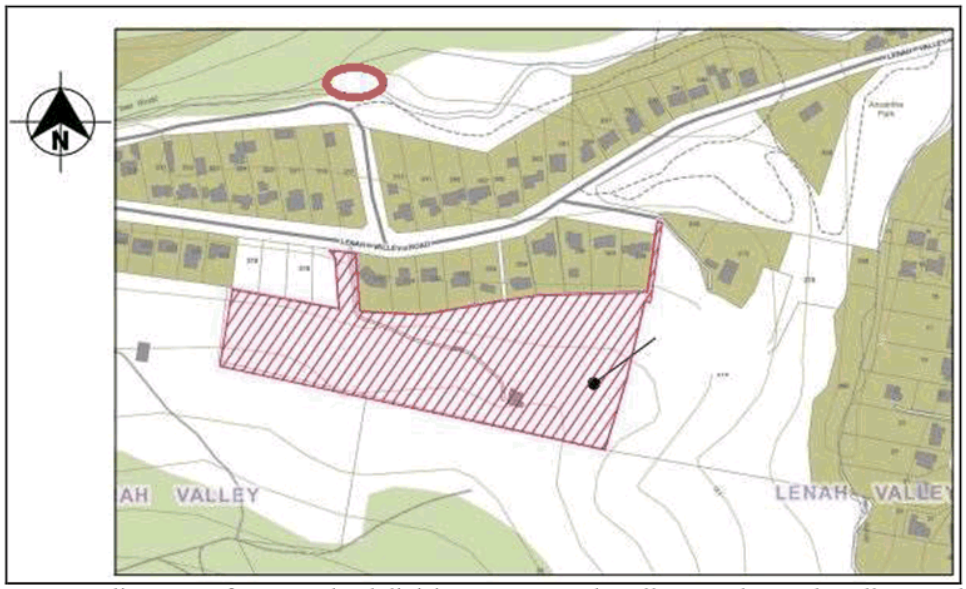

Figure 1 - Locality map of proposed subdivision 306A Lenah Valley Road, Lenah Valley. Study site and proposed storm water outlet located on the southern bank of New Town Rivulet (red) within New Town Rivulet Liner Park.

1 Dawson & Rochow, 1982
2 DPIPWE, 2009
3 KPS2000
4 Natural Values Atlas 3.0

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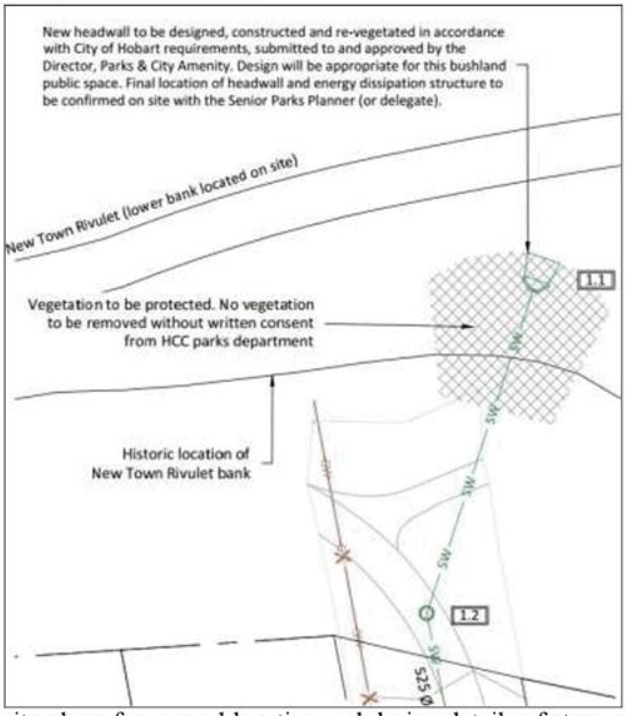

Figure 2 – Engineers site plan of proposed location and design details of storm water outlet including remedial works on the southern streambank of New Town Rivulet.

Figure 3 – Aerial image showing approximate location of proposed stormwater outlet clear of important native riparian and in-stream vegetation.

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Native Vegetation

The study site has been subject to varying land use and management practices. The site could be divided into two distinct zones: Landscaped garden areas including grassed areas (planted natives) and natural areas (limited to watercourse riparian vegetation, colonisation by natural recruitment).

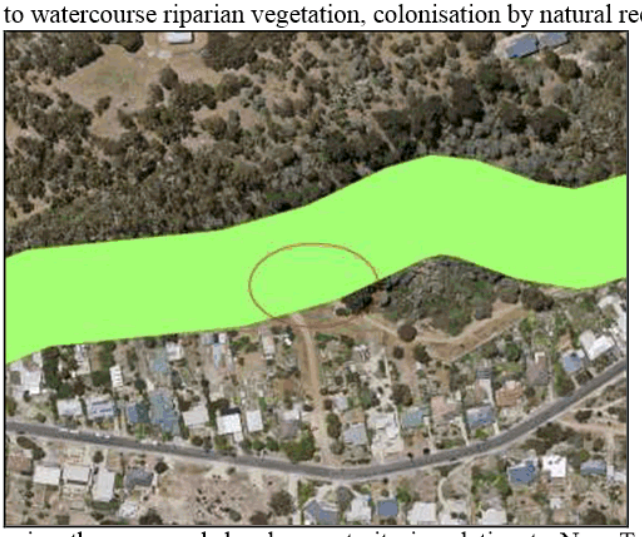

Figure 4 - Image showing the proposed development site in relation to New Town Rivulet Class 2 Waterways Protection Area (green).

TASVEG 3.0 classify the area as dry *Eucalyptus globulus*[5] vegetation community however field surveys indicate this classification should be limited to vegetation on the northern side of New Town Rivulet. As mentioned the southern stream bank approximately delineates the altered landscaped environs from native vegetation community to the north.

Figure 5 - TASVEG 3.0 distribution and classification of vegetation communities surrounding the proposed development site (red), DAM – dry Eucalyptus amygdalina, DOB – dry Eucalyptus obliqua, FUR – Urban land use, DGL – dry Eucalyptus globulus, (Ref – LISTMAP, DPIPWE).

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Assessment appears to indicate the study site is in a depositional location of the river with historical evidence indicating the main stream channel has changed position over the years. Whilst unsure of the history of the site it appears the southern stream bank has been altered through landscaping, infrastructure works but also shaped by natural events. Native vegetation such as *Pomaderris apetela, Acacia verticillata, Anodopetalum biglandulosum* and *Leptospermum lanigerum* occupies the in-stream island between the main channel and the southern flood channel. *Blechnum patersonii* was found occupying the ephemeral southern flood channel but appeared impacted by recent flood events.

Surveys found the riparian vegetation was not of the vegetation and health of the overall riparian community zone is assessed as poor primarily due to the absence of native riparian vegetation, proliferation of weed species and previous significant alteration to the southern bank. Given the dynamic environment and recent flood event vegetation within the watercourse had been significantly impacted and difficult to determine level of recruitment. However surveys found no evidence of woody species recruitment within the proposed development site.

Flora assessment identified the proposed outlet site is not consistent with DGL TASVEG 3.0 as described by Kitchener & Harris in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. No vascular plant species listed under Schedule 3, 4 or 5 of the Tasmanian *Threatened Species Protection Act 1995* or Commonwealth's *Environment Protection & Biodiversity Conservation Act 1999* was recorded on site [6].

Figure 6 – Image of proposed stormwater pipeline route and outlet (approx.) (red) showing significant disturbance resulting in lack of continuity of important riparian vegetation adjacent to the proposed outlet. This degraded area area is occupied by weeds *Myosotis scorpioides* (forget-me-nots), *Cardamine hirsute* (Flick weed), *Cirsium vulgare* (Thistles), *Galium aparine* (Cleavers) and *Poa annua*.

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Figure 7 - Image looking west at extents of exotic grass coverage and proliferation of Forget-me-nots, Cleavers, Thistles and flick weed. The browned off vegetation on the right is *Blechnum patersonii* located in the ephemeral southern flood channel impacted by recent floods.

Figure 8 – Image looking north at proposed stormwater pipeline route and outlet showing significant disturbance resulting in lack of continuity of important riparian vegetation

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Introduced Plants

Assessment found a number of common garden weeds and some environmental weed species including Cleavers, Flick weed, Blackberry, Thistles, Canary broom and Forget-me-nots. Within the study area these weed species occupied a variety of habitat and have colonised the landscaped areas as well as the verges close to the flood channel.

***Phytophthora cinnamomi* (Pc)**
Vegetation communities present within the study site are not considered susceptible to *Phytophthora cinnamomi*, however individual species present such as *Pultenaea* spp are susceptible to Pc. Recent survey of the Natural Values Database indicated no Pc infestation within the EMZ or elsewhere on the property [7].

Table 4 – Weed species present on site. (Excludes exotic grass and Plantago species).
SWMS – Southern Weed Management Strategy – 2013 - 2018

Weed Species	Status [11]	Distribution / Comment
Canary broom *Genista monspessulana*	Declared Weed (Tas) SWMS – Priority 4 Zone B - containment	Distribution mainly restricted to the disturbed eastern margin of the cleared area within degraded native vegetation. Management required. Eradication should be the objective preventing spread into high priority areas.
Flick weed (*Cardomine hirsuta*)	No formal status. Identified as invasive.	Widespread distribution. Found occupying grassed area, landscaped garden beds and previously disturbed areas. Infestation ranges from seedlings to mature flowering plants. Management required. Containment should be the objective preventing proliferation within waterways protection areas.
Cleavers (*Galium sp*)	No formal status. Identified as invasive.	Widespread distribution. Found occupying grassed area, landscaped garden beds and previously disturbed areas. Infestation ranges from seedlings to mature flowering plants. Management required. Containment should be the objective preventing proliferation within waterways protection areas.
Spear thistle *Cirsium vulgare*	Environmental Weed. Identified as invasive.	Distribution limited to disturbed areas and grassed area. Limited to rosettes, not mature plants recorded. Management required. Containment should be the objective preventing proliferation within waterways protection areas.
Forget-me-nots *(Myosotis scorpioides)*	No formal status. Identified as invasive.	Widespread distribution. Found occupying grassed area, landscaped garden beds and stream verges. Management required. Containment should be the objective preventing proliferation within waterways protection areas.
Blackberry (*Rubus fruticosus)*	Weed of National Significance Declared Weed (Tas) SWMS – Priority 4 Zone B - containment	Only one immature plant was found in the landscaped garden bed adjacent to the proposed pipeline route. Eradication should be the objective preventing spread into high priority areas. Management required.

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Weeds of National Significance and Declared weed under the *Tasmanian Weed Management Act 1999* have individual Weed Management Plan. These plans state intent to ensure all infestations of weeds are contained within existing infestations with the intention to control the spread of infestations, or into areas that support threatened species/communities[8] It is recommended implementing hygiene management prescriptions to ensure contractors vehicles and machinery are cleaning all machinery and equipment off-site prior to commencement of works in accordance with *Tasmanian Washdown Guidelines for Weed and Disease Control: Machinery, Vehicles and Equipment* (Edition 1, 2004)[9]. It is recommended a long term integrated weed management strategy post construction (3-5 years) with a revegetation plan be implemented to improve stream bank stability and improve the biodiversity of the important riparian community.

Figure 8 - Image showing typical infestation of Forget-me-nots infestation within the grassed area of New Town Rivulet Liner Parklands.

Figure 9 - Image of Spear thistle rosette located within the grassed area of New Town Rivulet Liner Parklands.

7 Kingborough Weed Management Strategy 2013-2018
8 Southern Tasmanian Weed Management Strategy 2005
9 Natural Values Atlas Database 3.0, DPIPWE

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Potential for Contributing to Conservation

As previously mention majority of the study site within of New Town Rivulet Liner Parkland is significantly modified with surveys indicating the floristic community structure varies from TASVEG 3.0 classification of DGL[10]. *Eucalyptus globulus* is absent from the gallery including understory species generally associated with structure and composition of DGL[11]. *Eucalyptus globulus* dominated vegetation communities north of the study site potentially represent potential core foraging habitat for the critically endangered Swift parrot[12]. A single *E. viminalis* located clear of the development site to the east potentially represents critical foraging and breeding habitat for the endangered Forty-spotted Pardalote. However desk top assessment indicates the study is more than 3 kilometres from documented populations and therefor only represents marginal habitat[12]. In accordance Biodiversity Values under TableE10.1 and E10.1A – Priority Biodiversity Values within HIPS2015 it appears the site represents Moderate Priority[13].

The site represents potential habitat for plant species listed under Tasmania's *Threatened Species Protection Act 1995* previously been recorded within 5 km[13] but not found within the study site. No Species under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* have been recorded [13]. In addition the study site represents potential but marginal habitat for a number of threatened plant species found within 500 metres [14] (see Table 1).

Table 1: Significant Plant species previously recorded within 500 radius of the study area [14].

Conservation Status			
Species	**TSPA**	**EPBC**	**Comment**
Threatened Species Observed within 500 metres			
Rytidosperma indutum Tall Wallaby grass	rare	-	Not recorded. Development site provides potential habitat. Not optimum survey period. Extent of proposed works unlikely to result in significant impact to important habitat.
Scleranthus brockiei Mountain knawel	rare	-	Not recorded. Development site and remainder of property does not represent suitable habitat. Extent of proposed works unlikely to result in significant impact to important habitat.
Scleranthus fasciculatus Spreading knawel	vulnerable	-	Not recorded. Development site and remainder of property does not represent suitable habitat. Extent of proposed works unlikely to result in significant impact to important habitat.
Vittadinia muelleri Narrow leafed new Holland daisy	rare	-	Found 250 metres to the south in open dry sclerophyll woodland. Not recorded within study site. Development site considered possible habitat. Extent of proposed works unlikely to result in significant impact to important habitat.

The site is in potential range for a number of threatened flora and fauna species that have been observed within 5 km but not found within the study however when the ecology of these species is considered the study site does not represent core habitat. Give the scale of the proposed development potential direct impacts on flora and fauna species are most likely limited to disturbance only.

10 Natural Values Atlas, DPIPWE
11TASVEG 3.0, Kitchener & Harris
12 Fauna Tech Note No. 8
13 HIPS2015
14 Natural Values Atlas, DPIPWE

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Legislative Implications

Commonwealths' *Environmental Protection & Biodiversity Conservation Act 1999* (EPBCA).
There are no potential issues of national significance or Threatening Process relating to nationally endangered and vulnerable fauna and flora listed under the EPBCA [15]. On this it appears a referral to the PCAB will not be required [21].

Tasmanian *Threatened Species Protection Act 1995* (TSPA)
Any impacts to threatened species listed under the TSPA will require a permit from the Policy and Conservation Assessment Branch (PCAB) DPIPWE [16]. No threatened species were recorded within the study site previously or during recent surveys. Listed plants in Table 1 have been observed within 500 metres however when the ecology of these species is taken into account it is anticipated the development proposal will not impact their survival. Therefore, on this basis it appears a referral under the PCAB will not be required.

Tasmanian *Nature Conservation Act 2002* and *Land Use Planning and Approvals Act 1993*
Modified riparian vegetation within the study site does not constitute threatened DGL vegetation community as classified by TASVEG 3.0 and therefore works does not trigger provisions within Tasmania's *Nature Conservation Act 2002*[17]. Approval for proposed works could be subject to approval from City of Hobart under by-laws for works in watercourses.

Tasmanian *Environmental Management & Pollution Control Act 1994 & Regulations 1996*
This legislation provides mechanisms to the protection of wetlands and waterways form environmental harm. Local government authorities are responsible for any necessary environmental regulation of smaller scale activities. Therefore, on this basis it appears approval from HCC is required and no referral under the EMPCA required [18].

State Policy on Water Quality Management 1997
Local councils are responsible under the RMPS for the prevention or control of pollution in surface water by activities within their local boundaries that are not Level 2 or Level 3 activities. Regulatory authorities (HCC) are required to provide guidelines in accordance best practice environmental management[19].

16 Commonwealths' Environmental Protection and Biodiversity Conservation Act 1999
17 Tasmanian Threatened Species Protection Act 1995
18 Tasmanian Nature Conservation Act 1999 & Land Use Planning and Approvals Act 1993
19 Tasmanian Environmental Management & Pollution Control Act 1996
19 State Policy on Water Quality Management 1997

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Tasmanian *Weed Management Act 1999* (WMA)

Declared weeds are subject to management plans under the WMA. Some of the species have widespread infestations in the Hobart municipality and are listed as Declared weeds under Tasmania's *Weed Management Act 1999* [20]. Given the potential impacts containment should be the objective which includes prevention of spread from the core site [20]. Hygiene measures at a minimum must include a wash down of earth moving machinery prior to commencement of works. Providing contractors can demonstrate equipment and machinery has not recently operated in a *Phytophthora cinnamomi* (Pc) Management Area it is anticipated inclusion of mechanisms to address potential Pc is not required. Given the potential for a large seed bank it is recommended machinery and vehicles are appropriately washed down at an approved facility immediately following works.

Local Government Act 1993

The propose works within of New Town Rivulet Liner Parklands requires a permit from City of Hobart under Public Spaces By-law No. 4 2018 [21].

20 Southern Tasmanian Weed Management Strategy 2005-2010
21 *Local Government Act 1993*

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Discussion

Flora

- The proposed stormwater pipeline route is entirely within a previously modified area and will not require the removal nor impact on important existing riparian vegetation adjacent to the site,
- The proposed location is not consistent with TASVEG 3.0 classification dry *Eucalyptus globulus* forest (DGL) (Harris & Kitchener, 2005),
- No plant species listed under Schedules of the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* or Tasmania's *Threatened Species Protection Act 1995* has been previously documented on site. No threatened species were recorded on site and therefore referral under this Act will not be required.

Fauna

- No faunal species listed under Schedules of the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* or Tasmania's *Threatened Species Protection Act 1995* has been previously documented on site. No threatened species were recorded on site. No threatened species were recorded on site and therefore referral under this Act will not be required.
- The site is within potential range of a number of threatened species however it is anticipated the level of disturbance will not impact on core or critical habitat for identified species.

Providing best practice and appropriate mechanisms are implemented prior to and during construction phase it is anticipated the proposed works will not result in significant environmental impact. Site plans indicate the development footprint will be limited and will not impact riparian vegetation including the tree protection zone of adjacent eucalyptus.

Plans and on-site discussions indicate works and construction techniques will result in small-scale disturbance to the profile and integrity of the streambank. However with appropriate protection mechanisms in place pre and post construction I do not anticipate works will result in significant mobilisation of sediment or impact water quality downstream. Designs indicate the level of the outlet will be similar to existing streambed levels and include a 'riffle' and a hard surface apron to mitigate high-flow rates and potential residual impacts such as scouring of the substrate.

In keeping with best practice the approval should be subject to rehabilitation post construction. This could include revegetation using local provenance species particularly to retain and improve stream bank stability around the disturbed site, provide important riparian vegetation connectivity and improve overall biodiversity values of the rivulet.

Given the potential for a large weed seed bank post construction weed management activities should be part of the remedial strategy to ensure the disturbed site does not contribute to environmental management issues within the New Town Rivulet Liner Park.

Recommendations include:

- Prior to commencement of works install protection barrier for retained Eucalypt west of the proposed construction areas. Barrier fence is to be installed 4.4 metres from the base of the trunk in accordance with AS4970-2009 - Protection of trees in development sites,
- Prior to commencement of works implement best practice hygiene management prescriptions to mitigate the accidental importation, and exportation, of additional weed seeds and plant material during the construction phase.
- Prior to commencement of works under directive of the engineer implement a Soil, Water and

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Erosion Management Plan in accordance with Best Practice Guidelines set out in DPIPWE '*Wetlands and Waterways Works Manual*',

- Plan works to avoid unnecessary disturbance of substrate and limit movement of machinery to within the proposal footprint,
- Remedial works including revegetation could be attached to the approval process including CoH undertaking weed management activities to strengthen natural recruitment, consolidate the streambank and improve overall biodiversity.

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APPENDIX A: VASCULAR PLANT SPECIES LIST
NEW TOWN RIVULET

DICOTYLEDONAE

FAMILY NAME

ASTERACEAE
Cassina aculeate
Bedfordia salicina
Olearia ramulosa
Senecio quadridentatus

BLECHNACEAE
Blechnum patersonii

CUNONIACEAE
Andopetalum biglandulosum

DROSERACEAE
Drosera peltata

ERICACEAE
Astroloma humifusum
Leptecophylla divaricata

EUPHORBIACEAE
Beyeria viscosa

FABACEAE
Pultenaea juniperina

GERANIACEAE
Geranium sp

GOODENEACEAE
Goodenia ovata

HEMEROCALLIDACEAE
Dianella tasmanica / revoluta

HALORAGACEAE
Gonocarpus teucrioides

MIMOSACEA
Acacia dealbata
Acacia melanoxylon
Acacia verticillata

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MYRTACEAE
Eucalyptus obliqua
Eucalyptus viminalis
Leptospermum scoparium

PITTOSPORACEAE
Bursaria spinosa

RHAMNACEAE
Pomaderris apetala

ROSEACEAE
Acaena novae-zelandiae

RUBIACEAE
Coprosma quadrifida

SANTALACEAE
Exocarpos cupressiformis

SAPINDACEAE
Dodonaea viscosa spatulata

MONOCOTYLEDONAE

FAMILY NAME

CYPERACEAE
Lepidosperma laterale

LOMANDRACEAE
Lomandra longifolia

LILIACEAE
Dianella sp

POACEAE
Austrodanthonia spp
Poa spp.

INTRODUCED PLANT SPECIES

ASTERACEAE
Cirsium vulgare

BORAGINACEAE

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Myosotis scorpioides

BRASSICACEAE
Cardamine hirsuta

FABACEAE
Genista monspessulana

GENTIANACEAE
Centaurium erythraea

ROSACEAE
Rubus fruticosus

PITTOSPORACEAE
Pittosporum undulatum

POACEAE
Dactylis glomerata
Poa annua
Festuca arundinacea

LEARY&COX
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4th December 2018 Ref No 9446

The General Manager
Hobart City Council
Via Planning Application Portal
https://apply.hobartcity.com.au/

Dear Sir

RESPONSE TO COUNCIL'S REQUEST FOR INFORMATION

I refer to Hobart City Council's RFI dated 1/11/2018.

Lodged herewith in the HCC planning application portal, please find the following documents:

- Subdivision Proposal Plan Rev I (Supersedes previous version and contains updated batter easements to reflect engineering revisions)
- Letter and Table of items addressed from AD Design and Consulting
- Revised Engineering Concept Plan from AD Design and Consulting (Rev E 15/11/18)
- Updated Bushfire Documentation by Lark and Creese.
- Flora Assessment by Lark and Creese, addressing the new proposed alignment of the stormwater discharge to the New Town Rivulet.

The table by AD Design and consulting clearly lists each item addressed, with the exception of the following:

BPAC1: Refer to amended Bushfire Documentation

Yours faithfully

LEARY & COX

TIM COX

UNIT G04, 40 MOLLE STREET, HOBART
PHONE: 03 6118 2030 EMAIL: admin@learyandcox.com ABN: 23 164 511 620

Engineering · Renewable Energy · Project Management

AD Design & Consulting

21/11/2018

City of Hobart
GPO Box 503, Hobart
Tasmania 7000

Attention: Manager of Development Services

Dear Sir/ Madam,

RE: REQUEST FOR FURTHER INFORMATION – APPLICATION NO. PLN1882
21 LOT SUBDIVISION - 306A LENAH VALLEY ROAD, LENAH VALLEY

In reference to your request for further information dated 1st November 2018 to the above-mentioned application, please refer to the enclosed table addressing the matters raised.

Should you have any further queries, please contact me on the below.

Yours sincerely,

Tom Norman
Civil Engineer | AD Design & Consulting Pty Ltd
tom@addconsulting.com.au
0402 592 454

Item	Request for Information	Response
SW1	Please provide the following: 1. An amended drainage design noting: • Minimum pipe size & type within the road reserve is 300 RCP CL 4 • Minimum pipe grade 1 in 150 • CSFCR backfill for all pipes beneath the road pavement • In accordance with Austroads design guide, drainage structures to be located outside of road pavement areas • Overland flow paths through private property require an easement. Catch drains are not an acceptable. • Drainage alignment must accommodate future road works • Drainage computations must incorporate discharge from entire lots (not just roofs) 2. Show all relevant service easements 3. Court bowl lip longitudinal section to be amended to show the design string Advice: Please telephone Council's Road and Environmental Engineer, Cameron Cecil, on 6238 2912 if you have any queries regarding the above.	1. • Minimum pipe size to be conditioned. Pipe class to be removed as this is to be determined upon engineering assessment. • Minimum pipe grade of 1 in 150 to be removed. Hydraulic design will be in accordance with LGAT standards, ARR 2016 and other relevant guidelines. These do not state a single minim grade but note its dependency on pipe size. • Backfill requirements are to be removed. Backfill specification will be based on a number of factors determined upon an engineering assessment. • Pipe work is required under the pavement due to space restriction within the road reserve. During detailed design pipe work will be moved to under kerb were feasible to do so. Pipe class and cover will be appropriately spec'd for the traffic loading. • A diversion drain has been provided within lot 5 to manage overland flow from the upper catchment. There is no clause within the Hobart City Council Interim planning scheme, State Stormwater Strategy of HCC specification which prevent diversion drains being provided to manage overland flow. ARR 2016, specified by HCC as the authority on stormwater design, outlines the standards to use diversion drains in stormwater management systems to protect developments. The purpose of this diversion drain is to divert upstream flows into the proposed dn525 culvert which conveys 1% AEP flow past the development safely. Furthermore, we question the necessity of an easement for a private diversion drain which doesn't transvers any other property. What would be the granted rights and to whom?

		• Given that there is no proposed or approved future road infrastructure outlined, other than what is being prosed for this development, this RFI cannot be satisfied. Reasonable consideration has been taken for future development, and as such no aspects of the proposed development limits it. • An assessment of the entire area for Lot 7 to Lot 14 as been undertaken, see enclosed. It is shown that the proposed 300x450 culvert has sufficient capacity. 2. Shown refer to Leary & Cox documentation 3. Lip of kerb has been shown. Refer to drawing C091.
BPAC1	Either: (a) amended engineering drawings showing: the cul-de-sac having a minimum outer radius of at least 12m; property accesses for Lots 1 and 3 of at least 4m in carriageway width; and 0.5m horizontal clearance areas on either side of the proposed property access carriageway for Lot 3; or (b) an amended Bushfire Report, Bushfire Hazard Management Plan and Certific ate of Compliance consistent with the submitted engineering drawings. Advice: The submitted bushfire Certificate of Compliance references previous versions of the relevant documents (e.g. bushfire report). Please provide an amended Certificate of Compliance referencing the current versions. Advice: Please telephone Council's Environmental Development Planner, Rowan Moore, on 6238 2168 if you have any queries regarding the above.	Refer to Leary and Cox documentation
OSU	The vegetation assessment has been provided by the applicant to determine the extent of impact from the proposed upgrade to stormwater infrastructure to service the subdivision of 306A Lenah Valley Road, with the outfall proposed to be located in New Town Rivulet Linear Park. The report provides limited detail on the exact location and species of vegetation to be impacted. The vegetation needs to be mapped and shown on proposal plans as existing vegetation to be removed. The report should also provide commentary on the suitability of the proposed alignment and location of the pipeline and outlet, citing if there are any possible alternative alignments/locations and reasons why these options may or may not be suitable.	Location of proposed outfall as been revised base on site visit and discussion with HCC on the 13th November. Additional survey has been completed and is shown on our plans. Please refer to amended drawing C032.

	Advice: Please telephone Council's Park Planner, Jill Hickie, on 6238 2887 if you have any queries regarding the above.	
ENGr Fi 3	To ensure protection of Council's public infrastructure, please provide: Item 2a Driveway access to lot 4 is not shown on plans C030. Item 2b A suspended deck is likely to be feasible for lots 9 to 12 where the retaining wall is location along all the frontage of the property. A dimensioned long section (as outlined in plan C033) needs to show the variable height of the wall, the variable distance of the wall to the property boundary and the slope of the land. The City needs to ensure that a suspended deck is the most likely form of access and that a garage can be reasonable built within the property without undue expense to the owner. To reduce the distance the owner has to span a deck the City may require an embankment easement behind the wall instead of road reservation in which the owner can place a carport in an embankment easement. To make this determination we require the above information. Lots 6, 7 and 8 require more justification on why this should be a suspended deck arrangement and not a standard driveway. Plan C100 shows lots 6 and 7 as being achievable as a standard driveway and I envisage lot 8 to be similar. Cross and long sections of a standard driveways compared to a long section of a suspended deck is required. Item 4 On plan C100 the long sections need to show the boundary lines, chainage and existing and new surface levels as a minimum (refer to long section for road). Long sections are not shown for lots 8, 13 and 14. This is required. Cross sections of the driveway onto each lot is required or the worst case for similar driveways. Please note that the driveway to the property boundary is required to be constructed by the developer apart from where a suspended deck (with mountable kerb) is the most feasible option. If there is substantial works required within the property to gain driveway access onto the lot then we can require that the developer to undertake this, thus it is important for cross section to be provided for driveway access so we can assess this. Item 8 Retaining wall and associated handrail noted as by other needs to be removed on plan C091.	As discussed with HCC on the 19th November parts of this RFI are no longer relevant. Item 2a: completed previously Item 2b: All driveway long sections and indicative location on plan have now been shown. All lots can be accessed by either slab on ground or suspended driveways, this is shown on plan. Item 4: completed previously Item 8: completed previously Item 10: A 2.0m wide embankment easement from the highway reserve has been shown. This easement extends the full length of the retaining wall and is measured from the highway reserve (not the back of retaining wall) as requested. Justification for the embankment easement over an increase in highway reserve width is as follows. Due to steep slope of the site it is favorable to keep the buildings as close to the road as possible, high up on the lot, rather than pushing them further down the hill. Council voiced concerns over unfavorable constraints on building effecting the sales of lots and having a negative impact on the neighborhood. By allowing homes to be built further up the slope, we believe will help the issue. Further to the above: It was discussed that 'practical access' to each lot was to be conditioned. We would request that what constitutes 'practical access' be defined within the condition.

	Item 10 A minimum of 2m needs to be maintained behind the retaining wall for the City to undertake maintenance of the wall. Thus where the road reservation distance between the wall and property boundary is less than 2m then an embankment easement is required. The other option is to adjust the road reservation to align with the wall with a consistent 2m embankment easement behind it or extend the road reservation to 2m behind the wall. The determination of this will depend on item 2b. Please clearly show on plan C031 that there is 2m behind the retaining wall either by road reservation or embankment easement. There is an embankment easement on the high side of the road reservation outside properties 16 and 18 to 21. Please explain the reason for this or amend. Advice: Please telephone Council's Road and Environmental Engineer, Cameron Cecil, on 6238 2912 if you have any queries regarding the above.	
SURVFi1	The Road Works and Services Plan shows a proposed 300 mm diameter public SW main and 150 mm diameter sewer main through Lot 1 on SP 175675 that is part of the recently completed subdivision at 270A Lenah Valley Road. There is an existing 2.00 m wide Drainage Easement in favor of Hobart City Council through Lot 1 adjacent to the western boundary, however the proposed SW main appears to be located partly outside the easement and there is no easement in favor of TasWater over Lot 1. Additional information is required to satisfy Council that the drainage both of roads and lots in the subdivision can be satisfactorily carried off or disposed of through this property owned by a third party, i.e. what legal agreement is in place for the proposed SW and sewer through Lot 1 and how it is proposed to create easements in favor of Hobart City Council and TasWater for the proposed public infrastructure through Lot 1 on SP 175675. It is noted that Lot 1 on SP 175675 is in the process of being sold by its current owner Redlands Trading Pty Ltd to C and M Roden and mortgaged to MyState Bank. Advice: Please telephone Council's Registered Land Surveyor, Mark Anderson, on 6238 2120 if you have any queries regarding the above.	Sewer alignment has been revised due to the service easement not being included in 270 Lenah Valley Road's title as originally approved. Please refer to drawing C030 and C031.

Culvert FLows					
Catchment	Area (ha)	Tc (min)	Int. (mm/hr)	Coeff.	Q (L/s)
All lots	0.6369	10	76	0.7	94.11967
270 Lenah Valley					134.303
Total Flow					228.4227

Lot 7 to 14 flows through proposed culvert

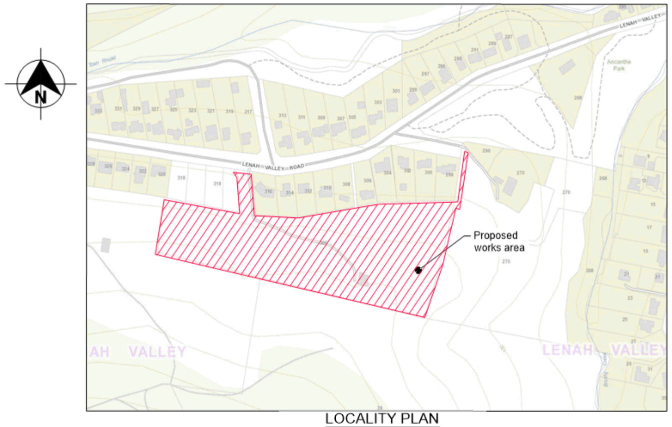
Colebrook - White Culvert Capacity		
Culvert ID	Existing	Proposed
Pipe Dia/BC	0.300	0.3 x 0.45
Length	6.760	6.76
US HGL	126.800	126.8
DS HGL	126.540	126.54
Gross Head	0.260	0.26
Friction Loss	0.105	0.08
MH Loss	0.156	0.18
Velocity	1.950	2.099
Flow	138	282

Lenah Valley Culvert Existing and Proposed Capacity

21 LOT RESIDENTIAL SUBDIVISION

306A LENAH VALLEY ROAD, LENAH VALLEY, TAS 7008

FOR
STEPHEN GATH



LOCALITY PLAN
NTS

Sheet List Table

Sheet Number	Sheet Title
1707 - C000	COVER SHEET, DRAWING LIST & LOCALITY PLAN
1707 - C001	GENERAL NOTES
1707 - C010	SITE PLAN
1707 - C011	1% AEP OVERLAND FLOW PATHS
1707 - C020	EARTH WORKS PLAN
1707 - C030	ROAD WORKS AND SERVICES PLAN SHEET 1
1707 - C031	ROAD WORKS AND SERVICES PLAN SHEET 2
1707 - C032	ROAD WORKS AND SERVICES PLAN SHEET 3
1707 - C033	ROAD WORKS AND SERVICES PLAN DRIVEWAYS
1707 - C034	SWEPTH PATH & CULDESAC DETAILS
1707 - C035	RETAINING WALL LAYOUT PLAN
1707 - C050	TYPICAL CROSS SECTIONS SHEET 1
1707 - C051	TYPICAL CROSS SECTIONS SHEET 2
1707 - C080	STORMWATER LONGITUDINAL SECTIONS
1707 - C081	STORMWATER LONGITUDINAL SECTIONS
1707 - C082	STORMWATER LONGITUDINAL SECTIONS
1707 - C083	STORMWATER LONGITUDINAL SECTIONS
1707 - C085	SEWER LONGITUDINAL SECTIONS
1707 - C086	SEWER LONGITUDINAL SECTIONS
1707 - C087	SEWER LONGITUDINAL SECTIONS
1707 - C088	SEWER LONGITUDINAL SECTIONS
1707 - C090	ROAD LONGITUDINAL SECTIONS
1707 - C091	ROAD LONGITUDINAL SECTIONS
1707 - C100	TYPICAL DRIVEWAY PROFILES SHEET 1
1707 - C101	TYPICAL DRIVEWAY PROFILES SHEET 2
1707 - C102	TYPICAL DRIVEWAY PROFILES SHEET 3
1707 - C103	TYPICAL DRIVEWAY PROFILES SHEET 4
1707 - C104	TYPICAL DRIVEWAY PROFILES SHEET 5
1707 - C105	TYPICAL DRIVEWAY PROFILES SHEET 6
1707 - C106	TYPICAL DRIVEWAY PROFILES SHEET 7

Sheet List Table

Sheet Number	Sheet Title
1707 - C110	ROAD CROSS SECTIONS SHEET 1
1707 - C111	ROAD CROSS SECTIONS SHEET 2
1707 - C112	ROAD CROSS SECTIONS SHEET 3
1707 - C113	ROAD CROSS SECTIONS SHEET 4
1707 - C114	ROAD CROSS SECTIONS SHEET 5
1707 - C115	ROAD CROSS SECTIONS SHEET 6
1707 - C116	ROAD CROSS SECTIONS SHEET 7
1707 - C117	ROAD CROSS SECTIONS SHEET 8
1707 - C120	STORMWATER CATCHMENT PLAN

SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
D	27/09/18	RESPONSE TO RFI DATED 04/09/18	TN	AD	AD
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn	Signed	Date
Designed	Signed	Date
Checked	Signed	Date
Approved	Signed	Date

Drawing Title: COVER SHEET, DRAWING LIST & LOCALITY PLAN

Project No. 1707

Scale: NTS | Sheet Size: A3

Drawing No. 1707 - C000 | Rev: D

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PROJECT NOTES

General

1. These notes have been prepared as a guide to relevant codes, regulations and standards for use by the contractor during the construction process.
2. Hobart City Council (HCC) current specifications and drawings are to be read in conjunction with these drawings. works to be carried out to the satisfaction of the manager, engineering services of HCC and in accordance with HCC permit xxxx.
3. The Council and all service authorities shall be notified, in writing, seven days prior to commencement of the works. all existing services in the vicinity of the works are to be located prior to commencement.
3. Workmanship and materials to comply with requirements of S.A.A codes, building code of Australia and by-laws and ordinances of relevant building authorities. all codes referred to are those current (as amended) at commencement of contract.
4. Prior to commencement of the works, the contractor shall provide the superintendent the following information.
   (a) Source of quarry material.
   (b) Optimum moisture content and maximum modified dry density of the fine crushed rock (FCR), to be used from NATA approved laboratory.
   (c) If the source of the quarry material is changed during the course of the works, new test results shall be provided.
5. On completion, the contractor is responsible for the removal of all rubbish and spoil from the site.
6. Implement soil and water management procedures to avoid erosion, contamination and sedimentation of site, surrounding areas and drainage systems. refer to council permit xxxx, condition 9 for minimum requirements.
7. All services are to be located prior to commencement of works.
8. All levels are to be confirmed prior to commencement of works.
9. All levels are to Australian height datum (A.H.D).

Approvals

1. The Contractor is responsible for ensuring that start work notices are in placed for all works.
2. The Contractor shall not commence construction within a road reserve until the following requirements are met:
   2.1. The 'Permit to carry out works within a council road reservation' has been issued by Council; and
   2.2. All traffic management has been prepared in accordance with DSG traffic control code of practice.
3. Refer to Council permit for full disclosure of permit conditions.

Soil and Water Management

1. Implement soil and water management procedures to avoid erosion, contamination and sedimentation of site, surrounding areas and drainage systems. refer to Council permit xxxx, condition 9 for minimum requirements.
2. All works are to be carried out in accordance with 'Soil and Water Management on building and construction site. All guidelines are available from the Derwent Estuary Program website.

   www.derwentestuary.org.au/stormwater-factsheets

Earthworks

1. All general earthworks, material and workmanship shall comply with the current edition of the S.A.A code for earthworks, AS3798 where applicable.
2. The Contractor is to engage an approved Geotechnical Engineer to carry out Level 1 testing of all earthworks to AS3798, including:
   2.1. Subgrade;
   2.2. Fills;
   2.3. Pavements; and
   2.4. Backfilling of service trenches.

   Certification of these elements are to be provided prior to practical completion.
3. All earthwork filling is to be constructed in accordance with section 6 of AS3798. Minimum 95% standard dry density (SMDD).
4. The contractor shall erect and maintain all shoring, planking and strutting, dewatering devices, barricades, signs, lights etc necessary to keep works in a safe and stable condition and for the protection of the public.
5. The Contractor must take the utmost care to protect all existing vegetation, unless identified on the civil works plans for removal. Should any tree be removed without the Council - open space teams written authority, or damaged due to negligence by the Contractor, then the Contractor shall pay compensation for the tree.
6. All areas shown on the drawings to be cut or filled are to be stripped of topsoil to a depth of 100mm. upon completion of the bulk earthworks, the topsoil is to be spread to a depth of 100mm, over the area and graded to finished levels shown on the drawings with a minimum slope of 1 in 150.
7. The disposal site for soil removal and surplus cut shall be on site as directed by the Superintendent.

Services

1. All conduit trenches under road pavement and kerb and channel shall be backfilled with 20 mm class 4 FCR.
2. Connections to existing stormwater and sewer to Council & Taswater standards and approvals.
3. Telstra conduits and cable ducts will be laid in trenches excavated and backfilled by the Contractor. The Contractor shall give Telstra Area Engineer 7 days notice prior to commencing work.
4. 100 mm diameter agricultural drains to be constructed behind or under kerb and channel, kerb only and edge strips where directed by the Superintendent or as shown on the plans and to be connected to underground SW drains.
5. The reinstatement and compaction of public authority service trenches shall be the Contractors responsibility, and to the satisfaction of of the manager, technical services of HCC.

Signage

1. Contractor to install all signage.
2. Contractor to install "end of road" barricade/sign at end of works in accordance with staging plans.

Roads

1. All works are to be carried out in accordance with Local Council and DSG standards. Any departures from the standards requires the prior approval of the Superintendent and Council Municipal Engineer.
2. The Contractor must supply to the Superintendent a schedule and plan of testing to be carried out on pavement & backfill material and this is to be approved by the Superintendent before any works can commence.
3. All batters shall be 1 in 4 unless otherwise stated.
4. All footpaths to be 100 thick,N25 concrete in accordance with TSD-R11-v1. thickening at vehicle crossovers in accordance with TSD-R09-v1.
5. All kerb and channel, kerb only, edge strips, and concrete inverts to be constructed in accordance with TSD-R14-v1. All concrete to be 25MPa and have a minimum cement content to be 280 kg/m^3.
6. For all filling and backfilling requirements, refer to Earthworks section.

Drainage

1. All works to be carried out in accordance with Council Municipal Standards, LGAT standard drawings, AS3500 and project specification where required and to the satisfactory of Councils Municipal Engineer.
2. All fill material is to be placed and compacted prior to excavation of trenches.
3. All trench excavations over 1.5m in depth must be carried out in accordance with workplace standard code of practice for excavation works. Contractor to notify Superintendent 48 hours prior to commencing excavations.
4. All stormwater drains shall be as specified on drawings, if not specified all pipes are to be Iplex Blackmax or approved equivalent.
5. All stormwater pits in allotments shall be 1.0m offset from building lines unless otherwise shown.
6. All pits constructed on steep terrain, the finished surface profile of the structure is to match the existing or finished slope of the ground.
7. All house drains for allotments shall be at a sufficient depth to control drainage at a minimum of 1 in 100 fall from all points within the building area, and shall be connected to underground drains in road reserves where possible, with 600mm. Minimum cover at building line. house drains to be placed 2.0m from the low corner of the lot unless otherwise shown.
8. All pipes, located beneath existing or proposed road pavement, driveways, footpaths and drains must be completely backfilled with 20mm, class 4 FCR, watered, compacted & tested to the satisfaction of HCC.
9. All pipe work in stormwater drainage pits are to be well aligned ensuring incoming flows are jetted directly to the outlet pipe, that is, the centre line of the inlet pipe is to intersect the centre line of the outlet pipe at the outlet pit wall.
10. All stormwater pits unless otherwise specified are to be constructed with a minimum concrete strength of 25MPa provide 2No. 65 dia weep holes for stormwater side entry pits and manholes.
11. All stormwater lot connections to be 150 dia class SN8, pipes under roads to be class SN8. seal off all unused connections.
12. All anchor blocks (concrete bulkheads) are to be keyed into undisturbed, competent material to ensure movement of bedding and backfill material is reduced and the integrity of the pipe is maintained.

Water

1. All water works are to be constructed in accordance with WSAA water code of Australia (MRWA) - WSA 03-2011 VER 3.1 and Taswater's supplement to the code.
2. All property connections are to be DN25 PE100 PN16 and in accordance with TW-SD-W-20 with meter with integral dual check valve, gate valve and PVC box as specified by Taswater.
3. All thrust blocks to be in accordance with WSA03-2011-3.1 MRWA VER 2.0 MRWA-W-204 AND 205.
4. Detector tape is to be installed over all non-metallic water mains.
5. All conduits for poly water road crossings are to be uPVC SN8 100mm.
6. All dual service road crossings are to be DN63 PE100 PN16 pipe.
7. All single service road crossings are to be DN25 PE100 PN16 pipe.
8. All hydrant road marking indicators shall be in accordance with section 8 of the Institute of Municipal Engineering Australia's Tasmanian Division document titled 'Fire Hydrant Guidelines' and Taswater's supplement to WSA 03-2011-3.1 MRWA.
9. All water works must be tested and inspected by Taswater prior to backfill.
10. The allowable deflections shall be in accordance with MRWA-W-212.

Sewerage

1. All sewerage works are to be in accordance with WSAA Sewerage Code of Australia (MRWA) WSA 02-2002-2.3 MRWA VER 1.0 and Taswater's supplement to the code.
2. All maintenance structures are to be in accordance with SEW-1300 series.
3. Provide 150mm inspection shafts in accordance with SEW 1351-M type a.
4. All lot connections must 100mm UPVC SN10 and be in accordance with SEW-1106. i.o's must be raised to surface and protected with a poly cover to Taswater approval.
5. All sewer pipes must be DN150 UPVC minimum SN8 solvent weld joint.
6. All pipework under trafficable areas, including driveways are to be backfilled with 20mm, Class 4 FCR.
7. All sewer works must be tested and inspected by taswater prior to backfill.
8. All steep sewers over 15% are to be provided with trench stops and bulkheads as per WSA TABLE 8.1.
9. Fall through manholes to be 150mm max 30mm min

Schedule of works by TasWater

1. All live connections water and sewer infrastructure are to be performed by Taswater at the Developers cost.

Services Constructed in Embankment Fill

Where the location of water or sewer requiring fill or construction in an embankment, along the route of the type shown in the design drawings. Note that all earthworks are to be constructed in accordance with AS3798.

Proceed as follows:

1. Prepare the foundation for the fill by cleaning away all debris, vegetation, organic material and topsoil for the full width of the fill area.
2. compact the cleared soil surface to not less than 95% of it's standard maximum dry density (AS3798).
3. Place the fill in layers not exceeding 200mm thickness and compact each layer to not less than 95% of it's standard maximum dry density (AS3798). Bring the compacted fill level up to a height of at least 300mm above the design level of the top of the pipe.
4. Place the remainder of the fill in layers not exceeding 300mm thickness and compact each layer to not less than 95% of it"s standard maximum dry density (AS3798).

SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client	Project	Drawing Title	Project No.	Sheet Size	Drawing No.	Rev
STEPHEN GATH	21 LOT RESIDENTIAL SUBDIVISION 306A LENAH VALLEY RD LENAH VALLEY TAS 7008	PROJECT NOTES	1707	A3	1707 - C001	B

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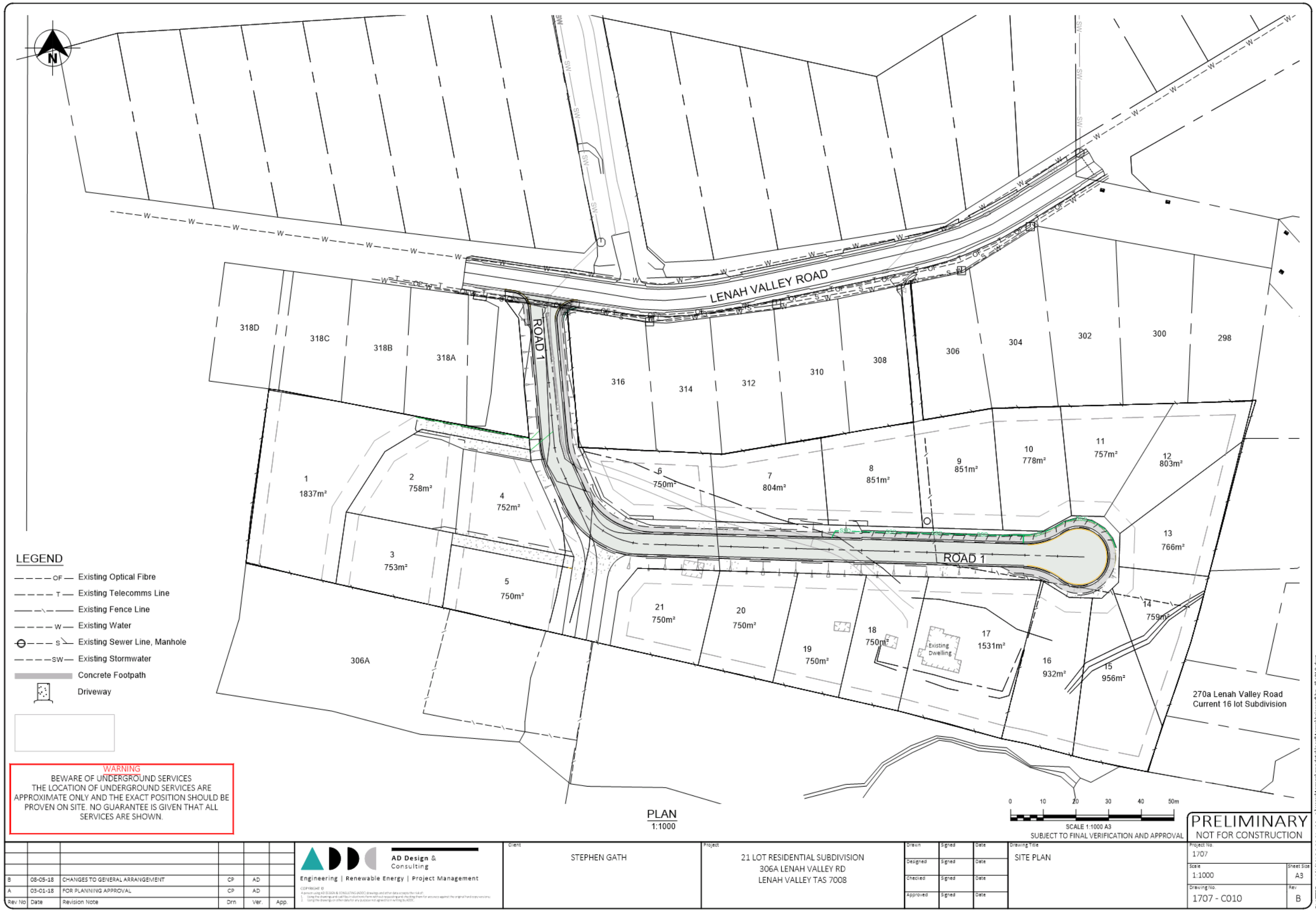
LENAH VALLEY ROAD
ROAD 1
318D
318C
318B
318A
316
314
312
310
308
306
304
302
300
298
306A
1 1837m²
2 758m²
3 753m²
4 752m²
5 750m²
6 750m²
7 804m²
8 851m²
9 851m²
10 778m²
11 757m²
12 803m²
13 766m²
14 759m²
15 956m²
16 932m²
17 1531m²
18 750m²
19 750m²
20 750m²
21 750m²
Existing Dwelling
270a Lenah Valley Road
Current 16 lot Subdivision
LEGEND
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole
Existing Stormwater
Concrete Footpath
Driveway
WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THE EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL SERVICES ARE SHOWN.
PLAN
1:1000
0 10 20 30 40 50m
SCALE 1:1000 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 08-05-18 CHANGES TO GENERAL ARRANGEMENT CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
SITE PLAN
Project No.
1707
Scale
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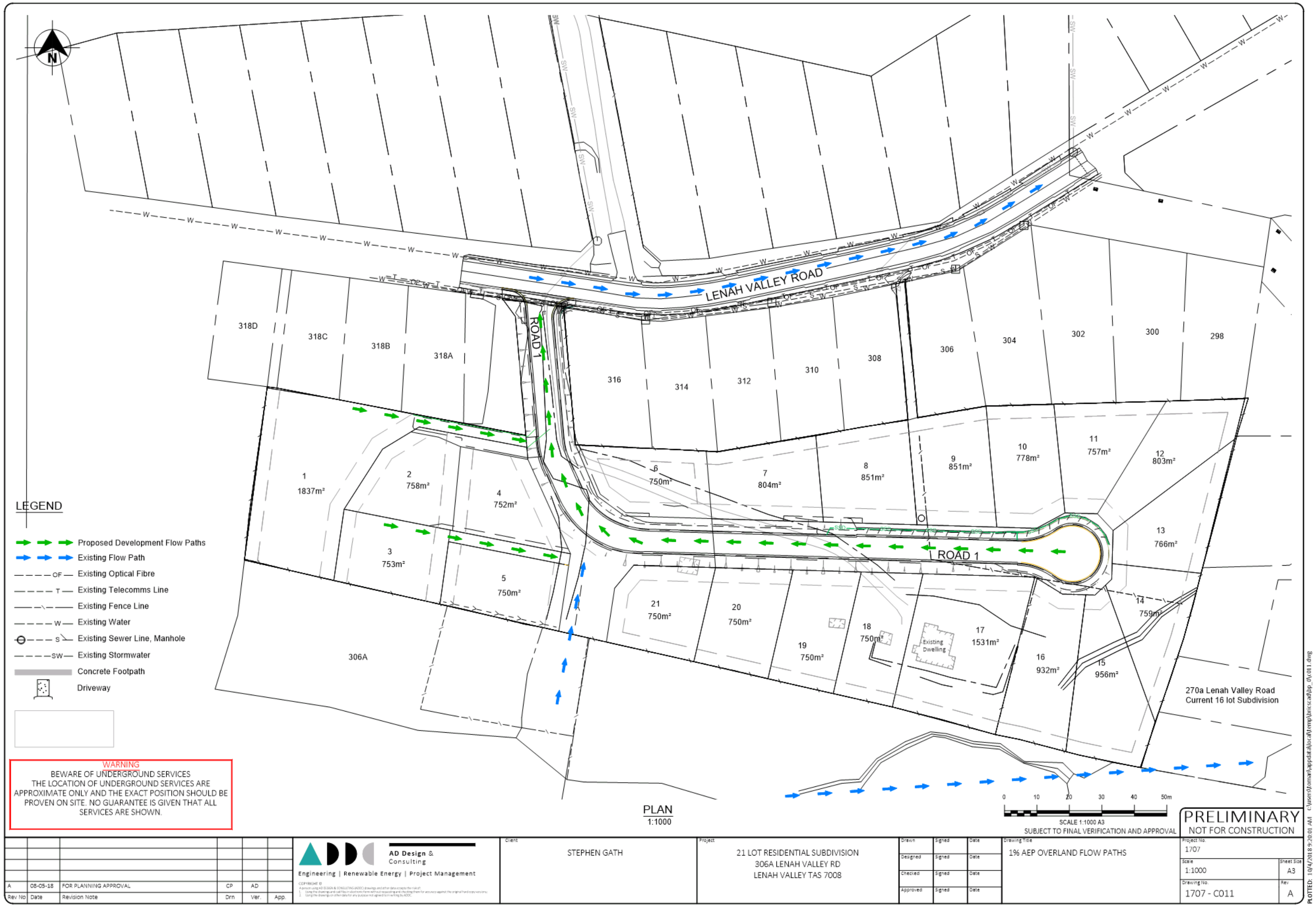
Sheet Size
A3
Drawing No.
1707 - C010
Rev
B


LENAH VALLEY ROAD
ROAD 1
LEGEND
Proposed Development Flow Paths
Existing Flow Path
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole
Existing Stormwater
Concrete Footpath
Driveway
WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THE EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL SERVICES ARE SHOWN.
270a Lenah Valley Road
Current 16 lot Subdivision
306A
PLAN
1:1000
SCALE 1:1000 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
AD Design & Consulting
Engineering | Renewable Energy | Project Management
STEPHEN GATH
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
1% AEP OVERLAND FLOW PATHS
1707
1:1000
A3
1707 - C011
A
08-05-18
FOR PLANNING APPROVAL
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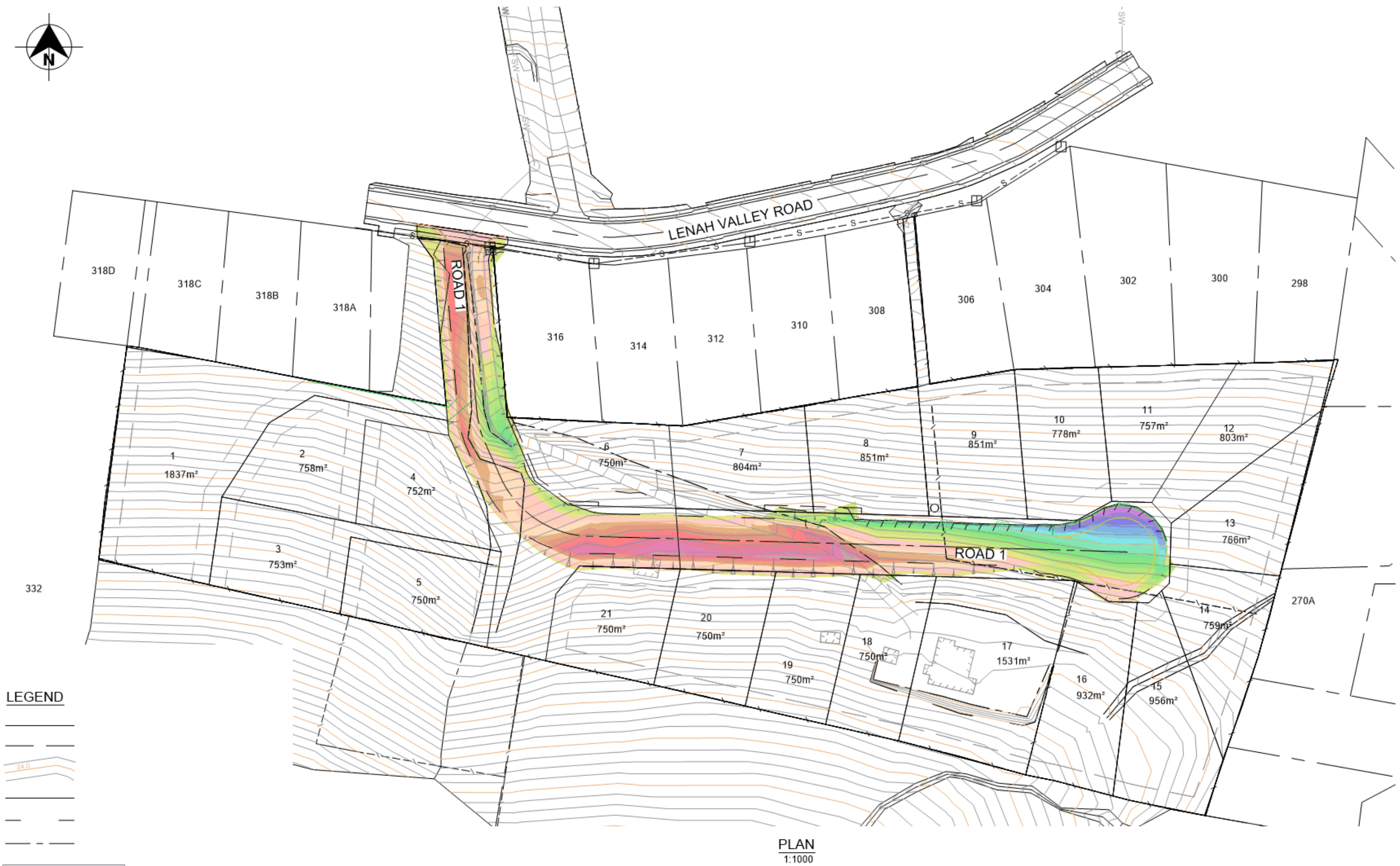

PLAN
1:1000

CUT/FILL DEPTH RANGE (Lower Value to Upper Value)			
-3.5	to	-3.25	m
-3.25	to	-3	m
-3	to	-2.75	m
-2.75	to	-2.5	m
-2.5	to	-2.25	m
-2.25	to	-2	m
-2	to	-1.75	m
-1.75	to	-1.5	m
-1.5	to	-1.25	m
-1.25	to	-1	m
-1	to	-.75	m
-.75	to	-.5	m
-.5	to	-.25	m
-.25	to	0	m
0	to	.25	m
.25	to	.5	m
.5	to	.75	m
.75	to	1	m
1	to	1.25	m
1.25	to	1.5	m
1.5	to	1.75	m
1.75	to	2	m
2	to	2.25	m
2.25	to	2.5	m
2.5	to	2.75	m
2.75	to	3	m
3	to	3.25	m
3.25	to	3.5	m
3.5	to	5	m

WARNING
BEWARE OF UNDERGROUND SERVICES
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EARTHWORK QUANTITIES

Surface from	Surface to	Cut m³	Fill m³	Balance m³
Existing stripped 150mm	Earthworks (subgrade)	-1933	1123	-810.000

Note:
1. Cut and Fill hatch shown is between existing natural surface and proposed subgrade level.
2. Quantities are in-situ and do not account for bulking factors.

0 10 20 30 40 50m
SCALE 1:1000 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

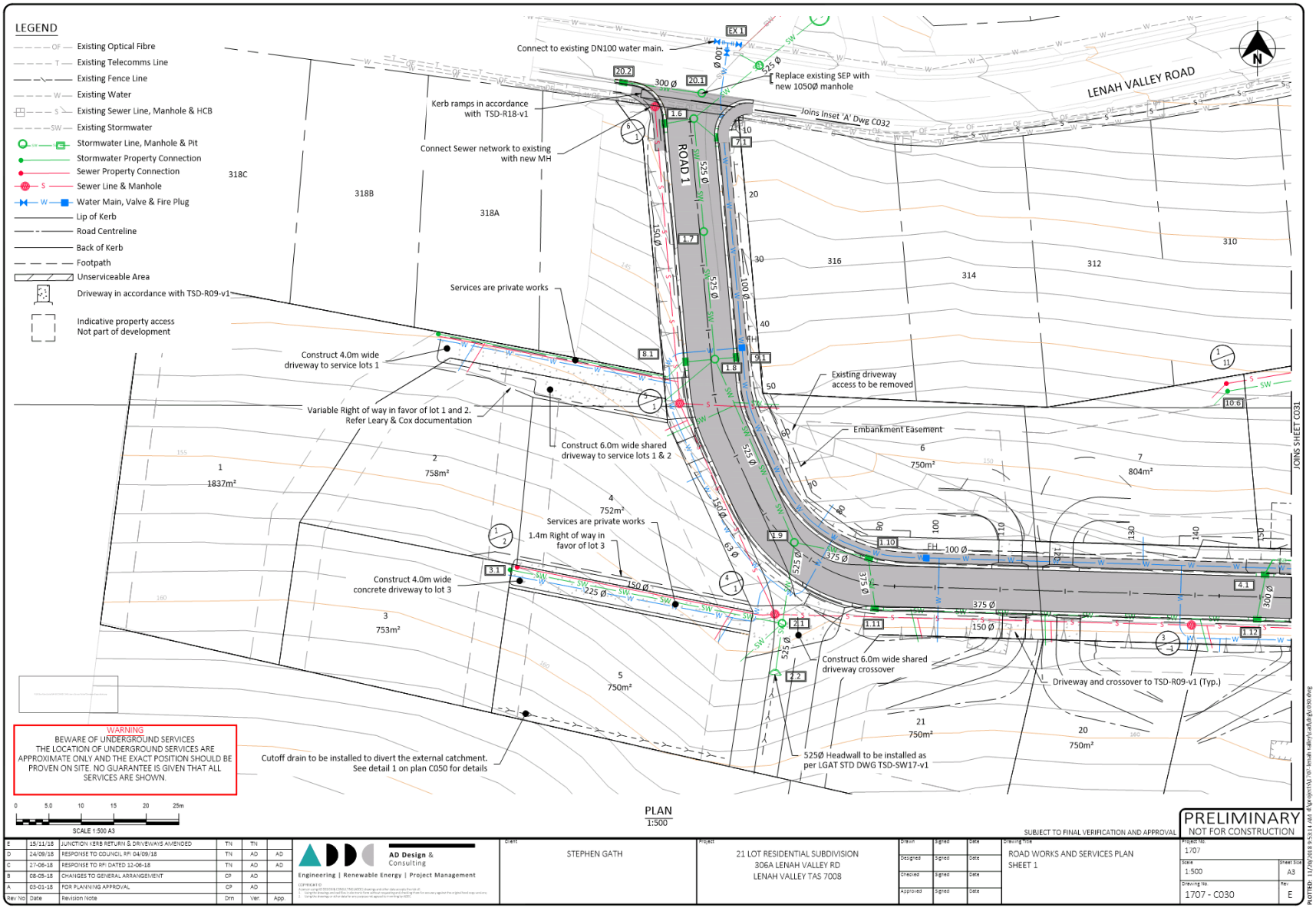
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Signed / Date
Designed / Signed / Date
Checked / Signed / Date
Approved / Signed / Date

Drawing Title: EARTHWORKS PLAN

Project No. 1707
Scale 1:1000
Sheet Size A3
Drawing No. 1707 - C020
Rev B

PLOTTED: 10/4/2018 9:20:01 AM


LEGEND
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole & HCB
Existing Stormwater
Stormwater Line, Manhole & Pit
Stormwater Property Connection
Sewer Property Connection
Sewer Line & Manhole
Water Main, Valve & Fire Plug
Lip of Kerb
Road Centreline
Back of Kerb
Footpath
Unserviceable Area
Driveway in accordance with TSD-R09-v1
Indicative property access
Not part of development
LENAH VALLEY ROAD
ROAD 1
Connect to existing DN100 water main.
Replace existing SEP with new 1050Ø manhole
Joins Inset 'A' Dwg C032
Kerb ramps in accordance with TSD-R18-v1
Connect Sewer network to existing with new MH
Services are private works
Construct 4.0m wide driveway to service lots 1
Variable Right of way in favor of lot 1 and 2. Refer Leary & Cox documentation
Construct 6.0m wide shared driveway to service lots 1 & 2
Existing driveway access to be removed
Embankment Easement
Services are private works
1.4m Right of way in favor of lot 3
Construct 4.0m wide concrete driveway to lot 3
Construct 6.0m wide shared driveway crossover
Driveway and crossover to TSD-R09-v1 (Typ.)
Cutoff drain to be installed to divert the external catchment. See detail 1 on plan C050 for details
525Ø Headwall to be installed as per LGAT STD DWG TSD-SW17-v1
318C
318B
318A
316
314
312
310
1 1837m²
2 758m²
3 753m²
4 752m²
5 750m²
6 750m²
7 804m²
20 750m²
21 750m²
JOINS SHEET C031
WARNING
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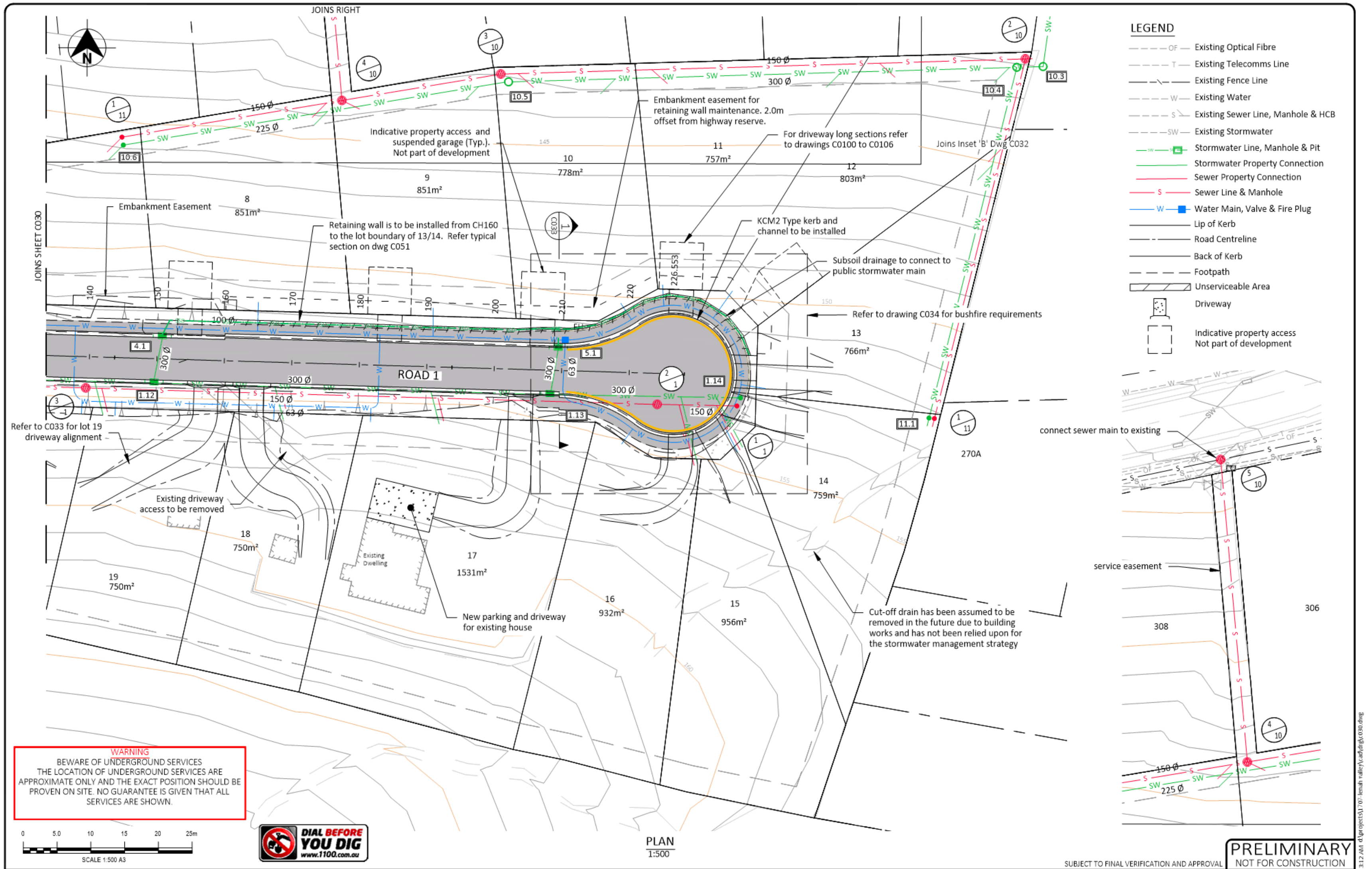
0 5.0 10 15 20 25m
SCALE 1:500 A3
PLAN
1:500
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
E 15/11/18 JUNCTION KERB RETURN & DRIVEWAYS AMENDED TN TN
D 24/09/18 RESPONSE TO COUNCIL RFI 04/09/18 TN AD AD
C 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
B 08-05-18 CHANGES TO GENERAL ARRANGEMENT CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client: STEPHEN GATH
Project: 21 LOT RESIDENTIAL SUBDIVISION 306A LENAH VALLEY RD LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title: ROAD WORKS AND SERVICES PLAN SHEET 1
Project No. 1707
Scale 1:500
Sheet Size A3
Drawing No. 1707 - C030
Rev E
PLOTTED: 11/20/2018 8:53:14 AM


LEGEND
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole & HCB
Existing Stormwater
Stormwater Line, Manhole & Pit
Stormwater Property Connection
Sewer Property Connection
Sewer Line & Manhole
Water Main, Valve & Fire Plug
Lip of Kerb
Road Centreline
Back of Kerb
Footpath
Unserviceable Area
Driveway
Indicative property access
Not part of development
JOINS RIGHT
JOINS SHEET C030
Embankment easement for retaining wall maintenance. 2.0m offset from highway reserve.
Indicative property access and suspended garage (Typ.). Not part of development
For driveway long sections refer to drawings C0100 to C0106
Joins Inset 'B' Dwg C032
Embankment Easement
Retaining wall is to be installed from CH160 to the lot boundary of 13/14. Refer typical section on dwg C051
KCM2 Type kerb and channel to be installed
Subsoil drainage to connect to public stormwater main
Refer to drawing C034 for bushfire requirements
ROAD 1
Refer to C033 for lot 19 driveway alignment
Existing driveway access to be removed
New parking and driveway for existing house
Existing Dwelling
connect sewer main to existing
service easement
Cut-off drain has been assumed to be removed in the future due to building works and has not been relied upon for the stormwater management strategy
8 851m²
9 851m²
10 778m²
11 757m²
12 803m²
13 766m²
14 759m²
15 956m²
16 932m²
17 1531m²
18 750m²
19 750m²
270A
306
308
WARNING
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DIAL BEFORE YOU DIG www.1100.com.au
SCALE 1:500 A3
PLAN 1:500
PRELIMINARY NOT FOR CONSTRUCTION
SUBJECT TO FINAL VERIFICATION AND APPROVAL

Rev No	Date	Revision Note	Drn	Ver.	App
E	15/11/18	SEWER ALIGNMENT & DRIVEWAYS AMENDED	TN	TN	
D	14/09/18	RESPONSE TO COUNCIL RFI DATED 04/09/18	TN	AD	AD
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
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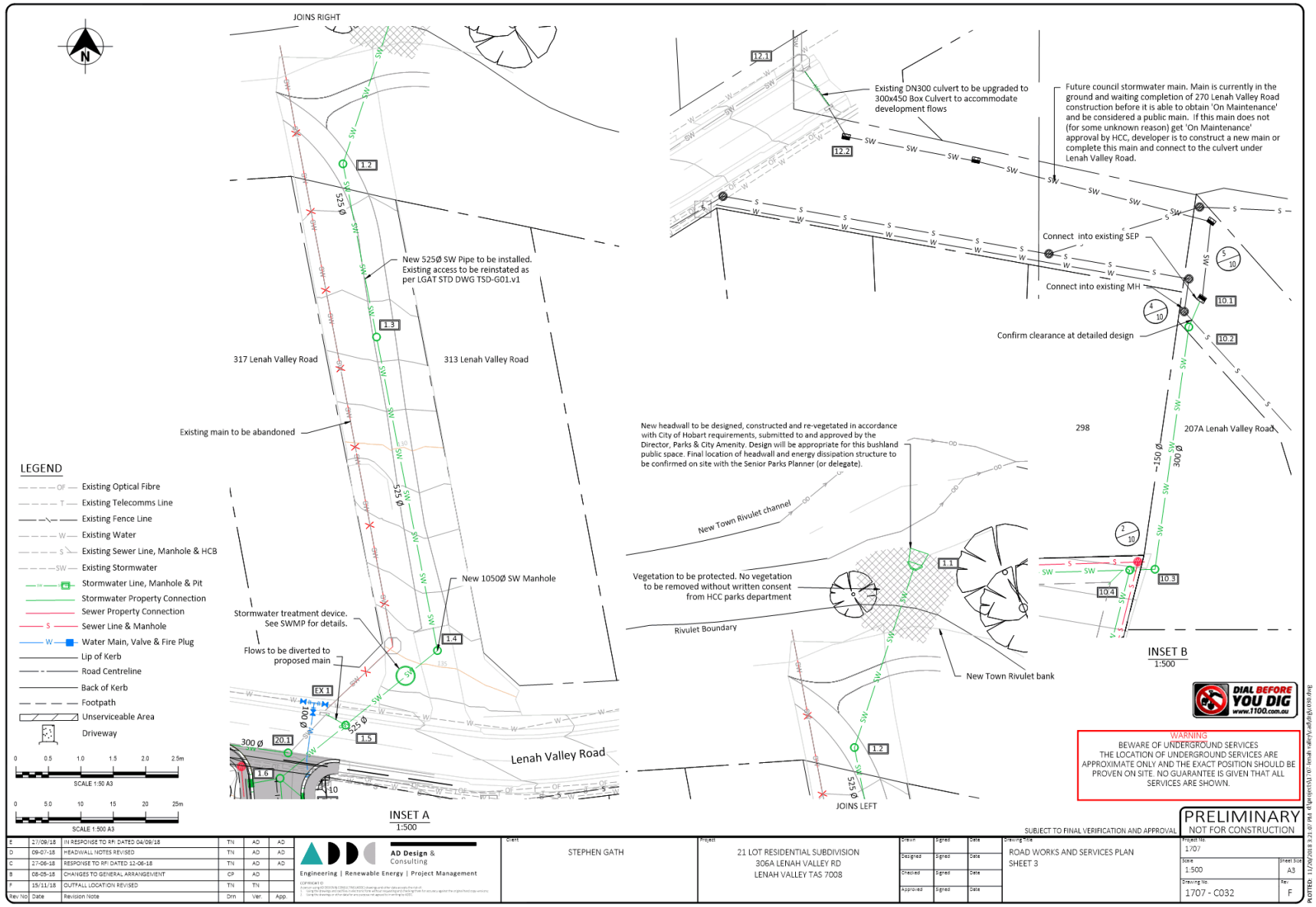
Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawing Title: ROAD WORKS AND SERVICES PLAN
SHEET 2

Project No. 1707
Scale 1:500
Sheet Size A3
Drawing No. 1707 - C031
Rev E


JOINS RIGHT
New 525Ø SW Pipe to be installed. Existing access to be reinstated as per LGAT STD DWG TSD-G01.v1
317 Lenah Valley Road
313 Lenah Valley Road
Existing main to be abandoned
New 1050Ø SW Manhole
Stormwater treatment device. See SWMP for details.
Flows to be diverted to proposed main
Lenah Valley Road
INSET A
1:500
Existing DN300 culvert to be upgraded to 300x450 Box Culvert to accommodate development flows
Future council stormwater main. Main is currently in the ground and waiting completion of 270 Lenah Valley Road construction before it is able to obtain 'On Maintenance' and be considered a public main. If this main does not (for some unknown reason) get 'On Maintenance' approval by HCC, developer is to construct a new main or complete this main and connect to the culvert under Lenah Valley Road.
Connect into existing SEP
Connect into existing MH
Confirm clearance at detailed design
New headwall to be designed, constructed and re-vegetated in accordance with City of Hobart requirements, submitted to and approved by the Director, Parks & City Amenity. Design will be appropriate for this bushland public space. Final location of headwall and energy dissipation structure to be confirmed on site with the Senior Parks Planner (or delegate).
New Town Rivulet channel
Vegetation to be protected. No vegetation to be removed without written consent from HCC parks department
Rivulet Boundary
New Town Rivulet bank
298
207A Lenah Valley Road
INSET B
1:500
JOINS LEFT
LEGEND
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole & HCB
Existing Stormwater
Stormwater Line, Manhole & Pit
Stormwater Property Connection
Sewer Property Connection
Sewer Line & Manhole
Water Main, Valve & Fire Plug
Lip of Kerb
Road Centreline
Back of Kerb
Footpath
Unserviceable Area
Driveway
SCALE 1:50 A3
SCALE 1:500 A3
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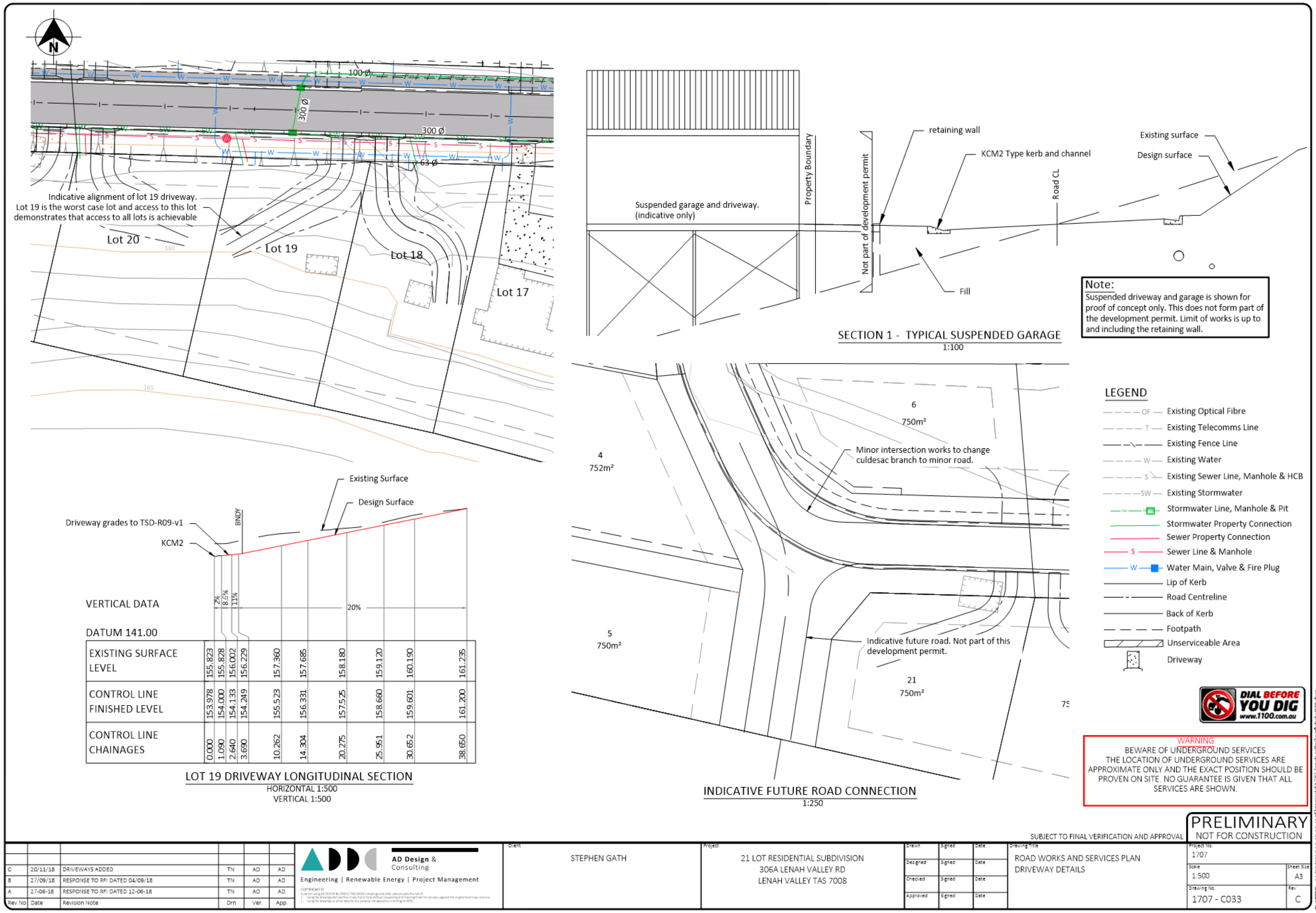
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
E 27/09/18 IN RESPONSE TO RFI DATED 04/09/18 TN AD AD
D 09-07-18 HEADWALL NOTES REVISED TN AD AD
C 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
B 08-05-18 CHANGES TO GENERAL ARRANGEMENT CP AD
F 15/11/18 OUTFALL LOCATION REVISED TN TN
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client: STEPHEN GATH
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing title: ROAD WORKS AND SERVICES PLAN
SHEET 3
Project No. 1707
Scale 1:500
Sheet Size A3
Drawing No. 1707 - C032
Rev F
PLOTTED: 11/10/2018 8:23:07 PM d:\projects\17-07-lenah valley\cad\dgn\1707-c032.dwg


N
Indicative alignment of lot 19 driveway.
Lot 19 is the worst case lot and access to this lot demonstrates that access to all lots is achievable
Lot 20
Lot 19
Lot 18
Lot 17
100 Ø
300 Ø
63 Ø
Suspended garage and driveway.
(indicative only)
Property Boundary
Not part of development permit
retaining wall
KCM2 Type kerb and channel
Road CL
Fill
Existing surface
Design surface
Note:
Suspended driveway and garage is shown for proof of concept only. This does not form part of the development permit. Limit of works is up to and including the retaining wall.
SECTION 1 - TYPICAL SUSPENDED GARAGE
1:100
Existing Surface
Design Surface
Driveway grades to TSD-R09-v1
KCM2
BNDY
2%
8.5%
11%
20%
VERTICAL DATA
DATUM 141.00
LOT 19 DRIVEWAY LONGITUDINAL SECTION
HORIZONTAL 1:500
VERTICAL 1:500
6
750m²
4
752m²
Minor intersection works to change culdesac branch to minor road.
5
750m²
Indicative future road. Not part of this development permit.
21
750m²
INDICATIVE FUTURE ROAD CONNECTION
1:250
LEGEND
Existing Optical Fibre
Existing Telecomms Line
Existing Fence Line
Existing Water
Existing Sewer Line, Manhole & HCB
Existing Stormwater
Stormwater Line, Manhole & Pit
Stormwater Property Connection
Sewer Property Connection
Sewer Line & Manhole
Water Main, Valve & Fire Plug
Lip of Kerb
Road Centreline
Back of Kerb
Footpath
Unserviceable Area
Driveway
DIAL BEFORE YOU DIG
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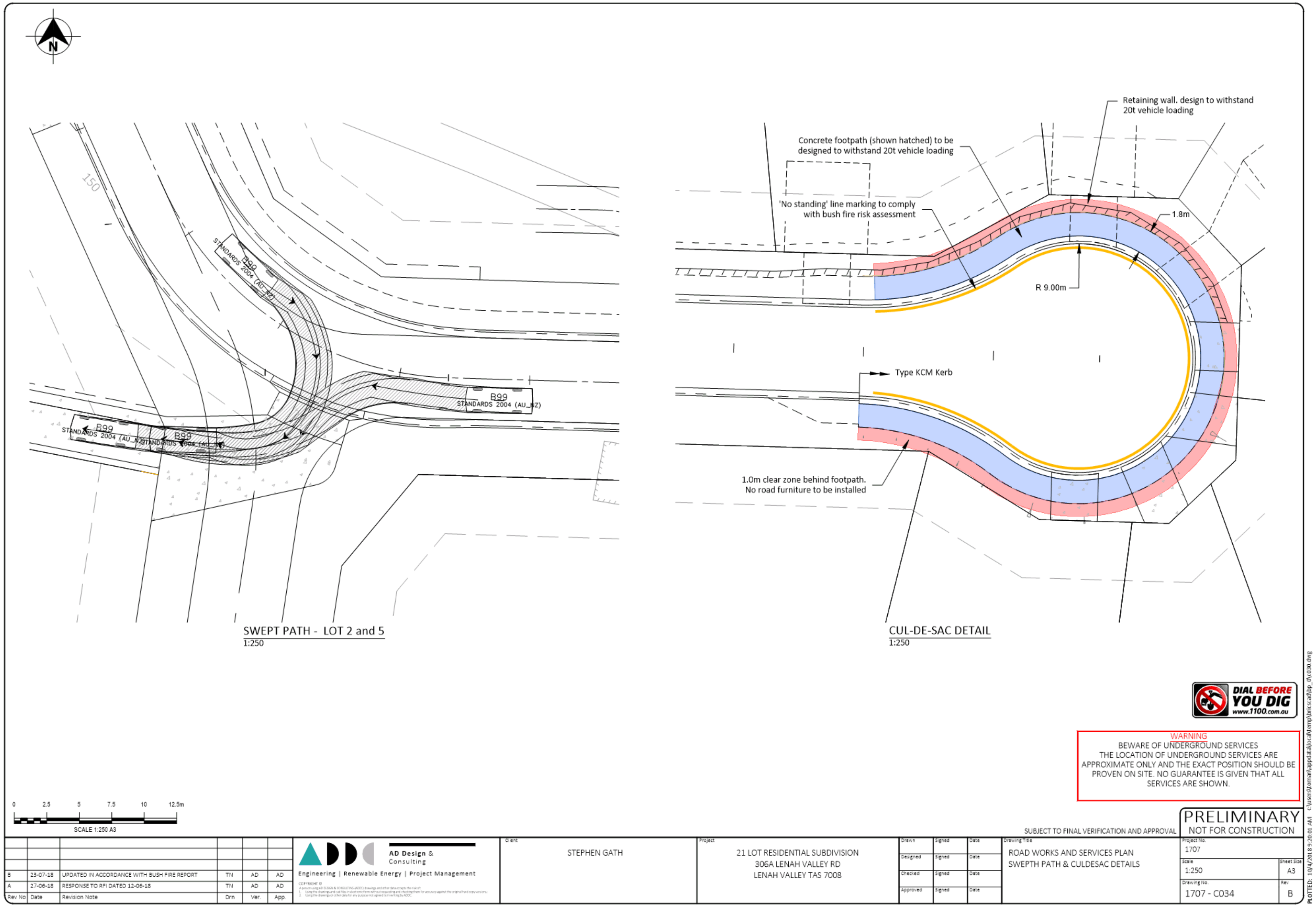
PRELIMINARY
NOT FOR CONSTRUCTION
SUBJECT TO FINAL VERIFICATION AND APPROVAL
C 20/11/18 DRIVEWAYS ADDED TN AD AD
B 27/09/18 RESPONSE TO RFI DATED 04/09/18 TN AD AD
A 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
Rev No Date Revision Note Drn Ver App
AD Design & Consulting
Engineering | Renewable Energy | Project Management
STEPHEN GATH
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
ROAD WORKS AND SERVICES PLAN
DRIVEWAY DETAILS
1707
1:500
A3
1707 - C033
C

EXISTING SURFACE LEVEL	155.823	155.828	156.002	156.229	157.360	157.685	158.180	159.120	160.190	161.235
CONTROL LINE FINISHED LEVEL	153.978	154.000	154.133	154.249	155.523	156.331	157.525	158.660	159.601	161.200
CONTROL LINE CHAINAGES	0.000	1.090	2.640	3.690	10.262	14.304	20.275	25.951	30.652	38.650


N
STANDARDS 2004 (AU_NZ)
B99
SWEPT PATH - LOT 2 and 5
1:250
Retaining wall, design to withstand 20t vehicle loading
Concrete footpath (shown hatched) to be designed to withstand 20t vehicle loading
'No standing' line marking to comply with bush fire risk assessment
1.8m
R 9.00m
Type KCM Kerb
1.0m clear zone behind footpath. No road furniture to be installed
CUL-DE-SAC DETAIL
1:250
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0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 23-07-18 UPDATED IN ACCORDANCE WITH BUSH FIRE REPORT TN AD AD
A 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
ROAD WORKS AND SERVICES PLAN
SWEPTH PATH & CULDESAC DETAILS
Project No. 1707
Scale 1:250
Sheet Size A3
Drawing No. 1707 - C034
Rev B
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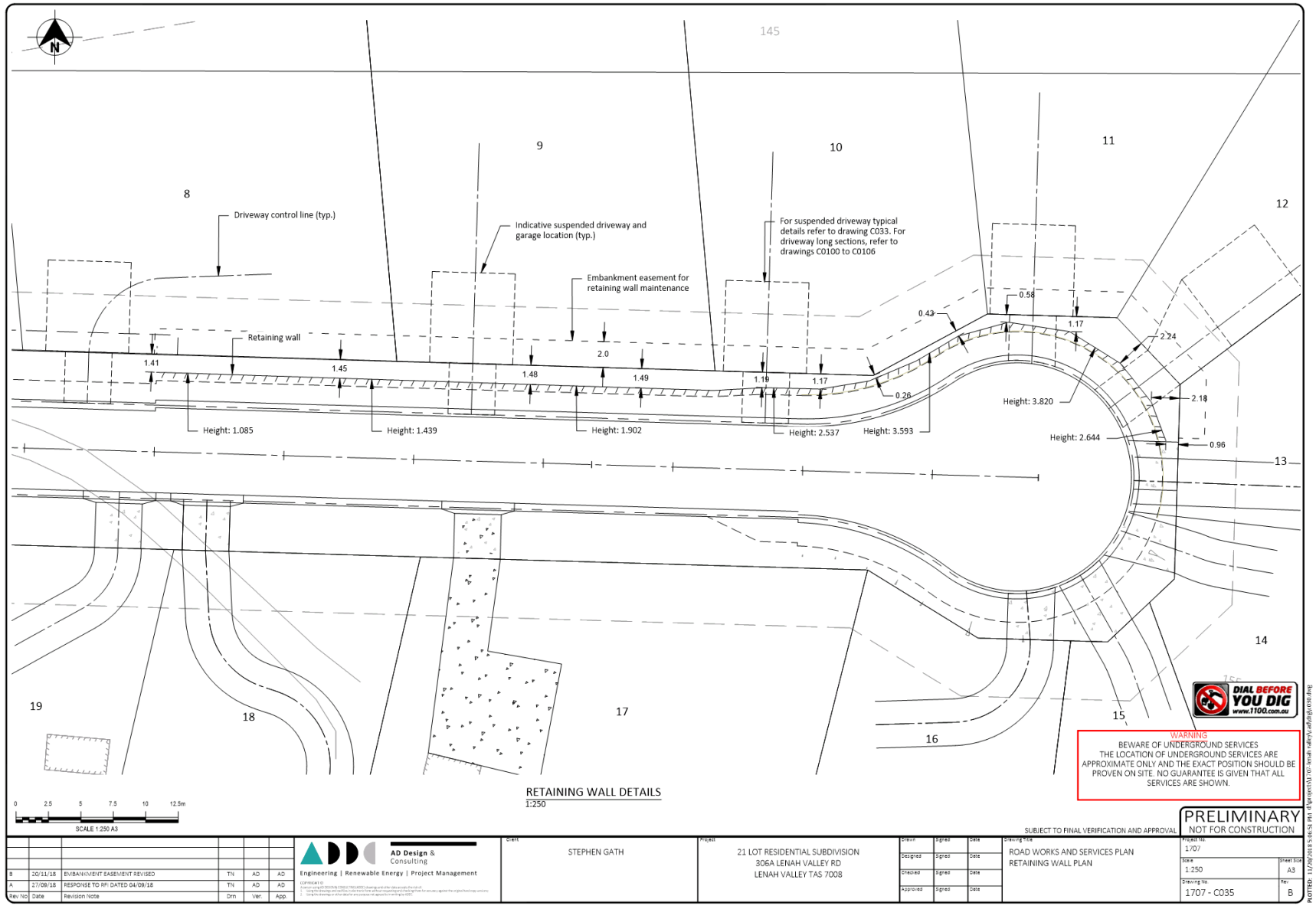
N
145
8
9
10
11
12
13
14
15
16
17
18
19
Driveway control line (typ.)
Indicative suspended driveway and garage location (typ.)
For suspended driveway typical details refer to drawing C033. For driveway long sections, refer to drawings C0100 to C0106
Embankment easement for retaining wall maintenance
Retaining wall
1.41
1.45
1.48
2.0
1.49
1.19
1.17
0.26
0.43
0.58
1.17
2.24
2.18
0.96
Height: 1.085
Height: 1.439
Height: 1.902
Height: 2.537
Height: 3.593
Height: 3.820
Height: 2.644
0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3
RETAINING WALL DETAILS
1:250
DIAL BEFORE YOU DIG
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WARNING
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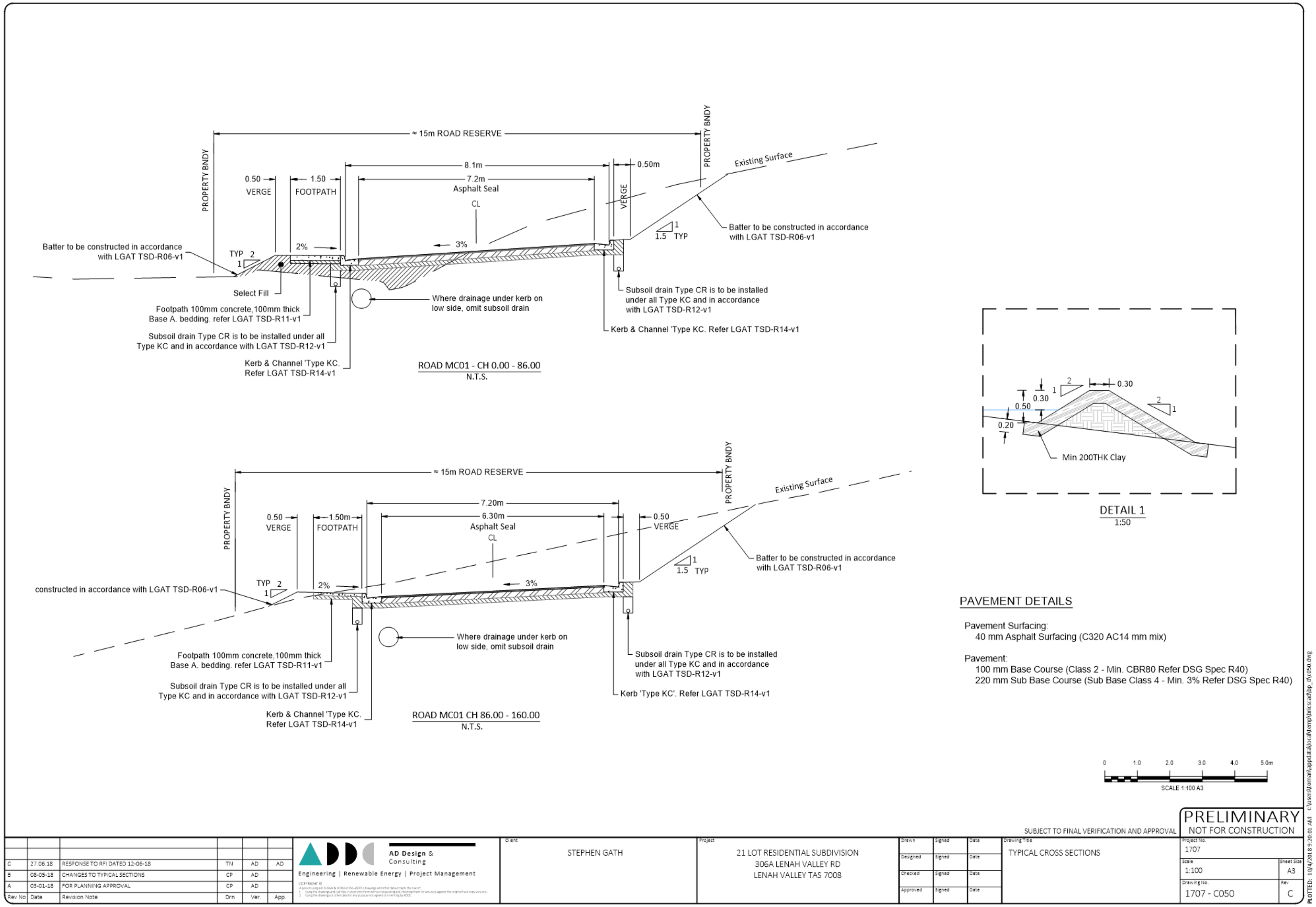
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 20/11/18 EMBANKMENT EASEMENT REVISED TN AD AD
A 27/09/18 RESPONSE TO RFI DATED 04/09/18 TN AD AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client: STEPHEN GATH
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title: ROAD WORKS AND SERVICES PLAN
RETAINING WALL PLAN
Project No. 1707
Scale 1:250
Sheet Size A3
Drawing No. 1707 - C035
Rev B
PLOTTED: 11/10/2018 5:06:51 PM d:\projects\17-07-lenah valley\cad\dgn\C035.dwg


≈ 15m ROAD RESERVE
PROPERTY BNDY
8.1m
0.50m
0.50
VERGE
1.50
FOOTPATH
7.2m
Asphalt Seal
CL
VERGE
Existing Surface
Batter to be constructed in accordance with LGAT TSD-R06-v1
TYP 2 1
2%
3%
1 1.5 TYP
Select Fill
Footpath 100mm concrete,100mm thick Base A. bedding. refer LGAT TSD-R11-v1
Subsoil drain Type CR is to be installed under all Type KC and in accordance with LGAT TSD-R12-v1
Kerb & Channel 'Type KC. Refer LGAT TSD-R14-v1
Where drainage under kerb on low side, omit subsoil drain
ROAD MC01 - CH 0.00 - 86.00
N.T.S.
7.20m
6.30m
1.50m
constructed in accordance with LGAT TSD-R06-v1
Kerb 'Type KC'. Refer LGAT TSD-R14-v1
ROAD MC01 CH 86.00 - 160.00
N.T.S.
0.30
0.50
0.20
Min 200THK Clay
DETAIL 1
1:50
PAVEMENT DETAILS
Pavement Surfacing:
40 mm Asphalt Surfacing (C320 AC14 mm mix)
Pavement:
100 mm Base Course (Class 2 - Min. CBR80 Refer DSG Spec R40)
220 mm Sub Base Course (Sub Base Class 4 - Min. 3% Refer DSG Spec R40)
0 1.0 2.0 3.0 4.0 5.0m
SCALE 1:100 A3
PRELIMINARY
NOT FOR CONSTRUCTION
SUBJECT TO FINAL VERIFICATION AND APPROVAL
C 27.06.18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
B 08-05-18 CHANGES TO TYPICAL SECTIONS CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
TYPICAL CROSS SECTIONS
Project No.
1707
Scale
1:100
Sheet Size
A3
Drawing No.
1707 - C050
Rev
C
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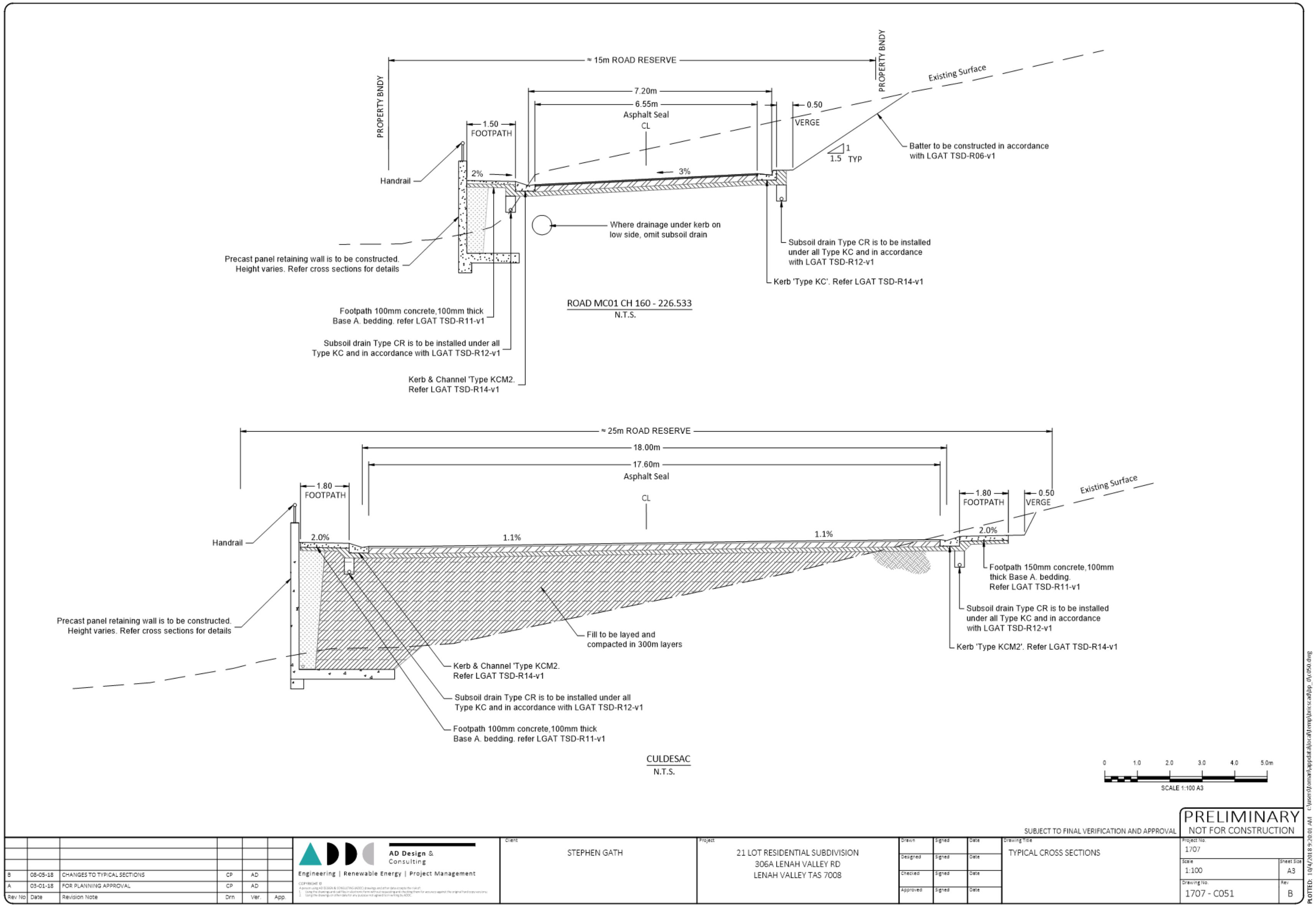
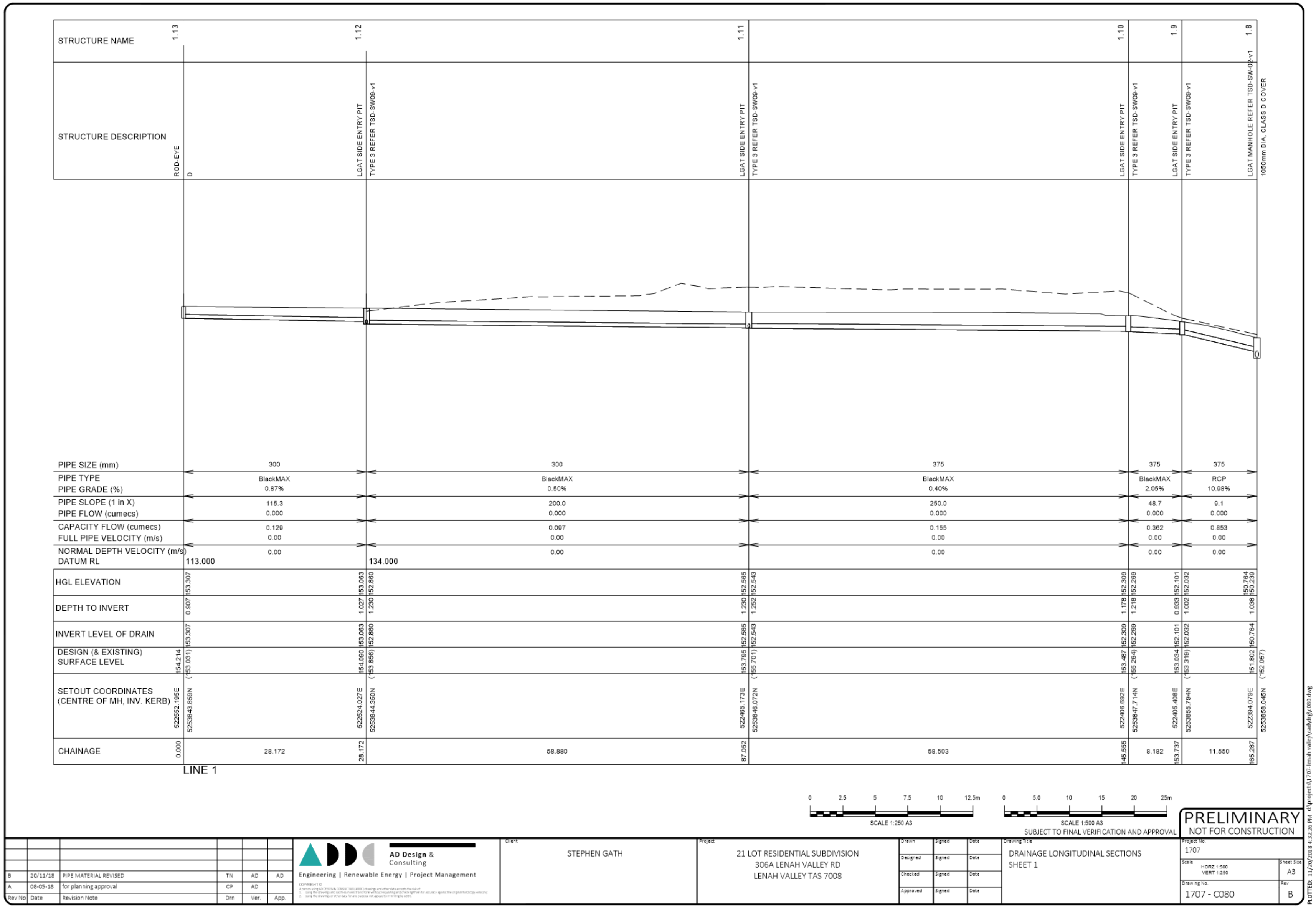

≈ 15m ROAD RESERVE
PROPERTY BNDY
PROPERTY BNDY
Existing Surface
7.20m
6.55m
Asphalt Seal
CL
0.50
VERGE
1.50
FOOTPATH
Batter to be constructed in accordance with LGAT TSD-R06-v1
1
1.5 TYP
Handrail
2%
3%
Where drainage under kerb on low side, omit subsoil drain
Subsoil drain Type CR is to be installed under all Type KC and in accordance with LGAT TSD-R12-v1
Precast panel retaining wall is to be constructed. Height varies. Refer cross sections for details
Kerb 'Type KC'. Refer LGAT TSD-R14-v1
ROAD MC01 CH 160 - 226.533
N.T.S.
Footpath 100mm concrete,100mm thick Base A. bedding. refer LGAT TSD-R11-v1
Subsoil drain Type CR is to be installed under all Type KC and in accordance with LGAT TSD-R12-v1
Kerb & Channel 'Type KCM2. Refer LGAT TSD-R14-v1
≈ 25m ROAD RESERVE
18.00m
17.60m
Asphalt Seal
1.80
FOOTPATH
CL
1.80
FOOTPATH
0.50
VERGE
Existing Surface
Handrail
2.0%
1.1%
1.1%
2.0%
Footpath 150mm concrete,100mm thick Base A. bedding. Refer LGAT TSD-R11-v1
Subsoil drain Type CR is to be installed under all Type KC and in accordance with LGAT TSD-R12-v1
Precast panel retaining wall is to be constructed. Height varies. Refer cross sections for details
Fill to be layed and compacted in 300m layers
Kerb 'Type KCM2'. Refer LGAT TSD-R14-v1
Kerb & Channel 'Type KCM2. Refer LGAT TSD-R14-v1
Subsoil drain Type CR is to be installed under all Type KC and in accordance with LGAT TSD-R12-v1
Footpath 100mm concrete,100mm thick Base A. bedding. refer LGAT TSD-R11-v1
CULDESAC
N.T.S.
0 1.0 2.0 3.0 4.0 5.0m
SCALE 1:100 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 08-05-18 CHANGES TO TYPICAL SECTIONS CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
TYPICAL CROSS SECTIONS
Project No. 1707
Scale 1:100
Sheet Size A3
Drawing No. 1707 - C051
Rev B
PLOTTED: 10/4/2018 9:20:01 AM


STRUCTURE NAME
1.13
1.12
1.11
1.10
1.9
1.8
STRUCTURE DESCRIPTION
ROD-EYE 0
LGAT SIDE ENTRY PIT TYPE 3 REFER TSD-SW09-v1
LGAT SIDE ENTRY PIT TYPE 3 REFER TSD-SW09-v1
LGAT SIDE ENTRY PIT TYPE 3 REFER TSD-SW09-v1
LGAT SIDE ENTRY PIT TYPE 3 REFER TSD-SW09-v1
LGAT MANHOLE REFER TSD-SW-02-v1 1050mm DIA. CLASS D COVER
PIPE SIZE (mm) 300 300 375 375 375
PIPE TYPE BlackMAX BlackMAX BlackMAX BlackMAX RCP
PIPE GRADE (%) 0.87% 0.50% 0.40% 2.05% 10.98%
PIPE SLOPE (1 in X) 115.3 200.0 250.0 48.7 9.1
PIPE FLOW (cumecs) 0.000 0.000 0.000 0.000 0.000
CAPACITY FLOW (cumecs) 0.129 0.097 0.155 0.362 0.853
FULL PIPE VELOCITY (m/s) 0.00 0.00 0.00 0.00 0.00
NORMAL DEPTH VELOCITY (m/s) 0.00 0.00 0.00 0.00 0.00
DATUM RL 113.000 134.000
HGL ELEVATION 153.307 153.063 152.860 152.565 152.543 152.309 152.269 152.101 152.032 150.764 150.239
DEPTH TO INVERT 0.907 1.027 1.230 1.230 1.252 1.178 1.218 0.933 1.002 1.038
INVERT LEVEL OF DRAIN 153.307 153.063 152.860 152.565 152.543 152.309 152.269 152.101 152.032 150.764
DESIGN (& EXISTING) SURFACE LEVEL 154.214 (153.031) 154.090 (153.856) 153.795 (155.701) 153.487 (155.264) 153.034 (153.319) 151.802 (152.057)
SETOUT COORDINATES (CENTRE OF MH, INV. KERB) 522552.195E 5253843.859N 522524.027E 5253844.350N 522465.173E 5253846.072N 522406.692E 5253847.714N 522405.408E 5253855.794N 522394.079E 5253858.045N
CHAINAGE 0.000 28.172 28.172 58.880 87.052 58.503 145.555 8.182 153.737 11.550 165.287
LINE 1
0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3
0 5.0 10 15 20 25m
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 20/11/18 PIPE MATERIAL REVISED TN AD AD
A 08-05-18 for planning approval CP AD
Rev No Date Revision Note Drn Ver. App.
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Client
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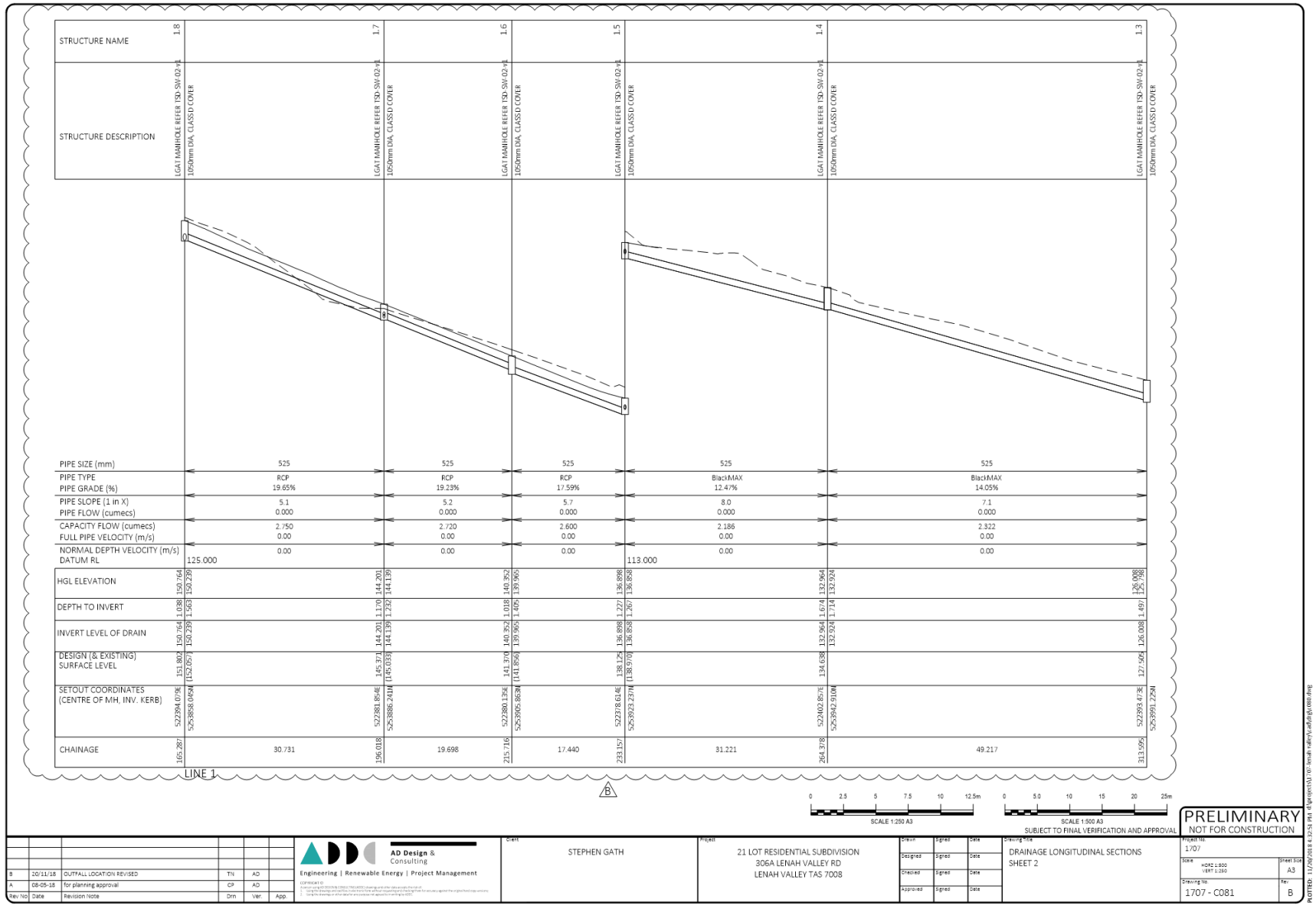
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
DRAINAGE LONGITUDINAL SECTIONS
SHEET 1
Project No. 1707
Scale HORZ 1:500 VERT 1:250
Sheet Size A3
Drawing No. 1707 - C080
Rev B
PLOTTED: 11/20/2018 4:32:26 PM


STRUCTURE NAME
1.8
1.7
1.6
1.5
1.4
1.3
STRUCTURE DESCRIPTION
LGA1 MANHOLE REFER TSD-SW-02 v1
1050mm DIA, CLASS D COVER
PIPE SIZE (mm)
525
PIPE TYPE
RCP
BlackMAX
PIPE GRADE (%)
19.65%
19.23%
17.59%
12.47%
14.05%
PIPE SLOPE (1 in X)
5.1
5.2
5.7
8.0
7.1
PIPE FLOW (cumecs)
0.000
CAPACITY FLOW (cumecs)
2.750
2.720
2.600
2.186
2.322
FULL PIPE VELOCITY (m/s)
NORMAL DEPTH VELOCITY (m/s)
DATUM RL
125.000
113.000
HGL ELEVATION
150.764
150.239
144.201
144.139
140.352
139.965
136.898
136.858
132.964
132.924
126.008
125.798
DEPTH TO INVERT
1.038
1.563
1.170
1.232
1.018
1.405
1.227
1.267
1.674
1.714
1.497
INVERT LEVEL OF DRAIN
DESIGN (& EXISTING) SURFACE LEVEL
151.802
(152.057)
145.371
(145.033)
141.370
(141.856)
138.125
(138.970)
134.638
127.505
SETOUT COORDINATES (CENTRE OF MH, INV. KERB)
5252394.079E
5253858.045N
5252381.854E
5253886.241N
5252380.135E
5253905.863N
5252318.614E
5253923.237N
5252402.857E
5252942.910N
5252393.473E
5253991.275N
CHAINAGE
165.287
30.731
196.018
19.698
215.716
17.440
233.157
31.221
264.378
49.217
313.595
LINE 1
A
B
0
2.5
5
7.5
10
12.5m
SCALE 1:250 A3
0
5.0
10
15
20
25m
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
B 20/11/18 OUTFALL LOCATION REVISED TN AD
A 08-05-18 for planning approval CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing Title
DRAINAGE LONGITUDINAL SECTIONS
SHEET 2
Project No.
1707
Scale
HOR 1:500
VERT 1:250
Sheet Size
A3
Drawing No.
1707 - C081
Rev
B
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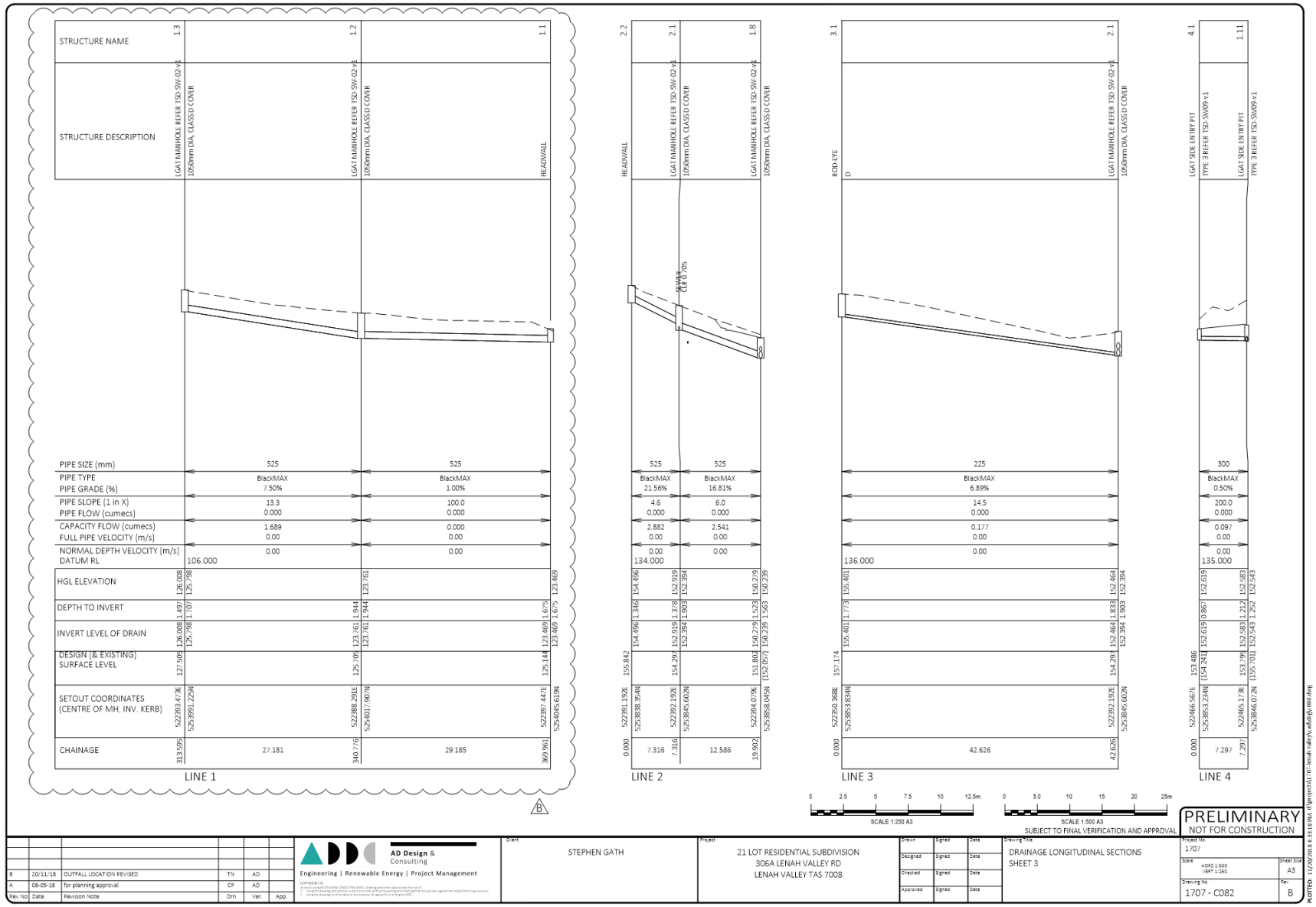
LINE 1
LINE 2
LINE 3
LINE 4
SCALE 1:250 A3
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
AD Design & Consulting
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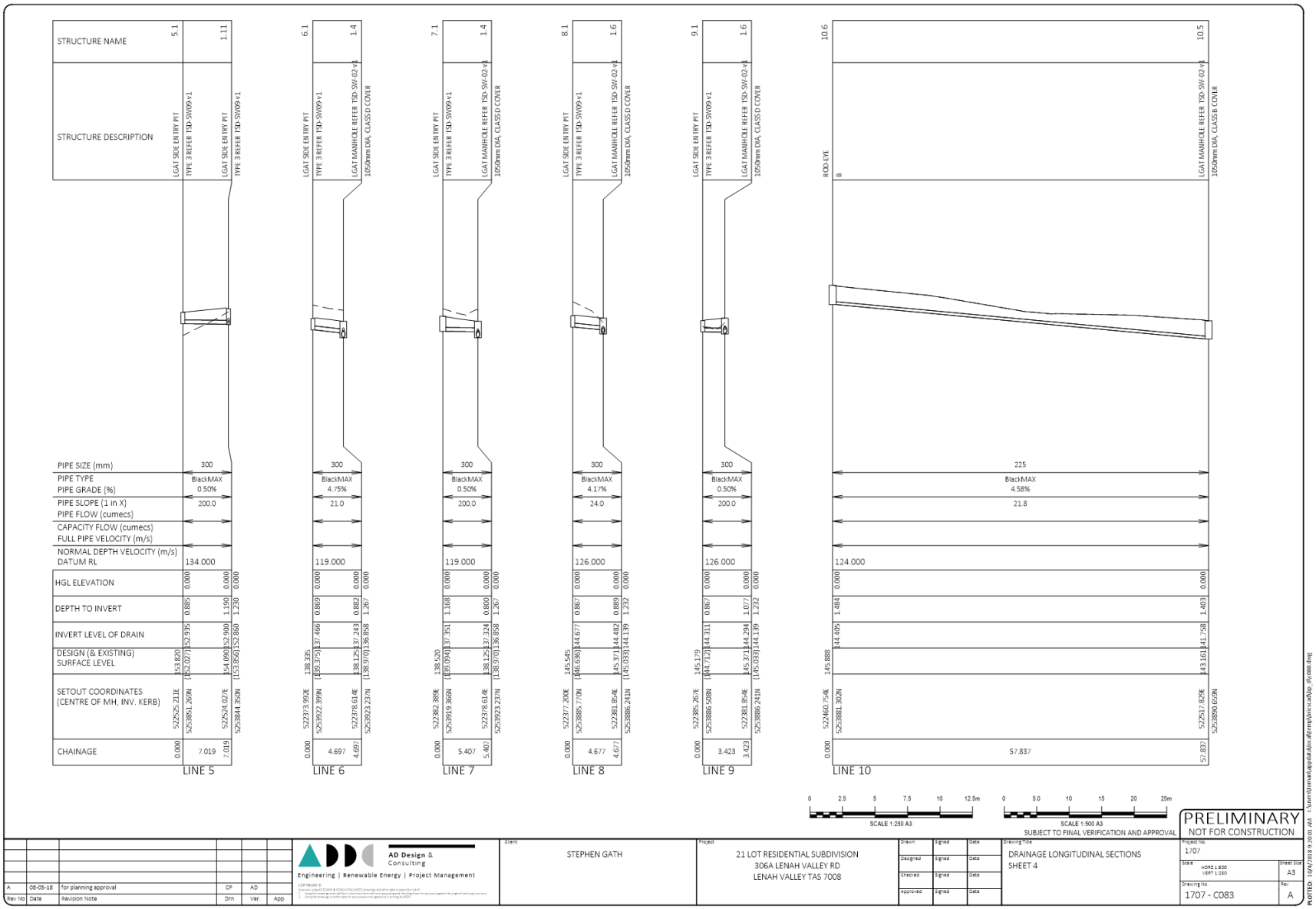
STEPHEN GATH
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
DRAINAGE LONGITUDINAL SECTIONS
SHEET 3
1707
1707 - C082
B
20/11/18 OUTFALL LOCATION REVISED
08-05-18 for planning approval


LINE 5
LINE 6
LINE 7
LINE 8
LINE 9
LINE 10
PRELIMINARY
NOT FOR CONSTRUCTION
SUBJECT TO FINAL VERIFICATION AND APPROVAL
AD Design & Consulting
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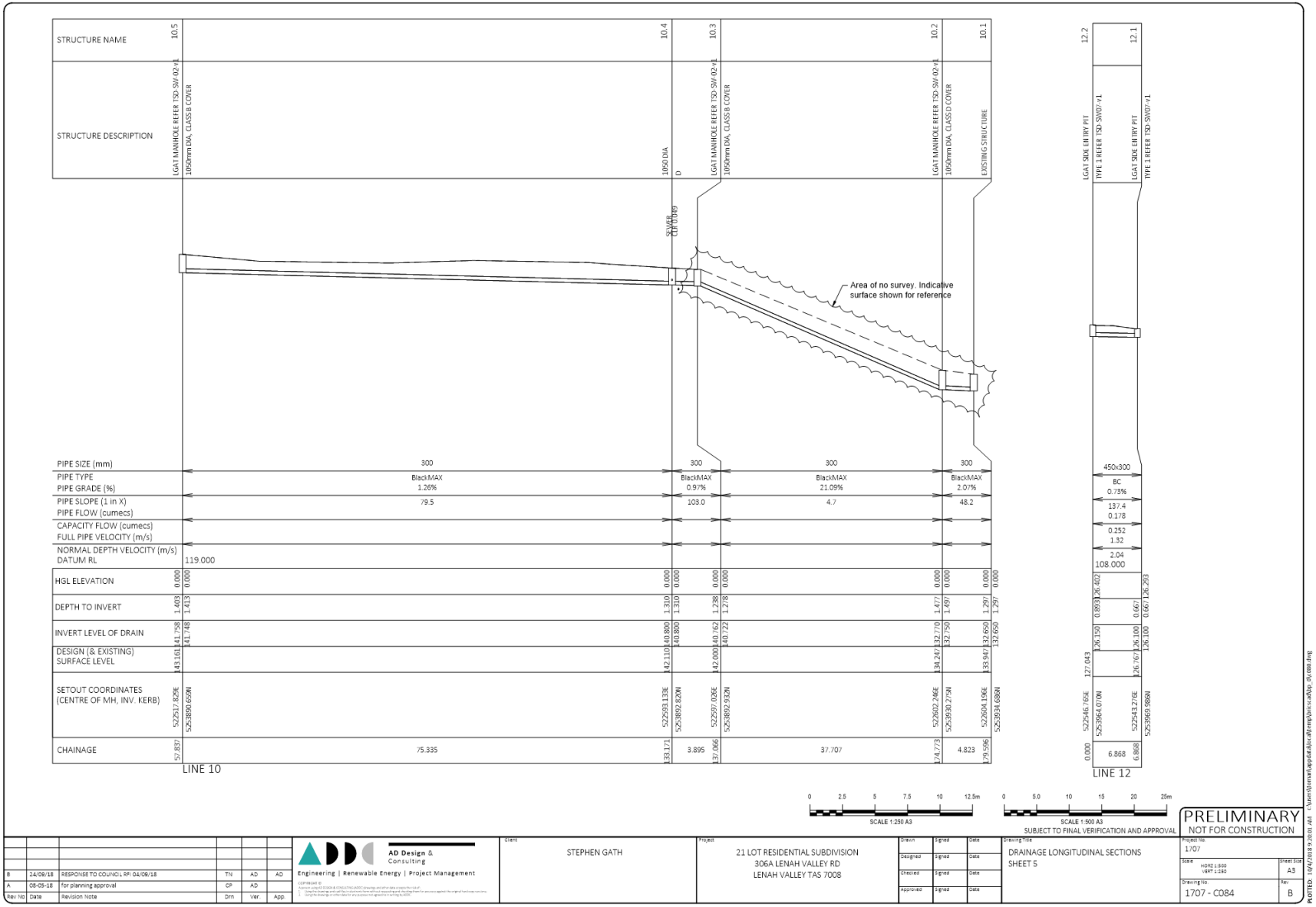
STEPHEN GATH
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
DRAINAGE LONGITUDINAL SECTIONS
SHEET 4
1707 - C083
A
08-05-18
for planning approval


STRUCTURE NAME
STRUCTURE DESCRIPTION
LGA1 MANHOLE REFER TSD-SW-02-v1
1050mm DIA, CLASS B COVER
1050 DIA
D
LGA1 MANHOLE REFER TSD-SW-02-v1
1050mm DIA, CLASS B COVER
LGA1 MANHOLE REFER TSD-SW-02-v1
1050mm DIA, CLASS D COVER
EXISTING STRUCTURE
LGA1 SIDE ENTRY PIT
TYPE 1 REFER TSD-SW07-v1
LGA1 SIDE ENTRY PIT
TYPE 1 REFER TSD-SW07-v1
SEWER
CL# 0.049
Area of no survey. Indicative surface shown for reference
PIPE SIZE (mm)
PIPE TYPE
PIPE GRADE (%)
PIPE SLOPE (1 in X)
PIPE FLOW (cumecs)
CAPACITY FLOW (cumecs)
FULL PIPE VELOCITY (m/s)
NORMAL DEPTH VELOCITY (m/s)
DATUM RL
119.000
HGL ELEVATION
DEPTH TO INVERT
INVERT LEVEL OF DRAIN
DESIGN (& EXISTING) SURFACE LEVEL
SETOUT COORDINATES (CENTRE OF MH, INV. KERB)
CHAINAGE
300
BlackMAX
1.26%
79.5
300
BlackMAX
0.97%
103.0
300
BlackMAX
21.09%
4.7
300
BlackMAX
2.07%
48.2
450x300
BC
0.73%
137.4
0.178
0.252
1.32
2.04
108.000
75.335
3.895
37.707
4.823
6.868
LINE 10
LINE 12
SCALE 1:250 A3
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
AD Design & Consulting
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B 24/09/18 RESPONSE TO COUNCIL RFI 04/09/18 TN AD AD
A 08-05-18 for planning approval CP AD
Rev No Date Revision Note Drn Ver. App.
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawing Title
DRAINAGE LONGITUDINAL SECTIONS
SHEET 5
Project No
1707
Sheet Size
A3
Drawing No
1707 - C084
Rev
B
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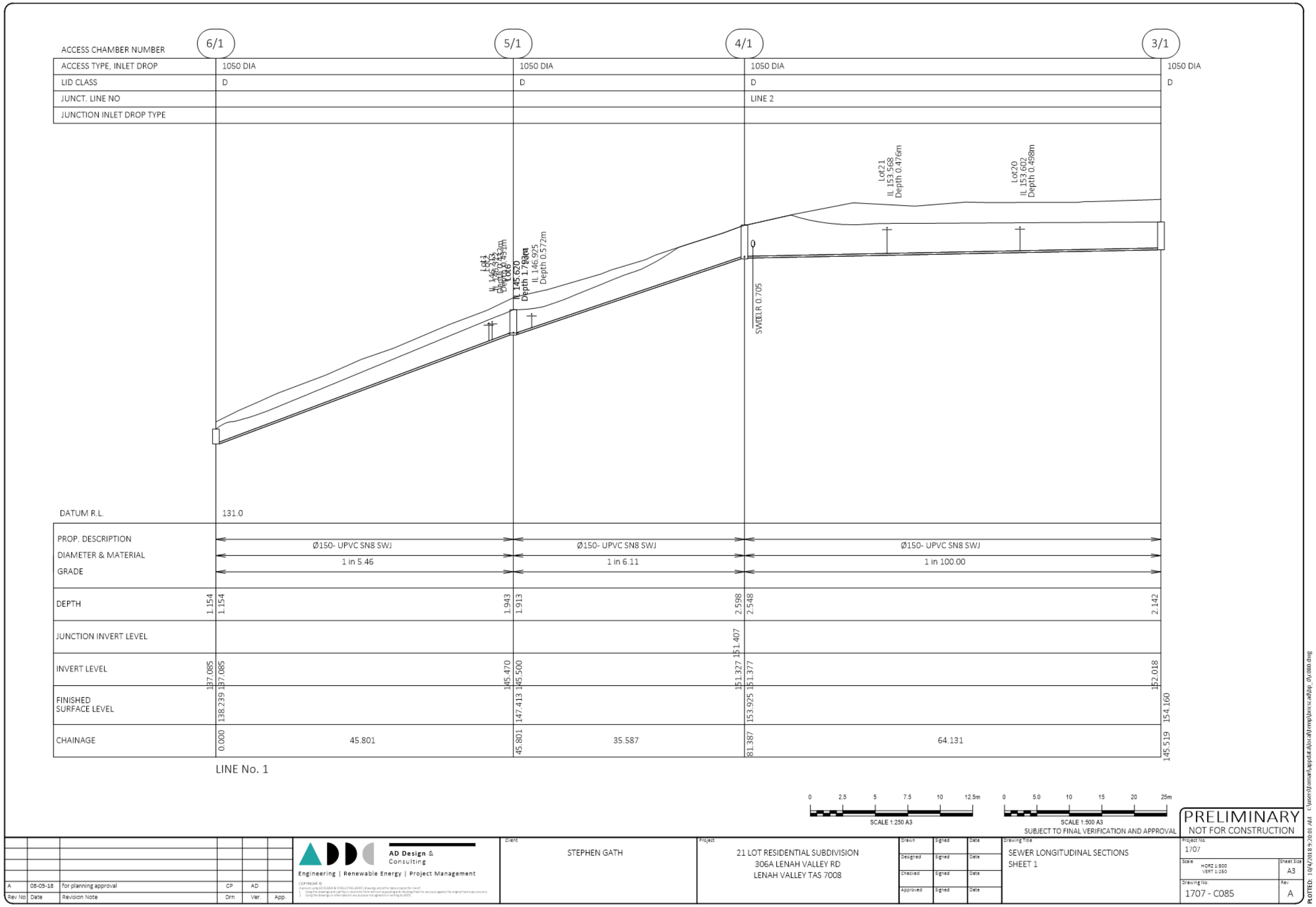
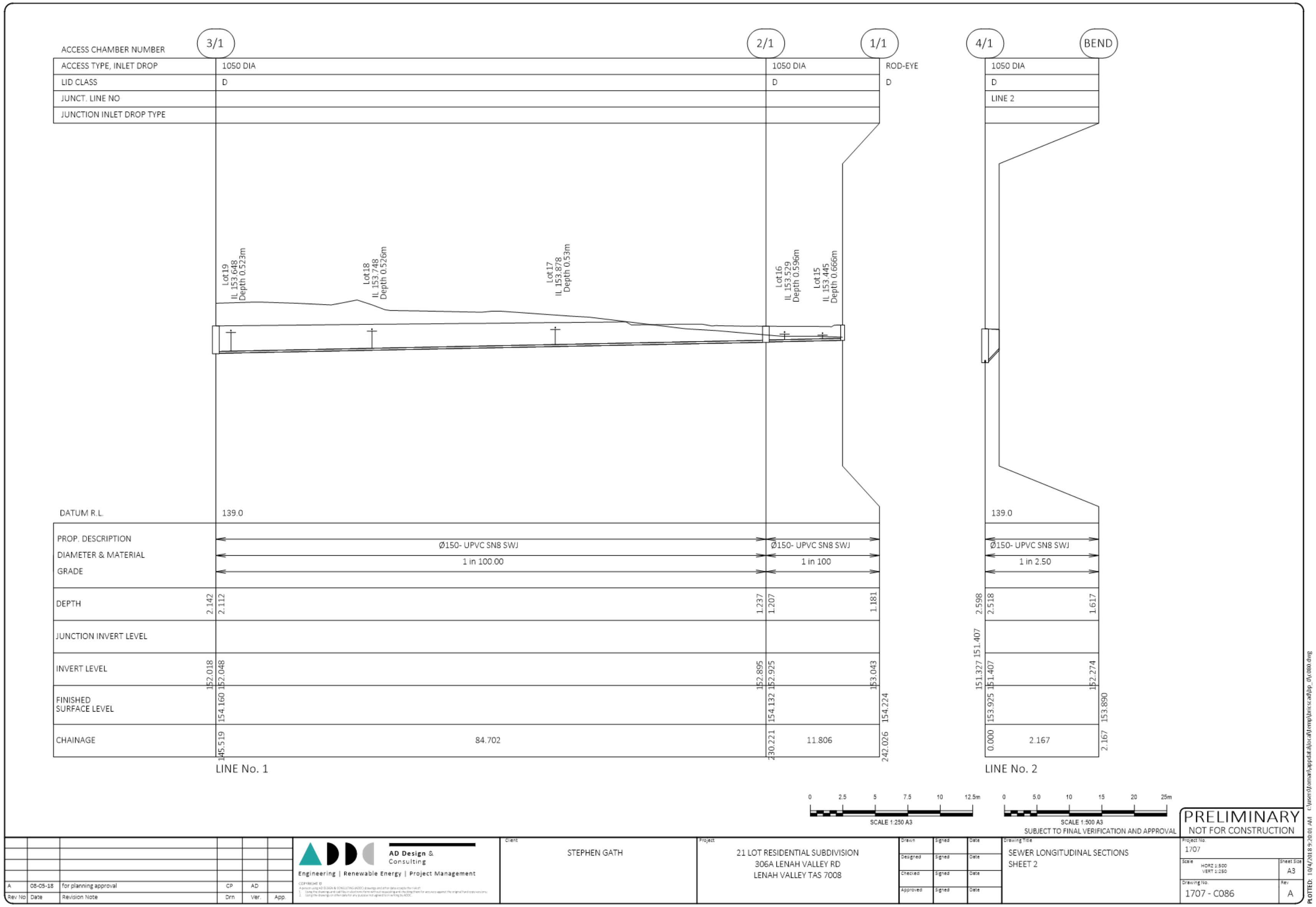

ACCESS CHAMBER NUMBER
6/1
5/1
4/1
3/1
ACCESS TYPE, INLET DROP
1050 DIA
LID CLASS
D
JUNCT. LINE NO
LINE 2
JUNCTION INLET DROP TYPE
Lot21
IL 153.568
Depth 0.476m
Lot20
IL 153.602
Depth 0.458m
IL 146.925
Depth 0.572m
Depth 1.798m
DATUM R.L.
131.0
PROP. DESCRIPTION
DIAMETER & MATERIAL
GRADE
Ø150- UPVC SN8 SWJ
1 in 5.46
1 in 6.11
1 in 100.00
DEPTH
1.154
1.154
1.943
1.913
2.598
2.548
2.142
JUNCTION INVERT LEVEL
151.407
INVERT LEVEL
137.085
137.085
145.470
145.500
151.327
151.377
152.018
FINISHED
SURFACE LEVEL
138.239
147.413
153.925
154.160
CHAINAGE
0.000
45.801
45.801
35.587
81.387
64.131
145.519
LINE No. 1
SCALE 1:250 A3
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
A
08-05-18
for planning approval
CP
AD
Rev No
Date
Revision Note
Drn
Ver.
App
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing Title
SEWER LONGITUDINAL SECTIONS
SHEET 1
Project No.
1707
Scale
HORZ 1:500
VERT 1:250
Sheet Size
A3
Drawing No.
1707 - C085
Rev
A


ACCESS CHAMBER NUMBER
3/1
2/1
1/1
4/1
BEND
ACCESS TYPE, INLET DROP
1050 DIA
ROD-EYE
LID CLASS
D
JUNCT. LINE NO
LINE 2
JUNCTION INLET DROP TYPE
Lot 19
IL 153.648
Depth 0.523m
Lot 18
IL 153.748
Depth 0.526m
Lot 17
IL 153.878
Depth 0.53m
Lot 16
IL 153.529
Depth 0.596m
Lot 15
IL 153.445
Depth 0.666m
DATUM R.L.
139.0
PROP. DESCRIPTION
DIAMETER & MATERIAL
GRADE
Ø150- UPVC SN8 SWJ
1 in 100.00
1 in 100
1 in 2.50
DEPTH
2.142
2.112
1.237
1.207
1.181
2.598
2.518
1.617
JUNCTION INVERT LEVEL
151.407
INVERT LEVEL
152.018
152.048
152.895
152.925
153.043
151.327
151.407
152.274
FINISHED SURFACE LEVEL
154.160
154.132
154.224
153.925
153.890
CHAINAGE
145.519
84.702
230.221
11.806
242.026
0.000
2.167
2.167
LINE No. 1
LINE No. 2
SCALE 1:250 A3
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
A
08-05-18
for planning approval
CP
AD
Rev No
Date
Revision Note
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Ver.
App
AD Design & Consulting
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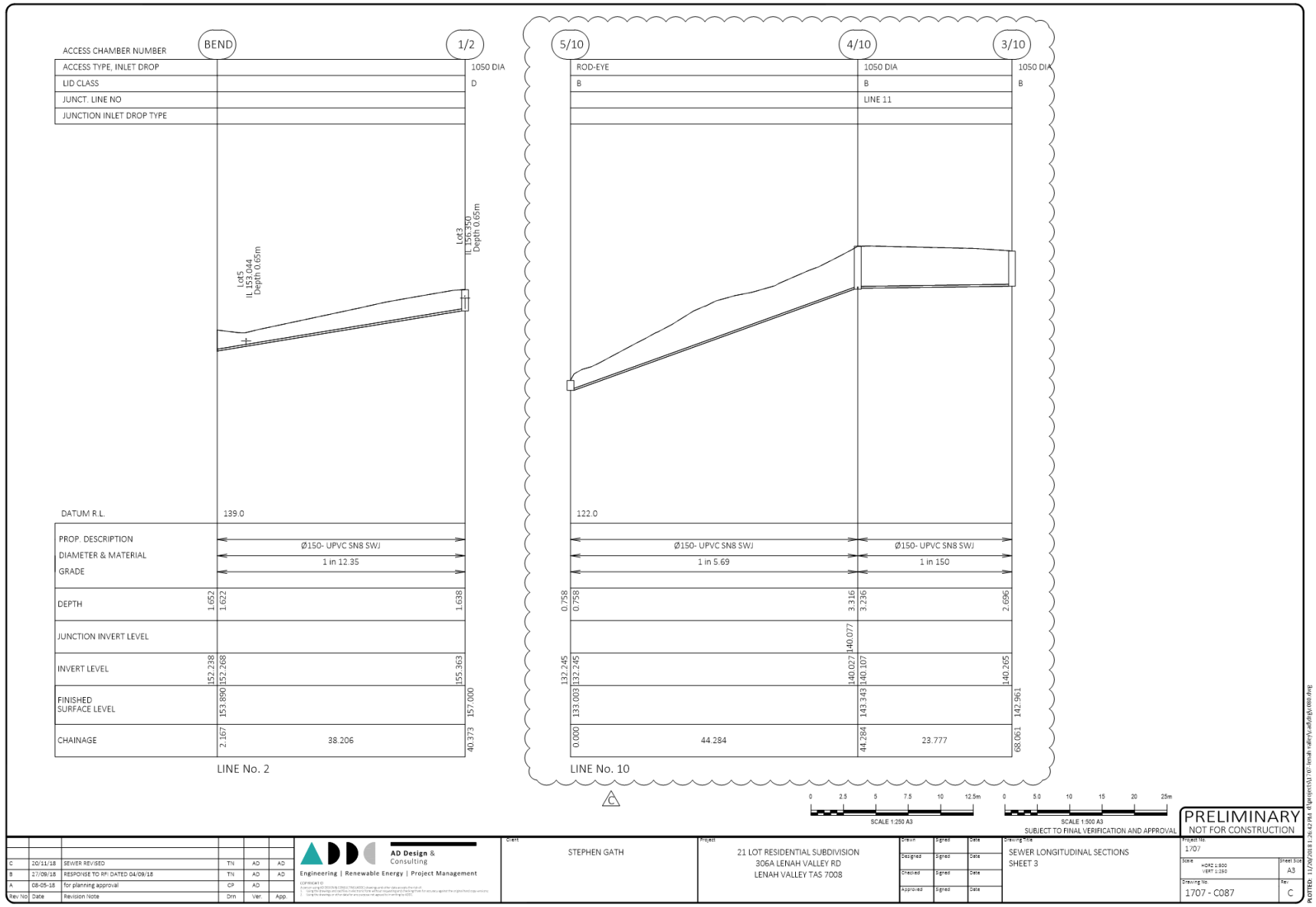
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing Title
SEWER LONGITUDINAL SECTIONS
SHEET 2
Project No.
1707
Scale
HORZ 1:500
VERT 1:250
Sheet Size
A3
Drawing No.
1707 - C086
Rev
A


ACCESS CHAMBER NUMBER
BEND
1/2
ACCESS TYPE, INLET DROP
1050 DIA
LID CLASS
D
JUNCT. LINE NO
JUNCTION INLET DROP TYPE
Lot5
IL 153.044
Depth 0.65m
Lot3
IL 156.350
Depth 0.65m
DATUM R.L.
139.0
PROP. DESCRIPTION
DIAMETER & MATERIAL
GRADE
Ø150- UPVC SN8 SWJ
1 in 12.35
DEPTH
1.652
1.622
1.638
JUNCTION INVERT LEVEL
INVERT LEVEL
152.238
152.268
155.363
FINISHED SURFACE LEVEL
153.890
157.000
CHAINAGE
2.167
38.206
40.373
LINE No. 2
5/10
4/10
3/10
ROD-EYE
1050 DIA
B
LINE 11
122.0
Ø150- UPVC SN8 SWJ
1 in 5.69
1 in 150
0.758
3.316
3.236
2.696
140.077
132.245
140.027
140.107
140.265
133.003
143.343
142.961
0.000
44.284
23.777
68.061
LINE No. 10
SCALE 1:250 A3
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
C 20/11/18 SEWER REVISED TN AD AD
B 27/09/18 RESPONSE TO RFI DATED 04/09/18 TN AD AD
A 08-05-18 for planning approval CP AD
Rev No Date Revision Note Drn Ver. App.
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Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing Title
SEWER LONGITUDINAL SECTIONS
SHEET 3
Project No.
1707
Scale
HOR 1:500
VERT 1:250
Sheet Size
A3
Drawing No.
1707 - C087
Rev
C
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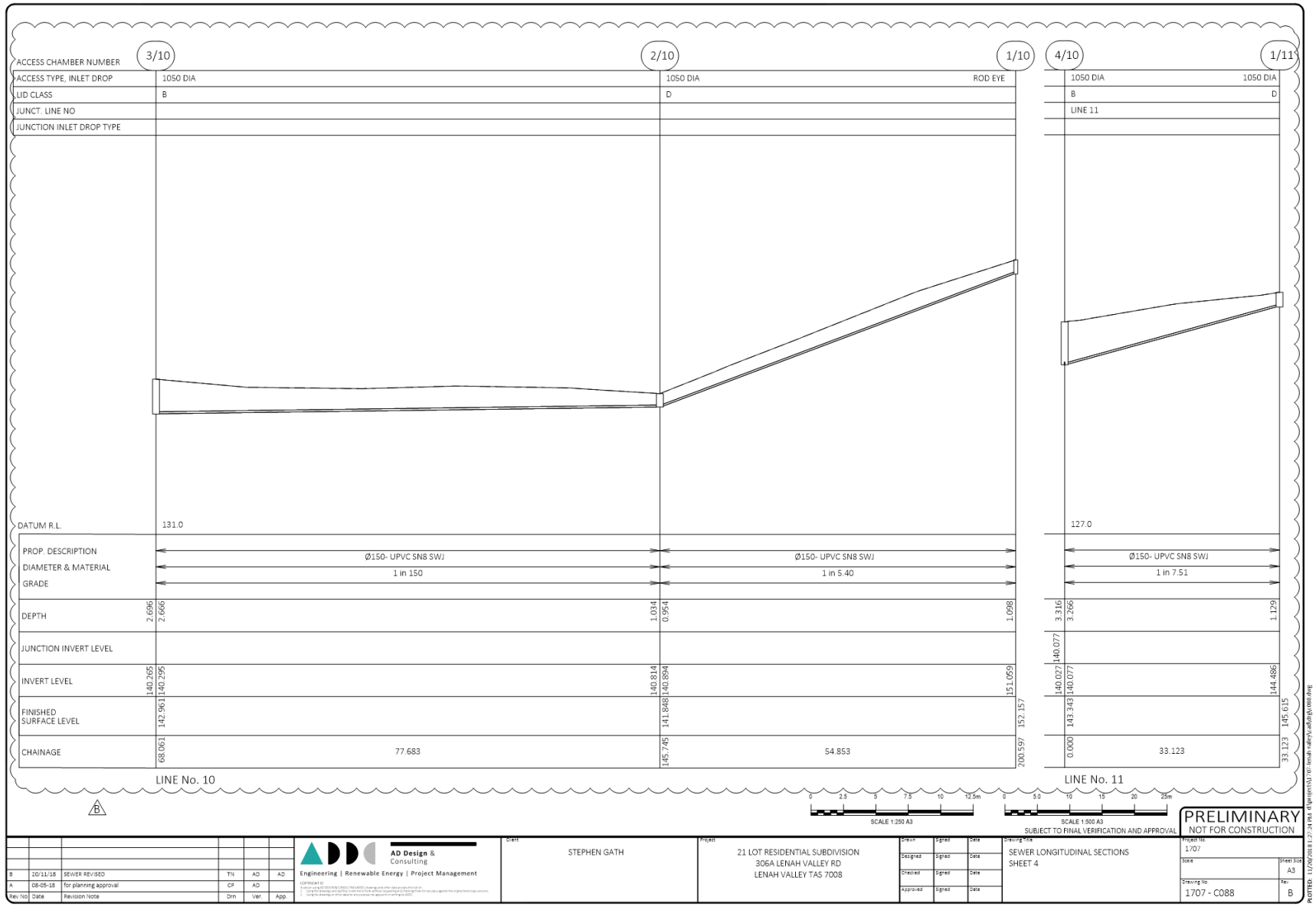
ACCESS CHAMBER NUMBER
3/10
2/10
1/10
4/10
1/11
ACCESS TYPE, INLET DROP
1050 DIA
1050 DIA
ROD EYE
1050 DIA
1050 DIA
LID CLASS
B
D
B
D
JUNCT. LINE NO
LINE 11
JUNCTION INLET DROP TYPE
DATUM R.L.
131.0
127.0
PROP. DESCRIPTION
Ø150- UPVC SN8 SWJ
Ø150- UPVC SN8 SWJ
Ø150- UPVC SN8 SWJ
DIAMETER & MATERIAL
GRADE
1 in 150
1 in 5.40
1 in 7.51
DEPTH
2.696
2.666
1.034
0.954
1.098
3.316
3.266
1.129
JUNCTION INVERT LEVEL
140.077
INVERT LEVEL
140.265
140.295
140.814
140.894
151.059
140.077
140.077
144.486
FINISHED SURFACE LEVEL
142.961
141.848
152.157
143.343
145.615
CHAINAGE
68.061
77.683
145.745
54.853
200.597
0.000
33.123
LINE No. 10
LINE No. 11
B
0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3
0 5.0 10 15 20 25m
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
Rev No
Date
Revision Note
Drn
Ver.
App.
B
20/11/18
SEWER REVISED
TN
AD
AD
A
08-05-18
for planning approval
CP
AD
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STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn
Designed
Checked
Approved
Signed
Date
Drawing Title
SEWER LONGITUDINAL SECTIONS
SHEET 4
Project No.
1707
Scale
Sheet Size
A3
Drawing No.
1707 - C088
Rev
B
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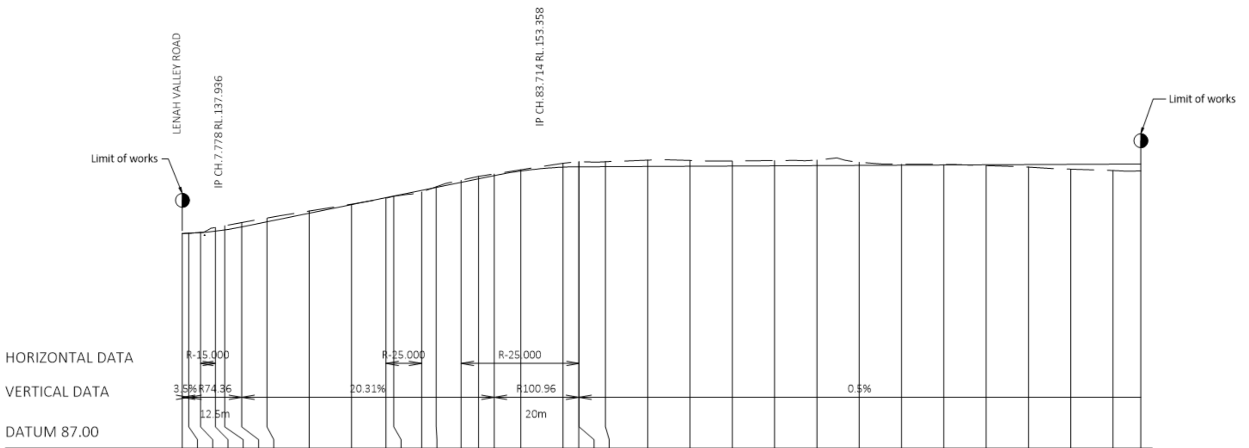

EXISTING SURFACE LEVEL	137.664	137.721	137.892	139.080	139.492	140.234	141.306	142.969	144.561	145.987	146.434	147.463
CUT / FILL DEPTH TO EXISTING SURFACE	0.000	0.004	0.026	0.875	0.996	1.029	0.888	0.520	0.082	-0.146	-0.077	-0.381
CONTROL LINE FINISHED LEVEL	137.663	137.717	137.866	138.205	138.496	139.205	140.418	142.449	144.480	146.132	146.511	147.845
CONTROL LINE CHAINAGES	0.000	1.528	4.308	7.834	10.000	14.028	20.000	30.000	40.000	48.136	50.000	56.566

EXISTING SURFACE LEVEL	148.701	150.199	151.140	151.704	152.720	154.238	154.622	154.619	154.592	154.982	154.899
CUT / FILL DEPTH TO EXISTING SURFACE	0.159	0.460	0.567	0.376	0.312	0.916	1.214	1.211	1.152	1.493	1.359
CONTROL LINE FINISHED LEVEL	148.542	149.739	150.573	151.327	152.408	153.321	153.408	153.409	153.440	153.490	153.540
CONTROL LINE CHAINAGES	60.000	65.892	70.000	73.714	80.000	90.000	93.714	93.816	100.000	110.000	120.000

EXISTING SURFACE LEVEL	154.745	154.862	154.987	154.490	154.013	153.951	153.695	153.336	152.843	152.517	152.401
CUT / FILL DEPTH TO EXISTING SURFACE	1.155	1.222	1.297	0.750	0.223	0.111	-0.195	-0.605	-1.148	-1.523	-1.672
CONTROL LINE FINISHED LEVEL	153.590	153.640	153.690	153.740	153.790	153.840	153.890	153.940	153.991	154.041	154.073
CONTROL LINE CHAINAGES	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	226.553

MC01 LONGITUDINAL SECTION
HORIZONTAL 1:1000
VERTICAL 1:1000

SCALE 1:500 A3
SCALE 1:1000 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

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Client: STEPHEN GATH

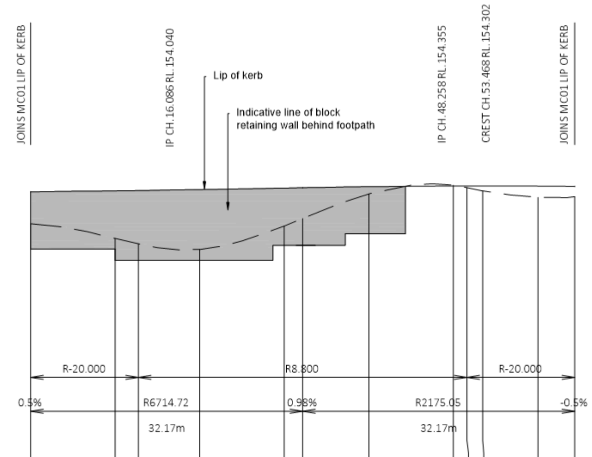
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Signed / Date
Designed / Signed / Date
Checked / Signed / Date
Approved / Signed / Date

Drawing Title: ROAD LONGITUDINAL SECTION
SHEET 1 OF 2

Project No. 1707
Scale: HORZ 1:1000 VERT 1:1000
Sheet Size: A3
Drawing No. 1707 - C090
Rev: B

PLOTTED: 10/4/2018 9:20:01 AM



EXISTING SURFACE LEVEL	152.077	151.210	150.890	150.556	151.941	152.379	153.836	154.348	154.201	154.011	153.631	153.669
CUT / FILL DEPTH TO EXISTING SURFACE	-1.882	-2.807	-3.145	-3.534	-2.236	-1.819	-0.424	0.049	-0.100	-0.291	-0.661	-0.606
CONTROL LINE FINISHED LEVEL	153.960	154.017	154.035	154.089	154.177	154.198	154.260	154.299	154.301	154.302	154.292	154.275
CONTROL LINE CHAINAGES	0.000	10.000	12.742	20.000	30.000	32.172	40.000	50.000	51.601	53.468	60.000	64.343

CULDESAC KERB LIP PROFILE
HORIZONTAL 1:500
VERTICAL 1:250

0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3

0 5.0 10 15 20 25m
SCALE 1:500 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App
D	20/11/18	NOTES CLARIFIED	TN	AD	AD
C	29-09-18	IN RESPONSE TO RFI 04/09/18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
Engineering | Renewable Energy | Project Management

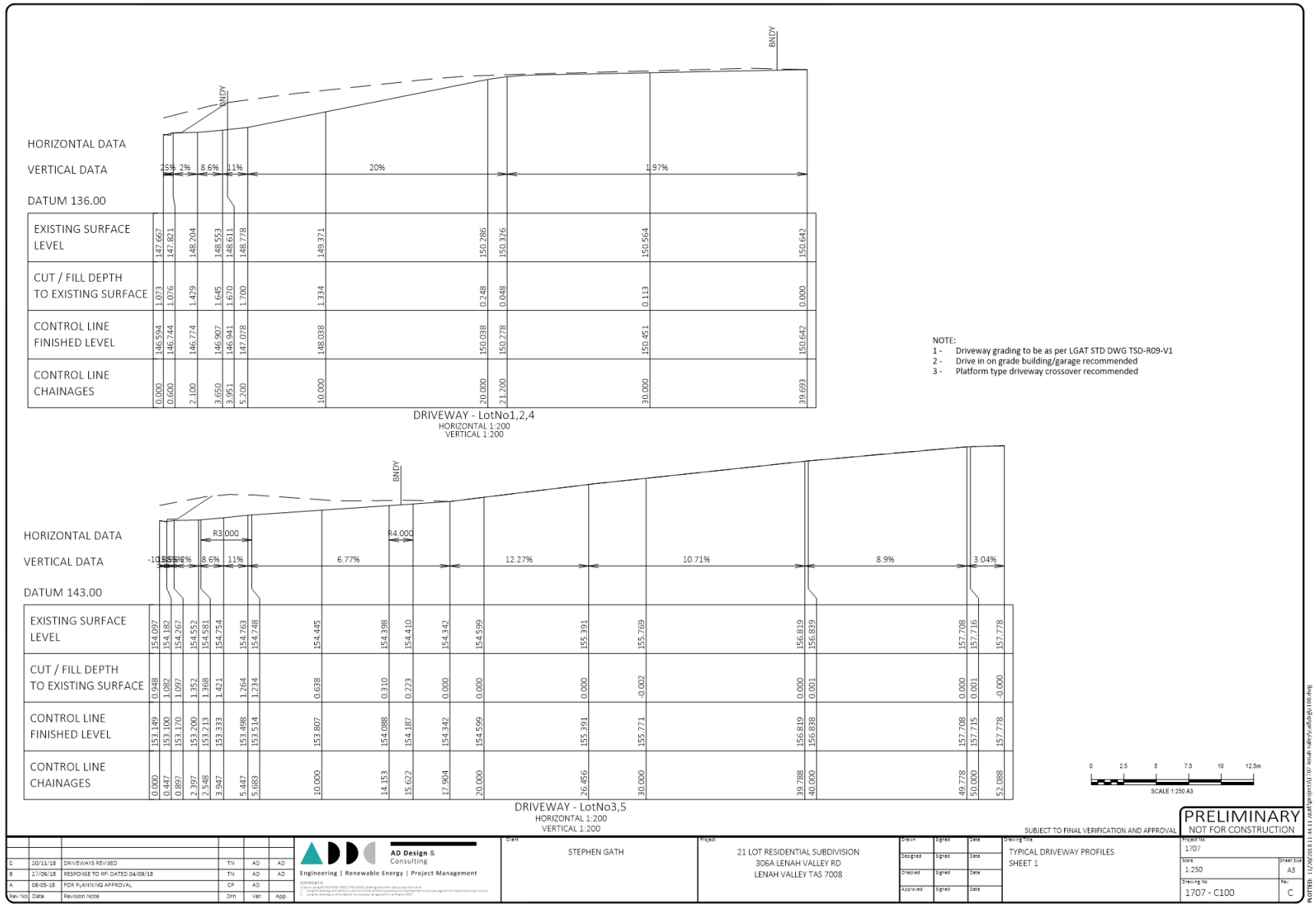
Client: STEPHEN GATH

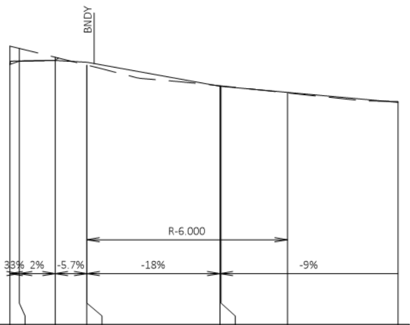
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Designed / Checked / Approved — Signed — Date

Drawing Title: ROAD LONGITUDINAL SECTION
SHEET 2 OF 2

Project No. 1707
Scale HORZ 1:500 VERT 1:250
Sheet Size A3
Drawing No. 1707 - C091
Rev D


BNDY
BNDY
HORIZONTAL DATA
VERTICAL DATA
DATUM 136.00
25% 2% 8.6% 11% 20% 1.97%
EXISTING SURFACE LEVEL
147.667 147.821 148.204 148.553 148.611 148.778 149.371 150.286 150.326 150.564 150.642
CUT / FILL DEPTH TO EXISTING SURFACE
1.073 1.076 1.429 1.645 1.670 1.700 1.334 0.248 0.048 0.113 0.000
CONTROL LINE FINISHED LEVEL
146.594 146.744 146.774 146.907 146.941 147.078 148.038 150.038 150.278 150.451 150.642
CONTROL LINE CHAINAGES
0.000 0.600 2.100 3.650 3.951 5.200 10.000 20.000 21.200 30.000 39.693
DRIVEWAY - LotNo1,2,4
HORIZONTAL 1:200
VERTICAL 1:200
NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended
BNDY
HORIZONTAL DATA
VERTICAL DATA
DATUM 143.00
R3.000
R4.000
-10.55% 8.6% 11% 6.77% 12.27% 10.71% 8.9% 3.04%
EXISTING SURFACE LEVEL
154.097 154.182 154.267 154.552 154.581 154.754 154.763 154.748 154.445 154.398 154.410 154.342 154.599 155.391 155.769 156.819 156.839 157.708 157.716 157.778
CUT / FILL DEPTH TO EXISTING SURFACE
0.948 1.082 1.097 1.352 1.368 1.421 1.264 1.234 0.638 0.310 0.723 0.000 0.000 0.000 -0.002 0.000 0.001 0.000 0.001 -0.000
CONTROL LINE FINISHED LEVEL
153.149 153.100 153.170 153.200 153.213 153.333 153.498 153.514 153.807 154.088 154.187 154.342 154.599 155.391 155.771 156.819 156.838 157.708 157.715 157.778
CONTROL LINE CHAINAGES
0.000 0.447 0.897 2.397 2.548 3.947 5.447 5.683 10.000 14.153 15.622 17.904 20.000 26.456 30.000 39.788 40.000 49.778 50.000 52.088
DRIVEWAY - LotNo3,5
HORIZONTAL 1:200
VERTICAL 1:200
0 2.5 5 7.5 10 12.5m
SCALE 1:250 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
C 20/11/18 DRIVEWAYS REVISED TN AD AD
B 27/09/18 RESPONSE TO RFI DATED 04/09/18 TN AD AD
A 08-05-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
TYPICAL DRIVEWAY PROFILES
SHEET 1
Project No. 1707
Scale 1:250
Sheet Size A3
Drawing No. 1707 - C100
Rev C
PLOTTED: 11/20/2018 11:44:11 AM



HORIZONTAL DATA

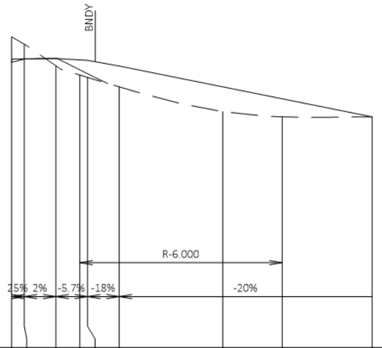
VERTICAL DATA

DATUM 141.00

EXISTING SURFACE LEVEL	154.152	154.042	153.623	153.254	153.253	152.278	152.273	151.937	151.537
CUT / FILL DEPTH TO EXISTING SURFACE	0.863	0.604	0.151	-0.132	-0.133	0.026	0.025	-0.029	0.042
CONTROL LINE FINISHED LEVEL	153.290	153.438	153.472	153.387	153.387	152.253	152.248	151.965	151.494
CONTROL LINE CHAINAGES	0.000	0.450	2.150	3.646	3.650	9.950	10.000	13.141	18.373

DRIVEWAY - LotNo6

HORIZONTAL 1:200
VERTICAL 1:200



HORIZONTAL DATA

VERTICAL DATA

DATUM 140.00

EXISTING SURFACE LEVEL	154.662	154.315	153.295	152.856	152.746	152.294	151.128	150.882	150.879
CUT / FILL DEPTH TO EXISTING SURFACE	1.203	0.706	-0.344	-0.719	-0.808	-0.989	-1.175	-0.859	-0.010
CONTROL LINE FINISHED LEVEL	153.459	153.609	153.639	153.574	153.554	153.284	152.304	151.742	150.889
CONTROL LINE CHAINAGES	0.000	0.600	2.100	3.239	3.600	5.100	10.000	12.810	17.072

DRIVEWAY - LotNo7

HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App
A	29-09-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

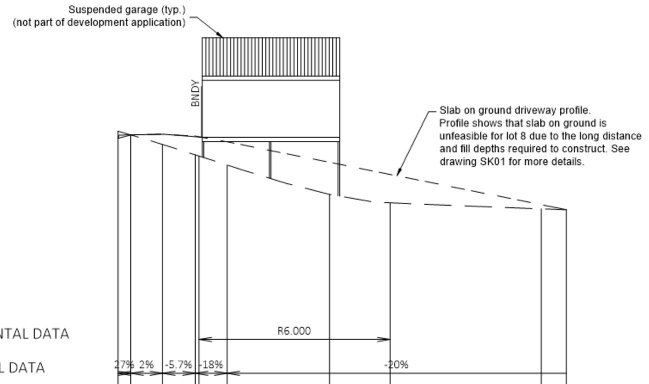
Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 2

Project No: 1707
Scale: 1:200
Sheet Size: A3
Drawing No: 1707 - C101
Rev: A

PLOTTED: 10/4/2018 9:20:01 AM



HORIZONTAL DATA

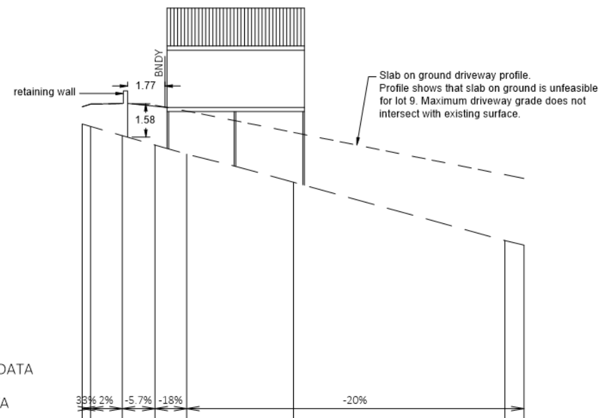
VERTICAL DATA

DATUM 140.00

EXISTING SURFACE LEVEL	153.843	153.669	153.216	152.726	152.670	152.246	150.856	150.452	150.172	150.128
CUT / FILL DEPTH TO EXISTING SURFACE	0.337	0.000	-0.483	-0.884	-0.908	-1.094	-1.514	-1.347	-0.198	-0.005
CONTROL LINE FINISHED LEVEL	153.506	153.668	153.698	153.610	153.578	153.340	152.370	151.799	150.370	150.133
CONTROL LINE CHAINAGES	0.000	0.600	2.100	3.650	3.827	5.150	10.000	12.858	20.000	21.186

DRIVEWAY - LotNo8

HORIZONTAL 1:200
VERTICAL 1:200



HORIZONTAL DATA

VERTICAL DATA

DATUM 137.00

EXISTING SURFACE LEVEL	152.849	152.734	152.304	151.860	151.430	150.098	147.346	147.128
CUT / FILL DEPTH TO EXISTING SURFACE	-0.813	-1.060	-1.520	-1.876	-2.036	-2.358	-3.110	-3.147
CONTROL LINE FINISHED LEVEL	153.662	153.794	153.824	153.736	153.466	152.456	150.456	150.275
CONTROL LINE CHAINAGES	0.000	0.400	1.900	3.450	4.950	10.000	20.000	20.905

DRIVEWAY - LotNo9

HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App
A	29-09-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

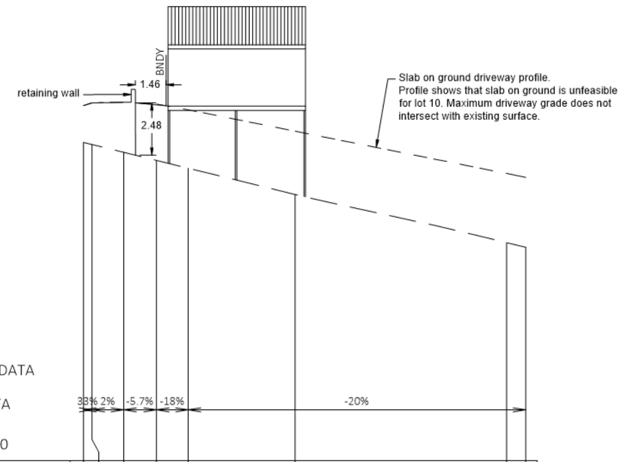
Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 3

Project No: 1707
Scale: 1:200
Sheet Size: A3
Drawing No: 1707 - C102
Rev: A

PLOTTED: 10/4/2018 9:20:01 AM



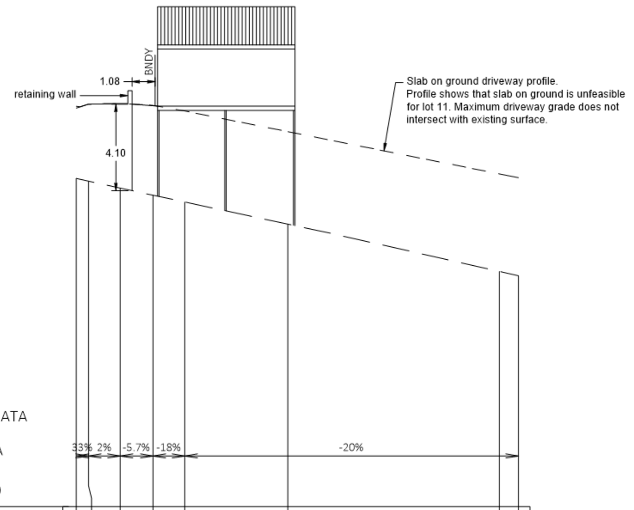
HORIZONTAL DATA

VERTICAL DATA

DATUM 137.00

EXISTING SURFACE LEVEL	152.038	151.938	151.566	151.186	150.818	149.580	147.302	147.085
CUT / FILL DEPTH TO EXISTING SURFACE	-1.738	-1.969	-2.372	-2.663	-2.761	-2.989	-3.268	-3.303
CONTROL LINE FINISHED LEVEL	153.776	153.908	153.938	153.849	153.579	152.569	150.569	150.388
CONTROL LINE CHAINAGES	0.000	0.400	1.900	3.450	4.950	10.000	20.000	20.905

DRIVEWAY - LotNo10
HORIZONTAL 1:200
VERTICAL 1:200



HORIZONTAL DATA

VERTICAL DATA

DATUM 135.00

EXISTING SURFACE LEVEL	150.526	150.399	150.071	149.735	149.413	148.368	146.130	145.925
CUT / FILL DEPTH TO EXISTING SURFACE	-3.328	-3.646	-4.004	-4.251	-4.303	-4.375	-4.613	-4.637
CONTROL LINE FINISHED LEVEL	153.854	154.045	154.075	153.987	153.717	152.743	150.743	150.562
CONTROL LINE CHAINAGES	0.000	0.580	2.080	3.630	5.130	10.000	20.000	20.905

DRIVEWAY - LotNo11
HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App
A	29-09-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

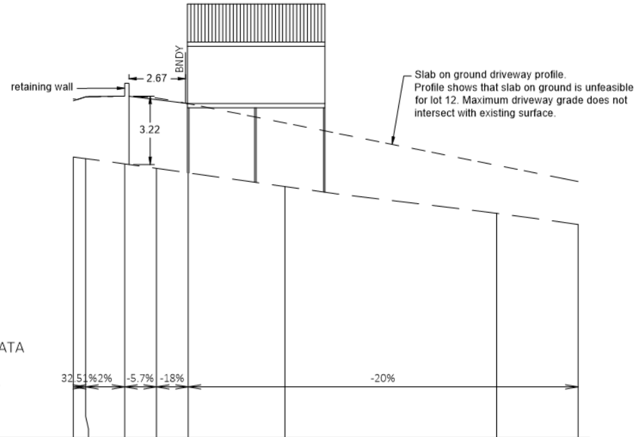
AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 4

Project No. 1707
Scale 1:200
Sheet Size A3
Drawing No. 1707 - C103
Rev A



HORIZONTAL DATA

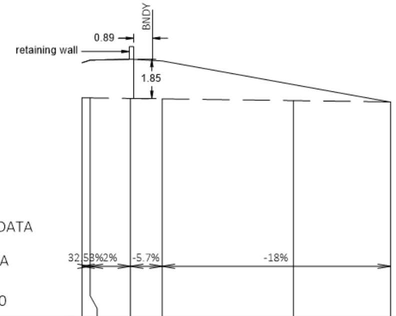
VERTICAL DATA: 32.51% | 2% | -5.7% | -18% | -20%

DATUM 138.00

EXISTING SURFACE LEVEL	151.262	151.187	150.936	150.724	150.512	149.865	148.604	148.074
CUT / FILL DEPTH TO EXISTING SURFACE	-2.655	-2.918	-3.206	-3.333	-3.275	-3.007	-2.269	-2.029
CONTROL LINE FINISHED LEVEL	153.917	154.105	154.142	154.057	153.787	152.872	150.872	150.103
CONTROL LINE CHAINAGES	0.000	0.579	2.428	3.928	5.428	10.000	20.000	23.846

DRIVEWAY - LotNo12

HORIZONTAL 1:200
VERTICAL 1:200



HORIZONTAL DATA

VERTICAL DATA: 32.58% | 2% | -5.7% | -18%

DATUM 142.00

EXISTING SURFACE LEVEL	152.375	152.370	152.344	152.324	152.240	152.177
CUT / FILL DEPTH TO EXISTING SURFACE	-1.659	-1.793	-1.857	-1.792	-0.760	0.004
CONTROL LINE FINISHED LEVEL	154.035	154.163	154.201	154.116	152.999	152.173
CONTROL LINE CHAINAGES	0.000	0.396	2.296	3.796	10.000	14.588

DRIVEWAY - LotNo13

HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
A	29-09-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Signed / Date
Designed / Signed / Date
Checked / Signed / Date
Approved / Signed / Date

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 5

Project No. 1707
Scale 1:200
Sheet Size A3
Drawing No. 1707 - C104
Rev A

PLOTTED: 10/4/2018 9:20:01 AM

HORIZONTAL DATA									
VERTICAL DATA									
DATUM 143.00									
EXISTING SURFACE LEVEL	153.092	153.117	153.213	153.309	153.456	153.476	153.454	153.426	
CUT / FILL DEPTH TO EXISTING SURFACE	-0.976	-1.080	-1.014	-0.833	-0.495	-0.278	-0.160	-0.013	
CONTROL LINE FINISHED LEVEL	154.068	154.197	154.227	154.142	153.951	153.754	153.613	153.439	
CONTROL LINE CHAINAGES	0.000	0.396	1.896	3.396	5.779	8.245	10.000	12.178	

DRIVEWAY - LotNo14
HORIZONTAL 1:200
VERTICAL 1:200

HORIZONTAL DATA									
VERTICAL DATA									
DATUM 143.00									
EXISTING SURFACE LEVEL	153.962	154.032	154.292	154.484	154.666	154.904	155.123	155.410	155.786
CUT / FILL DEPTH TO EXISTING SURFACE	-0.146	-0.205	0.024	0.088	0.104	-0.045	-0.109	-0.162	-0.231
CONTROL LINE FINISHED LEVEL	154.108	154.237	154.268	154.397	154.562	154.949	155.232	155.572	156.017
CONTROL LINE CHAINAGES	0.000	0.396	1.946	3.446	4.946	6.883	8.299	10.000	12.223

DRIVEWAY - LotNo15
HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
B	20/11/18	DRIVEWAYS REVISED	TN	AD	AD
A	29/09/18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Designed / Checked / Approved — Signed — Date

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 6

Project No: 1707
Scale: 1:200
Sheet Size: A3
Drawing No: 1707 - C105
Rev: B

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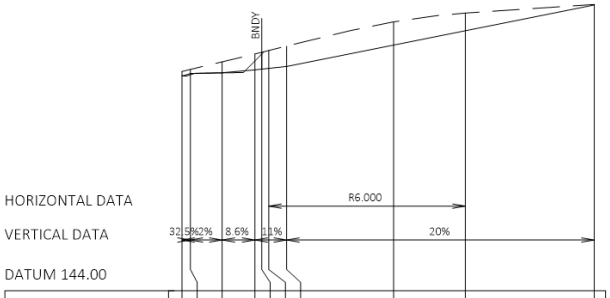
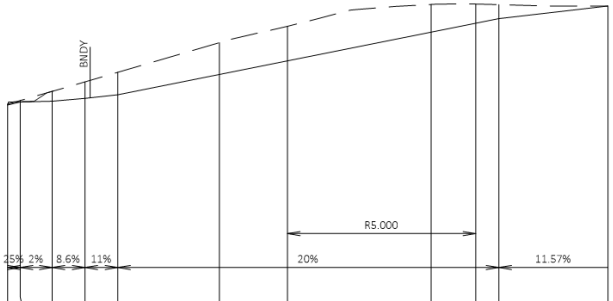


HORIZONTAL DATA										
VERTICAL DATA										
DATUM 144.00										
EXISTING SURFACE LEVEL	154.354	154.450	154.810	155.183	155.261	155.341	155.551	156.699	157.114	157.520
CUT / FILL DEPTH TO EXISTING SURFACE	0.219	0.185	0.516	0.755	0.797	0.841	0.958	1.096	0.833	0.021
CONTROL LINE FINISHED LEVEL	154.135	154.265	154.295	154.428	154.464	154.500	154.593	155.603	156.281	157.498
CONTROL LINE CHAINAGES	0.000	0.398	1.898	3.448	3.774	4.100	4.948	10.000	13.389	19.475

DRIVEWAY - LotNo16
HORIZONTAL 1:200
VERTICAL 1:200



HORIZONTAL DATA										
VERTICAL DATA										
DATUM 144.00										
EXISTING SURFACE LEVEL	154.118	154.289	154.716	155.166	155.618	157.018	157.792	158.821	158.841	158.810	158.749
CUT / FILL DEPTH TO EXISTING SURFACE	0.049	0.070	0.468	0.784	1.066	1.506	1.636	1.309	0.907	0.658	0.000
CONTROL LINE FINISHED LEVEL	154.068	154.218	154.248	154.382	154.552	155.512	156.156	157.512	157.934	158.152	158.749
CONTROL LINE CHAINAGES	0.000	0.600	2.100	3.650	5.200	10.000	13.220	20.000	22.108	23.200	28.357

DRIVEWAY - LotNo17
HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
B	20/11/18	DRIVEWAYS REVISED	TN	AD	AD
A	29-09-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

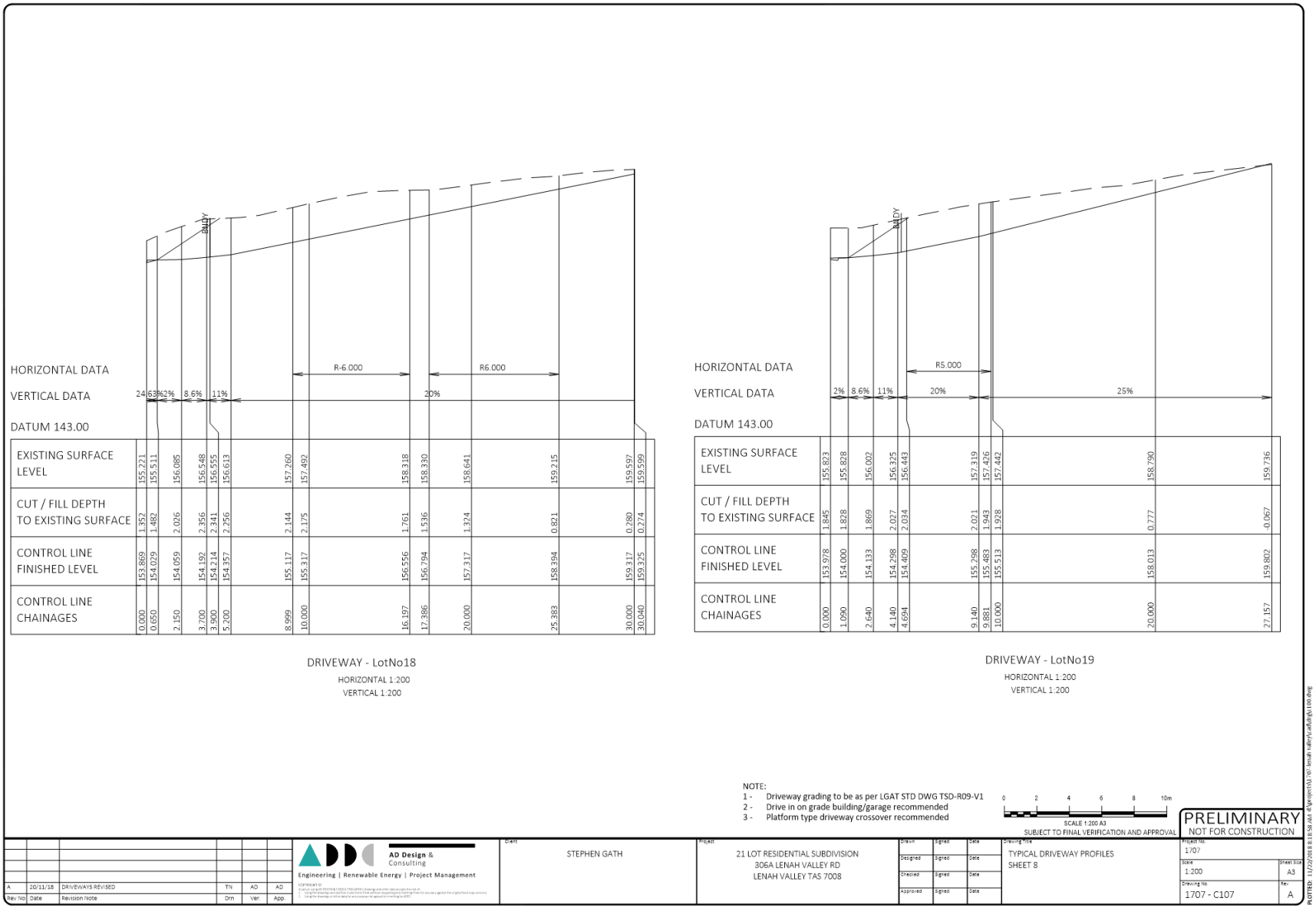
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

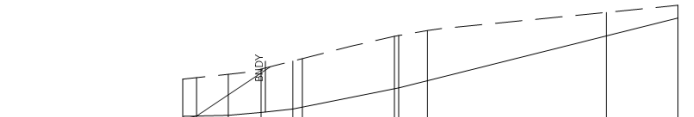
Drawn / Designed / Checked / Approved — Signed — Date

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 7

Project No: 1707
Scale: 1:200
Sheet Size: A3
Drawing No: 1707 - C106
Rev: B

PLOTTED: 11/22/2018 8:11:18 AM d:\projects\17 - 07 - lenah valley\cad\dgn\1707-c106.dwg


BALLY
R-6.000
R6.000
HORIZONTAL DATA
VERTICAL DATA
DATUM 143.00
24.63%
2%
8.6%
11%
20%
EXISTING SURFACE LEVEL
155.221 155.511 156.085 156.548 156.555 156.613 157.260 157.492 158.318 158.330 158.641 159.215 159.597 159.599
CUT / FILL DEPTH TO EXISTING SURFACE
1.352 1.482 2.026 2.356 2.341 2.256 2.144 2.175 1.761 1.536 1.324 0.821 0.280 0.274
CONTROL LINE FINISHED LEVEL
153.869 154.029 154.059 154.192 154.214 154.357 155.117 155.317 156.556 156.794 157.317 158.394 159.317 159.325
CONTROL LINE CHAINAGES
0.000 0.650 2.150 3.700 3.900 5.200 8.999 10.000 16.197 17.386 20.000 25.383 30.000 30.040
DRIVEWAY - LotNo18
HORIZONTAL 1:200
VERTICAL 1:200
BALDY
R5.000
HORIZONTAL DATA
VERTICAL DATA
DATUM 143.00
2%
8.6%
11%
20%
25%
EXISTING SURFACE LEVEL
155.823 155.828 156.002 156.325 156.443 157.319 157.426 157.442 158.790 159.736
CUT / FILL DEPTH TO EXISTING SURFACE
1.845 1.828 1.869 2.027 2.034 2.021 1.943 1.928 0.777 0.067
CONTROL LINE FINISHED LEVEL
153.978 154.000 154.133 154.298 154.409 155.298 155.483 155.513 158.013 159.802
CONTROL LINE CHAINAGES
0.000 1.090 2.640 4.140 4.694 9.140 9.881 10.000 20.000 27.157
DRIVEWAY - LotNo19
HORIZONTAL 1:200
VERTICAL 1:200
NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended
0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
A 20/11/18 DRIVEWAYS REVISED TN AD AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client: STEPHEN GATH
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 8
Project No. 1707
Scale 1:200
Sheet Size A3
Drawing No. 1707 - C107
Rev A
PLOTTED: 11/22/2018 8:11:58 AM



HORIZONTAL DATA / VERTICAL DATA / DATUM 143.00												
EXISTING SURFACE LEVEL	155.549	155.618	155.778	156.026	156.406	156.518	157.575	157.614	157.843	158.702		159.037
CUT / FILL DEPTH TO EXISTING SURFACE	1.898	1.805	1.935	2.049	2.264	2.288	2.473	2.473	2.363	1.110		0.597
CONTROL LINE FINISHED LEVEL	153.651	153.813	153.843	153.977	154.142	154.231	155.102	155.142	155.480	157.592		158.440
CONTROL LINE CHAINAGES	0.000	0.650	2.150	3.700	5.200	5.645	10.000	10.200	11.555	20.000		23.393

DRIVEWAY - LotNo20
HORIZONTAL 1:200
VERTICAL 1:200

HORIZONTAL DATA / VERTICAL DATA / DATUM 143.00												
EXISTING SURFACE LEVEL	155.544	155.606	155.761	155.767	155.924	156.072	156.993	157.077	158.118	158.532		
CUT / FILL DEPTH TO EXISTING SURFACE	1.935	1.847	1.972	1.973	2.002	1.985	2.024	2.020	1.061	0.174		
CONTROL LINE FINISHED LEVEL	153.609	153.759	153.789	153.793	153.922	154.087	154.969	155.057	157.057	158.358		
CONTROL LINE CHAINAGES	0.000	0.600	2.100	2.152	3.650	5.150	9.557	10.000	20.000	26.504		

DRIVEWAY - LotNo21
HORIZONTAL 1:200
VERTICAL 1:200

NOTE:
1 - Driveway grading to be as per LGAT STD DWG TSD-R09-V1
2 - Drive in on grade building/garage recommended
3 - Platform type driveway crossover recommended

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
A	20/11/18	DRIVEWAYS ADDED	TN	AD	AD

AD Design & Consulting
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Client: STEPHEN GATH

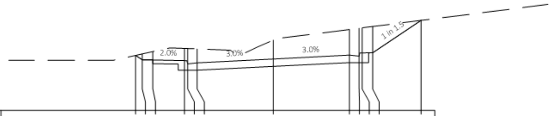
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Designed / Checked / Approved — Signed — Date

Drawing Title: TYPICAL DRIVEWAY PROFILES
SHEET 9

Project No: 1707
Scale: 1:200
Sheet Size: A3
Drawing No: 1707 - C108
Rev: A

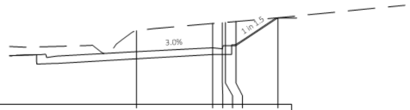
PLOTTED: 11/22/2018 8:19:30 AM d:\projects\1-07-lenah valley\cad\dgn\1707-C108.dwg



DATUM 138.0

DESIGN LEVEL	140.585	140.378	140.368	140.338	140.188	140.238	140.418	140.598	140.548	140.698	140.708	142.231
EXISTING LEVEL	140.585	140.652	140.761	140.911	140.906	140.890	141.306	141.805	141.862	141.881	141.944	142.231
OFFSET	-6.511	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	6.984

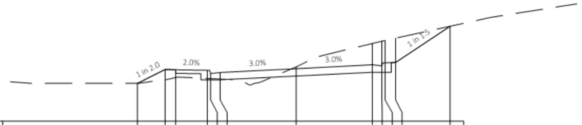
CH 20.000



DATUM 136.0

DESIGN LEVEL	138.496	138.676	138.626	138.776	138.786	140.104
EXISTING LEVEL	139.492	139.833	139.872	139.885	139.928	140.104
OFFSET	0.000	3.600	4.050	4.200	4.700	6.677

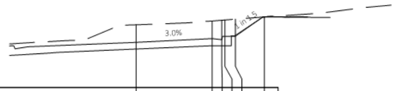
CH 10.000



DATUM 142.0

DESIGN LEVEL	143.784	144.440	144.430	144.400	144.250	144.300	144.480	144.660	144.610	144.760	144.770	146.484
EXISTING LEVEL	143.784	143.948	144.058	144.018	144.011	143.989	144.561	145.671	145.780	145.816	145.925	146.484
OFFSET	-7.512	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	7.271

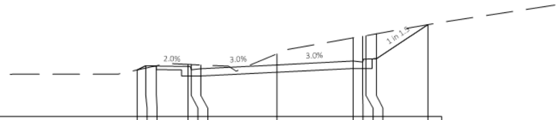
CH 40.000



DATUM 136.0

DESIGN LEVEL	138.133	138.313	138.263	138.413	138.423	139.337
EXISTING LEVEL	138.962	139.143	139.179	139.190	139.230	139.337
OFFSET	0.000	3.600	4.050	4.200	4.700	6.071

CH 7.213



DATUM 140.0

DESIGN LEVEL	142.207	142.409	142.399	142.369	142.219	142.269	142.449	142.629	142.579	142.729	142.739	144.359
EXISTING LEVEL	142.207	142.296	142.406	142.470	142.464	142.445	142.969	143.730	143.810	143.837	143.926	144.359
OFFSET	-6.603	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	7.131

CH 30.000

0 2 4 6 8 10m

SCALE 1:200 A3

SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
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Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn	Signed	Date
Designed	Signed	Date
Checked	Signed	Date
Approved	Signed	Date

Drawing Title: CROSS SECTIONS
SHEET 1

Project No. 1707

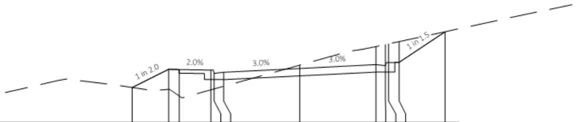
Scale: HORZ 1:200 VERT 1:200

Sheet Size: A3

Drawing No. 1707 - C110

Rev: C

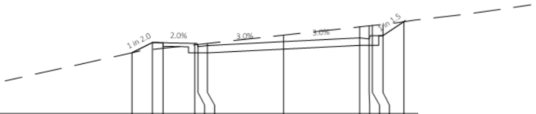
PLOTTED: 10/4/2018 9:20:01 AM c:\users\toman\appdata\local\temp\



DATUM 146.0

DESIGN LEVEL	147.642	148.502	148.492	148.462	148.312	148.362	148.542	148.722	148.672	148.822	148.832	150.278
EXISTING LEVEL	147.642	147.559	147.244	147.531	147.573	147.698	148.701	149.576	149.672	149.705	149.812	150.278
OFFSET	-7.920	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	6.870

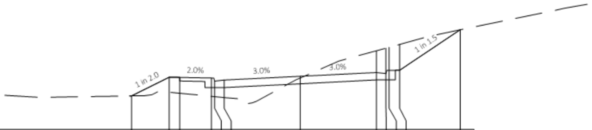
CH 60.000



DATUM 149.0

DESIGN LEVEL	151.885	152.368	152.358	152.328	152.178	152.228	152.408	152.588	152.538	152.688	152.698	153.358
EXISTING LEVEL	151.885	152.043	152.098	152.262	152.278	152.327	152.720	153.113	153.162	153.179	153.233	153.358
OFFSET	-7.166	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	5.690

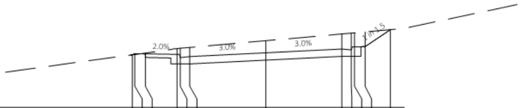
CH 80.000



DATUM 144.0

DESIGN LEVEL	145.586	146.471	146.461	146.431	146.281	146.331	146.511	146.691	146.641	146.791	146.801	148.710
EXISTING LEVEL	145.586	145.757	145.709	145.565	145.551	145.508	146.434	147.719	147.842	147.883	148.019	148.710
OFFSET	-7.971	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	7.563

CH 50.000



DATUM 148.0

DESIGN LEVEL	150.475	150.533	150.523	150.493	150.343	150.393	150.573	150.753	150.703	150.853	150.863	151.658
EXISTING LEVEL	150.475	150.490	150.558	150.770	150.783	150.823	151.140	151.457	151.496	151.509	151.553	151.658
OFFSET	-6.316	-6.200	-5.700	-4.200	-4.050	-3.600	0.000	3.600	4.050	4.200	4.700	5.893

CH 70.000

0 2 4 6 8 10m

SCALE 1:200 A3

SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn	Signed	Date
Designed	Signed	Date
Checked	Signed	Date
Approved	Signed	Date

Drawing Title: CROSS SECTIONS
SHEET 2

Project No. 1707

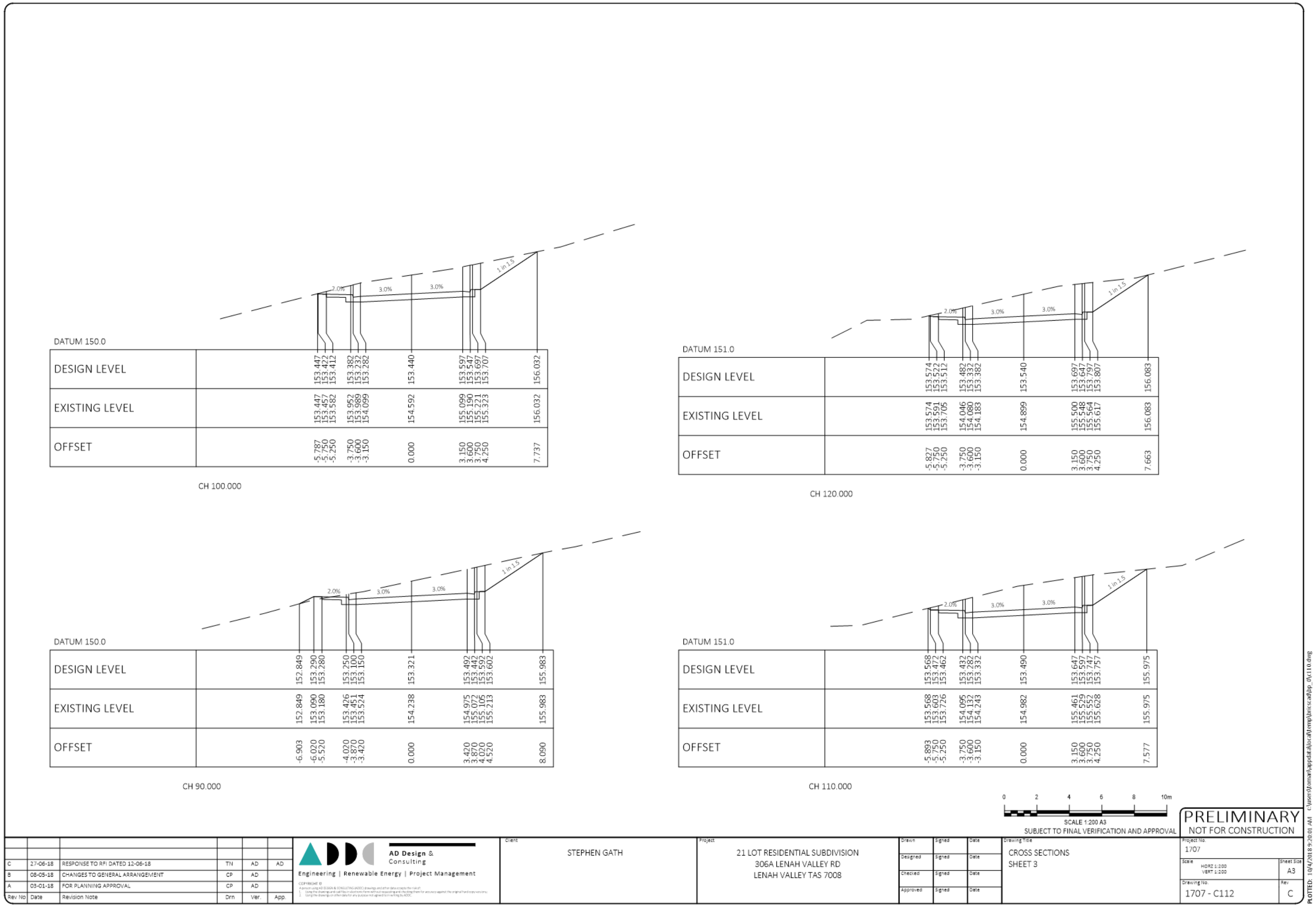
Scale: HORZ 1:200, VERT 1:200

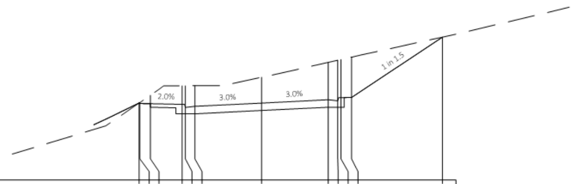
Sheet Size: A3

Drawing No. 1707 - C111

Rev: C

PLOTTED: 10/4/2018 9:20:01 AM c:\users\toman\appdata\local\temp\...

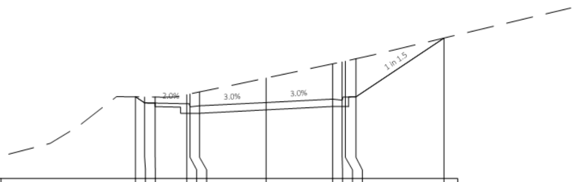

DATUM 150.0
DESIGN LEVEL 153.447 153.422 153.412 153.382 153.232 153.282 153.440 153.597 153.547 153.697 153.707 156.032
EXISTING LEVEL 153.447 153.457 153.582 153.952 153.989 154.099 154.592 155.099 155.190 155.221 155.323 156.032
OFFSET -5.787 -5.750 -5.250 -3.750 -3.600 -3.150 0.000 3.150 3.600 3.750 4.250 7.737
2.0% 3.0% 3.0% 1 in 1.5
CH 100.000
DATUM 151.0
DESIGN LEVEL 153.574 153.522 153.512 153.482 153.332 153.382 153.540 153.697 153.647 153.797 153.807 156.083
EXISTING LEVEL 153.574 153.591 153.705 154.046 154.080 154.183 154.899 155.500 155.548 155.564 155.617 156.083
OFFSET -5.827 -5.750 -5.250 -3.750 -3.600 -3.150 0.000 3.150 3.600 3.750 4.250 7.663
2.0% 3.0% 3.0% 1 in 1.5
CH 120.000
DATUM 150.0
DESIGN LEVEL 152.849 153.290 153.280 153.250 153.100 153.150 153.321 153.492 153.442 153.592 153.602 155.983
EXISTING LEVEL 152.849 153.090 153.180 153.426 153.451 153.524 154.238 154.975 155.072 155.105 155.213 155.983
OFFSET -6.903 -6.020 -5.520 -4.020 -3.870 -3.420 0.000 3.420 3.870 4.020 4.520 8.090
2.0% 3.0% 3.0% 1 in 1.5
CH 90.000
DATUM 151.0
DESIGN LEVEL 153.568 153.472 153.462 153.432 153.282 153.332 153.490 153.647 153.597 153.747 153.757 155.975
EXISTING LEVEL 153.568 153.603 153.726 154.095 154.132 154.243 154.982 155.461 155.529 155.552 155.628 155.975
OFFSET -5.893 -5.750 -5.250 -3.750 -3.600 -3.150 0.000 3.150 3.600 3.750 4.250 7.577
2.0% 3.0% 3.0% 1 in 1.5
CH 110.000
0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
C 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
B 08-05-18 CHANGES TO GENERAL ARRANGEMENT CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
CROSS SECTIONS
SHEET 3
Project No. 1707
Scale HORZ 1:200 VERT 1:200
Sheet Size A3
Drawing No. 1707 - C112
Rev C
PLOTTED: 10/4/2018 9:20:01 AM



DATUM 150.0

DESIGN LEVEL	153.644	153.623	153.613	153.583	153.433	153.483	153.640	153.798	153.748	153.898	153.908	156.767
EXISTING LEVEL	153.644	153.665	154.009	154.462	154.462	154.465	154.862	155.569	155.671	155.705	155.819	156.767
OFFSET	-5.782	-5.750	-5.250	-3.750	-3.600	-3.150	0.000	3.150	3.600	3.750	4.250	8.539

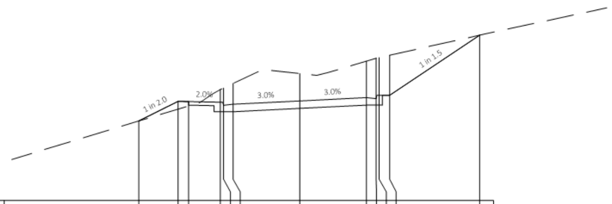
CH 140.000



DATUM 150.0

DESIGN LEVEL	153.857	153.573	153.563	153.533	153.383	153.433	153.590	153.748	153.698	153.848	153.858	156.635
EXISTING LEVEL	153.857	153.853	153.847	153.963	153.994	154.088	154.745	155.416	155.512	155.545	155.659	156.635
OFFSET	-6.177	-5.750	-5.250	-3.750	-3.600	-3.150	0.000	3.150	3.600	3.750	4.250	8.416

CH 130.000



DATUM 149.0

DESIGN LEVEL	152.745	153.673	153.663	153.633	153.483	153.533	153.690	153.848	153.798	153.948	153.958	156.792
EXISTING LEVEL	152.745	153.306	153.457	154.231	154.302	154.514	154.987	155.571	155.701	155.734	155.846	156.792
OFFSET	-7.605	-5.750	-5.250	-3.750	-3.600	-3.150	0.000	3.150	3.600	3.750	4.250	8.501

CH 150.000

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	

AD Design & Consulting
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Client: STEPHEN GATH

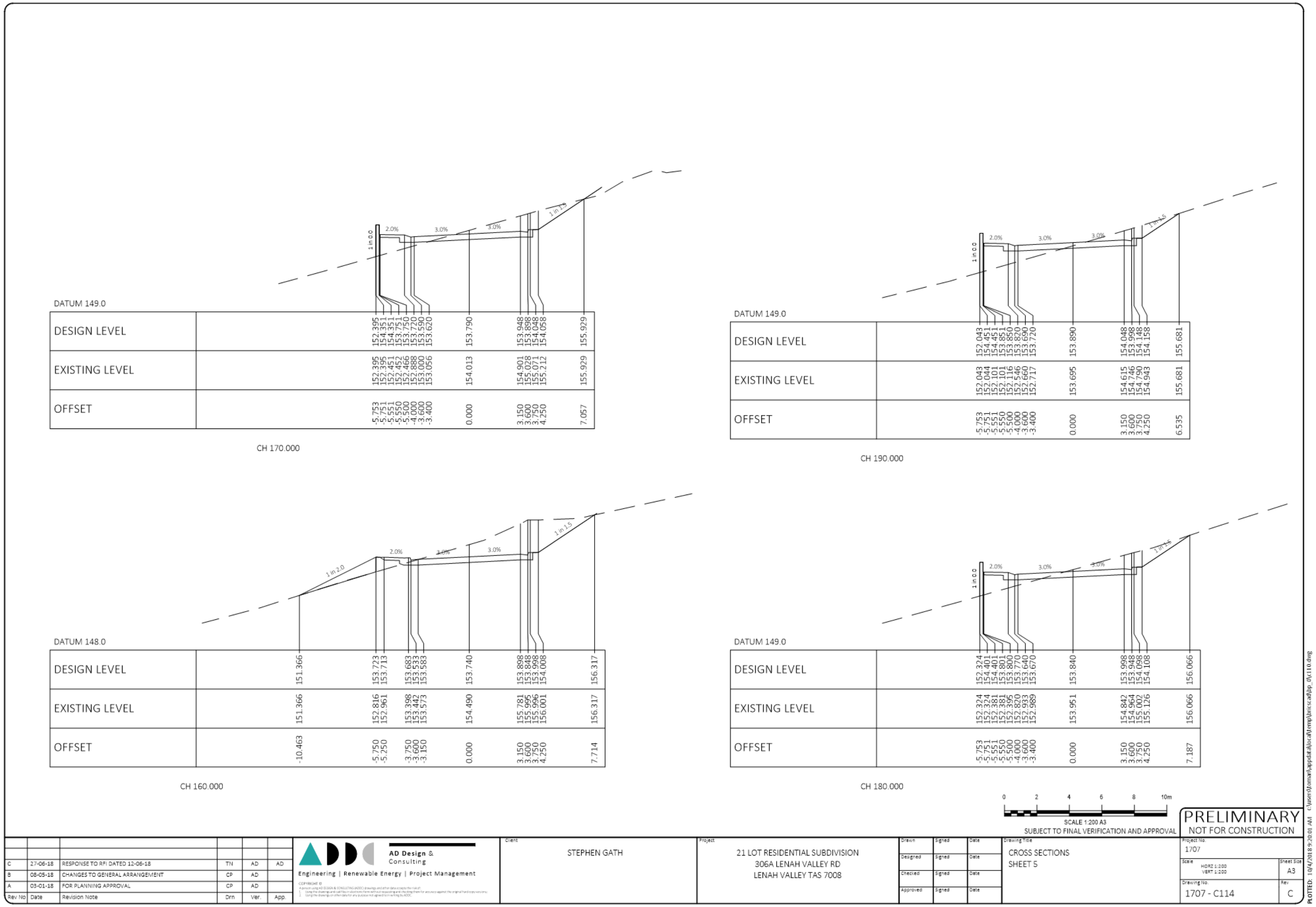
Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Signed / Date
Designed / Signed / Date
Checked / Signed / Date
Approved / Signed / Date

Drawing Title: CROSS SECTIONS
SHEET 4

Project No. 1707
Scale: HORZ 1:200 VERT 1:200
Sheet Size: A3
Drawing No. 1707 - C113
Rev: C

PLOTTED: 10/4/2018 9:20:01 AM



CH 170.000 (DATUM 149.0)

DESIGN LEVEL	152.395	154.351	154.351	153.751	153.750	153.720	153.590	153.620	153.790	153.948	153.898	154.048	154.058	155.929
EXISTING LEVEL	152.395	152.395	152.451	152.452	152.466	152.888	153.000	153.056	154.013	154.901	155.028	155.071	155.212	155.929
OFFSET	-5.753	-5.751	-5.551	-5.550	-5.500	-4.000	-3.600	-3.400	0.000	3.150	3.600	3.750	4.250	7.057

CH 190.000 (DATUM 149.0)

DESIGN LEVEL	152.043	154.451	154.451	153.851	153.850	153.820	153.690	153.720	153.890	154.048	153.998	154.148	154.158	155.681
EXISTING LEVEL	152.043	152.044	152.101	152.101	152.116	152.546	152.660	152.717	153.695	154.615	154.746	154.790	154.943	155.681
OFFSET	-5.753	-5.751	-5.551	-5.550	-5.500	-4.000	-3.600	-3.400	0.000	3.150	3.600	3.750	4.250	6.535

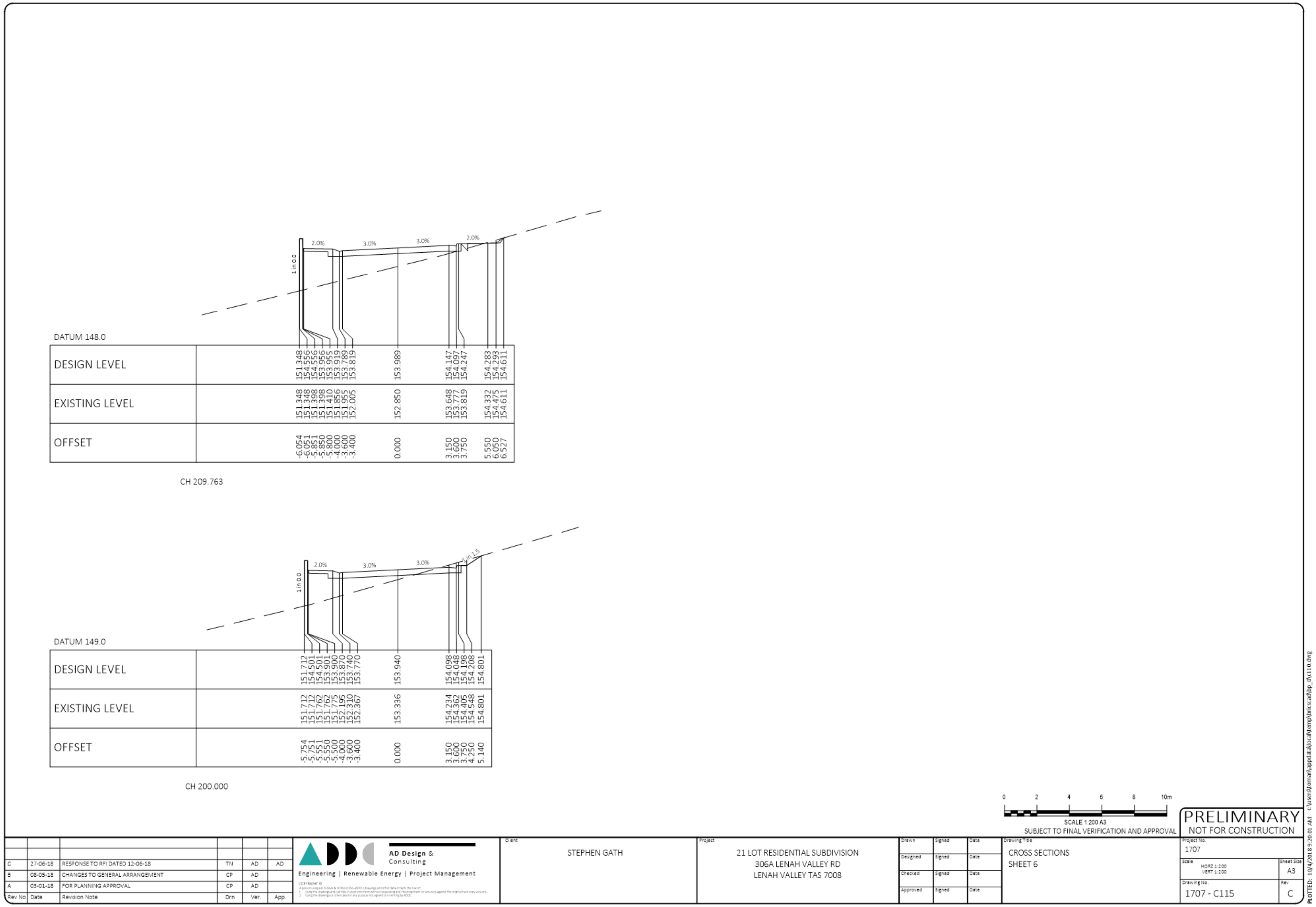
CH 160.000 (DATUM 148.0)

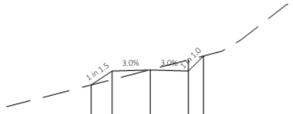
DESIGN LEVEL	151.366	153.723	153.713	153.683	153.533	153.583	153.740	153.898	153.848	153.998	154.008	156.317
EXISTING LEVEL	151.366	152.816	152.961	153.398	153.442	153.573	154.490	155.781	155.995	155.996	156.001	156.317
OFFSET	-10.463	-5.750	-5.250	-3.750	-3.600	-3.150	0.000	3.150	3.600	3.750	4.250	7.714

CH 180.000 (DATUM 149.0)

DESIGN LEVEL	152.324	154.401	154.401	153.801	153.800	153.770	153.640	153.670	153.840	153.998	153.948	154.098	154.108	156.066
EXISTING LEVEL	152.324	152.324	152.381	152.381	152.395	152.820	152.933	152.989	153.951	154.842	154.964	155.002	155.126	156.066
OFFSET	-5.753	-5.751	-5.551	-5.550	-5.500	-4.000	-3.600	-3.400	0.000	3.150	3.600	3.750	4.250	7.187

Rev No	Date	Revision Note	Drn	Ver.	App.
C	27-06-18	RESPONSE TO RFI DATED 12-06-18	TN	AD	AD
B	08-05-18	CHANGES TO GENERAL ARRANGEMENT	CP	AD	
A	03-01-18	FOR PLANNING APPROVAL	CP	AD	


2.0%
3.0%
3.0%
2.0%
1 in 0.0
DATUM 148.0
DESIGN LEVEL
151.348 154.556 154.556 153.956 153.955 153.919 153.789 153.819 153.989 154.147 154.097 154.247 154.283 154.293 154.611
EXISTING LEVEL
151.348 151.348 151.398 151.398 151.410 151.856 151.955 152.005 152.850 153.648 153.777 153.819 154.332 154.475 154.611
OFFSET
-6.054 -6.051 -5.851 -5.850 -5.800 -4.000 -3.600 -3.400 0.000 3.150 3.600 3.750 5.550 6.050 6.527
CH 209.763
2.0%
3.0%
3.0%
1 in 1.5
1 in 0.0
DATUM 149.0
DESIGN LEVEL
151.712 154.501 154.501 153.901 153.900 153.870 153.740 153.770 153.940 154.098 154.048 154.198 154.208 154.801
EXISTING LEVEL
151.712 151.712 151.762 151.762 151.775 152.195 152.310 152.367 153.336 154.234 154.362 154.405 154.548 154.801
OFFSET
-5.754 -5.751 -5.551 -5.550 -5.500 -4.000 -3.600 -3.400 0.000 3.150 3.600 3.750 4.250 5.140
CH 200.000
0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
C 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
B 08-05-18 CHANGES TO GENERAL ARRANGEMENT CP AD
A 03-01-18 FOR PLANNING APPROVAL CP AD
Rev No Date Revision Note Drn Ver. App
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
CROSS SECTIONS
SHEET 6
Project No.
1707
Scale
HORZ 1:200
VERT 1:200
Sheet Size
A3
Drawing No.
1707 - C115
Rev
C



DATUM 148.0

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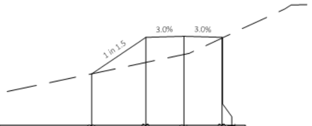
CH 16.812



DATUM 148.0

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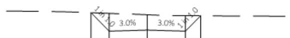
CH 10.000



DATUM 152.0

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CH 0.000

TYPICAL DRIVEWAY IN FILL
Driveways 6, 7, 13 (Lot 7 Shown)

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
A	29-03-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

AD Design & Consulting
Engineering | Renewable Energy | Project Management

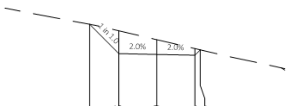
Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawn / Signed / Date
Designed / Signed / Date
Checked / Signed / Date
Approved / Signed / Date

Drawing Title: CROSS SECTIONS
SHEET 7

Project No. 1707
Scale: HORZ 1:200 VERT 1:200
Sheet Size: A3
Drawing No. 1707 - C116
Rev: A



DATUM 155.0

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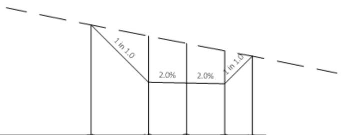
CH 20.000



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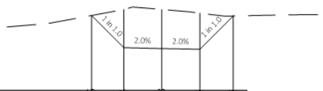
CH 10.000



DATUM 152.0

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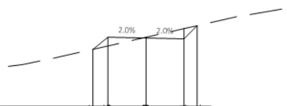
CH 0.000



DATUM 158.0

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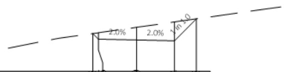
CH 38.650



DATUM 158.0

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CH 30.000

TYPICAL DRIVEWAY IN CUT
Driveways 13 - 21 (Lot 19 Shown)

0 2 4 6 8 10m
SCALE 1:200 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL

PRELIMINARY
NOT FOR CONSTRUCTION

Rev No	Date	Revision Note	Drn	Ver.	App.
A	29-03-18	IN RESPONSE TO RFI DATED 04/09/18	TN	AD	AD

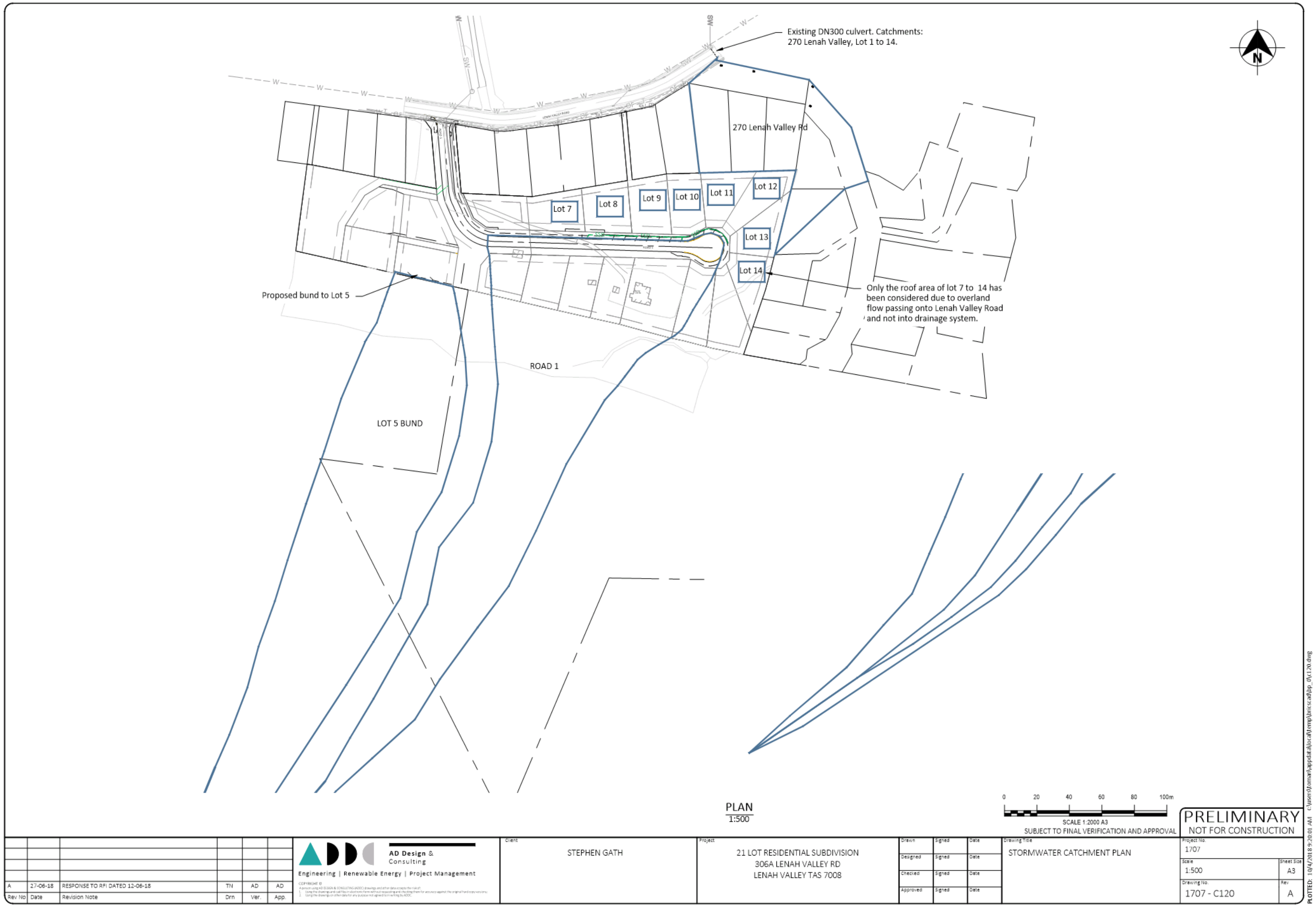
AD Design & Consulting
Engineering | Renewable Energy | Project Management

Client: STEPHEN GATH

Project: 21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008

Drawing Title: CROSS SECTIONS
SHEET 8

Project No: 1707
Scale: HORZ 1:200 VERT 1:200
Sheet Size: A3
Drawing No: 1707 - C117
Rev: A


Existing DN300 culvert. Catchments: 270 Lenah Valley, Lot 1 to 14.
270 Lenah Valley Rd
Lot 7
Lot 8
Lot 9
Lot 10
Lot 11
Lot 12
Lot 13
Lot 14
Only the roof area of lot 7 to 14 has been considered due to overland flow passing onto Lenah Valley Road and not into drainage system.
Proposed bund to Lot 5
ROAD 1
LOT 5 BUND
N
PLAN
1:500
0 20 40 60 80 100m
SCALE 1:2000 A3
SUBJECT TO FINAL VERIFICATION AND APPROVAL
PRELIMINARY
NOT FOR CONSTRUCTION
A 27-06-18 RESPONSE TO RFI DATED 12-06-18 TN AD AD
Rev No Date Revision Note Drn Ver. App.
AD Design & Consulting
Engineering | Renewable Energy | Project Management
Client
STEPHEN GATH
Project
21 LOT RESIDENTIAL SUBDIVISION
306A LENAH VALLEY RD
LENAH VALLEY TAS 7008
Drawn Signed Date
Designed Signed Date
Checked Signed Date
Approved Signed Date
Drawing Title
STORMWATER CATCHMENT PLAN
Project No.
1707
Scale
1:500
Sheet Size
A3
Drawing No.
1707 - C120
Rev
A

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Consulting

PROJECT

306A LENAH VALLEY RD, LENAH VALLEY, TAS

Stormwater Management Plan

CLIENT

STEPHEN GATH

DATE

May 2018

Engineering · Renewable Energy · Project Management

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Contents

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AD Design & Consulting Pty Ltd
ACN 55 169 899 683

E. admin@addconsulting.com.au | A. 42 Bathurst, Hobart, Tas 7000|W.www.addconsulting.com.au

Document Status

Rev No.	Author	Status	Approved for Issue	
			Name	Date
A	DB	For Information	AD	

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1. Introduction

1.1 Background

Stephen Garth has engaged AD Design & Consulting for preliminary civil design and documentation for a 21-lot residential subdivision development at 306 A, Lenah Valley Road, Lenah Valley, Tasmania.

An assessment of the stormwater quantity and quality for the site has been prepared to demonstrate compliance with both the Hobart City Council Planning Scheme 2015 and State guidelines to support a residential development planning application under the Land Use Planning and Approvals Act 1993 and Building Application. This Stormwater Management Plan (SWMP) discusses the impacts associated with stormwater and any proposed infrastructure and mitigation options.

The aim of this SWMP is,

- To calculate the peak discharges from the pre-development and post-development site conditions and to assess any mitigation (detention) options that may be required to avoid overloading stormwater infrastructure, flooding, erosion and worsening of downstream conditions.
- To apply stormwater quality treatment measures to ensure the water quality objectives for the development are achieved.

1.2 Legislative Context

The Tasmanian State Stormwater Strategy provides a method to address recommendations of the Tasmanian State Policy on Water Quality Management 1997 (SPWQM). This emphasises management of stormwater at the source and highlights the importance of managing stormwater in new developments at the design, construction and operational stages. Best practice guidance on stormwater treatment options to achieve these targets are provided in the document Water Sensitive Urban Design - Engineering Procedures: Stormwater for Tasmania (2012).

The Hobart City Council Interim Planning Scheme 2015 (HCCIPS) further addresses the objectives of the State Stormwater Strategy. The HCCIPS Stormwater Management Code E7.0 applies to developments requiring management of stormwater. Applicants may be required to provide a report from a suitably qualified person advising of the suitability of: private and public stormwater systems for a proposed development or use; or a site for an on-site stormwater disposal system. Code E7.0 outlines acceptable stormwater quality and quantity targets.

1.3 Council Meeting

A meeting was held with Council stormwater hydraulics and hydrology engineers on the 23rd April to address Council's Request For Information (RFI) particularly concerns of stormwater drainage design, detention and treatment requirements.

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2. Site Overview

Land Owner	S Gath
Location	306 A Lenah Valley Road, Lenah Valley, Tas
Municipality	Hobart City Council
Title Reference	158907/2
Planning Controls	Hobart City Council Interim Planning Scheme 2015
Zoning	General Residence
Property Area	2.3 ha

Table 1: Site Details. Source: LIST © State of Tasmania

Figure 1: Location Plan. Source: annotated map and aerial from the LIST © State of Tasmania

2.1 Site Observations

The site is located approximately 130 m south of the New Town Rivulet with frontage onto Lenah Valley Road and is referred to as 306 A Lenah Valley Road, Lenah Valley, Tasmania. The total area is approximately 2.3 ha and typically grades south to north. This site has an existing dwelling, outbuildings, internal driveway and associated drainage which are to be removed with the existing dwelling to remain (Lot 17). The remainder of the site is semi-rural at the frontage (northern property boundary) becoming low density shrubbery and eventually bushland at the southern boundary of the property. This is a typically steep site with slopes greater than 20 % in some sections.

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3. Catchment Hydrology

3.1 Methodology

This assessment has been undertaken in accordance with Australian Rainfall and Runoff 2016 (ARR'16) and uses the new 2016 rainfall intensity, frequency and duration (IFD) data, which match the recently released temporal pattern ensembles for ARR'16. Design rainfall events are derived from these and applied within the XPSTORM model.

Rainfall assessment was completed using a lumped catchment approach to a location upstream of the existing internal road. The lumped catchment approach is endorsed by ARR'16 as a suitable method of deriving critical duration design storm events and is described by Figure 2.

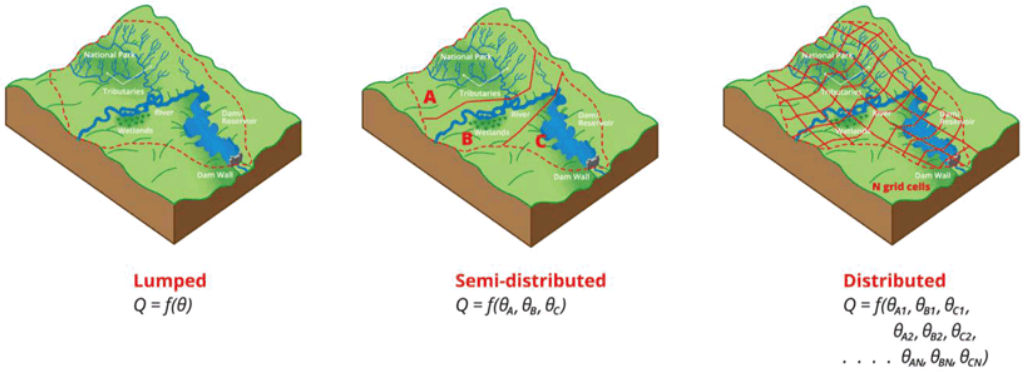

Figure 2: Catchment Modelling Options

Landuse information, including surface roughness and infiltration capacity, were derived from an assessment of the aerial photography available via LISTmap, historical aerial photography within the Google Maps environment and from the Australian Rainfall & Runoff (ARR) Data Hub.

3.2 External and Internal Catchments

The study area is a generally grassed bushland at the upper catchment changing to semi-urban area with a steep change in elevation. The ultimate catchment discharge location is the New Town Rivulet to the north with the internal drainage as described in the previous sections. The internal catchment area is approximately 2.3 ha with an 8.2 ha external catchment, which have been included in the catchment analysis.

An XPSTORM model was developed to assess the local hydrology, applying Laurenson's Method for hydrologic routing for the design storm temporal patterns. The existing land use is semi-urban shrubbery, existing concrete internal access, an existing dwelling and outbuildings. For modelling purposes, the fraction impervious for the internal catchment area was set to 5 % for existing and 38 % post development.

The contributing catchment area used to determine the critical duration storm and as such the peak flows for all associated sub-catchment areas was interpolated from contour data obtained from the LIST Map data sets and lidar data. The catchment area defined for the project is shown on Figure 3. Uniform areal distribution of 'point' design storms has been assumed in the hydrological analysis due to the relatively small area of the catchment.

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Figure 3: Catchment Extents

The following table outlines the existing catchment details.

Table 2: Pre-Development Site Catchment Details

Location	Area (ha)	Slope (%)	Fraction Impervious (%)	Pervious Area (ha)	Impervious Area (ha)
Internal	2.3	20-22	5	0.12	2.18
External	8.2	22-28	0	0	8.2

The proposed development introduces an increase in impervious areas from new paved road areas, drives access, roofs and other typical structures. The changed catchment characteristics are outlined in Table 3.

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Table 3: Post-Developed Site Catchment Details

Location	Area (ha)	Slope (%)	Fraction Impervious (%)	Pervious Area (ha)	Impervious Area (ha)
Internal	2.3	20-22	38	0.87	1.43

3.3 Rainfall Losses

Methods for modelling the proportion of rainfall that is "lost" to infiltration are outlined in both ARR1987 and ARR2016. The methods are of varying complexity, with the more complex options only suitable if sufficient data are available. The method most typically used for design flood estimation is to apply an initial and continuing loss to the rainfall. The initial loss represents the wetting of the catchment prior to runoff starting to occur, and the continuing loss represents the ongoing infiltration of water into the saturated soils while rainfall continues.

Initial losses of 0 mm and 0 mm and continuing loss rates of 3.8 mm/h and 0 mm/h were adopted for pervious and impervious areas within the internal area of the catchment, respectively. An initial loss of 0 mm and continuing loss rate of 3.8 mm/h was adopted for pervious areas of the bushland external catchment.

3.4 Design Rainfall

The rainfall Intensity-Frequency-Duration (IFD) curve and the storm temporal patterns used for the hydrological analysis were obtained from the Bureau of Meteorology for the ARR'16 data. The assessment was completed for the 5 % and 1 % AEP design storm events.

3.4.1 Critical Duration and Peak Flows

The critical rainfall durations have been calculated by applying the ARR'16 ensemble temporal patterns to the lumped catchment which allowed the identification of the critical duration for each AEP. The results of each of the ensembles and with the mean design storm identified for each ensemble are compared to determine the critical storm duration. This critical storm forms the basis and is the design rainfall applied to each smaller catchment (pre-development internal, post development internal, external catchment) to determine their respective peak flows. Figure 4 and Figure 5 show the mean design storm events with the critical storm duration identified for the 5 %, and 1 % AEP respectively.

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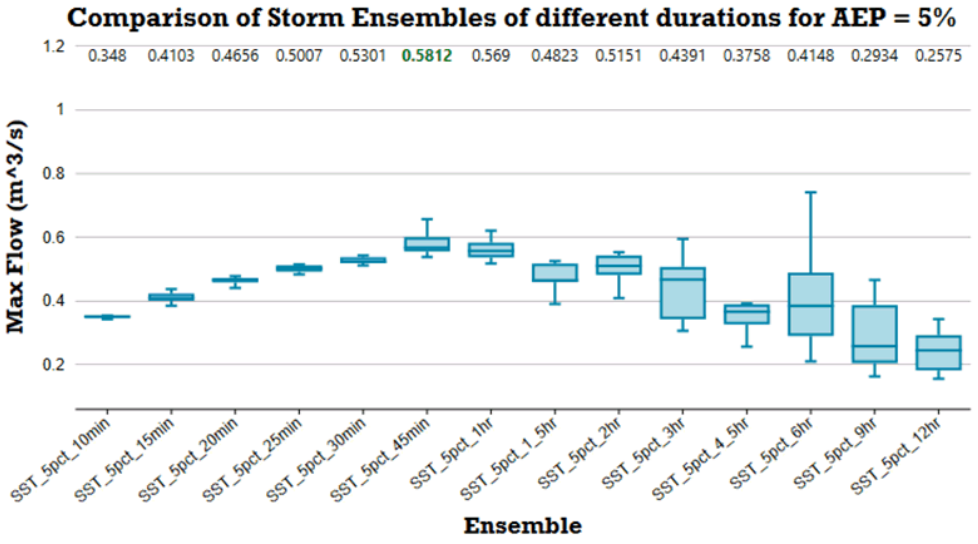

Figure 4: 5 % AEP Mean Design Storm for a Range of Durations for lumped catchment

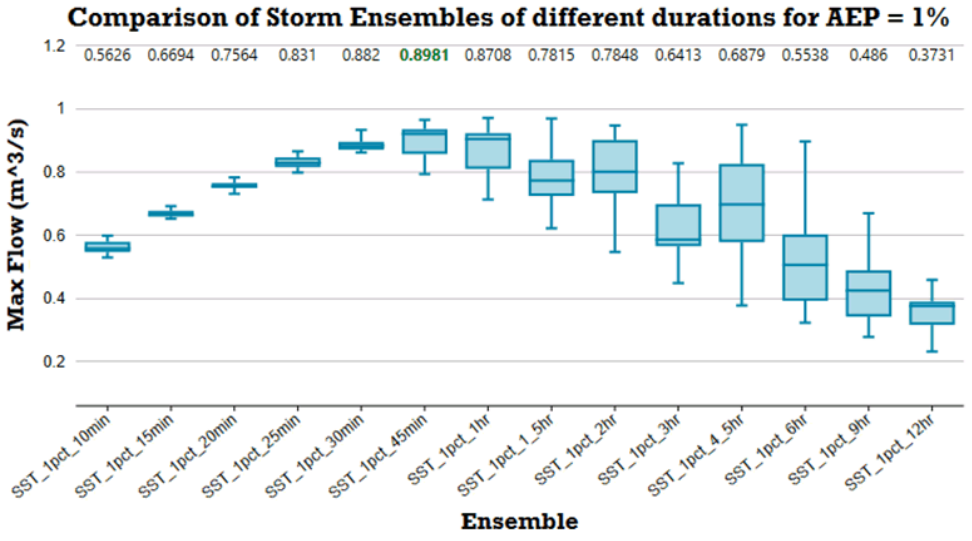

Figure 5: 1 % AEP Mean Design Storm for a Range of Durations for lumped catchment

The above figures indicate that the critical duration for the 5 % AEP ensemble is the 45-minute design storm event with the 1 % AEP ensemble being controlled by the 45-minute duration design storm event.

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3.5 Detention Requirements

Only stormwater runoff generated from the site development is to be detained and treated. The aim is to ensure post-development flows do not exceed pre-development flows by detaining the excess run off volume due to creation of impervious surfaces and releasing gradually into the stormwater network as to not detrimentally effect and overload downstream infrastructure and receiving environments.

Table 4: Pre- & Post Development Conditions

Site	Catchment Area (ha)	Fraction Impervious (%)	Pervious Area (ha)	Impervious Area (ha)	Q20 (m^3/s)
Pre-Development	2.3	5	2.18	0.12	0.203
Post-Development	2.3	38	1.43	0.87	0.249

For the purposes of this report we have calculated the required 5 % AEP critical storm detention volume to be 146 m^3. This has been calculated in XPSTORM using a surface area of 100 m^2 and flow limited to pre-development peak flow of 0.203 m^3/s. See Appendix A for Hydrographs.

For this development we are proposing not to detain the post-development flow increase from the site based on the following reasons:

- When considering the overall catchment area and the site location being only 150 m from the ultimate discharge point, the New Town Rivulet, it is sensible to convey the runoff generated within the development into the rivulet and downstream before runoff from the greater external catchment reaches the same point.
- It is estimated the time to peak flow for this external catchment that drains into the New Town Rivulet at this point is 8 hours (based on meeting with council) and so the internally generated run off must be detained for a significantly long period and then released. This would be impractical and so it may be better practice to drain the internally generated stormwater into the rivulet immediately.
- The site is in the lower third of the catchment and discharges into a channelised watercourse as do other surrounding properties. As per Hobart City Council website on storm surge and flood prone land any properties typically at elevation 3 m Australian Height Datum (Tasmania AHD83) are at risk in a 1 % AEP event. Using the Council's flood modelling data of the 1 % AEP event indicates the properties with frontage onto the rivulet at this location are not at risk and so additional stormwater runoff from proposed development will not cause or exacerbate any existing flooding issues.

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3.6 1% AEP Runoff

Figure 6: Two contributing external sub-catchments

There is a substantial external catchment approximately 8.2 ha upstream of the development which can be divided into two sub catchments (1) and (2) generating peak flows of 0.596 m^3/s and 0.222 m^3/s for the 1 % AEP events which will pass through the site. Sub-catchment 2 will be sheet flow with an existing cut off drain before the site directing overland flow north-east, east away from the site.

Sub-catchment 1 is the larger of the two, with a natural depression forming just before the southern boundary of the site concentrating the overland sheet flow. This flow path will follow the internal road and will continue down towards Lenah Valley Road. It is proposed that this concentrated runoff be attenuated using energy dissipaters to control flow velocities, ensure collection by a headwall configuration and mitigate flow bypass. The receiving downstream internal drainage network is to be sized to convey the 1 % AEP design event to the site's legal discharge point at the access from Lenah Valley Road.

At the previously mentioned meeting It has been noted by Council that the current drainage network in the immediate area upstream and downstream of the site is undersized and potentially unable to service the increased runoff generated by the development.

A proposed option is to implement a new, independent line from the site's legal discharge point (northern boundary) to the rivulet instead of connecting into the existing stormwater infrastructure. This would only service the site and its upstream external catchment and not detrimentally impact the existing system. It would be sized to service the 1 % AEP flows from sub-catchment 1 and run off from the internal site itself.

The internal catchment will utilise accesses and driveways to convey the runoff to the internal road which will attenuate and convey the runoff generated within the catchment for 1 % AEP event. The internal road grading slopes at 0.5 % east to west from the cul-de-sac towards the 90-degree bend and services most of the site except lots 7 to 13.

Table 5: 1 % AEP Design Storm Parameters

Catchment	Catchment Area (ha)	Fraction Impervious (%)	Pervious Area (ha)	Impervious Area (ha)	Q100 (l/s)
1	6.2	0	6.2	0	596
2	2.0	0	2.0	0	222

3.6.1 Climate Change Factors

In the RFI Council requested 30 % loading onto existing 1 % AEP peak flow values to account for climate change factors. ARR recommends applying the RCP 4.5 values in addressing changes due to climate change as such the Q100 flow is estimated to increase by 7.6 % by 2090. Table 6 illustrates the peak flow value increases to account for climate change using both recommendations.

Table 6: Climate change effects

Catchment	Q100 (l/s)	Q100 (l/s) [RCP 4.5]	Q100 (l/s) [30 %]
1	596	642	775
2	222	239	289
Internal	418	450	544

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4. Hydraulics

To illustrate feasibility of options outlined preliminary hydraulics calculations are conducted below to illustrate the pipe sizes required to service 1 % AEP design events.

4.1 Legal point discharge 1 (northern boundary)

The line that would service the external catchment in the 1 % AEP event was sized based on the flattest grade in the line approximately 5 % (cross road culvert) as if this section had capacity then the system can convey the runoff captured at the southern boundary of the catchment to the New Town Rivulet. See Table 7

A 525 mm is proposed to service this external sub-catchment 1 up to the 1 % AEP design event and runoff generated by the development (excluding lots 7-13) to 5 % AEP event. This will discharge at the northern boundary of the site at the access from Lenah Valley Road and is a legal point of discharge for the development.

Note, as highlighted above the internal road itself will act as an overland flow path for the internal site (excluding lots 7-13) for the 1 % AEP event.

Figure 7: Proposed drainage network to New Town Rivulet

Table 7: Preliminary calculations for point of discharge at northern boundary for 1 % AEP

Network	Pipe diameter (mm)	Grade (1 in X)	Capacity (l/s)	Input [Development] (l/s)	Capacity Remaining (l/s)
Cross Road Culvert	525	20	1250	642+239	369
Outlet	525	10	1768	642+239	887

The Table 7 results are conservative by assuming all external sub-catchment 2 (239 l/s) runoff are to be serviced by the 525 mm pipe. However, a portion of sub-catchment 2 will be diverted east away from the site by an existing cut off drain before the development.

Table 8: Preliminary calculations for point of discharge at northern boundary for 5 % AEP

Network	Pipe diameter (mm)	Grade (1 in X)	Capacity (l/s)	Input [Development] (l/s)	Capacity Remaining (l/s)
Cross Road Culvert	525	20	1250	419+159+268	404
Outlet	525	10	1768	419+159+268	922

For completeness, Table 8 shows peak flows for the 5 % AEP event for the external sub catchment 1, 2 and the internal post development flow (climate change factors applied). This illustrates there is sufficient capacity available.

4.2 Legal point discharge 2 (eastern boundary)

Runoff generated within lots 7 to 13 will be captured and conveyed through a piped network using the proposed easement along the eastern boundary of 306 A and western boundary of 270A Lenah Valley Road and connecting to this downstream network. Design is based on site topography and lot layout which enables more of the area of lots 7 to 13 to be effectively drained. This is the second legal point of this charge for the development.

Preliminary hydraulic calculations were conducted to illustrate the receiving network has capacity as observed in Table 9 and illustrated below,

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Figure 8: Downstream Network referenced in table below

Table 9: Capacity checks for downstream networks

Network	Pipe diameter (mm)	Grade (1 in X)	Capacity (l/s)	Input [lots 7-13] (l/s)	Capacity Remaining (l/s)
270A	300	10	398	58	340
Cross Road Culvert	300	100	126	58	67
Outlet	300	8	445	58	387

Table 9 indicates the input from lots 7-13 remove 14.5 % and 13 % from the 270 A and Outlet drainage networks respectively. The only concern is the cross-road culvert where the input is 46 % of the pipe's capacity which has been identified as an issue by Council previously. However, if surcharging occurs it would be onto Lenah Valley road and into the existing kerb and channel system (a defined flow path). Figure 8 shows five side entry pits with RCP 300 mm pipes able to capture and convey the runoff into the rivulet.

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4.3 External cut off drain

A bund infrastructure is proposed to convey runoff generated from external sub-catchment 1 at the southern boundary of lots 3 and 5 to prevent flood risk. Flows will be directed into the headwall configuration mentioned earlier. Preliminary calculations are shown in Table 10.

Table 10: Bund parameters and capacities

AEP (%)	Depth (m)	Side Slope (1 in x)	Natural Grade (1 in x)	Longitudinal Grade (1 in x)	Capacity (l/s)	Required Capacity (l/s)	Capacity Remaining (l/s)
5	0.5	2.00	3.57	200	535	264	271
1	0.5	2.00	3.57	200	535	406	129

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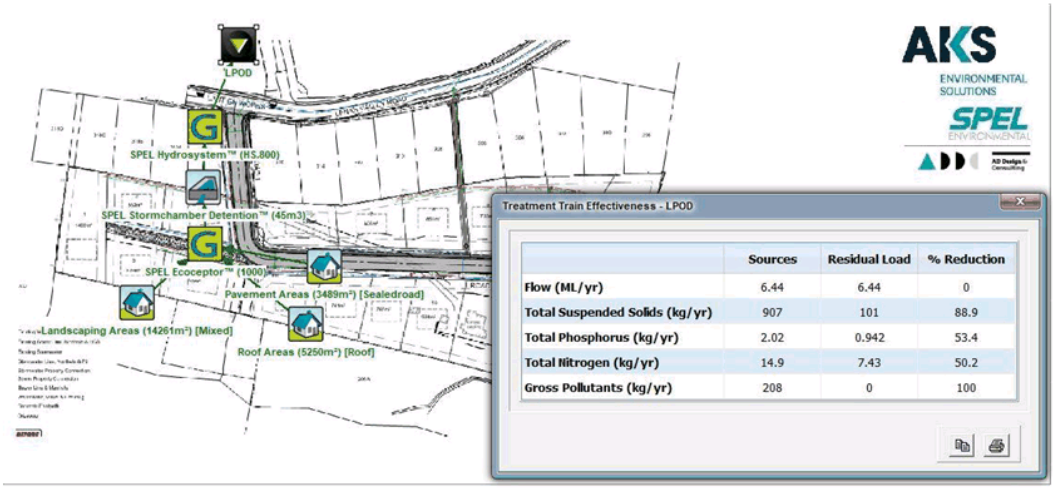
5. Stormwater Quality

The stormwater quality and treatment are to be achieved using the propriety products from AKS SPEL Environmental Integrated Water Solutions. Refer Appendix B for stormwater quality report.

The treatment train has been designed in MUSIC to ensure compliance with the planning scheme water quality objectives and will provide a cost-effective option for the development in the long term. The proposed treatment system will comprise of the following items:

- 1 x SPEL Ecoceptor (1000) – Primary Treatment;
- 1 x SPEL Hydrosystem (HS.800) – Tertiary Treatment.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.44	6.44	0
Total Suspended Solids (kg/yr)	907	101	88.9
Total Phosphorus (kg/yr)	2.02	0.942	53.4
Total Nitrogen (kg/yr)	14.9	7.43	50.2
Gross Pollutants (kg/yr)	208	0	100

Figure 9: Treatment train to achieve water quality objectives

An alternative option as discussed with Council at the meeting mentioned previously is to pay a contribution to Council, this is to be assessed in detailed design.

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6. Conclusion

This Stormwater Management Plan details the methodology and results of the stormwater quantity and quality aspects for the proposed residential development at 306 A Lenah Valley Road, Lenah Valley, Tasmania. The quantity modelling has been completed using XPSTORM in accordance with the requirements of Hobart City Council and Australian Rainfall and Runoff 2016 – where appropriate.

The results of the quantity analysis indicated that the proposed closed detention basins can mitigate the peak discharges that will occur in response to the increase of fraction impervious area within the catchment. The preliminary detention basin design indicates an area of 146 m^3 is required to mitigate the peak discharge for events up to the 5 % AEP design storm event.

However, due to the site's location, general topography and considering the greater external catchment it was determined that best management practice was to implement drainage infrastructure to capture and convey the runoff from the upstream external catchment and generated within the site into a piped network and discharged into the New Town Rivulet.

The water quality assessment has been completed in MUSIC in accordance with the requirements of Hobart City Council and Melbourne Water guidelines. It is proposed that the site treated using the specified proprietary products from SPEL Environmental Integrated Water Solutions. This system will be able to treat the catchment run off and achieve the required water quality objectives. The option to pay a contribution to Council has also been considered and to be assessed in detailed design.

In conclusion, this stormwater management plan has:

- Provided legal discharge points for the development,
- Provided 1 % AEP overland flow paths to prevent inundation,
- Outlined a feasible stormwater system for the development,
- Mitigated the effects of the development on downstream infrastructure both in terms of peak flows and water quality as required by the HCCIPS Stormwater Management Code E7.0

AD Design & Consulting

Appendix A Hydrographs

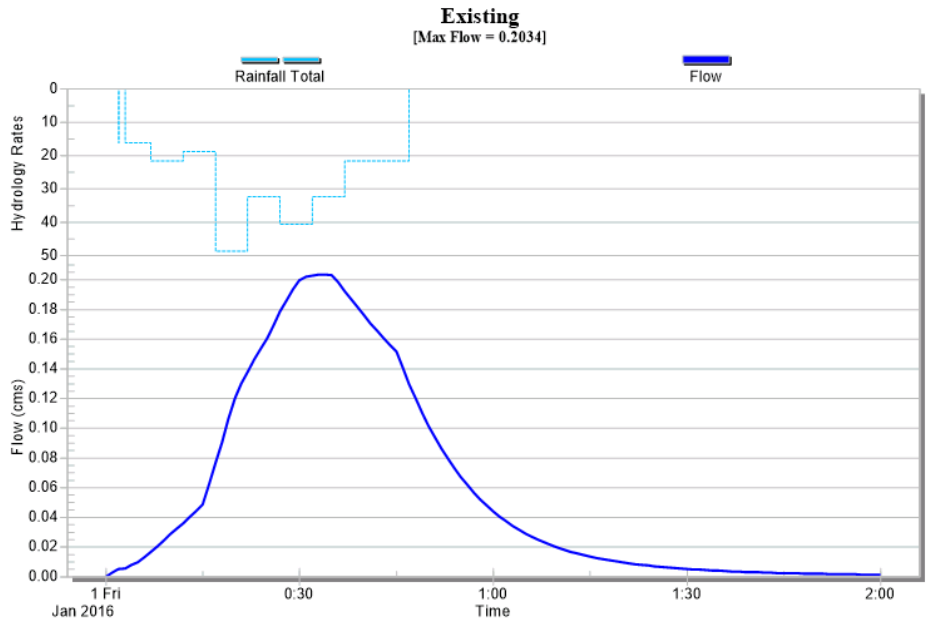

Figure 10: 5 % AEP hydrograph for pre-development site conditions

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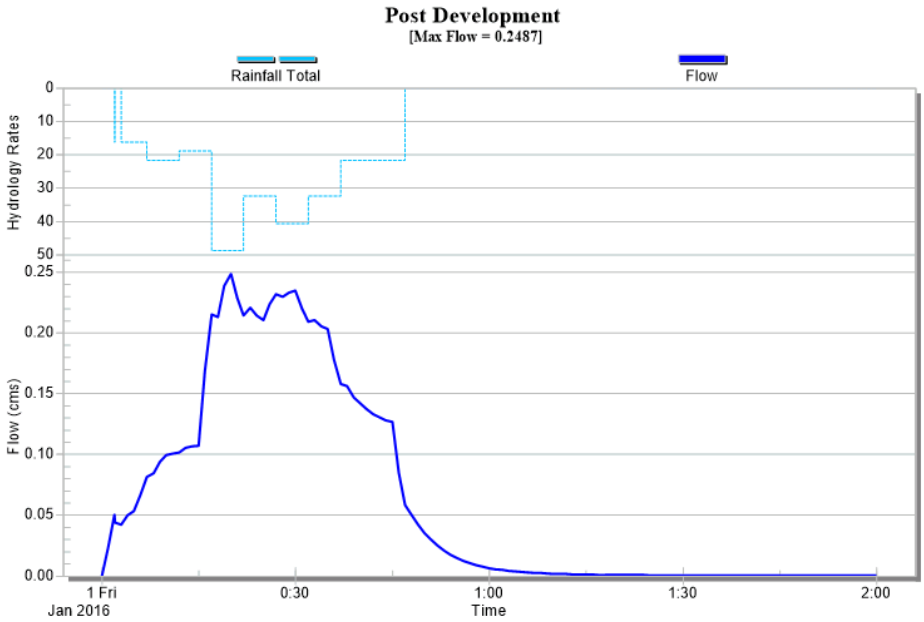

Figure 11: 5 % AEP hydrograph for post development site conditions

AD Design & Consulting

Appendix B AKS SPEL Stormwater Quality Report

AKS ENVIRONMENTAL SOLUTIONS

SPEL Stormwater Management Proposal

AD Design

Proposed Stormwater Plan for 306A Lenah Valley Rd, Lenah Valley

Document No: 58174_SWMP_R1

Report Date: May 9, 2018

INTEGRATED WATER SOLUTIONS
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SPEL

AKS ENVIRONMENTAL SOLUTIONS

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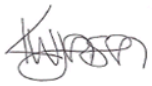
SPEL ENVIRONMENTAL

AKS ENVIRONMENTAL SOLUTIONS

Document Control Record

Approved By:	Kurt Jensen
Position:	Environmental Division Manager
Signed:	
Date:	9 May 2018

SPEL ENVIRONMENTAL

Revision Status

Revision No	Description Of Revision	Date:	Approved:
1	SUBMISSION	9 May 2018	

AKS Environmental
ABN 88 151 483 984
191 Station Street
Corio VIC 3214

Telephone: + 61 3 5274 1336
Fax: +61 3 5274 9966
Email: kurt@aksindustries.com.au

Confidentiality

Section 1

1 Confidentiality

1.1 Conferee

This entire document has been presented to AD Design as **commercial-in-confidence** on the basis that it should not be disclosed in any part or whole to any third party without written consent from AKS Environmental.

This document contains:

- **Intellectual Property** – Material and design that are commercially sensitive intellectual property
- **Pricing Schedule** - Information from AKS Environmental and details about commercially sensitive pricing

1.2 Request for Information

Please direct all enquiries regarding this submission to:

Kurt Jensen | Environmental Division Manager
AKS Environmental
191 Station Street
Corio Victoria 3214

Telephone: + 61 3 5274 1336
Fax: +61 3 5274 9966
Email: kurt@aksindustries.com.au

AKS ENVIRONMENTAL SOLUTIONS

Executive Summary

Section 2

SPEL ENVIRONMENTAL

2 Executive Summary

SPEL Environmental has been commissioned by **AD Design** to prepare a Conceptual Stormwater Management Plan (CSMP) for the proposed precinct development located at 306A Lenah Valley Rd, Lenah Valley.

The stormwater quality modelling was undertaken using the MUSIC version 6.2 software. The modelling results (see **Table 2.1**) indicate the 70%, 80%, 45% and 45% reduction targets for Gross Pollutants (GP), Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN) respectively can be achieved.

Table 2.1: Treatment Train Effectiveness

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Reduction Target (%)
Flow (ML/yr)	6.44	6.44	**0**	0
Total Suspended Solids	922	106	**88.9**	80
Total Phosphorus	2.02	0.939	**53.6**	45
Total Nitrogen	15.2	7.56	**50.2**	45
Gross Pollutants	208	0	**100**	70

Stormwater management for the site is achieved using the following devices:

- One (1) x SPEL Ecoceptor 1000
- One (1) x SPEL Hydrosystem HS.800
- SPEL Stormchamber Detention 114m3

AKS ENVIRONMENTAL SOLUTIONS

Overview

Section 3

SPEL ENVIRONMENTAL

3 Overview

3.1 Company Background

SPEL Environmental is a market leader in the environmental compliance sector since 1991. During that time, we have established many satisfied customers who return to SPEL Environmental when they require new and more advanced technological solutions and services. SPEL Environmental devotes a great deal of time, effort and financial investment to maintain our position as a market leader in a rapidly developing field. We employ the latest industry knowledge and advancements, providing our customers with the most progressive stormwater improvement technology.

SPEL Environmental develops long term partnerships with our clients and providing on-going technical support which include a comprehensive scheduled service and maintenance program. We take pride in delivering quality workmanship and customer satisfaction that has created a market reputation, taking SPEL Environmental to where it is today. In order maintain this vision and standard, we are heavily committed to Australian manufacturing and site water quality testing programs to control and maintain consistent quality.

SPEL Environmental is committed to the health and safety of its people and protecting the environment in which they work. We understand the challenges associated with a project of this nature and the physical environment involved. Our safety, environmental and quality standards apply to all our people, products and services, providing certainty that the client's safety, environmental and quality requirements are adhered to.

3.2 Introduction

This report has been prepared by SPEL Environmental to accompany and be considered part of a Development Application (DA) for a proposed precinct development located at 306A Lenah Valley Rd, Lenah Valley. The site is located within the catchment of the City of Hobart.

3.3 Site Locality

The subject site is bounded by Lenah Valley Rd to the North. Situated in the City of Hobart the site has a total area of 23.0ha (see **Figure 3.1**).

Figure 3.1 Site Location

3.4 Site Layout

The proposed development is presented on **Figure 3.2**.

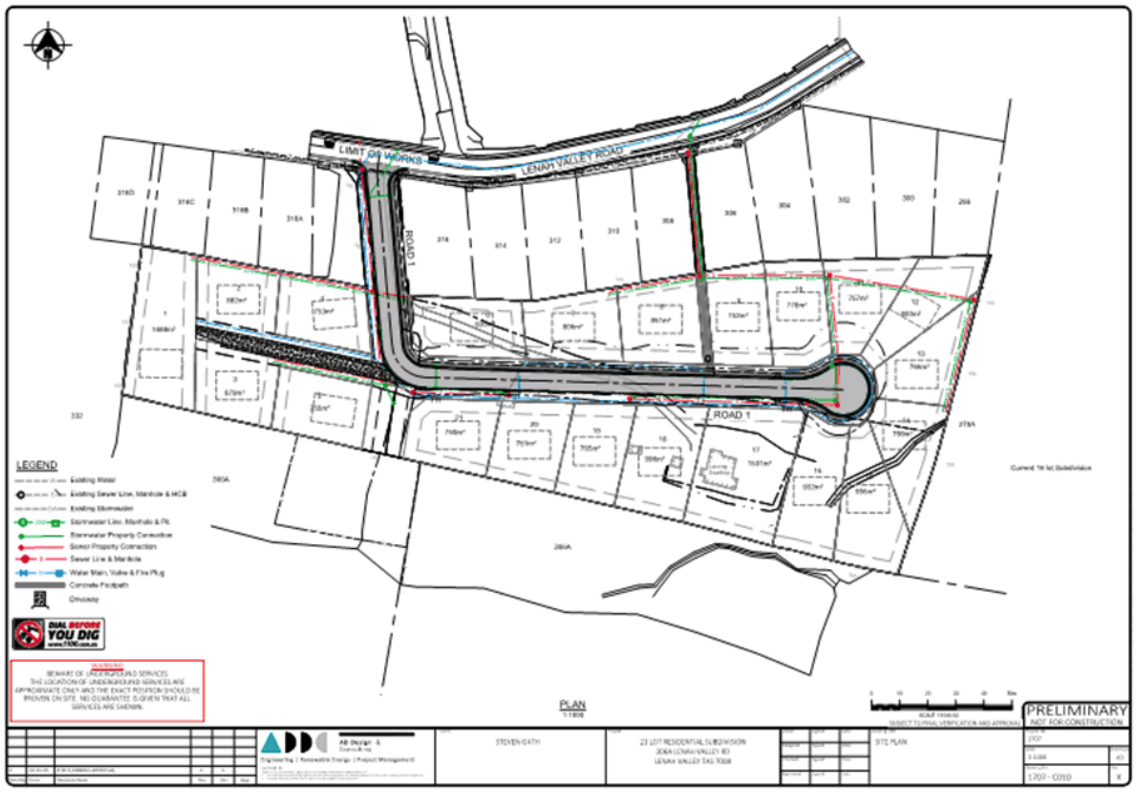


Figure 3.2 Proposed Site Layout

AKS ENVIRONMENTAL SOLUTIONS

Quality Management – Operational Controls

Section 4

SPEL ENVIRONMENTAL

4 Quality Management – Operational Controls

4.1 Water Quality Objectives

Melbourne Water (2016) requires treatment of stormwater so that annual pollutant loads achieve targets set out in the Best Practice Environmental Management Guidelines (BPEMG). These are:

- 80% reduction in Total Suspended Solids (TSS) from typical urban loads;
- 45% reduction in Total Nitrogen (TN) from typical urban loads;
- 45% reduction in Total Phosphorus (TP) from typical urban loads; and
- 70% reduction in Gross Pollutants (GP) from typical urban loads.

4.2 Treatment Train

Based on the site characteristics and the range of available Stormwater Quality Improvement Devices (SQIDs), this study has developed an overall concept that will satisfy the requirements of downstream environmental protection. **Figure 4.1** shows a schematic representation of the proposed treatment train elements.

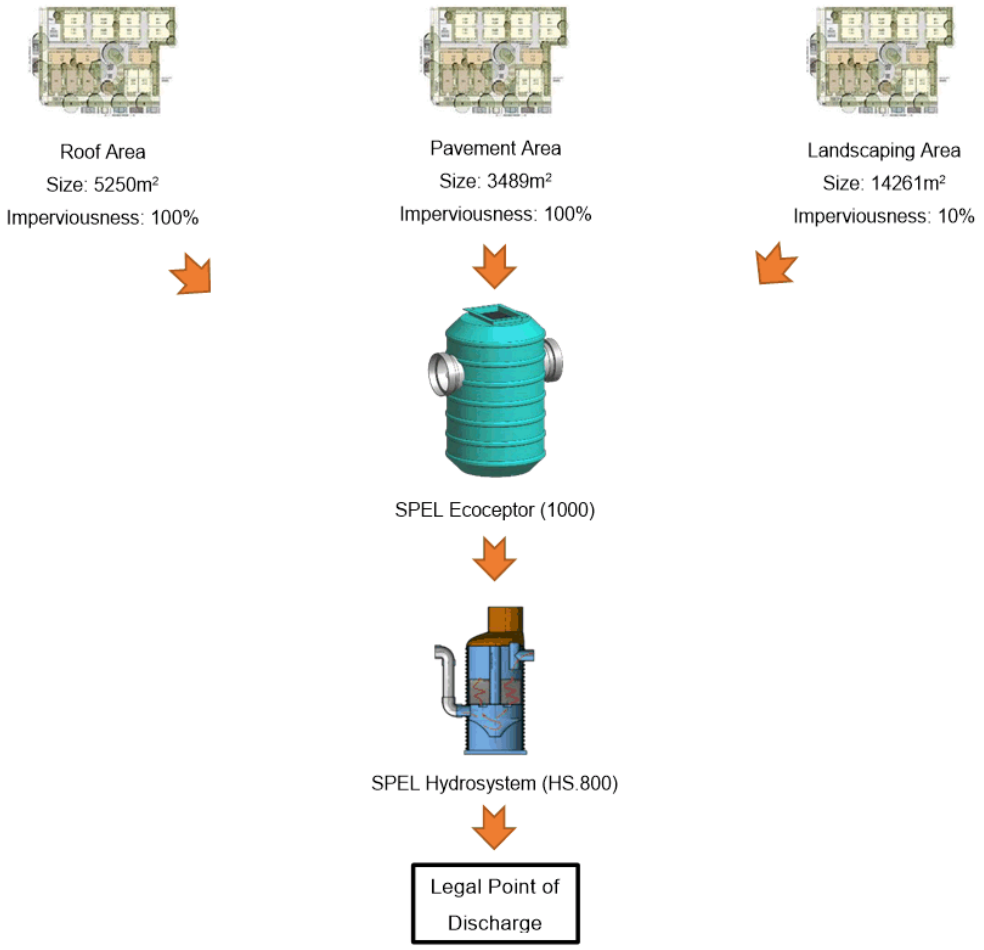


Figure 4.1 Treatment Train Schematic

AKS ENVIRONMENTAL SOLUTIONS

4.2.1 SPEL Ecoceptor – General Information

The SPEL Ecoceptor™ is vertically configured, single chamber fibreglass Stormwater Quality Improvement Device (SQID) designed for use in stormwater drains (see **Appendix 1**). The Ecoceptor separates and captures gross pollutants, sediments and silt including light liquids (petroleum hydrocarbons). These, in turn, rise to the top of the chamber (below invert) and are secured in the separation zone till the system is maintained.

- **Vortex separation -** The SPEL Ecoceptor™ has a hydraulic force on incoming flows which produce a vortex cleaning action preventing captured pollutants, including fine TSS, from resuspending and discharging.
- **Ease of maintenance –** The cylindrical shape of the SQID with its tapered base (there are no square corners) affords efficient, effective and thorough cleaning of accumulated pollutants; ***this process if always done without the need of jetting and hosing the accrued mass of pollutants in the base of the system, a process which is common to all concrete systems.***

SPEL engages ongoing site tests for water quality of the Ecoceptor devices continually across a wide spectrum of catchments on Australia`s east coast. We have pleasure in submitting the following independently analysed NATA test results:

- **TSS -** Lab, site testing in conjunction with flow modelling reveals reductions of >80% of TSS.

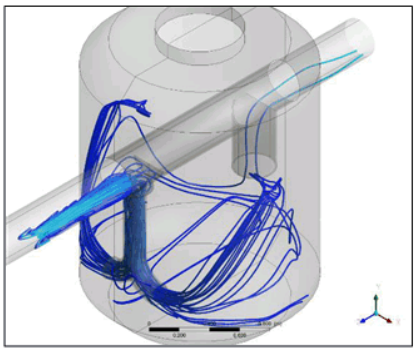


Figure 4.2: Flow in the SPEL Ecoceptor

SPEL ENVIRONMENTAL

4.2.2 SPEL Hydrosystem – General Information

The SPEL Hydrosystem is a tertiary stromwater treatment filtration device targeting known pollutants of concern including Total Suspended Solids (TSS); Nutrients (TP & TN); Gross Pollutants; as well as Heavy Metals (i.e. Cu, Zn, Pb). This specialist stormwater filtration system is installed within conventional concrete manholes, polyethylene and fibreglass shafts. The pre-fabricated and pre-assembled SPEL Hydrosystem is quickly and safely installed using onsite diggers (see Figure 4.3 below). This system is designed for an array of applications with treatment flow rates ranging from 2.5l/s up to 144l/s. The Hydrosystem is designed in an off-line configuration and operates at full treatment flow with a hydraulic fall of 250mm across the system.

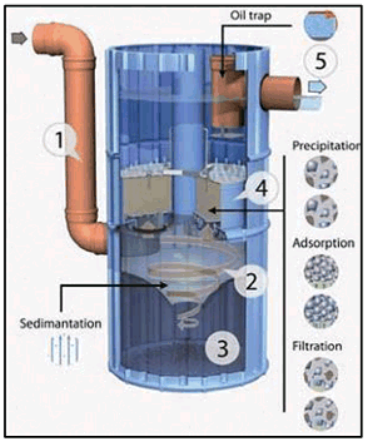
Figure 4.3: SPEL Hydrosystem (SHS.1000) installation using onsite digger

4.2.2.1 International Validation and Testing

SPEL Hydrosystem have been lab and field tested by several Universities and Institutes across Germany. The German Institute for Structural Engineering (DIBt) granted a general technical approval (Z-84.2-4)1 passing all test conditions under heavy trafficable conditions. Field test data has been obtained across Germany including Bremer Straße in Hamburg-Harburg2 reinforcing the above approval.

Function Principles:

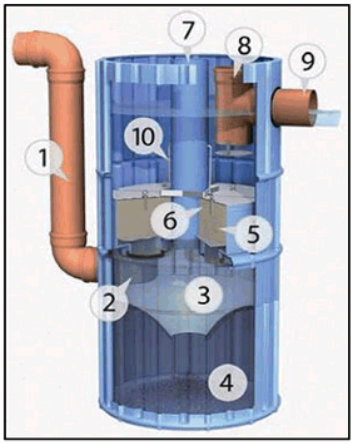
1. The rainwater from the connected area is fed into the basal section of the filter housing. The angled inlet generates a radial flow pattern.
2. The hydrodynamic separator converts turbulent waters into a radial laminar flow pattern, generating particle sedimentation, particularly of the sand fraction.
3. This takes place over an inlet to the lower section of the filter shaft. The sediment is retained in a silt trap chamber below the separator. The silt trap needs to be emptied out at intervals.
4. In the central section of the filter housing is the actual filter,
5. Filter Element: Metal. The filter element filters out the fine materials in an up-flow process and dissolved materials are precipitated and adsorbed. The filter can be backwashed. When exhausted the filter is easily exchanged.
6. The filter element is easily pulled up via shaft openings.
7. Above the filter element is the clean water. It passes via a blockade of light substances and then flows over the outlet into a soak away.



Schematic of SPEL Hydrosystem Process

Product Components:

1. Rainwater Inlet (DN 200).
2. Angled Inlet.
3. Separator Chamber.
4. Silt Trap.
5. Filter Elements (4 No.).
6. Removal Device for Filter Element.
7. Overflow.
8. Blockade of light substances and suction pipe
9. Outlet to storage or to waste.
10. Locking buoyancy control system



Schematic of SPEL Hydrosystem Components

4.3 Maintenance Procedure

The SPEL treatment train specified above is an engineered stormwater treatment solution for the reduction in TSS, nutrients, gross pollutants and hydrocarbons. The Stormwater Quality Improvement Devises (SQIDs) identified in the stormwater treatment solution will required on-going maintenance for a prescribed period as specified by their respective council/authority. A draft of the proposed treatment train maintenance contract can be seen in **Appendix 2**.

AKS ENVIRONMENTAL SOLUTIONS

Quality Analysis - MUSIC

Section 5

SPEL ENVIRONMENTAL

5 Quality Analysis – MUSIC

Water quality modelling has been undertaken of the post-development (mitigated) scenario using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software to demonstrate the load based reduction targets are achieved. A stormwater treatment train has been developed and modelled to determine the effectiveness of the proposed system in achieving the relevant water quality objectives.

5.1 Rainfall and Evapotranspiration Parameters

Table 5.1 summarized the meteorological and rainfall-runoff data used in the MUSIC model.

Table 5.1 Meteorological and Rainfall Runoff Data

Parameter	Value
Rainfall station	086071
Time step	6 minute
Modelling period	1959
Mean annual rainfall (mm)	655 mm
Evapotranspiration	1050 mm

5.2 Catchment Parameters

Based on the proposed land uses within the development, the subject site has been modelled as an urban source node. The rainfall-runoff parameters and pollutant generation parameters are based on parameters recommended by Melbourne Water (2016) (**Tables 5.2** and **5.3**).

Table 5.2 Rainfall Runoff Parameters

Parameter	All Nodes
Rainfall threshold (mm)	1.0
Soil storage capacity (mm)	120
Initial storage (% capacity)	25
Field capacity (mm)	50
Infiltration capacity coefficient a	200
Infiltration capacity exponent b	1
Initial depth (mm)	10
Daily recharge rate (%)	25
Daily base flow rate (%)	5
Daily deep seepage rate (%)	0

Table 5.3: Pollutant Export Parameters for Urban Sites

Catchment ID		Total Suspended Solids [log (mm/L)]		Total Phosphorous [log (mm/L)]		Total Nitrogen [log (mm/L)]	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Hardst and	Storm Flow Concentration	2.2	0.32	-0.45	0.25	0.42	0.19
	Base Flow Concentration	1.1	0.17	-0.82	0.19	0.32	0.12
Roof	Storm Flow Concentration	2.2	0.32	-0.45	0.25	0.42	0.19
	Base Flow Concentration	1.1	0.17	-0.82	0.19	0.32	0.12

5.3 Treatment Node Parameters

The following sections describe the modelling parameters applied to MUSIC for each of the treatment nodes included as part of the water quality assessment.

5.3.1 SPEL Ecoceptor Parameters

SPEL engages ongoing site tests for water quality of the Stormceptor devices continually across a wide spectrum of catchments on Australia`s east coast. The SPEL Stormceptor parameters utilised within MUSIC are summarised in **Table 5.4**:

Table 5.4 SPEL Ecoceptor Treatment Node Parameters

Catchment ID	SPEL Ecoceptor
Are the proposed pollutant reduction efficiencies independently verified using a method suited to local conditions?	Yes
Does the data provided include performance results under dry weather flows (to account for potential pollutant leeching?)	Yes
It the assumed high-glow bypass rate consistent with manufacturer specifications?	Yes
High Flow by-pass (m^3/s)	0.024
Low Flow	0.000
TSS Input (mg/L) Output (mg/L)	100 31
TN Input (mg/L) Output (mg/L)	100 79
TP Input (mg/L) Output (mg/L)	100 6.7
Gross Pollutants Input (mg/L) Output (mg/L)	15 0

5.3.2 SPEL Hydrosystem Parameters

A generic node has been utilized in MUSIC, for the purpose of simulating treatment efficacy of SPEL Hydrosystem and the transform function in the node has been modified based on SPEL Environmental's 2nd and 3rd Party field testing product data. These test results and papers are available upon request from SPEL Environmental. The SPEL Hydrosystem parameters utilised within MUSIC are summarised in **Table 7.5**.

Table 7.5: SPEL Hydrosystem Parameters

Catchment ID	SPEL Hydrosystem
Are the proposed pollutant reduction efficiencies independently verified using a method suited to local conditions?	Y
Does the data provided include performance results under dry weather flows (to account for potential pollutant leeching?)	Y
It the assumed high-glow bypass rate consistent with manufacturer specifications?	Y
High Flow by-pass (m^3/s) (for each separate system)	0.005
Low Flow	0.000
TSS Input (mg/L) Output (mg/L)	1000 90
TN Input (mg/L) Output (mg/L)	50 26.5
TP Input (mg/L) Output (mg/L)	5 2.95
Gross Pollutants Input (mg/L) Output (mg/L)	15 0

5.4 MUSIC Results

Results of the MUSIC modelling for the treatment train effectiveness are summarised in **Table 5.6**. The results indicate the 80%, 45%, 45% and 70% reduction target for TSS, TP, TN and gross pollutants respectively are achieved. A screen capture of the MUSIC modelling results is included as **Figure 5.2**.

Table 7.6: Treatment Train Effectiveness

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Reduction Target (%)
Flow (ML/yr)	6.44	6.44	**0**	0
Total Suspended Solids	922	106	**88.9**	80
Total Phosphorus	2.02	0.939	**53.6**	45
Total Nitrogen	15.2	7.56	**50.2**	45
Gross Pollutants	208	0	**100**	70

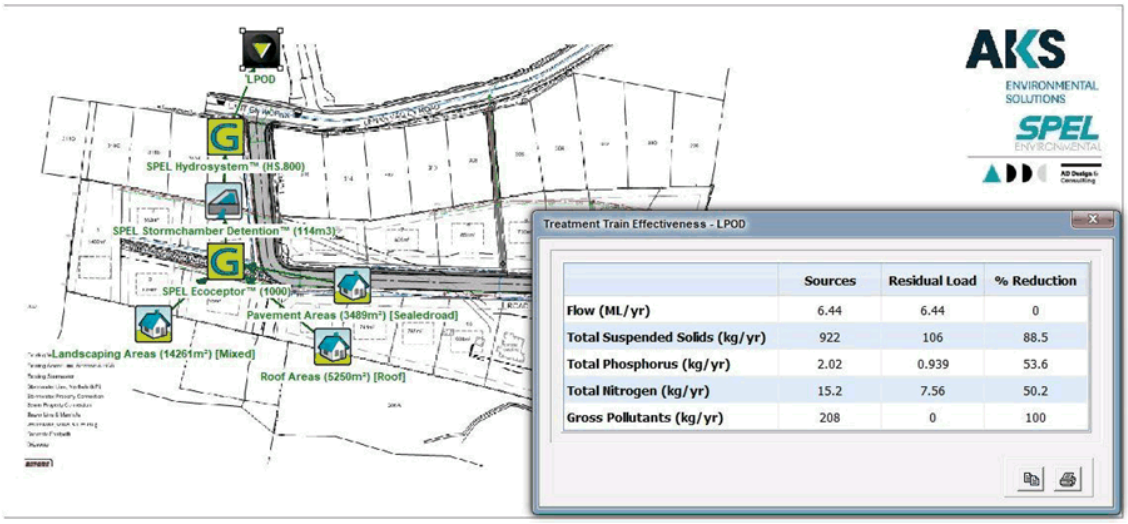


Figure 5.2: Treatment Train Effectiveness & Layout

AKS ENVIRONMENTAL SOLUTIONS

Summary and Recommendation

Section 6

SPEL ENVIRONMENTAL

AKS ENVIRONMENTAL SOLUTIONS

6 Summary and Recommendation

Based on the water quality assessment using the MUSIC software, it is found that the pollutant reduction targets can be achieved by adopting the SQIDs specified in **Table 6.1**.

Table 6.1: Recommended Stormwater Quality Improvement Devices

Stormwater Quality Improvement Device	Quantity
SPEL Ecoceptor (1000)	1
SPEL Hydrosystem (HS. 800)	1
SPEL Stormchamber Detention	114m3

The recommended SQIDs are designed to capture stormwater at the downstream end of the drainage network and treat the runoff prior to discharging into the local waterway. The pollutant reduction targets achieved (as modelled in MUSIC) are summarised in **Table 6.2**.

Table 6.2: MUSIC modelling results

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Reduction Target (%)
Flow (ML/yr)	6.44	6.44	**0**	0
Total Suspended Solids	922	106	**88.9**	80
Total Phosphorus	2.02	0.939	**53.6**	45
Total Nitrogen	15.2	7.56	**50.2**	45
Gross Pollutants	208	0	**100**	70

SPEL ENVIRONMENTAL

References

Section 7

7 References

Melbourne Water (2016). *MUSIC Guidelines – Input Parameters and modelling approaches for MUSIC users in Melbourne Water's service area 2016*

List of Appendices

AKS ENVIRONMENTAL SOLUTIONS

Appendix 1 – SPEL SQID Product Guides

SPEL ENVIRONMENTAL

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

Introduction

The SPEL Ecoceptor is a hydrodynamic stormwater quality improvement device (SQID) that has a unique treatment action producing low velocity conditions producing discharge water quality outcomes complying to statutory guidelines across Australia. It has been independently tested in Australia and is suitable for all types of conditions and soil-type loadings.

It separates and captures sediments, silt, total suspended solids, nutrients and total petroleum hydrocarbons (TPH) and oil and grease. TPH and oil & grease rise to the "oil-capture" zone of the treatment chamber and are contained in all flow events. Captured pollutants cannot resuspend or scour from the treatment chamber in all flow events.

Areas with a high fraction of impervious surfaces,including car parks, ports, streeetscapes, roads, subdivisions and industrial estates that require stormwater treatment are ideal for the SPEL Ecoceptor. MUSIC node is available on request.

The one-piece, self-contained fibreglass construction , is lightweight and yet robust in strength making it simple and cost-effective when performing installations.

No site assemblage is required as is the case with the heavier concrete devices. The SPEL Ecoceptor fibreglass SQID can be installed in all types of trafficable zones, including vehicular truck (Class D) and aircraft loadings (Class G).

The cyclinderical shape of the SPEL Ecoceptor with its sloped cone-configured base ensures sediment accretes at the centre of the SQID`s base affording easy and simple cleaning.

The fibreglass gel coat ensures that oil and grease are removed without sticking to the sides of the internal walls.

Flow rates on standard units of up to 1400 LPS and can fit pipe sizes from 225mm to 1200mm (other sizes available on request.)

Maintenance

INSPECTION AND CLEANING

The regularity of inspections of the SPEL Ecoceptor is contingent on the features and properties of the catchment area.

SPEL recommends an inspections of the Ecoceptor at the end of the first month after installation to determine the volume of trapped silt and pollutants.

Information sourced can be useful in factoring the frequency of on-going inspections or cleaning operations.

In the event of excessive rain or an oil spill, an inspection is recommended immediately upon such an event.

Ascertain silt depth and if build-up is evident, then a vacuum-loader truck should be engaged for the cleaning of the tank.

SPEL Ecoceptor cleaning procedure is simple, by simply lifting the external lid (two persons may be required), resting it securely in a safe manner and then inserting suction hose into the chamber.

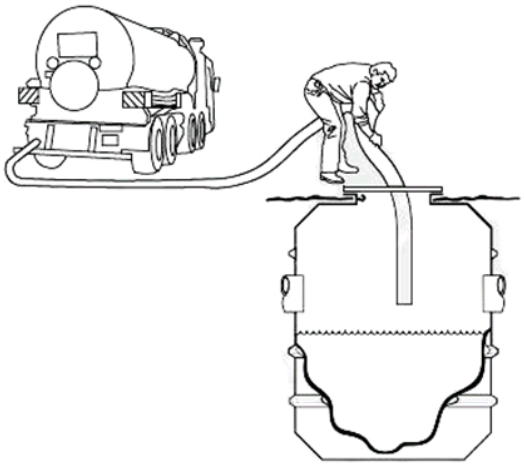
Ensure that the chamber is thoroughly cleaned of all refuse and debris before accessing the chamber - if required.

The chamber is cleaned by inserting the suction hose through the manhole at ground level.

Always commence cleaning from the inlet side of the chamber and ensure on completion of the cleaning operation that the lid is secured to its normal position (and locked if necessary) before departing the site.

IMPORTANT

In the unlikely event of the chamber having to be entered ensure absolutely that all Workplace Health and Safety directives and Confined Space Regulations are strictly adhered to, including wearing long-arm rubber gloves and the appropriate footwear in the event of coming into contact with sharp objects.



VICTORIA & TASMANIA OFFICE

PO Box 292
North Geelong BC VIC 3215

191 Station Street
Corio VIC 3214

Phone: + 61 3 5274 1336
Fax: +61 3 5274 9966

STATE CONTACTS

New South Wales	61 2 8838 1055
Canberra	61 2 6128 1000
Queensland	61 7 3277 5110
Victoria & Tasmania	61 3 5274 1336
South Australia	61 8 8275 8000
West Australia	61 8 9350 1000
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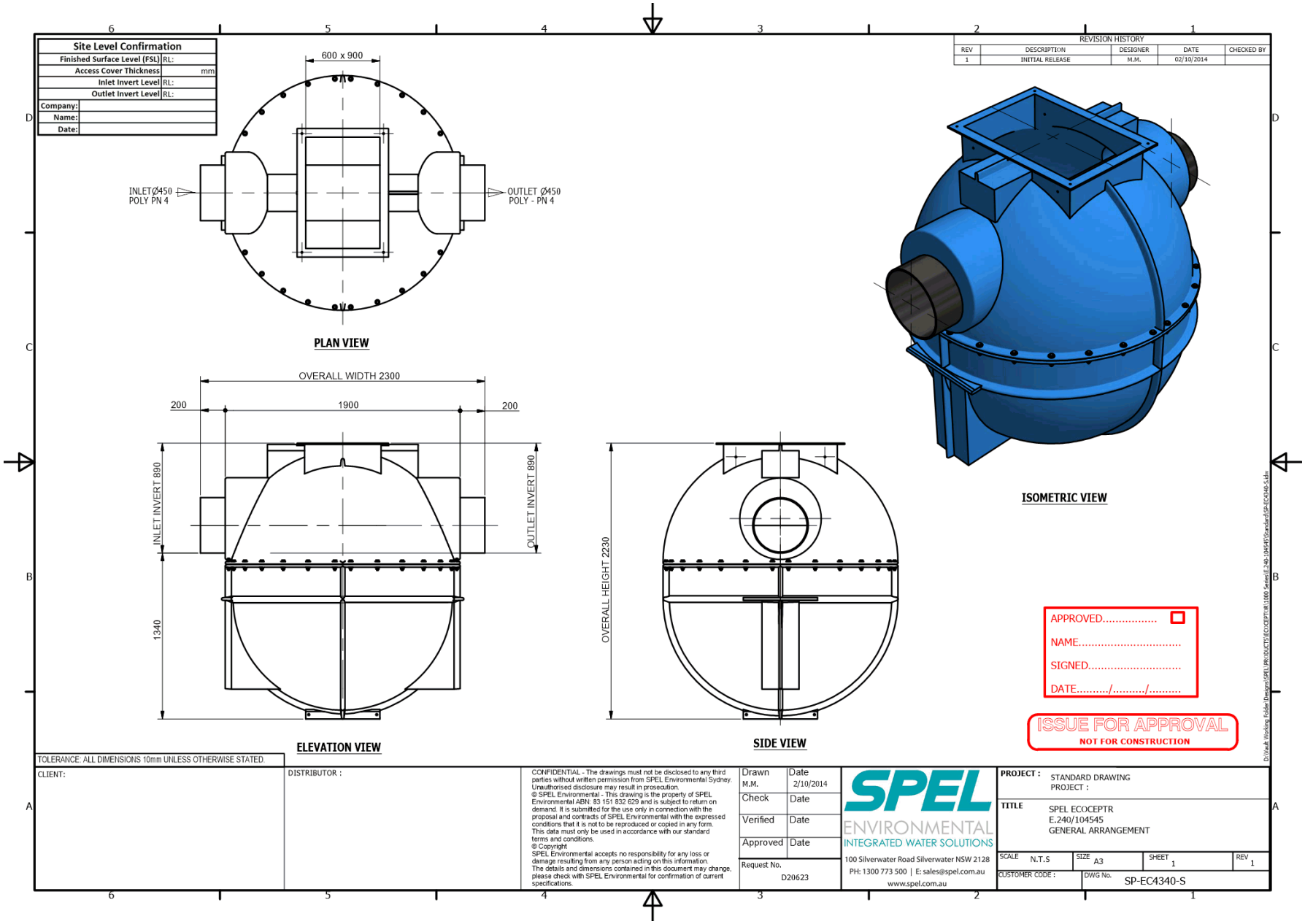
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Access Cover Thickness mm
Inlet Invert Level RL:
Outlet Invert Level RL:
Company:
Name:
Date:
REVISION HISTORY
REV | DESCRIPTION | DESIGNER | DATE | CHECKED BY
1 | INITIAL RELEASE | M.M. | 02/10/2014
600 x 900
INLET Ø450 POLY PN 4
OUTLET Ø450 POLY - PN 4
PLAN VIEW
ISOMETRIC VIEW
OVERALL WIDTH 2300
200
1900
200
INLET INVERT 890
OUTLET INVERT 890
1340
ELEVATION VIEW
OVERALL HEIGHT 2230
SIDE VIEW
APPROVED.....
NAME.....
SIGNED.....
DATE...../...../.....
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SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au
PROJECT : STANDARD DRAWING
PROJECT :
TITLE SPEL ECOCEPTR
E.240/104545
GENERAL ARRANGEMENT
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SPELFilter Hydrosystem

Environmentally aware and efficient.

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SPEL ENVIRONMENTAL
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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.

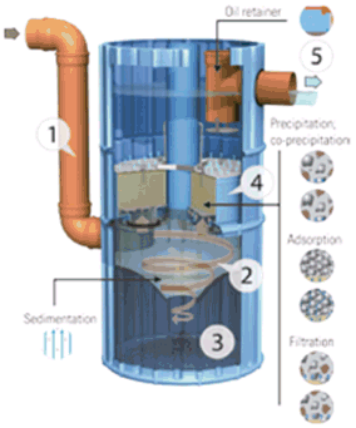
A settling funnel to the silt trap chamber entrance ensures sediments are not remobilised. Above the separator are the filter inserts, covering the entire diameter of the unit's housing, where the second treatment step takes place.

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.

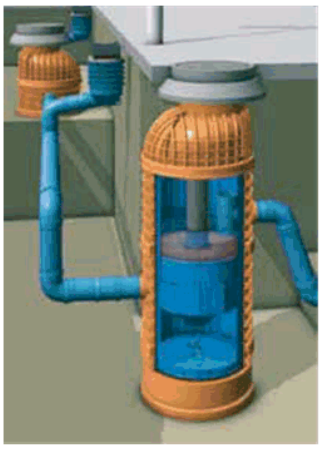
Housing material: Polyethylene
Housing weight: 68 kg
Total weight: 220 to 350 kg depending on filter type
Packing unit SPEL Hydrosystem 1000: Pallet: 1 piece

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)



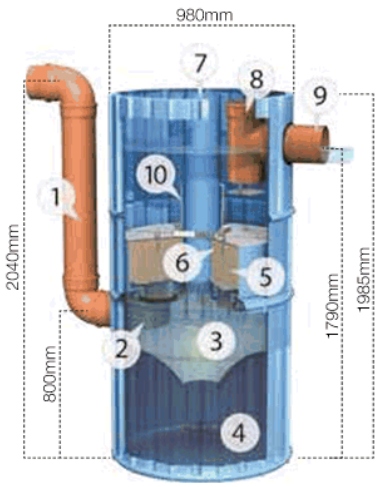
Example: Installation in a shaft made of plastic

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.

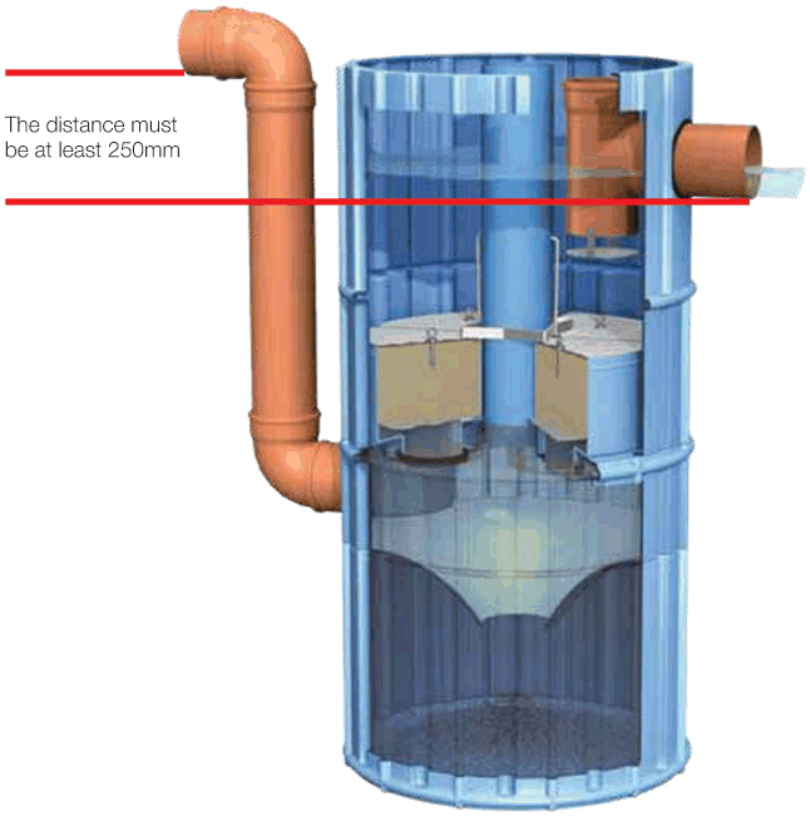
Type	Nature of the surface to be drained	Weight of filter element / piece	Total Weight
Heavy traffic with technical approval (Z-84.2-4)	Highly polluted traffic areas (car parks in front of supermarkets, main roads, HGV access roads)	54kg	300kg
Traffic	Slightly polluted traffic areas (side streets, staff 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	43.674	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.

VICTORIA & TASMANIA OFFICE

PO Box 292
North Geelong BC VIC 3215

191 Station Street
Corio VIC 3214

Phone: + 61 3 5274 1336
Fax: +61 3 5274 9966

DESIGN OFFICES

New South Wales	61 2 8838 1055
Canberra	61 2 6128 1000
Queensland	61 7 3277 5110
Victoria & Tasmania	61 3 5274 1336
South Australia	61 8 8275 8000
West Australia	61 8 9350 1000
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SPELFilter Hydrosystem 1.0

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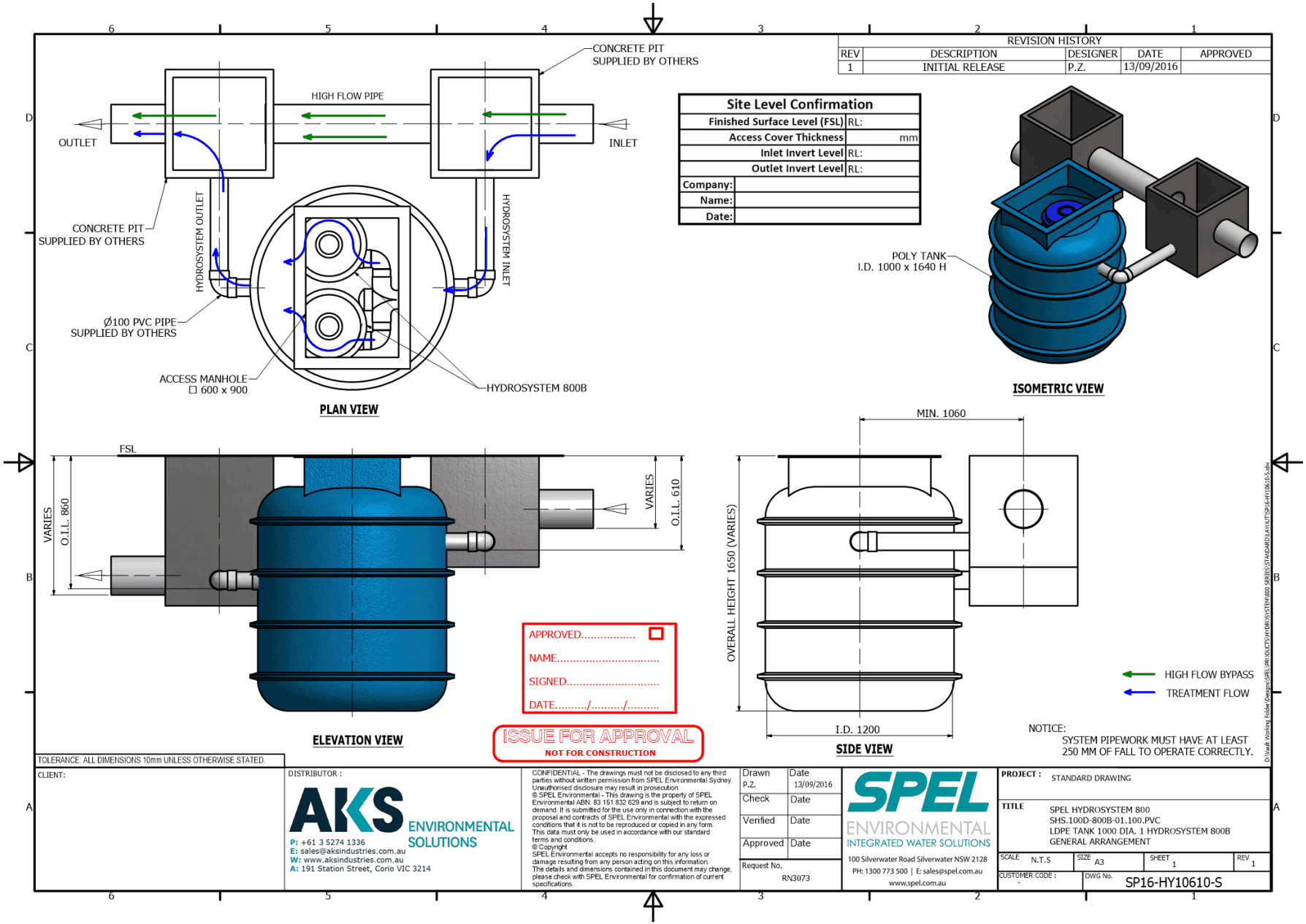
REVISION HISTORY
REV | DESCRIPTION | DESIGNER | DATE | APPROVED
1 | INITIAL RELEASE | P.Z. | 13/09/2016
Site Level Confirmation
Finished Surface Level (FSL) RL:
Access Cover Thickness mm
Inlet Invert Level RL:
Outlet Invert Level RL:
Company:
Name:
Date:
CONCRETE PIT SUPPLIED BY OTHERS
HIGH FLOW PIPE
OUTLET
INLET
HYDROSYSTEM OUTLET
HYDROSYSTEM INLET
CONCRETE PIT SUPPLIED BY OTHERS
Ø100 PVC PIPE SUPPLIED BY OTHERS
ACCESS MANHOLE ☐ 600 x 900
HYDROSYSTEM 800B
PLAN VIEW
POLY TANK I.D. 1000 x 1640 H
ISOMETRIC VIEW
FSL
VARIES
O.I.L. 860
VARIES
O.I.L. 610
ELEVATION VIEW
MIN. 1060
OVERALL HEIGHT 1650 (VARIES)
I.D. 1200
SIDE VIEW
HIGH FLOW BYPASS
TREATMENT FLOW
APPROVED.....
NAME.....
SIGNED.....
DATE...../...../.....
ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION
NOTICE:
SYSTEM PIPEWORK MUST HAVE AT LEAST 250 MM OF FALL TO OPERATE CORRECTLY.
TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.
CLIENT:
DISTRIBUTOR :
AKS ENVIRONMENTAL SOLUTIONS
P: +61 3 5274 1336
E: sales@aksindustries.com.au
W: www.aksindustries.com.au
A: 191 Station Street, Corio VIC 3214
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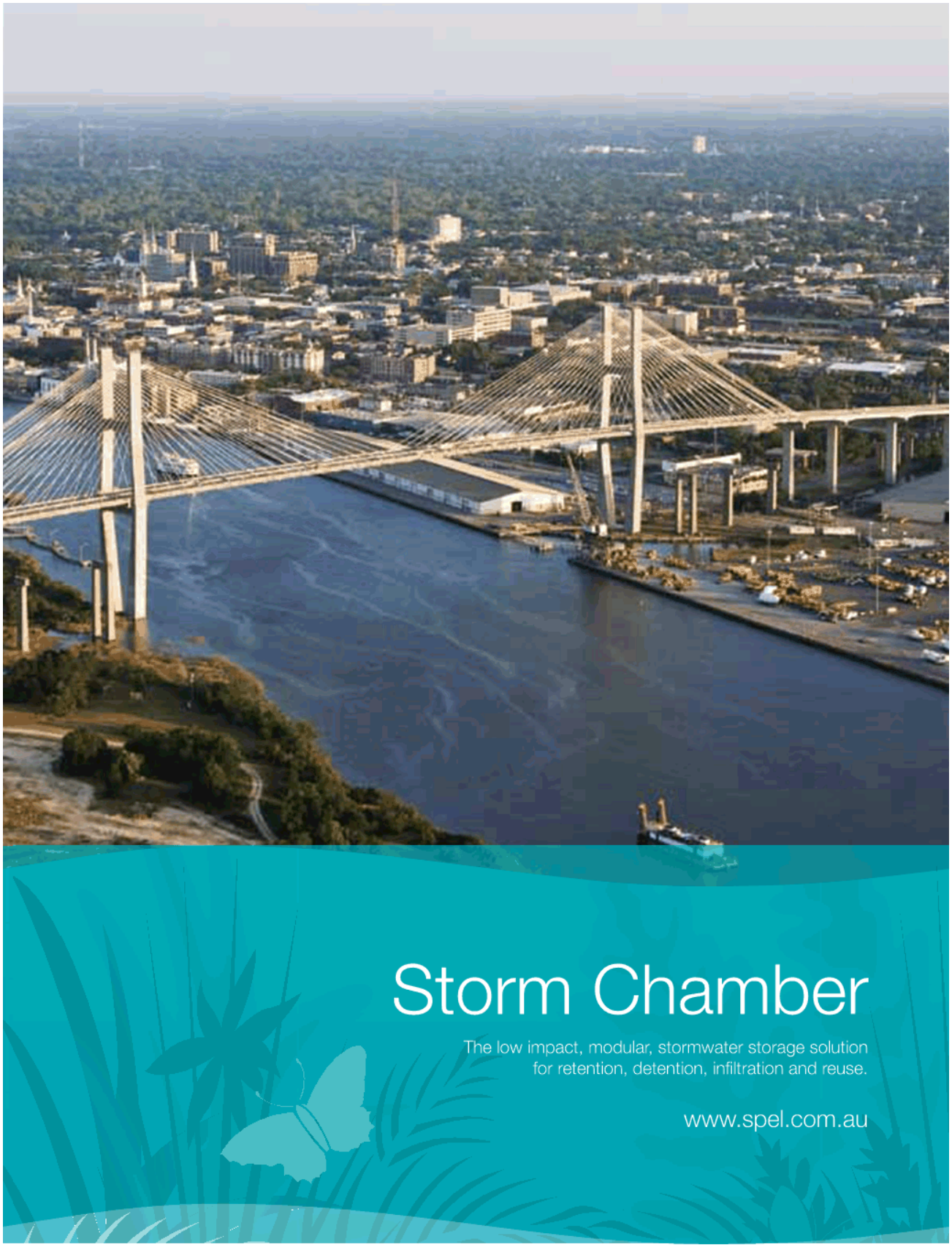
Drawn P.Z. Date 13/09/2016
Check Date
Verified Date
Approved Date
Request No. RN3073
SPEL ENVIRONMENTAL INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au
PROJECT : STANDARD DRAWING
TITLE SPEL HYDROSYSTEM 800
SHS.100D-800B-01.100.PVC
LDPE TANK 1000 DIA. 1 HYDROSYSTEM 800B
GENERAL ARRANGEMENT
SCALE N.T.S SIZE A3 SHEET 1 REV 1
CUSTOMER CODE : -
DWG No. SP16-HY10610-S
D:\Vault Working Folder\Designs\SPEL\PRODUCTS\HYDROSYSTEM\800 SERIES\STANDARD\JAVKIT\SP16-HY10610-S.dwg


Storm Chamber
The low impact, modular, stormwater storage solution
for retention, detention, infiltration and reuse.
www.spel.com.au
SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS



Benefits over other storage methods

- Helps counter drought conditions by maintaining groundwater base flow to streams.
- Superior load ratings for trafficable areas.
- Maximised volume for efficient storage void ratio.
- The least cost underground alternative.
- The lowest installed cost of any modular storage technology.
- Burial depths up to over 9m.
- Layered installations possible for restricted surface area sites.
- Superior design eliminates costly and complicated header manifold systems.
- Can be utilized for conveyance in remote locations.
- Recycled HDPE construction allows smaller excavation and decreased footprint.

A septic drainfield for storm water

Significantly less cost, quicker, easier than pipe for conveyance.

Benefits over similiar technologies

	Storm Chamber	Other Technology
Header pipe manifold in flow/out flow	No	Yes
AASHTO H-20 wheel load rating	Exceeds by 4X	Meets
End plates to purchase & install	No	Yes
Need for pre-treatment devices	No	Yes
Maximum height of fill	9.14m	2.44m
Require compacting stone base	No	Yes
Two & three layered installation	Yes	No
Number chambers required	40-45% fewer	40-45% more
Installed cost & time	Significantly less	Significantly more
Footprint	Significantly less	Significantly more
Excavation, stone, backfill	Significantly less	Significantly more
Compaction, grading & filter fabric		Significantly morev

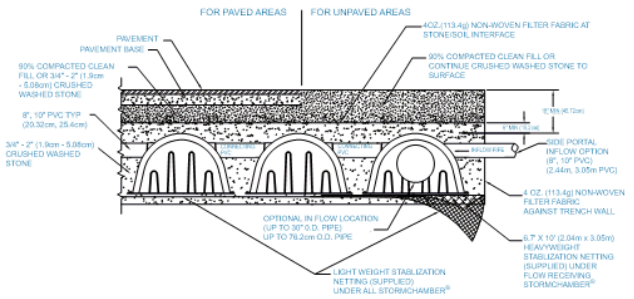
Source: Brown, Whitney, Schueler, Thomas. National Pollutant Removal Performance Database for Stormwater BMPs, August 1997, Center for Watershed Protection, Ellicott City, Maryland.

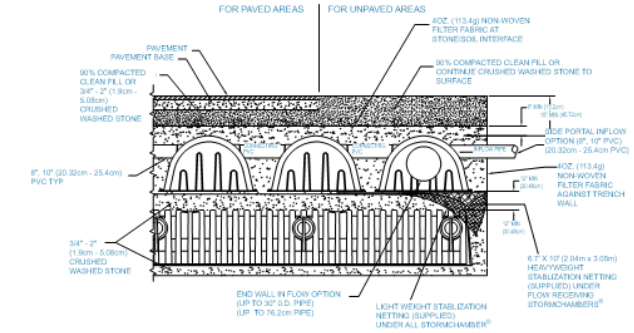
SPEL StormChamber Specifications

Storm Chamber storage = 2.12m³
Design storage capacity = 3.26 to 4.56m³
Length = 2.59m
Width = 1.52m
Height = 86.36cm

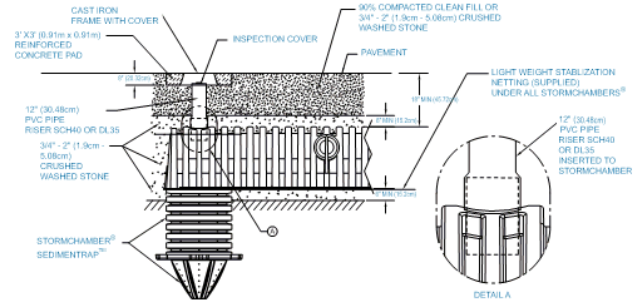
Typical Applications/Uses

RECOMMENDED INSTALLATION OF STORMCHAMBER®

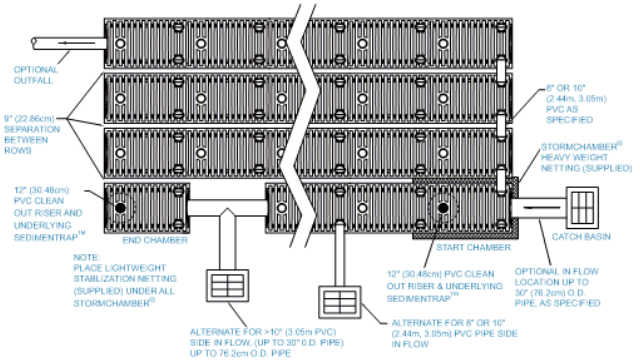




SEDIMENTRAP™ AT BEGINNING AND END OF ROW(S) RECEIVING INFLOW



EXAMPLE "STANDARD" CONFIGURATION



VICTORIA & TASMANIA OFFICE

PO Box 292
North Geelong BC VIC 3215

191 Station Street
Corio VIC 3214

Phone: + 61 3 5274 1336
Fax: +61 3 5274 9966

STATE CONTACTS

New South Wales	61 2 8838 1055
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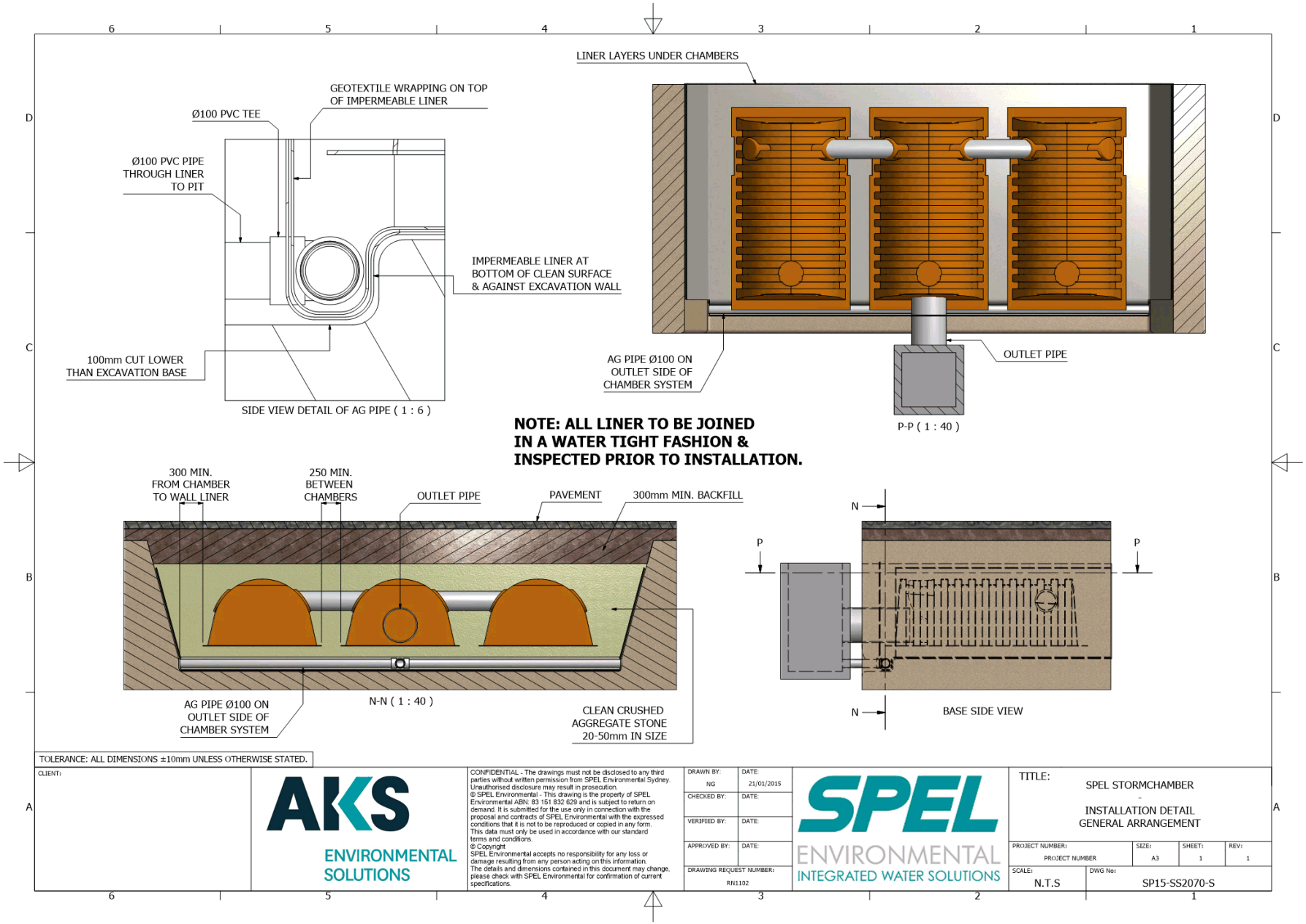
LINER LAYERS UNDER CHAMBERS
GEOTEXTILE WRAPPING ON TOP OF IMPERMEABLE LINER
Ø100 PVC TEE
Ø100 PVC PIPE THROUGH LINER TO PIT
IMPERMEABLE LINER AT BOTTOM OF CLEAN SURFACE & AGAINST EXCAVATION WALL
100mm CUT LOWER THAN EXCAVATION BASE
SIDE VIEW DETAIL OF AG PIPE (1 : 6)
AG PIPE Ø100 ON OUTLET SIDE OF CHAMBER SYSTEM
OUTLET PIPE
P-P (1 : 40)
NOTE: ALL LINER TO BE JOINED IN A WATER TIGHT FASHION & INSPECTED PRIOR TO INSTALLATION.
300 MIN. FROM CHAMBER TO WALL LINER
250 MIN. BETWEEN CHAMBERS
OUTLET PIPE
PAVEMENT
300mm MIN. BACKFILL
AG PIPE Ø100 ON OUTLET SIDE OF CHAMBER SYSTEM
N-N (1 : 40)
CLEAN CRUSHED AGGREGATE STONE 20-50mm IN SIZE
N
P
P
N
BASE SIDE VIEW
TOLERANCE: ALL DIMENSIONS ±10mm UNLESS OTHERWISE STATED.
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DRAWN BY: NG
DATE: 21/01/2015
CHECKED BY:
DATE:
VERIFIED BY:
DATE:
APPROVED BY:
DATE:
DRAWING REQUEST NUMBER: RN1102
SPEL ENVIRONMENTAL INTEGRATED WATER SOLUTIONS
TITLE:
SPEL STORMCHAMBER
-
INSTALLATION DETAIL
GENERAL ARRANGEMENT
PROJECT NUMBER: PROJECT NUMBER
SIZE: A3
SHEET: 1
REV: 1
SCALE: N.T.S
DWG No: SP15-SS2070-S

AKS ENVIRONMENTAL SOLUTIONS

Appendix 2 – Draft Treatment Train Maintenance Contract

SPEL ENVIRONMENTAL

AKS ENVIRONMENTAL SOLUTIONS

SPEL STORMWATER QUALITY TREATMENT DEVICE MAINTENANCE AGREEMENT

FOR

306A Lenah Valley Rd, Lenah Valley

This Equipment Maintenance Agreement (the "Maintenance Agreement") is made and effective

[DATE],

BETWEEN: AKS Industries Australia Pty Ltd (the "Service Provider"), of
191 Station Street, Corio VIC 3214 (ABN: 88 151 483 984) hereafter known as AKS

AND: [EQUIPMENT OWNER] (the "Client"), of
[COMPLETE ADDRESS]

SUMMARY

This 10 year maintenance contract covers the maintenance of the SPEL Ecoceptor, the SPEL Stormchambers and the SPEL Hydrosystem Located at 306A Lenah Valley Rd, Lenah Valley

Where the Client has requested the provision of maintenance and the Service Provider is willing to provide such services as per the terms of this agreement both parties agree to:

1. WARRANTY:

The standard warranty on the SPEL Ecoceptor and SPEL Hydrosystem is 12 months. Goods sold shall only have the benefit of a manufacturer's warranty if the purchaser has complied with the manufacturer's instructions in relation to installation, maintenance and operation of the said goods.
AKS also holds a 25 Years on the fibreglass construction (as per our warranty certificate).

2. MAINTENANCE CALLS:

Service Provider agrees to provide maintenance services of maintenance calls and interim calls as required at the installation address specified above on the equipment listed. All charges specified are those currently in effect and are subject to change only at the time of subsequent annual renewal. If the charges are increased, the Client may, as of the effective date of such increase, terminate this Agreement by written notice to the Service Provider. Otherwise, the new charges shall become effective upon the date specified in the renewal invoice. Client calls hereunder are restricted to the normal working hours of the Service Provider.

All service commenced outside of Service Provider's normal working hours will be charged at published rates for service time and expense only.

SPEL

3. SERVICES:

The following services are included:

Maintenance Summary

The SPEL treatment systems will be inspected in accordance with the respective Maintenance Manual procedures. The SPEL Hydrosystem change out maintenance process comprises the removal and replacement of each SPEL Hydrosystem cartridge and the cleaning of the silt out of the vault or manhole with a vacuum truck. In the event these works are required, Client will be notified accordingly. The AKS personnel that enter the tank [if necessary] will be trained in confined space entry

Life Cycle Cost (LCC) – The maintenance requirements for the Stormceptor and the Hydrosystem is very site specific and actually relates to the sediment load and sediment characteristics.

Maintenance Triggers

The basic activities included in the maintenance contract are as follows:

- Visual inspection of the vault and filter conditions annually
- If there is a silt build up, it needs to be vacuumed out accordingly
- TSS accumulation in the filters is what dictates the life cycle of individual filter.

Optimum performance of the equipment covered by this Agreement can be expected only if supplies provided by, or meeting the specifications of Service Provider are used. Service Provider shall have full and free access to the equipment to provide service thereon. If persons other than Service Provider's representatives perform maintenance or repairs, and as a result further work is required by Service Provider to restore the equipment to operating condition, such repairs will be billed at Service Provider's published time and material rates then in effect.

4. ANNUAL RATE FOR SERVICES:

ACTIVITY	FREQUENCY [subject to site characteristics]	VALUE [subject to CPI index]
SPEL Ecoceptor - Visual inspection for hydrocarbon and silt depth. **SPEL Hydrosystem** - Visual inspection for sediment accumulation **SPEL Stormchamber** – Visual inspection for sediment accumulation	Year 1 & 2 - Every six months Year 3 - 10 - Annually	$375.00+GST per site visit for this project. The ten (10) year total for inspections is $4,500.00+GST
Silt Removal When required the SPEL Ecoceptor and SPEL Hydrosystem will need the silt vacuumed out. AKS will supply vacuum truck and labour to maintain the system.	This is dictated by silt condition on the site, detected through the site inspections. AKS have allowed for one (1) maintenance supervision per annum.	AKS supervision will be $625.00+GST / visit, additional equipment (Sucker truck ect) will be on a cost plus basis. The ten (10) year total for maintenance (excluding sucker truck) is estimated $6,250.00+GST
SPEL Hydrosystem replacement – allowance for one filter change out of each SPEL Hydrosystem throughout a 10 year period (If required)	We estimate the life of the SPEL Hydrosystem to be between 5 – 7 years, subject to silt condition on the site.	The replacement value is $6,365.00 per SPEL Hydrosystem inclusive of the labour, management and labour for the day
SUMMARY		
Based on the selection above the, annual rate is $1,711.50+GSTp.a. This comprises of the above inspection schedule, maintenance, filter replacement and associated reporting spread over the 10 year contract. The annual rate shall be paid in advance as at the renewal date each year. The annual rate shall be indexed by CPI at each annual renewal date (If applicable). Any payment not made by the 30th day of the month shall be considered overdue and in addition to Service Provider's other remedies, Service Provider may levy a late payment charge equal to 4% per month on any overdue amount.		

5. PAYMENTS:

For service as specified above on the equipment listed, the undersigned Client agrees to pay in advance the total annual charge specified below to Service Provider, in accordance with the terms specified on the face of the invoice.

There shall be added to the charges provided for in this Agreement amounts equal to any taxes, however designated, levied or based on such charges or on this Agreement, or on the services rendered or parts supplied pursuant hereto, including GST.

6. BINDING AGREEMENT:

The undersigned Client represents that he is the owner of the equipment, or that they have the owner's authority to enter into this agreement.

This Agreement is subject to acceptance by Service Provider. It takes effect on the date written above and continues in effect for ten years and will remain in force thereafter, with automatic annual renewal at the indexed rates, until cancelled in writing by either party or at the end of a 2 year period – whichever is earlier.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

AKS Industries Australia Pty Ltd
ACN 151 483 984

of 191 Station Street, Corio VIC 3214

CLIENT

_____	_____
Authorized Signature	Authorized Signature
_____	_____
Kurt Jensen – Environmental Division Manager	Client Print Name and Title

SPEL
191 Station Street
Corio VIC 3214
P 03 5274 1336 F 03 5274 9966
E sales@aksindustries.com.au
W aksindustries.com.au
ABN 88 151 483 984

MIDSON
traffic
pty ltd

Steven Gath

306A Lenah Valley Road Subdivision
Traffic Impact Assessment

August 2017

ENGINEERS
AUSTRALIA

PROFESSIONAL ENGINEER OF THE YEAR
INDIVIDUAL
AWARDS
TASMANIA
WINNER 2016

Contents

Figure Index

Table Index

1. Introduction

1.1 Background

Midson Traffic were engaged by Mr Steven Gath to prepare a traffic impact assessment for a proposed residential subdivision at 306A Lenah Valley Road, Lenah Valley.

1.2 Traffic Impact Assessment (TIA)

A traffic impact assessment (TIA) is a process of compiling and analysing information on the impacts that a specific development proposal is likely to have on the operation of roads and transport networks. A TIA should not only include general impacts relating to traffic management, but should also consider specific impacts on all road users, including on-road public transport, pedestrians, cyclists and heavy vehicles.

This TIA has been prepared in accordance with the Department of State Growth (DSG) publication, *A Framework for Undertaking Traffic Impact Assessments*, September 2007. This TIA has also been prepared with reference to the Austroads publication, *Guide to Traffic Management,* Part 12: *Traffic Impacts of Developments*, 2009.

Land use developments generate traffic movements as people move to, from and within a development. Without a clear understanding of the type of traffic movements (including cars, pedestrians, trucks, etc), the scale of their movements, timing, duration and location, there is a risk that this traffic movement may contribute to safety issues, unforeseen congestion or other problems where the development connects to the road system or elsewhere on the road network. A TIA attempts to forecast these movements and their impact on the surrounding transport network.

A TIA is not a promotional exercise undertaken on behalf of a developer; a TIA must provide an impartial and objective description of the impacts and traffic effects of a proposed development. A full and detailed assessment of how vehicle and person movements to and from a development site might affect existing road and pedestrian networks is required. An objective consideration of the traffic impact of a proposal is vital to enable planning decisions to be based upon the principles of sustainable development.

This TIA also addresses E5.0 Road and Railway Assets Code, and E6.0 Parking and Access Code of the Hobart Interim Planning Scheme, 2015.

1.3 Statement of Qualification and Experience

This TIA has been prepared by an experienced and qualified traffic engineer in accordance with the requirements of Council's Planning Scheme and The Department of State Growth's, *A Framework for Undertaking Traffic Impact Assessments*, September 2007, as well as Council's requirements.

The TIA was prepared by Keith Midson. Keith's experience and qualifications are briefly outlined as follows:

- 21 years professional experience in traffic engineering and transport planning.
- Master of Transport, Monash University, 2006
- Master of Traffic, Monash University, 2004
- Bachelor of Civil Engineering, University of Tasmania, 1995
- Engineers Australia: Fellow (FIEAust); Chartered Professional Engineer (CPEng); Engineering Executive (EngExec); National Engineers Register (NER)

1.4 Project Scope

The project scope of this TIA is outlined as follows:

- Review of the existing road environment in the vicinity of the site and the traffic conditions on the road network.
- Provision of information on the proposed development with regards to traffic movements and activity.
- Identification of the traffic generation potential of the proposal with respect to the surrounding road network in terms of road network capacity.
- Review of the parking requirements of the proposed development. Assessment of this parking supply with Planning Scheme requirements.
- Traffic implications of the proposal with respect to the external road network in terms of traffic efficiency and road safety.

1.5 Subject Site

The subject site is located at 306A Lenah Valley Road, Lenah Valley. The subject site and surrounding road network is shown in Figure 1. The existing site access driveway is shown in Figure 2.

Figure 1 Subject Site & Surrounding Road Network

Source: LIST Map, DPIPWE

Figure 2 Existing Site Access

1.6 Reference Resources

The following references were used in the preparation of this TIA:

- Hobart Interim Planning Scheme, 2015 (Planning Scheme)
- Austroads, *Guide to Traffic Management,* Part 12: *Traffic Impacts of Developments*, 2009
- Austroads, Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections, 2009
- DSG, *A Framework for Undertaking Traffic Impact Assessments*, 2007
- Roads and Maritime Services NSW, *Guide to Traffic Generating Developments*, 2002 (RTA Guide)
- Roads and Maritime Services NSW, *Updated Traffic Surveys,* 2013 (Updated RTA Guide)
- Australian Standards, AS2890.1, *Off-Street Parking*, 2004 (AS2890.1:2004)

2. Existing Conditions

2.1 Transport Network

For the purpose of this report, the transport network consists only of Lenah Valley Road. Lenah Valley is approximately 3.3 kilometres long and Road connects between Augusta Road at its eastern end to a dead-end to the west (approximately 2.6 kilometres west of the Girrabong Road intersection). It provides access to a predominantly residential catchment in Lenah Valley, and also provides access to the recreational trail, the New Town Rivulet Track.

The general urban speed limit of 50-km/h applies to Lenah Valley Road. Traffic volumes are estimated to be in the order of 1,200 vehicles per day near the subject site. The road width is typically 7 metres.

Lenah Valley Road at the site's access is shown in Figure 3.

Figure 3 Lenah Valley Road at Site Access

2.2 Road Safety Performance

Crash data can provide valuable information on the road safety performance of a road network. Existing road safety deficiencies can be highlighted through the examination of crash data, which can assist in determining whether traffic generation from the proposed development may exacerbate any identified issues.

Crash data was obtained from the Department of State Growth for a 5½ year period (1st January 2012 to 30 June 2017) for Lenah Valley Road west of Brushy Creek Road.

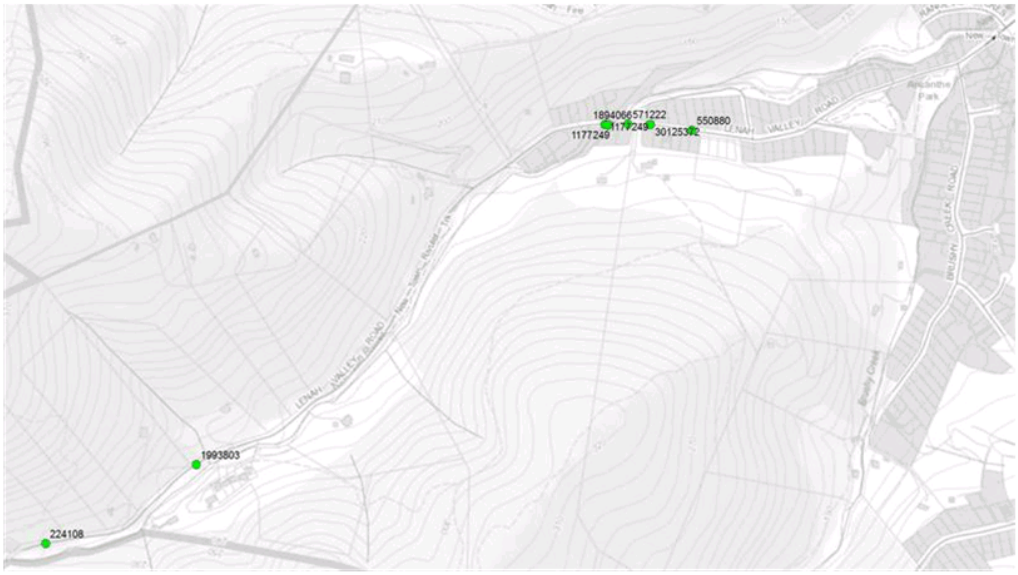
The findings of the crash data is summarised as follows:

- A total of 7 crashes were reported during this time.

- Of these crashes, 2 involved minor injury, 1 involved first aid at the scene, and 4 involved property damage only.
- Vulnerable road users: 1 crash involved a motorcycle; no crashes involved pedestrians; and no crashes involved cyclists.
- Crash location: No crashes were reported east of the subject site; 5 crashes were reported immediately west of the site; and 2 were reported towards the western end of Lenah Valley Road. The crash locations are shown in Figure 4.
- Crash types: no clear crash trends were evident. The majority of crashes involved single vehicle collisions where the vehicle has lost control and left the carriageway. No crashes involved vehicles emerging from driveways.

The crash history is considered to be relatively low and typical of a low volume residential network.

Figure 4 Crash Locations



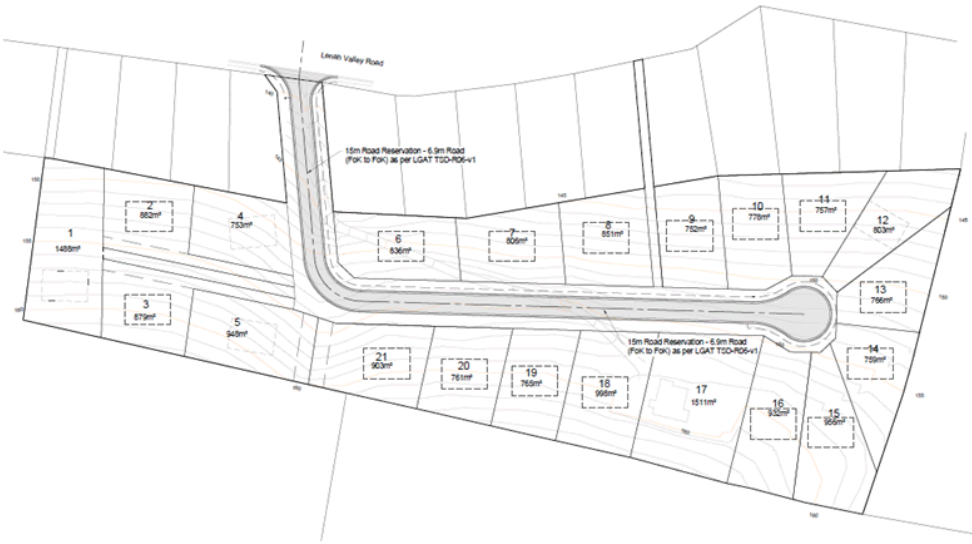
3. Proposed Development

3.1 Development Proposal

The proposed development involves a 21 lot subdivision. Access to the subdivision is via a new road connecting to Lenah Valley Road, with the road forming a cul-de-sac that is approximately 230 metres long.

The proposed development is shown in Figure 5.

Figure 5 Proposed Subdivision Plans



4. Traffic Impacts

4.1 Traffic Generation

Traffic generation rates were sourced from the RMS Guide. The RMS Guide (updated surveys) states the following traffic generation rates for residential developments:

- Daily vehicle trips 7.4 per dwelling
- Weekday peak hour vehicle trips 0.78 per dwelling

Based on these rates, the traffic generation from the subdivision is likely to be in the order of 155 trips per day, and 16 trips per hour during peak periods.

4.2 Trip Distribution

It is likely that the majority of traffic will enter and leave the subdivision from/to the east (connecting with the external road network such as Girrabong Road, Augusta Road, etc).

4.3 Access Impacts

The proposed subdivision will create a new road junction located at the existing driveway to the site (as shown in Figure 2). The road junction should be designed in accordance with Tasmanian Municipal Standards.

The new road junction was assessed against the requirements of the Planning Scheme: E5.0, '*Road and Railway Assets Code*'.

4.3.1 Road Junction Planning Scheme Requirements

Acceptable Solution A3 of Clause E5.5.1 of the Planning Scheme states "*The annual average daily traffic (AADT) of vehicle movements, to and from a site, using an existing access or junction, in an area subject to a speed limit of 60km/h or less, must not increase by more than 20% or 40 vehicle movements per day, whichever is the greater*".

The proposed development will generate more than 20% of the existing site traffic volume and more than 20 vehicles per day. The development was therefore assessed against the requirements of Performance Criteria P3, which states:

> *"Any increase in vehicle traffic at an existing access or junction in an area subject to a speed limit of 60km/h or less, must be safe and not unreasonably impact on the efficiency of the road, having regard to:*
>
> *(a) the increase in traffic caused by the use;*
>
> *(b) the nature of the traffic generated by the use;*

(c) the nature and efficiency of the access or the junction;

(d) the nature and category of the road;

(e) the speed limit and traffic flow of the road;

(f) any alternative access to a road;

(g) the need for the use;

(h) any traffic impact assessment; and

(i) any written advice received from the road authority."

The following is relevant with respect to the proposed subdivision:

a. The increased traffic generated by the proposed development is likely to be 155 vehicles per day when all lots are fully developed and occupied with dwellings.

b. All traffic generated by the proposed development will be residential in nature. This is compatible with the existing traffic utilising Lenah Valley Road near the subject site.

c. The proposed road junction servicing the site will operate at a high level of service based on the relatively low traffic volumes on all approaches.

d. Lenah Valley Road is a minor collector road that has no through road function near the site. It provides access to the residential catchment west of Brushy Creek Road, as well as the New Town Rivulet Track.

e. The general urban speed limit of 50-km/h applies to Lenah Valley Road.

f. No alternative access is possible for the proposed development. The site is located behind existing residential lots.

g. Not assessed in this report.

h. This report documents the findings of a traffic impact assessment.

i. No written advice has been received by the road authority (Council) relating to the access.

Based on the above assessment, the proposed access meets the requirements of Performance Criteria P3 of Clause E5.5.1 of the Planning Scheme.

4.3.2 Road Junction Sight Distance

Acceptable Solution A1 of Clause E5.6.4 of the Planning Scheme states that sight distances at "*an access or junction must comply with the Safe Intersection Sight Distance shown in Table E5.1*". The requirements of Table E5.1 are reproduced in Table 1.

Table 1 Planning Scheme SISD Requirements

Vehicle Speed	Safe Intersection Sight Distance in metres, for speed limit of:	
km/h	60 km/h or less	Greater than 60 km/h
50	80	90
60	105	115
70	130	140
80	165	175
90		210
100		250
110		290

In this case, the required SISD is 80 metres, noting that the vehicle speed has been assumed to be equal to the legal speed limit.

The available sight distance from the site's access is shown in Figure 2. The available sight distance is measured to be 130 metres to the east and 115 metres to the west (noting that on-street parking can reduce available sight distance in both directions). The available sight distance therefore complies with the Acceptable Solution, A1, of E5.6.4 of the Planning Scheme.

4.4 Internal Road Design

Council relies on the design criteria of LGAT Tasmanian Standard Drawings and Subdivision Guidelines, 2013. The requirements for residential subdivision roads are reproduced in Table 2. Clause E.2.4 of the Planning Scheme states that "*All access, parking and traffic management works shall be constructed to the Council's current standards and in accordance with plans approved by the Council*". According to Council's development engineering guidelines[1] the following standards are applicable:

- Road design should be in accordance with Austroads Guidelines.
- LGAT Standard Drawings and Tasmanian Subdivision Guidelines.

[1] http://www.hobartcity.com.au/Development/Engineering_Standards_and_Guidelines

Table 2 LGAT Standard Drawings – Road Requirements, Residential

ROAD TYPES	ROAD TYPE	ROAD LENGTH / NUMBER OF TENEMENTS	MINIMUM ROAD WIDTH	MINIMUM RESERVATION WIDTH	MINIMUM FOOTPATH REQUIREMENTS
1 – Arterial	Detail design required				
2 – Sub Arterial					
3 – Collector	Through Road	Any length	11.0m	20.0m	Both Sides
4 – Local	Through Road	Any length	8.9m	18.0m	One Side Only
	Cul-De-Sac	Length > 150m	8.9m	18.0m	One Side Only
	Cul-De-Sac	Length ≤ 150m and / or No. of equiv. tenements ≤ 15	6.9m	15.0m	One Side Only

In this case, the proposed subdivision is a cul-de-sac that is greater than 150 metres in length and the number of lots accessed by the road is greater than 15. Normally this would trigger the requirement for minimum reservation width of 18 metres with a sealed road width of 8.9 metres. The general theory behind the provision of a wider road for a longer length of road is that the longer the road and the more properties connect to the road, the more traffic utilises the road (by traffic generation of connecting land use along its length).

The available land width for the initial 42 metres of the subdivision is restricted to 15 metres boundary to boundary. It is therefore not possible to provide an 18 metre reservation without land acquisition.

The site is narrow and has a relatively steep cross-fall of approximately 1:3. This creates design issues for an 18 metre reservation and road width of 8.9 metres. The provision of a wider road reservation results in reduced sizes of lots fronting the road, and creates cross-fall issues for lot access from the road. The road design has therefore been designed for a reservation width of 15.0 metres and a road width of 6.9 metres. This design standard would normally be acceptable if the cul-de-sac were shorter by only a small amount.

The narrower road design is considered acceptable for the following reasons:

- The provision of a road width of 6.9 metres (which equates to 6.9m face of kerb to face of kerb, resulting in a sealed road width of 6.0m excluding kerbs) will be generally consistent with the design of Lenah Valley Road. The existing width of Lenah Valley Road is 7 metres. Providing a wider pavement on the subdivision road would result in the cul-de-sac having a wider road width than Lenah Valley Road, which would be inconsistent with the road hierarchy.
- As noted above, the available land reservation width at the connection with Lenah Valley Road is 15 metres (for approximately 42 metres into the subject site), thus preventing a wider road reservation due to the existing property boundary constraints.
- Extending the cul-de-sac component of the subdivision is not possible due to the new subdivision to the east of the site (ie. the proposed subdivision size is constrained and cannot grow over time). The proposed development will therefore not have any future connectivity beyond the

subdivision. The traffic generation associated with the adjacent lots will therefore not change over time, providing a consistent traffic generation that will not increase.

- The LGAT/IPWEA standard drawings are a guide only. There are recent examples of roads approved in the Hobart area with road widths less than 6.9 metres (such as 22 Cuthbertson Place subdivision, Lenah Valley, which has a road width of 6.0 metres over a similar distance of road).
- The road width of 6.9 metres will provide a lower speed environment compared to 8.9 metres. The subdivision cul-de-sac has a 90-degree bend and is located on land with a relatively steep grade. A lower speed environment (resulting from a narrower carriageway) is therefore more appropriate for the road design.
- The road width is acceptable for the intended road function. With no through traffic, the pavement width enables vehicles to pass in opposite directions, as well as on-street parking (noting that two-way traffic would usually require a vehicle to give way to oncoming traffic in sections with cars parked on-street – this situation currently exists in Lenah Valley Road).
- The provision of a wider road reservation is likely to create issues of steep driveway grades into adjacent lots.

4.5 Pedestrian Impacts

The proposed development is likely to generate a relatively low amount of pedestrian movements in the surrounding road network. There are few pedestrian generators such as schools and shops to generate moderate pedestrian trips. The New Town Rivulet Track will attract some recreational pedestrian trips.

4.6 Road Safety Impacts

No significant adverse road safety impacts are foreseen for the proposed development. This is based on the following:

- There is sufficient spare capacity in Lenah Valley Road to absorb the relatively low peak hour traffic generated from the proposed development (16 trips per hour).
- The access will be consistent with other nearby road junctions. It would not be seen as 'unusual' or unexpected for motorists on Lenah Valley Road to observe vehicles entering or exiting the subject site.
- The existing road safety performance of the road network near the subject site does not indicate that there are any specific road safety deficiencies that might be exaggerated by the small increase in traffic volume.
- There is adequate sight distance from the access for the prevailing vehicle speeds on Lenah Valley Road in accordance Planning Scheme requirements.

5. Conclusions

This traffic impact assessment (TIA) investigated the traffic and parking impacts of a proposed 21 lot subdivision at 306A Lenah Valley Road, Lenah Valley.

The key findings of the TIA are summarised as follows:

- The road width and road corridor width does not strictly comply with the requirements of LGAT/IPWEA Standard Drawings. The provision of 6.0m sealed pavement width and 15.0m corridor width is considered acceptable for the cul-de-sac which will have a low volume traffic volume.
- The pavement width is consistent with the existing pavement width of Lenah Valley Road.
- The road width is restricted by various site constraints. The land is situated on relatively steep terrain and the subject site is also relatively narrow. The provision of a wider road corridor presents a number of design challenges and reduces the viability of the subdivision.

Based on the findings of this report and subject to the recommendations above, the proposed development is supported on traffic grounds.

Midson Traffic Pty Ltd ABN: 26 133 583 025

18 Earl Street
Sandy Bay TAS 7005
T: 0437 366 040 E: admin@midsontraffic.com.au W: www.midsontraffic.com.au

Document Status

Revision	Author	Review	Date
0	Keith Midson	Zara Kacic-Midson	7 August 2017
1	Keith Midson	Alan Darwin	15 August 2017
2	Keith Midson	Zara Kacic-Midson	23 August 2017

MIDSON traffic pty ltd

Keith Midson
Midson Traffic Pty Ltd
18 Earl Street
Sandy Bay TAS 7005
0437 366 040

19 April 2018

Mr Ben Ikin
Acting Manager Development Appraisal
Hobart City Council
GPO Box 503
Hobart TAS 7005

Dear Ben,

306A LENAH VALLEY ROAD, LENAH VALLEY – RESPONSE TO RFI

I am writing in response to Council's RFI dated 5th March 2018 in relation to the abovementioned address.

In relation to traffic, the RFI states:

> *"The estimate of traffic generation from the proposed subdivision assumes only 1 dwelling per lot for each of the 21 lots.*
>
> *The planning scheme only requires 325 m2 per dwelling.*
>
> *It is possible that up to 47 dwellings could be built on the 21 proposed lots.*
>
> *The TIA needs to be revised to take into account the possibility that many of the proposed lots could have multiple dwellings.*
>
> *Will the conclusions of the TIA remain unchanged if as many as 47 dwellings were to be built in this subdivision?"*

Whilst it is technically possible for 47 dwellings to be constructed on the 21 lots, it would be highly unlikely (statistically highly improbable). For the sake of the exercise, the following can be calculated with regards to traffic generation.

The RMS publication, *Guide to Traffic Generating Developments,* 2002 (and update, August 2013), states that single dwelling houses generate an average of 7.4 vehicles per day per dwelling, with a peak of 0.78 vehicles per hour per dwelling.

Medium density dwellings have a range of 4 to 5 vehicles per day per dwelling, with a peak generation of 0.4 to 0.5 vehicles per hour per dwelling. If all 21 lots were developed to maximum possible density, then the traffic generation rate of 4 vehicles per day and peak of 0.4 vehicles per hour would be appropriate.

Daily traffic generation comparison:

- 21 individual dwellings (1 per lot) = 21 x 7.4 = 155 vehicles per day
- 47 medium density dwellings = 47 x 4.0 = 188 vehicles per day
- Difference: = 33 vehicles per day

Peak hour traffic generation comparison:

- 21 individual dwellings = 21 x 0.78 = 16 vehicles per hour
- 47 medium density dwellings = 47 x 0.4 = 19 vehicles per hour
- Difference: = 3 vehicles per hour

It is the peak hour that is most critical in terms of impact on the network and safety. The difference of 3 vehicles per hour is insignificant and does not alter the findings of the traffic impact assessment (Midson Traffic, August 2017).

Note that if a different mix of development occurred (say 11 lots single dwellings and 10 lots multiple dwellings) then the multiple dwellings may have higher rate of up to 5 vehicles per day, with a peak of 0.5 vehicles per hour. But there would be less of them, so the overall traffic generation remains similar to the above calculations (equating to 181 vpd with peak of 19 vph) and again the findings of the traffic impact assessment are not altered.

I trust this satisfies Council's enquiry. Please contact me on 0437 366 040 if you require any further information.

Yours sincerely,

Keith Midson BE MTraffic MTransport FIEAust CPEng EngExec NER

DIRECTOR
Midson Traffic Pty Ltd