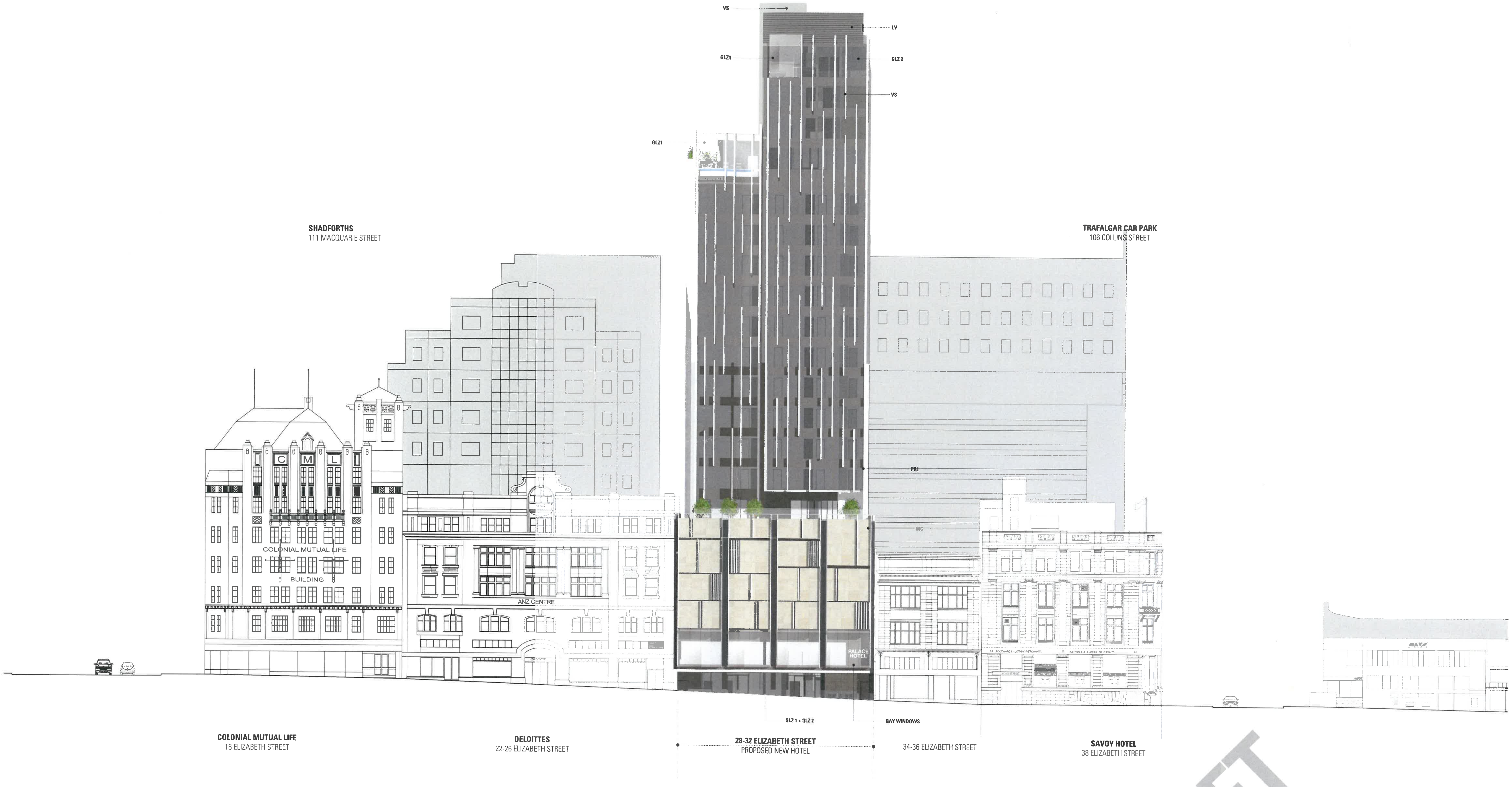

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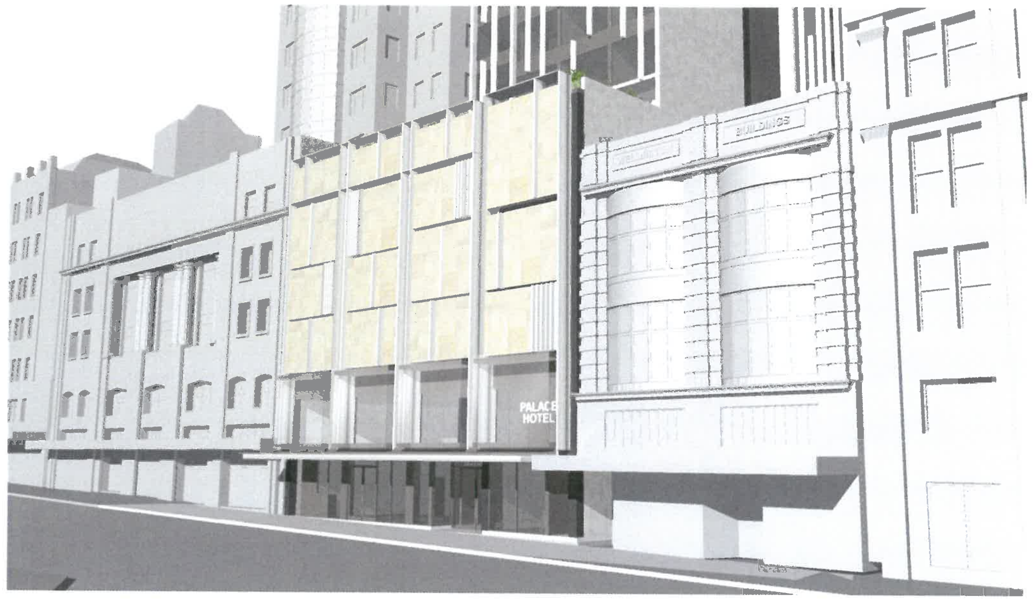

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SUPPORTING ASSESSMENT INFORMATION

CITY PLANNING
COMMITTEE MEETING
(OPEN PORTION OF THE MEETING)

TUESDAY 15 MARCH 2016
AT 5.00 P.M.

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6. COMMITTEE ACTING AS PLANNING AUTHORITY

6.1 APPLICATIONS UNDER THE HOBART INTERIM PLANNING SCHEME 2015

6.1.5 28-32 ELIZABETH STREET AND ADJOINING ELIZABETH STREET AND TRAFALGAR PLACE ROAD RESERVES, HOBART - DEMOLITION AND NEW DEVELOPMENT FOR HOTEL, RESTAURANT, BARS, FUNCTION FACILITIES AND CAFE - PLN-15-01162-01 - FILE REF: 7162977 & P/28-32/470

203x’s

Attached are copies of reports and other additional information that support the content of the Officer’s report contained in the agenda, referred at this item.

Attachment 1

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-01162-01 and was received on the 24 September 2015.

Planning Authority: Hobart City Council

MIDSON traffic pty ltd

Elizabeth Tasmania Pty Ltd

The Palace Hotel
28 Elizabeth Street
Traffic Impact Assessment

September 2015

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1. Introduction

1.1 Background

Midson Traffic were engaged by Elizabeth Tasmania Pty Ltd to prepare a traffic impact assessment for the development of the proposed 'Palace Hotel' development at 28 Elizabeth Street, Hobart.

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, unforseen 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.

The Hobart Interim Planning Scheme, 2015, states that a TIA is required if the increase in the number of vehicle movements per day is more than 40. It further states that the planning authority may require "*an assessment, by a suitably qualified person, of parking demand created by a use or development and the ability for such demand created by a use or development and the ability for such demand to be satisfied in the vicinity of a proposed use of development, if reliant on performance criteria to satisfy E6.6.1, E6.6.3 or E6.6.4*".

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 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:

- 19 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

Keith is a Director of the traffic engineering, transport planning and road safety company, Midson Traffic Pty Ltd. He is also a Teaching Fellow at Monash University, where he teaches and coordinates the subject 'Road Safety Engineering' as part of Monash's postgraduate program in traffic and transport. Keith is also an Honorary Research Associate with the University of Tasmania, where he lectures the subject 'Transportation Engineering' in the undergraduate civil engineering program as well as supervising several honours projects each year.

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 28 Elizabeth Street Hobart (within the Bus Mall). The rear of the site is accessed via Trafalgar Place.

The subject site and surrounding road network is shown in Figure 1.

Figure 1 Subject Site & Surrounding Road Network

Source: LIST Map, DPIPWE

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
- Institute of Transportation Engineers, Trip Generation Manual, 8th Edition, 2008 (ITE Manual)
- Australian Standards, AS2890.1, *Off-Street Parking*, 2004 (AS2890.1:2004)
- 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)

2. Existing Conditions

2.1 Transport Network

For the purpose of this report, the transport network consists of Elizabeth Street, Trafalgar Place, Macquarie Street and Collins Street. Other roads such as Argyle Street, Liverpool Street and Murray Street were considered in the context of the development, but not examined in detail.

These roads are outlined in the following sections.

2.1.1 Elizabeth Street

Elizabeth Street is a major collector road that provides accessibility to North Hobart to the west of Collins Street. The Mall is located between Collins Street and Liverpool Street, and the bus mall is located between Collins Street and Macquarie Street. To the east of Macquarie Street, Elizabeth Street provides an important link between Sullivans Cove and the Davey Street/ Macquarie Street couplet. At the Collins Street and Macquarie Street junctions, Elizabeth Street provides access for Metro bus services, as well as service vehicle access (including access to Lords Place) and taxi vehicle thoroughfare (to a much less extent).

The subject site's existing street frontage on the bus mall is shown in Figure 2.

Figure 2 Subject Site's Bus Mall Frontage

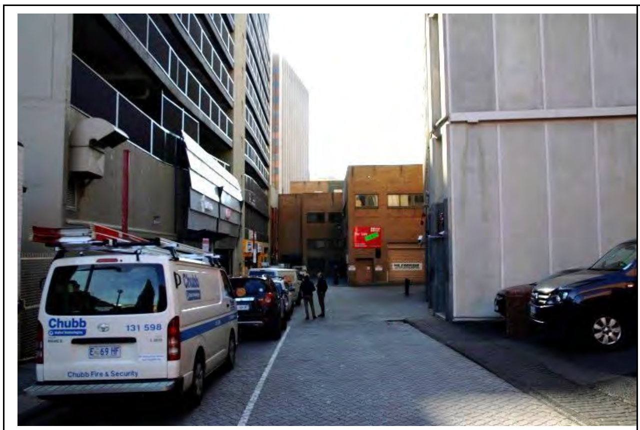
2.1.2 Trafalgar Place

Trafalgar Place is a short dead-end 'T' shaped road that provides access to the rear of several properties fronting the bus mall (including the subject site) and Collins Street. It also provides access to Trafalgar Car Park.

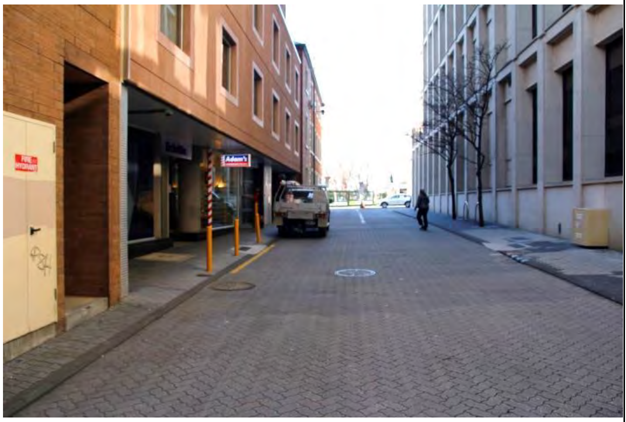
A footpath is provided on the southern side of Trafalgar Place. Only a narrow kerb edge is provided on the northern side of the road, with some localised widening for pedestrians at the access to the Deloittes Building adjacent to the subject site.

Trafalgar Place from various viewpoints is shown in Figure 3.

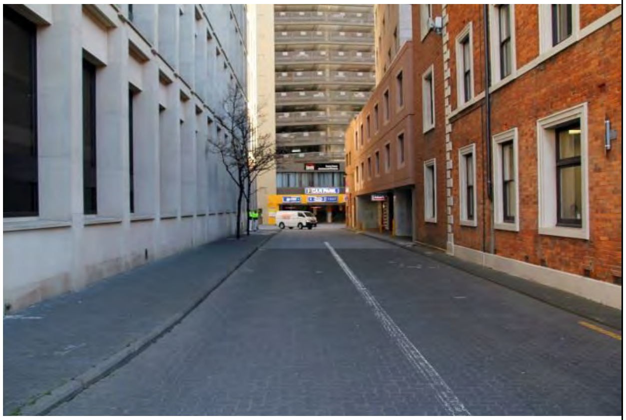
Figure 3 Trafalgar Place



Southern end of Trafalgar Place towards subject site



From Subject site looking towards Macquarie Street



From Macquarie Street towards site

Existing site access

2.1.3 Macquarie Street

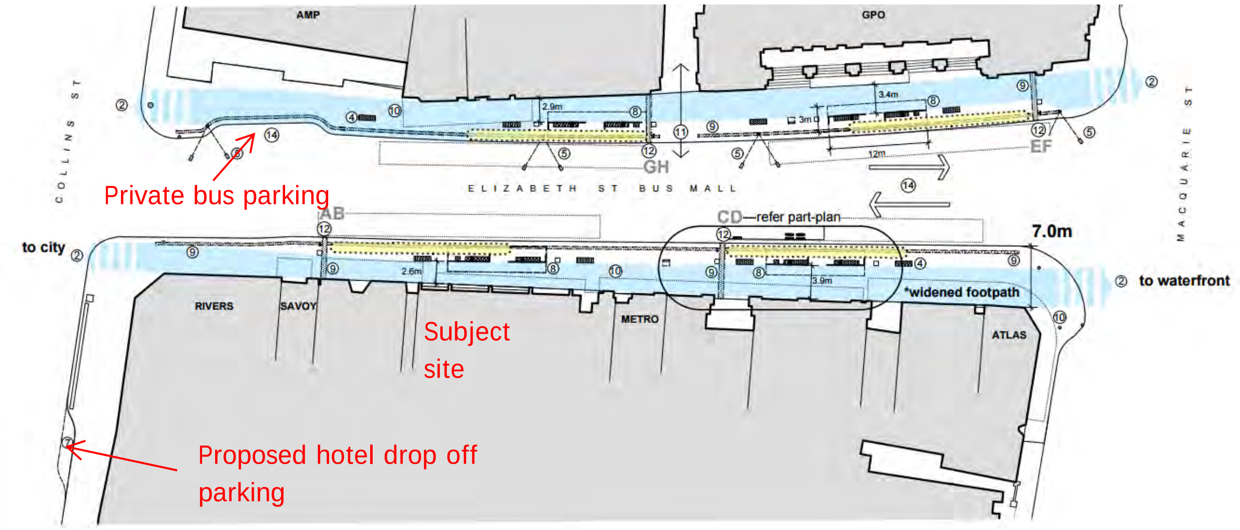
Macquarie Street is a major arterial road that forms the northbound component of the Davey Street/ Macquarie Street couplet through Hobart. It has three lanes near the bus mall and carries approximately 34,000 vehicles per day[1].

2.2 Bus Mall Upgrade

Plans are currently underway for the revitalisation of the Hobart Bus Mall in its current location in Elizabeth Street. The bus mall upgrade is a component of both the Inner City Action Plan and the Hobart Central Bus Interchange Planning Project, a joint project between the City of Hobart, the Department of State Growth, Metro Tasmania and TasBus. Construction is likely scheduled to commence in 2016.

A concept plan for the bus mall revitalisation is shown in Figure 4.

Figure 4 Bus Mall Upgrade



Source: www.hobartcity.com.au

2.3 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 between 1 January 2010 and 30th June 2015 for Elizabeth Street between Davey Street and Collins Street, and the full length of Trafalgar Place.

---

[1] State Growth SCATS data, Macquarie Street/ Barrack Street junction, October 2014.

The findings of the crash data is summarised as follows:

- A total of three crashes were reported in Trafalgar Place during that time. Two of these crashes occurred in the section of Trafalgar Place between Macquarie Street and the subject site, the other occurred in the section to the south (towards the Collins Street laneway). No crashes were reported at the Macquarie Street junction.
- Two of the crashes that were reported in Trafalgar Place involved "other manoeuvring", and one involved "vehicle door". No crashes involved injury.
- A total of 40 crashes were reported in Elizabeth Street between Davey Street and Macquarie Street. Of these crashes, 4 involved pedestrians. Three of the pedestrian crashes involved heavy vehicles (most likely buses) and occurred within the Bus Mall (one at Collins St, one at Macquarie St, and one mid-block). One pedestrian crash was reported at the Davey Street junction.
- A total of 11 crashes were reported at the Macquarie Street junction. Five of these crashes involved minor injury and the remainder involved property damage only. The dominant crash trend was 'right through', accounting for a total of 8 crashes. No crashes at this location involved heavy vehicles (assumed therefore that buses were not involved).
- Three crashes were reported at the junction of Collins Street. One of these crashes involved a pedestrian (as noted above), and two crashes involved a heavy vehicle reversing.
- A total of 7 crashes occurred within the bus mall. Of these crashes, 5 involved a parked vehicle (parked vehicle run away and 'parked'), one involved a pedestrian, and one involved a reversing manoeuvre.
- One crash was reported in Elizabeth Street between Davey Street and Macquarie Street. This crash involved a reversing manoeuvre and resulted in property damage only.
- A total of 11 crashes were reported at the junction of Davey Street. Of these crashes, 3 involved minor injury, 1 involved first aid at the scene, and the balance involved property damage only. The dominant crash trends at this junction were 'rear-end' (5 crashes) and 'right turn side swipe' (3 crashes).

The crash data is relatively typical of a busy CBD road environment, with high levels of pedestrian and bus activity. The crash history does not indicate that there are any specific road safety issues that may be exacerbated by traffic generated by the proposed development.

3. Proposed Development

3.1 Development Proposal

The proposed development involves the demolition of the existing building (previously the Westpac Bank), and the construction of a new 196 room hotel. The Hotel also comprises of bar, restaurant, gymnasium and car parking.

The proposed development plans are shown in Figure 5, Figure 6, Figure 7, Figure 8 and Figure 9.

Figure 5 Proposed Development – Ground Floor

Figure 6 Proposed Development – Mezzanine Floor

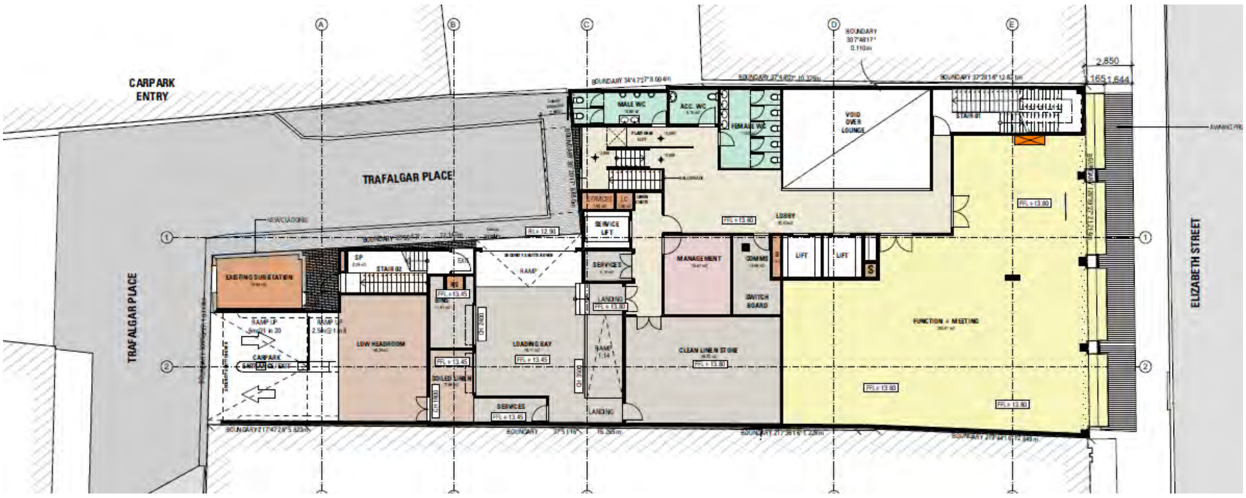


Figure 7 Proposed Development – Level 1

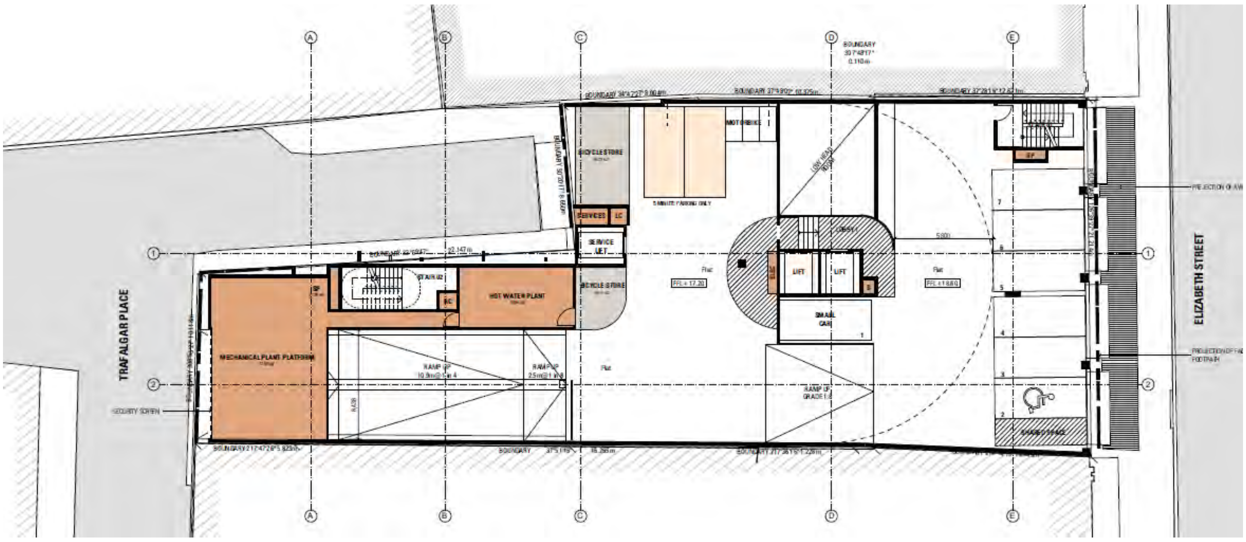


Figure 8 Proposed Development – Levels 2 & 3

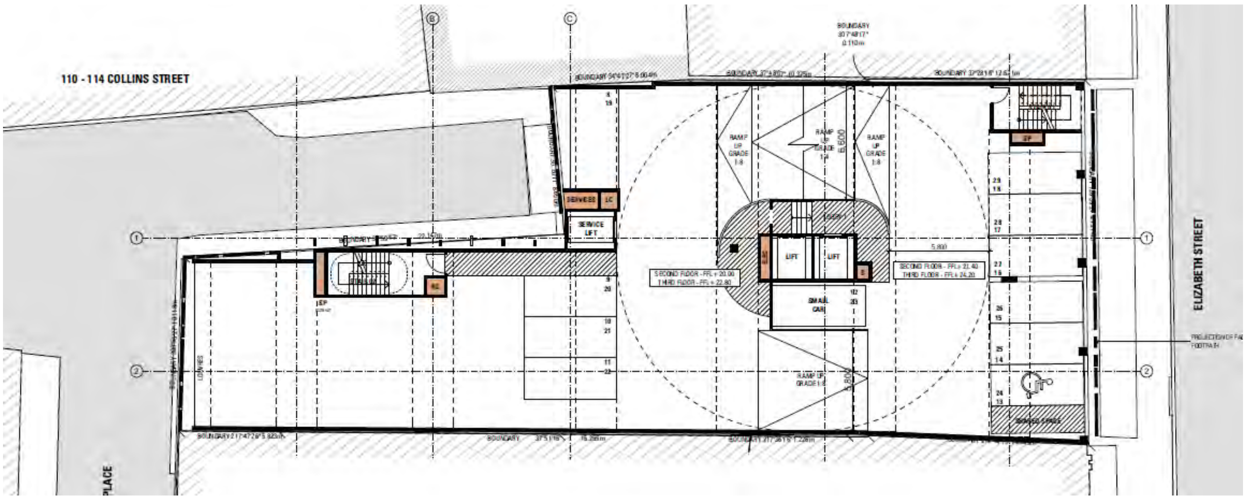
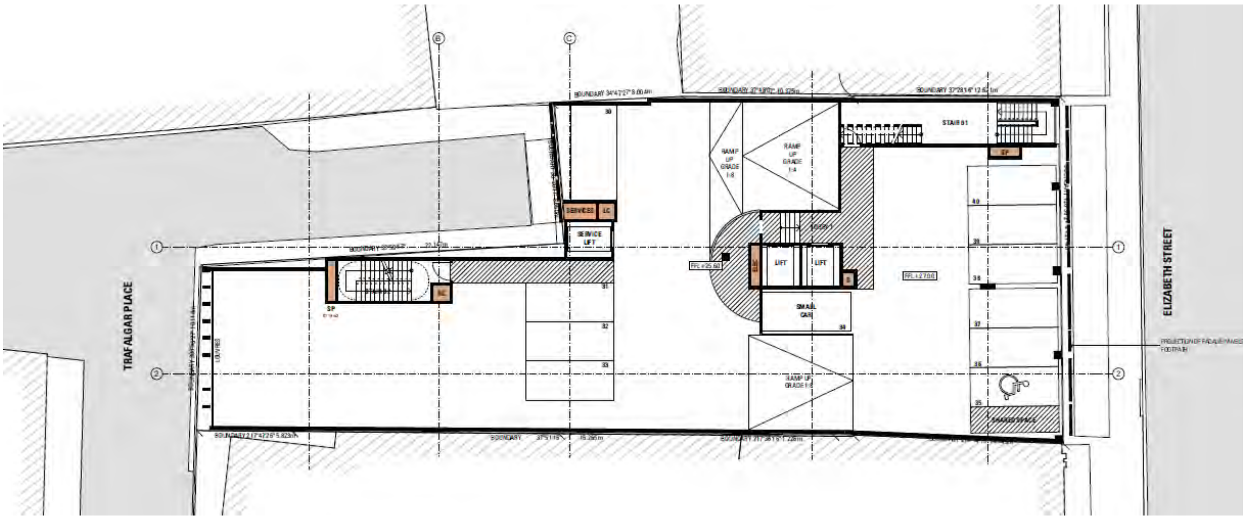


Figure 9 Proposed Development – Level 4



4. Traffic Impacts

4.1 Traffic Generation

The proposed development is an inner city hotel. It will be ideally suited to guests staying in city (such as business people, etc) who do not require a car. The site is very close to public transport (fronting bus mall) and is within close walking distance Sullivans Cove and CBD.

Traffic generation rates have been sourced from the ITE Manual (noting that the standard Australian traffic generation reference, RTA Guide, does not contain data for hotels of this type). The ITE Manual provides detailed trip generation rates for a hotel development as shown in Table 1.

Table 1 ITE Hotel Trip Generation Rates

Unit	Weekday	AM	PM	AM In	AM Out	PM In	PM Out
Rooms – Rate	8.17	0.56	0.59	61%	39%	53%	47%
Staff – Rate	14.34	0.69	0.80	60%	40%	54%	46%
Rooms – Total	1,569 trips	108 trips	113 trips	66 trips	42 trips	60 trips	53 trips
Staff - Total	215 trips	10 trips	12 trips	6 trips	4 trips	6 trips	6 trips
Total	**1,784 trips**	**118 trips**	**125 trips**	**72 trips**	**46 trips**	**67 trips**	**59 trips**

The trip generation rates provided in Table 1 relate to people trips, with mode share between car, pedestrian, bicycle, motorcycle and bus. Traffic generation at the site is restricted by the physical number of parking spaces provided (ie. it would not be possible for the car park to cater for 118 inward and 125 outward vehicle trips during the morning peak for example).

The proposed multi-level car park caters for a maximum occupancy of 40 spaces and 2 motorcycles. (Note that 2 spaces are located in the first level – these are not included in the total parking numbers as they are for short term check in prior to accessing a parking space elsewhere). The maximum traffic generation during the AM and PM peak periods is therefore likely to be in the order of 53 vehicles per hour when the hotel is at full capacity (with the inward and outward splits provided in Table 1).

All vehicle trips to the site will be via Trafalgar Place, which is accessible from Macquarie Street. All approaching traffic must therefore approach the site from Macquarie Street from the south. Vehicles departing exit onto Macquarie Street and travel north, or can then utilise Elizabeth Street to access destinations to the south, or Sullivans Cove.

As stated earlier, being an inner city Hotel, it is expected that it will attract a high proportion of guests who do not arrive by vehicle.

4.2 Access Impacts

Access to the car park is via an existing building entrance in Trafalgar Place. The ramp is 6.4 metres wide and has been designed with kerb on both wall edges to reduce the risk of vehicle impact with the internal walls on the ramp.

A boom gate mechanism is proposed at both ends of the ramp to ensure that only authorised entry is permitted. This also prevents vehicles from entering the car park during times when it is at capacity. The boom gate is operated by a swipe card with an intercom for manual over-ride.

Sight distance is restricted by the walls of the building at the junction with Trafalgar Place for exiting vehicles. At a distance of 2.5 metres back from the kerb (as required by Figure 3.2 of AS2890.1:2004), the available SSD for vehicles approaching from the west is approximately 10 metres. This sight distance increases rapidly as the vehicle moves into Trafalgar Place as part of its exit manoeuvre. Full sight distance is available to the exit of Trafalgar Place car park when the driver's position is located approximately 1.5 metres from the kerb. It is this direction which is considered the most important as the traffic on this approach travels immediately adjacent to the building line.

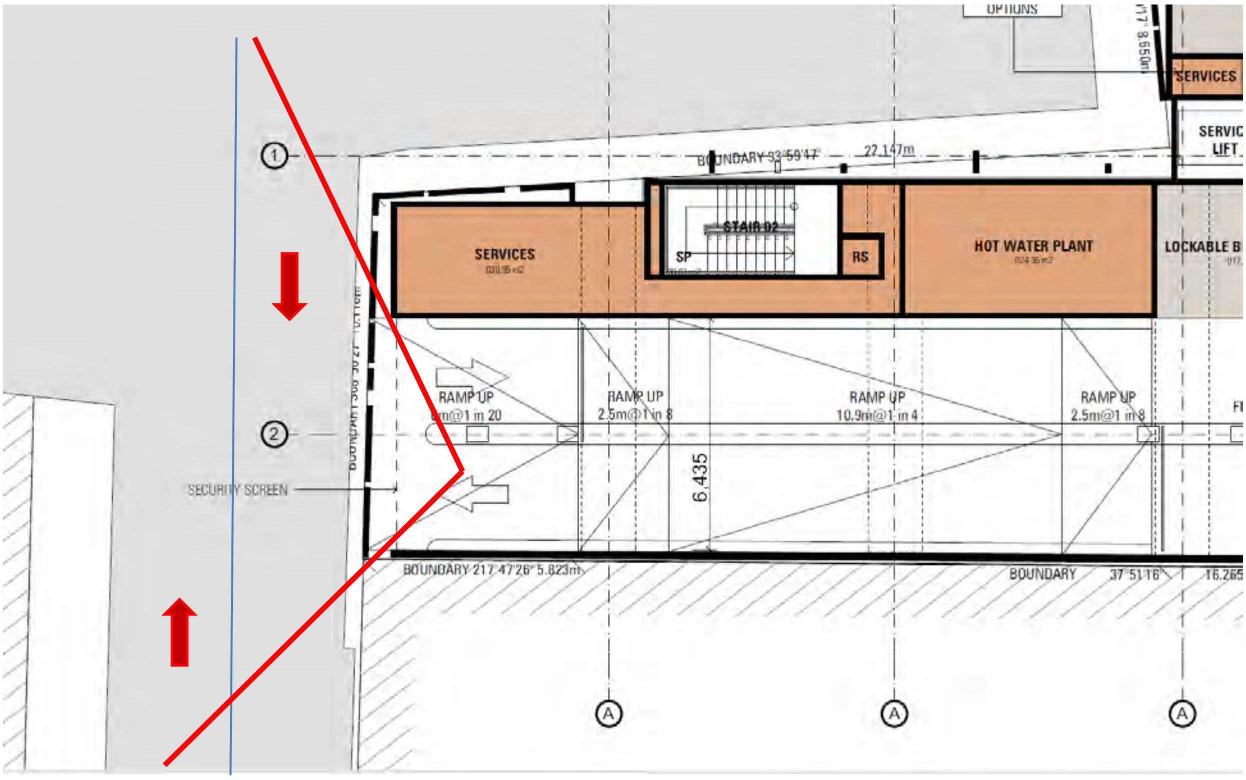
Sight lines to the west are lower, however traffic can move into Trafalgar Place without passing into the conflict area of vehicles in this approach. As with sight lines in to the east, as the vehicle moves into Trafalgar Place, sight distance increases rapidly.

Speeds were observed to be very low in Trafalgar Place. The short distance between the site's access and the 'T' end of Trafalgar Place (at the Trafalgar Car Park's access) is relatively short, thus vehicles do not have sufficient distance to reach reasonable speeds. The 85th percentile speed at the access is likely to be in the order of 30-km/h at the site's access.

Due to the identified sight distance restriction, it is important to ensure that measures are taken to maximise safety at this access location. The following measures are recommended:

- Provide a car park style speed hump at the exit of the car park to ensure vehicles leave the site at very low speed.
- Provide a warning system to alert motorists approaching the access on Trafalgar Place that a vehicle is exiting the site. This can be in the form of a flashing light above the access.

Figure 10 Access Sight Distance



4.3 Pedestrian Impacts

Pedestrian access is available at the Elizabeth Street and Trafalgar Place frontages. Access is available between both frontages, thus enabling guests and visitors to the hotel to access the bus mall and Trafalgar Place.

Within the car park, pedestrian access is available to the central elevator shaft. On the northern car parks on each level, access is via a level path. Access between northern car parks and the elevator access is level. Car parking spaces on the southern side of each level can access the elevator shaft via a small flight of stairs.

A service lift is located on the southern side of the car park on each level. The swept path of vehicles travels in very close proximity to the access to the lift. It is therefore recommended that a warning device be installed above the lift doors to alert approaching motorists that a person may be exiting the lift. Note that the service lift will have very infrequent usage within the car parking levels.

Pedestrian access is not permitted down the main access ramp to the car park to Trafalgar Place.

Pedestrian infrastructure is well provided on both roads connecting to the site. A formal pedestrian footpath is only available on the southern side of Trafalgar Place.

4.4 Road Safety Impacts

No significant adverse road safety impacts are foreseen for the proposed development, as the predicted future peak traffic generation of 53 vehicles per hour is not significant enough to generate any road safety deficiencies based on the following:

- Access to the site is via Trafalgar Place. This access is a low speed/ low volume environment with a positive road safety performance.
- Access to and from Trafalgar Place at Macquarie Street is via a T-junction. "Keep Clear" markings have been installed
- There is sufficient spare capacity in the surrounding road network to absorb the small predicted increase in peak hour traffic generated from the proposed development.
- The access is located in a commercial environment and as such, traffic movements into and out of the site will not be seen as an unusual event by other motorists.

4.5 Construction Traffic Management

The development is located in a busy central city location and as such, its construction will require careful planning to minimise traffic impacts of adjacent properties and the operation of the surrounding road network (including the bus mall).

The stages of construction of the Palace Hotel will consist of the following:

- Stage 1: Demolition of existing building
- Stage 2: Preliminary excavation works
- Stage 3: Construction

Prior to the commencement of works, a construction management plan (CMP) will be prepared by the contractor and submitted for approval Hobart City Council. This plan will contain a detailed traffic management for all construction stages that have a potential impact on traffic and pedestrian flow on the surrounding transport network.

Importantly, the construction activities should not impact on the normal operation of the bus mall. Consideration will also be required for loading areas in the loading areas located immediately adjacent to the site in Trafalgar Place, along with pedestrian paths and access to the Trafalgar Place Car Park.

5. Parking Assessment

5.1 Parking Provision

The proposed development will provide a total of 40 on-site parking spaces. These spaces are accessed via a ramp connecting to Trafalgar Place. Parking is provided over four levels, with a central circulating ramp connecting the spaces to the access ramp.

Provision for loading is via a service access adjacent to the car park ramp in Trafalgar Place.

5.2 Planning Scheme Requirements

Acceptable Solution A1 of Schedule E6.6.5 of the Planning Scheme states that:

(a) No on-site parking is provided; or

(b) On-site parking is provided at a maximum rate of 1 space per 200m^2 of gross floor area for commercial uses; or

(c) On-site parking is provided at a maximum rate of 1 space per dwelling for residential uses; or

(d) On-site parking is required operationally for an essential public service, including, hospital, police or other emergency service.

Note that with a gross floor area of 8,117m^2, a maximum of 41 spaces is permitted under (b). In this case, the proposed development provides a total of 42 parking spaces. This parking provision fails to comply with (a) and (b) of Acceptable Solution A1 in E6.6.5 (noting that (c) and (d) are not relevant to this proposal).

The proposed development provides a total of 42 spaces, which is only 1 space greater than the Acceptable Solution E6.6.5(b).

The proposed development was therefore assessed against the Performance Criteria P1, which is as follows:

> *Car parking provision:*
>
> *(a) Is in the form of a public car parking station provided as part of a development which utilises a major existing access; or*
>
> *(b) Must not compromise any of the following:*
>
> *i. Pedestrian safety, amenity or convenience;*
>
> *ii. The enjoyment of 'al fresco' dining or other outdoor activity;*
>
> *iii. Air quality and environmental health;*
>
> *iv. Traffic safety*

In this case, access to the parking area utilises an existing vehicular access to the site, located on Trafalgar Place. The access does not significantly interfere with pedestrian access as the primary footpath in Trafalgar Place is located on the opposite side of the road. There is no al fresco dining or other outdoor activity. Air quality and environmental health are not a concern arising from the proposed development. The site does not cause any significant road safety concern (refer to Section 4.4 for details).

It is therefore considered that the Performance Criteria, P1 is met for E6.6.5 of the Planning Scheme.

5.3 Car Parking Layout

The design of the car park has been carefully undertaken to comply with the requirements of the Australian Standards as much as possible.

5.3.1 Car Parking Dimensions

The design of the parking modules at the northern and southern ends of each parking levels have the following dimensions:

- Space width: 2.4 metres
- Space length: 5.4 metres
- Aisle width: 5.8 metres

These spaces therefore comply with the dimension requirements of User Class 1A in Australian Standards, AS2890.1:2004 (Residential, domestic and employee parking).

Spaces 10, 21 and 32 are located in the south-western corner of the 2nd, 3rd and 4th levels of the car park. These spaces require a relatively complex reversing manoeuvre, parallel to the circulating aisle. It is recommended that these spaces be reserved for staff to reduce the turnover of the spaces, and to ensure that some driver familiarity is maintained.

Spaces 3, 14, 25 and 36 are signed as "small car". The Australian Standards states that the minimum dimensions for a small car space are 2.3m x 5.0m. The spaces measure 2.4m x 5.4m, but have been designated as 'small car' due to the wall structure associated with the adjacent ramp, and the elevator structure.

5.3.2 Swept Path Assessment

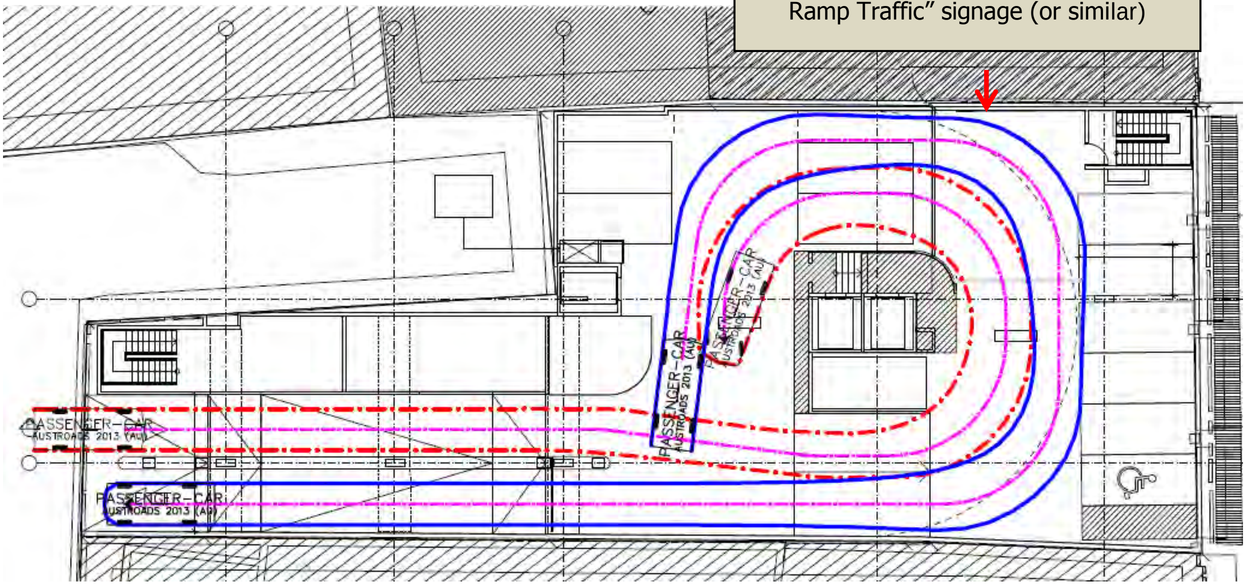
The relatively confined space within the building results in a car park design that has tight manoeuvring. Vehicles are required to circulate in an almost circular motion to navigate up or down the four car parking levels. The Australian Standards, AS2890.1:2004 states that the minimum radius of a curved circulation roadway is 11.8m for two-way flow, and 7.6m for one-way flow. In this case, the constrained site only enables approximately 9.5m radius. This is wider than the minimum for one-way flow, but less than the requirement of two-way flow.

A swept path assessment was undertaken to confirm vehicle manoeuvring within the car park. A swept path assessment of a B85 vehicle travelling up and down the ramps is shown in Figure 11. It can be seen that there is no margin for error when two vehicles are travelling in opposite directions. When a vehicle is travelling in one direction only, there is sufficient room to manoeuvre without concern.

To ensure that safety is maximised within the car park, the following measures are proposed:

- Warning signage: signage at the first internal ramp (adjacent to signage advising of the check in parking spaces) to advise of the narrow nature of the car park, with advisory speed (10-km/h).
- Centre line marking along all ramps and curves on ramp approaches.
- Signage on western walls of the car park (on northern side) advising that up-ramp traffic must give way to down-ramp traffic. This location will be more prominently visible for up-ramp traffic and will therefore have maximum impact (and will also not be obscured by parked vehicles or other potential obstructions). This location is shown indicatively in Figure 11.

Figure 11 Swept Path Assessment



"Up-Ramp Traffic Give Way to Down-Ramp Traffic" signage (or similar)

5.3.3 Ramp grades

The car park is located across 4 levels. This requires ramps at the following locations:

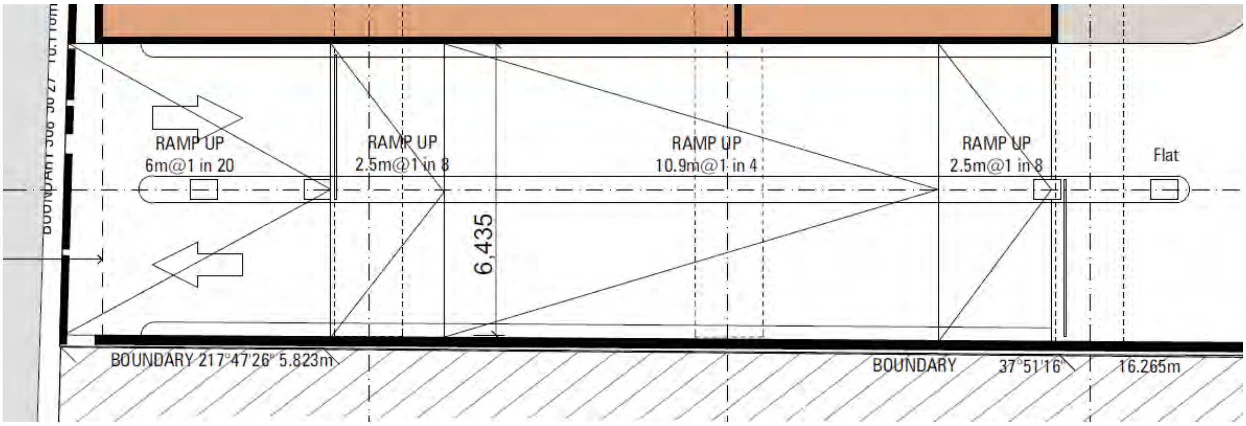
- Entry ramp from Trafalgar Place.
- Ramp either side of lift shaft on each level.

The ramp grades transition as follows:

- Entry: flat
- 6 metres: 1 in 20 (5% grade)
- 2.5 metres: 1 in 8 (12.5% grade)
- 10.9 metres: 1 in 4 (25% grade)
- 2.5 metres: 1 in 8 (12.5% grade)
- Car park level: flat

These grades conform to the requirements of the Australian Standards (AS2890.1:2004) in terms of maximum grade, as well as transitions. Specifically, the requirements of AS2890.1:2004, Section 2.5.3(b)(ii) specifies that the maximum permitted grade is 25% for accesses to car parks that are less than 20 metres in length. The requirements for change in grade are also met as per Section 2.5.3(d), which states that the maximum change in grade of a ramp is 12.5% algebraically. The entry ramp detail is shown in Figure 12.

Figure 12 Car Park Entry Ramp



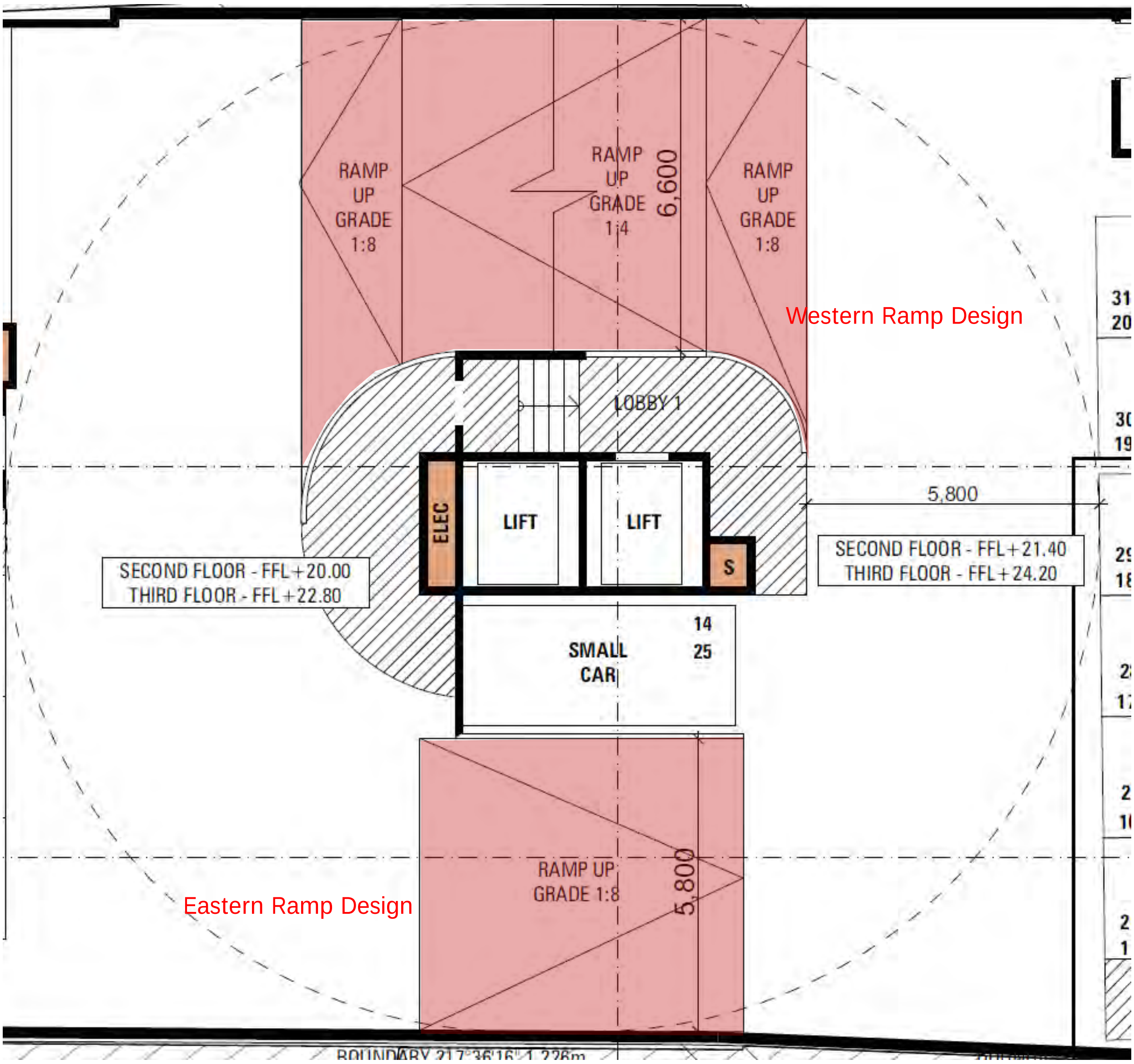
The grades within the car park itself have two designs:

- The eastern ramp is a constant 1 in 8 grade (12.5%).
- The western ramp is 1 in 4 grade (25%) with transitions of 1 in 8 (12.5%) on each approach.

These grades conform to the requirements of the Australian Standards (AS2890.1:2004) in terms of maximum grade, as well as transitions. Specifically, the requirements of AS2890.1:2004, Section 2.5.3(b)(ii) specifies that the maximum permitted grade is 25% for accesses to car parks that are less than 20 metres in length.

The requirements for change in grade are also met as per Section 2.5.3(d), which states that the maximum change in grade of a ramp is 12.5% algebraically. The ramp grade details are shown in Figure 13.

Figure 13 Car Park Internal Ramp Grades



5.4 Hotel Check-In Parking

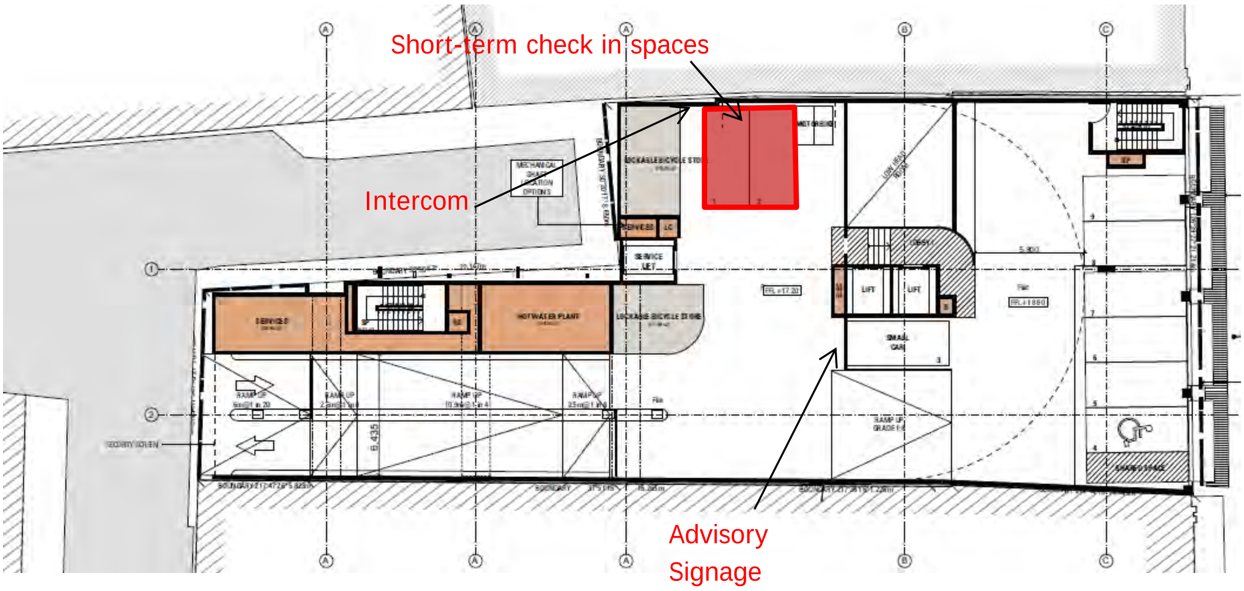
The location of the proposed Hotel is such that there is limited ability for guests to pull onto street to check in before accessing the car park. The Bus Mall does not permit access for Hotel traffic, and there are limited areas in Trafalgar Place for vehicles to stop a vehicle.

A five minute parking zone is proposed as part of the bus mall redevelopment in Collins Street, immediately south of the Elizabeth Street junction. This is proposed to replace the existing drop-off zone located within the bus mall for the Savoy Hotel. This is shown in Figure 4. The proposed five-minute zone would also service the proposed development due to its close proximity to the site (approximately 65 metres walking distance to the bus mall frontage of the site).

A system has therefore been developed, whereby a total of 2 spaces have been reserved on the first parking level for guests to stop and check in. Signage will be located to direct cars to these spaces within the car park ("Check In Spaces [left]/ Hotel Car Park [ahead]), and an intercom will be provided to assist customers with the process. They may then access the hotel to check in before moving their vehicle to the main car parking areas. This is shown in Figure 14. Signage is also proposed on the Macquarie Street/ Trafalgar Place junction to assist motorists.

As with most hotels, advice, internet and maps (standard leaflet style maps that can be written on) should be provided to assist guests to navigate through Hobart's streets if parked in an on-street location remote to the site.

Figure 14 Guest Check-In Parking Arrangements



It is typical of mainland inner city hotels to have limited on-street parking availability for check in. Normally hotels provide information regarding parking accessibility on their website (either through the check-in process or in general information), as well as via confirmation email when a room is booked. Similar Hotels in Hobart that provide parking information on their websites include Quest Savoy (no parking on-site), Hotel Grand Chancellor (limited parking), Hadleys (limited off-site parking), etc.

5.5 Taxi Parking

There is no provision for taxi parking for the proposed development. The nearest taxi rank for the site is in Collins Street.

Taxis are permitted to enter and travel through the Bus Mall, however parking is not formally available within the bus mall.

5.6 Bus Parking

A mini bus short-term parking area is proposed in Council's bus mall upgrade. This is proposed on the north-western corner of the bus mall and is suitable for use by the proposed hotel. Coordination with the Airport Shuttle bus may be required.

A (non-Metro) bus stop is also located in close proximity to the site in Macquarie Street, between Trafalgar Place and Elizabeth Street.

5.7 Service Vehicles

Service vehicles associated with the hotel will comprise mostly of smaller vans to collect and deliver laundry. Typically laundry services would operate early in the morning. Service vehicles associated with food delivery would also be done through the use of vans with a frequency of 2 to 3 times per day. General deliveries would also be undertaken using vans or utilities, with a frequency of up to 6 times per day.

Refuse management would be undertaken once or twice per week using an 8.8m service vehicle. This activity would be undertaken early during the morning.

Service vehicles have access to the site via the laneway running parallel to the car park ramp. A loading dock is provided beneath the car parking ramp for this purpose. A loading zone is also available in Trafalgar Place (south of the site). This loading zone is shared by nearby commercial properties.

The RTA Guide recommends the provision for commercial vehicles as set out as follows:

- Hotels and Motels (50% of spaces adequate for trucks). [applicable for hotels less than 200 rooms]
    - → 1 space per 50 bedrooms; plus
    - → 1 space per 1,000m^2 of public area set aside for bar, tavern, lounge and restaurant.

The total requirement would therefore be 4 + 1 = 5 spaces in accordance with the RTA Guide.

As well as the provision of a loading dock, the northern section of Trafalgar Place adjacent to the site is used as a loading area by adjacent businesses. The lack of through traffic and pedestrian movements makes this practice acceptable as a 'rear of shop' area.

In practice, the provision of the loading dock, as well as the northern section of Trafalgar Place and the existing loading dock is considered acceptable for the normal operation of the Hotel. It will be important to ensure that loading and unloading activities will not interfere with the normal traffic flow associated with the Trafalgar Place car park. It is therefore recommended that the Hotel adopt a management plan for deliveries to prevent impacts on the normal flow of traffic accessing Trafalgar Car Park.

5.8 Bicycle Parking

The Acceptable Solution, A1, or Schedule E6.6.4 of the Planning Scheme requires the provision of bicycle parking for developments. The requirements of the proposed development are set out in Table 2.

The employee bicycle spaces are classified as 'Class 1' or 'Class 2' spaces, which requires locked compounds with communal access using duplicate keys, or fully enclosed individual lockers.

Two separate bicycle parking areas are proposed on the first level of the car park, along with dedicated change rooms on the ground floor. These change room facilities are proposed to be used by staff (complying the requirements for Class 1 or Class 2 facilities). A total of approximately 40 bicycles can be stored in these lockable facilities, thus satisfying Acceptable Solution A1 of E6.6.4 of the Planning Scheme.

Table 2 Bicycle Parking Requirements

Use	Employee/ Visitor Bicycle Parking Requirement	Class	Required
Community meeting and entertainment	Employee = 1 for each 500m^2 of floor area Visitor = 4 plus 2 for each 200m^2 floor area	1 or 2 3	Function room area = 263m2: total = 1 Total 4+ 2 = 6
Food services	Employee = 1 for each 100m2 of floor area available to public Visitor = 1 for each 200m^2 floor area after the first 200m^2 floor area (min 2)	1 or 2 3	Café area = 59m^2 Restaurant = 109m^2 Total = 2 Total = 2
Hotel Industry	Employee = 1 for each 25m^2 bar floor area plus 1 for each 100m^2 lounge/ beer garden area Visitor = 1 for each 25m^2 bar floor area plus 1 for each 100m^2 lounge, beer garden area	1 or 2 3	Bar and lounge area = 24m^2 bar and 61m^2 lounge, cocktail bar = 12m^2 and 141m^2 lounge Total = 2 + 2 = 4 Total = 4
Visitor Accommodation	Employee = 1 for each 40 accommodation rooms Visitor = 1 for each 30 accommodation rooms	1 or 2 3	Total rooms = 196 Total = 5 Total = 7
TOTAL	**Employee** **Visitor**	1 or 2 3	**12** **19**

5.9 Parking for People with Disabilities

Acceptable Solution A1, of Schedule E6.6.2 of the Planning Scheme requires that 1 satisfy the relevant provisions of the Building Code of Australia. This equates to the provision of 1 space for every 20 car parking spaces.

The provision of 2 parking spaces for persons with a disability is therefore required (rounded to nearest whole number from 2.1 spaces). A total of 4 disabled parking spaces are proposed; one on each level of the car park (located on the north-eastern corner of each level). A level path of travel is available from these spaces to the elevators.

Acceptable Solution A1 of E6.6.2 is therefore met.

5.10 Motorcycle Parking

Acceptable Solution A1, of Schedule E6.6.3 of the Planning Scheme requires that 1 motorcycle space be provided for every 20 car parking spaces.

The provision of 2 motorcycle spaces is therefore required (rounded to nearest whole number from 2.1 spaces). These motorcycle parking spaces are proposed on the bottom level of the car park, adjacent to the 'check-in' parking spaces.

Acceptable Solution A1 of E6.6.3 is therefore met.

6. Conclusions

This traffic impact assessment (TIA) investigated the traffic and parking impacts of a proposed hotel development at 28 Elizabeth Street, Hobart. The hotel provides a total of 42 parking spaces (including 4 disabled parking spaces), 40 bicycle spaces and two motorcycle spaces.

The hotel provides on-site parking in the form of four levels of multi-level parking accessed from Trafalgar Place. Access to the car park is via a ramp located at an existing access to the building. The ramp grades and dimensions conform to the requirements of the Australian Standards. Sight lines for vehicles exiting the car park are of concern however. The following recommendations have been made to ensure safe vehicular access at this location:

- A speed hump placed at the exit of the car park to ensure low vehicle speeds.
- A warning device be installed to alert approaching motorists of vehicles exiting the site.

The internal car park layout it very tight. The dimensions of the car parking spaces comply with Australian Standards requirements for Class 1A, the circulation roadway is less than the minimum radius for two-way flow. Swept paths confirm that vehicles can pass in opposing directions (B85 vehicles), however to improve circulation and safety within the car park, signage should be installed to require vehicles travelling up the car park to give way to motorists travelling down. Consideration should also be made for the installation of warning devices when vehicles are travelling in opposing directions within the car park. Note that the selected warning devices should not distract motorists from their driving task.

The proposed development provides sufficient bicycle, motorcycle and disabled parking in accordance with the requirements of the Planning Scheme. Disabled parking is provided on all four parking levels, and level access is available from the parking spaces to the elevator access.

Pedestrian access is available from both Elizabeth Street and Trafalgar Place frontages, with pedestrian connectivity available between the frontages. Bicycle parking in the form of separate lockable storage is available for staff, with appropriate change rooms located immediately adjacent.

A service lift accesses all parking levels, with the swept path of down-ramp traffic located immediately adjacent to the lift doors. Warning in the form of flashing lights should be installed to alert approaching motorists of the presence of a pedestrian exiting the lift. Note that the service lifts would be used very infrequently on the car parking levels.

Service vehicles can access the site in the dedicated loading dock accessed via Trafalgar Place, as well as the existing loading zone located to the south in Trafalgar Place. The northern end of Trafalgar Place is also currently utilised as a service area for adjacent businesses. The function of the road will remain the same for this activity and is considered adequate to service the service vehicle requirements of the development.

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

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Document Status

Revision	Author	Review	Date
0	Keith Midson	Zara Kacic-Midson	30 July 2015
1	Keith Midson	Zara Kacic-Midson	7 August 2015
2	Keith Midson	Zara Kacic-Midson	18 September 2015

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-01162-01 and was received on the 18 November 2015.

Planning Authority: Hobart City Council

MIDSON traffic pty ltd

Elizabeth Tasmania Pty Ltd

The Palace Hotel
28 Elizabeth Street
Traffic Impact Assessment

November 2015

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1. Introduction

1.1 Background

Midson Traffic were engaged by Elizabeth Tasmania Pty Ltd to prepare a traffic impact assessment for the development of the proposed 'Palace Hotel' development at 28 Elizabeth Street, Hobart.

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, unforseen 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.

The Hobart Interim Planning Scheme, 2015, states that a TIA is required if the increase in the number of vehicle movements per day is more than 40. It further states that the planning authority may require "*an assessment, by a suitably qualified person, of parking demand created by a use or development and the ability for such demand created by a use or development and the ability for such demand to be satisfied in the vicinity of a proposed use of development, if reliant on performance criteria to satisfy E6.6.1, E6.6.3 or E6.6.4*".

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 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:

- 19 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

Keith is a Director of the traffic engineering, transport planning and road safety company, Midson Traffic Pty Ltd. He is also a Teaching Fellow at Monash University, where he teaches and coordinates the subject 'Road Safety Engineering' as part of Monash's postgraduate program in traffic and transport. Keith is also an Honorary Research Associate with the University of Tasmania, where he lectures the subject 'Transportation Engineering' in the undergraduate civil engineering program as well as supervising several honours projects each year.

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 28 Elizabeth Street Hobart (within the Bus Mall). The rear of the site is accessed via Trafalgar Place.

The subject site and surrounding road network is shown in Figure 1.

Figure 1 Subject Site & Surrounding Road Network

Source: LIST Map, DPIPWE

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
- Institute of Transportation Engineers, Trip Generation Manual, 8th Edition, 2008 (ITE Manual)
- Australian Standards, AS2890.1, *Off-Street Parking*, 2004 (AS2890.1:2004)
- 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)

2. Existing Conditions

2.1 Transport Network

For the purpose of this report, the transport network consists of Elizabeth Street, Trafalgar Place, Macquarie Street and Collins Street. Other roads such as Argyle Street, Liverpool Street and Murray Street were considered in the context of the development, but not examined in detail.

These roads are outlined in the following sections.

2.1.1 Elizabeth Street

Elizabeth Street is a major collector road that provides accessibility to North Hobart to the west of Collins Street. The Mall is located between Collins Street and Liverpool Street, and the bus mall is located between Collins Street and Macquarie Street. To the east of Macquarie Street, Elizabeth Street provides an important link between Sullivans Cove and the Davey Street/ Macquarie Street couplet. At the Collins Street and Macquarie Street junctions, Elizabeth Street provides access for Metro bus services, as well as service vehicle access (including access to Lords Place) and taxi vehicle thoroughfare (to a much less extent).

The subject site's existing street frontage on the bus mall is shown in Figure 2.

Figure 2 Subject Site's Bus Mall Frontage

2.1.2 Trafalgar Place

Trafalgar Place is a short dead-end 'T' shaped road that provides access to the rear of several properties fronting the bus mall (including the subject site) and Collins Street. It also provides access to Trafalgar Car Park.

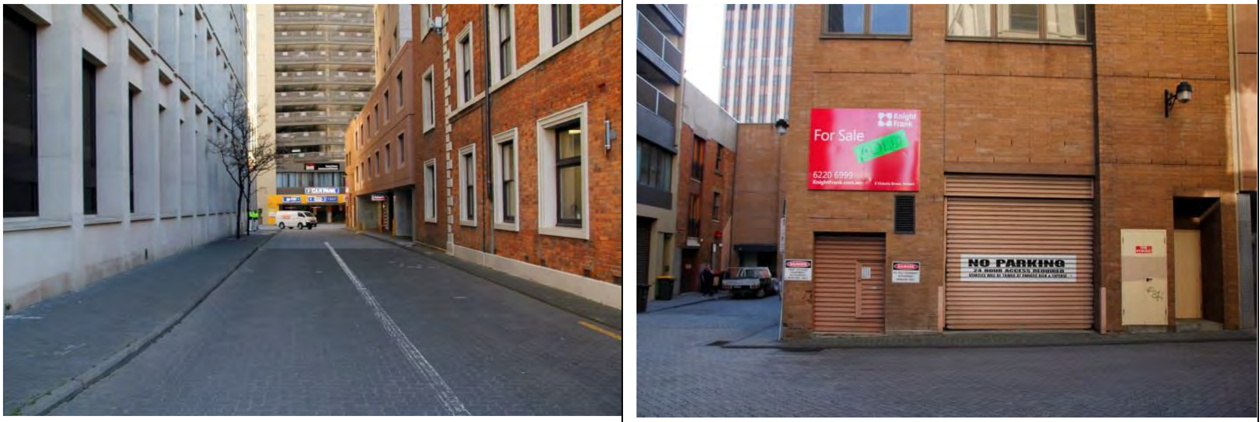
A footpath is provided on the southern side of Trafalgar Place. Only a narrow kerb edge is provided on the northern side of the road, with some localised widening for pedestrians at the access to the Deloittes Building adjacent to the subject site.

Trafalgar Place from various viewpoints is shown in Figure 3.

Figure 3 Trafalgar Place

Southern end of Trafalgar Place towards subject site

From Subject site looking towards Macquarie Street



From Macquarie Street towards site

Existing site access

2.1.3 Macquarie Street

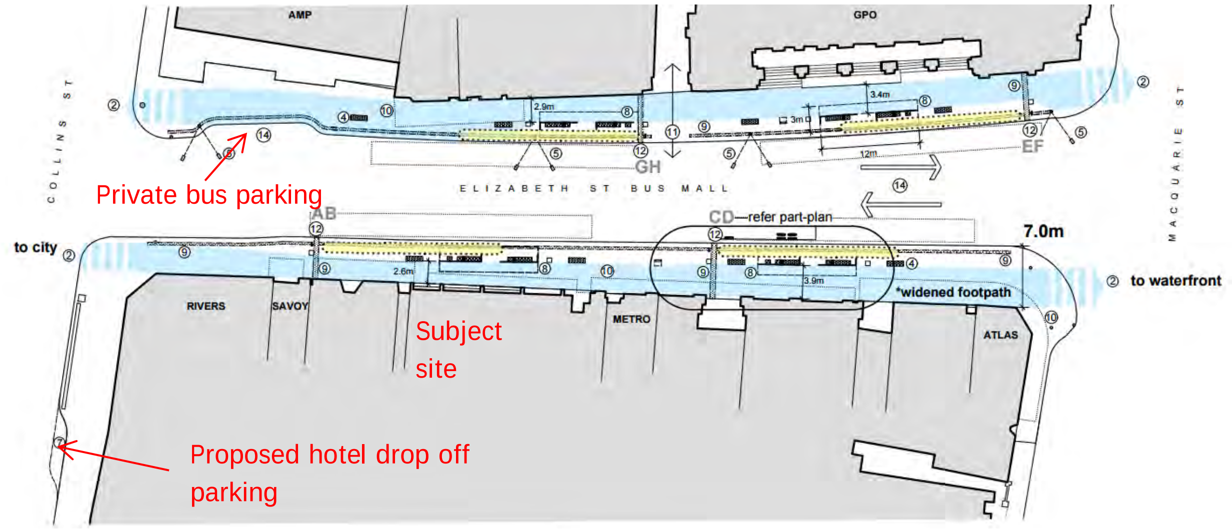
Macquarie Street is a major arterial road that forms the northbound component of the Davey Street/ Macquarie Street couplet through Hobart. It has three lanes near the bus mall and carries approximately 34,000 vehicles per day[1].

2.2 Bus Mall Upgrade

Plans are currently underway for the revitalisation of the Hobart Bus Mall in its current location in Elizabeth Street. The bus mall upgrade is a component of both the Inner City Action Plan and the Hobart Central Bus Interchange Planning Project, a joint project between the City of Hobart, the Department of State Growth, Metro Tasmania and TasBus. Construction is likely scheduled to commence in 2016.

A concept plan for the bus mall revitalisation is shown in Figure 4.

Figure 4 Bus Mall Upgrade



Source: www.hobartcity.com.au

2.3 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 between 1 January 2010 and 30th June 2015 for Elizabeth Street between Davey Street and Collins Street, and the full length of Trafalgar Place.

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[1] State Growth SCATS data, Macquarie Street/ Barrack Street junction, October 2014.

The findings of the crash data is summarised as follows:

- A total of three crashes were reported in Trafalgar Place during that time. Two of these crashes occurred in the section of Trafalgar Place between Macquarie Street and the subject site, the other occurred in the section to the south (towards the Collins Street laneway). No crashes were reported at the Macquarie Street junction.
- Two of the crashes that were reported in Trafalgar Place involved "other manoeuvring", and one involved "vehicle door". No crashes involved injury.
- A total of 40 crashes were reported in Elizabeth Street between Davey Street and Macquarie Street. Of these crashes, 4 involved pedestrians. Three of the pedestrian crashes involved heavy vehicles (most likely buses) and occurred within the Bus Mall (one at Collins St, one at Macquarie St, and one mid-block). One pedestrian crash was reported at the Davey Street junction.
- A total of 11 crashes were reported at the Macquarie Street junction. Five of these crashes involved minor injury and the remainder involved property damage only. The dominant crash trend was 'right through', accounting for a total of 8 crashes. No crashes at this location involved heavy vehicles (assumed therefore that buses were not involved).
- Three crashes were reported at the junction of Collins Street. One of these crashes involved a pedestrian (as noted above), and two crashes involved a heavy vehicle reversing.
- A total of 7 crashes occurred within the bus mall. Of these crashes, 5 involved a parked vehicle (parked vehicle run away and 'parked'), one involved a pedestrian, and one involved a reversing manoeuvre.
- One crash was reported in Elizabeth Street between Davey Street and Macquarie Street. This crash involved a reversing manoeuvre and resulted in property damage only.
- A total of 11 crashes were reported at the junction of Davey Street. Of these crashes, 3 involved minor injury, 1 involved first aid at the scene, and the balance involved property damage only. The dominant crash trends at this junction were 'rear-end' (5 crashes) and 'right turn side swipe' (3 crashes).

The crash data is relatively typical of a busy CBD road environment, with high levels of pedestrian and bus activity. The crash history does not indicate that there are any specific road safety issues that may be exacerbated by traffic generated by the proposed development.

3. Proposed Development

3.1 Development Proposal

The proposed development involves the demolition of the existing building (previously the Westpac Bank), and the construction of a new 196 room hotel. The Hotel also comprises of bar, restaurant, gymnasium and car parking. Car parking is provided over 4 levels with capacity for 39 spaces.

The proposed development plans for each level are shown in Figure 5, Figure 6, Figure 7, Figure 8 and Figure 9.

Figure 5 Proposed Development – Ground Floor

Figure 6 Proposed Development – Mezzanine Floor

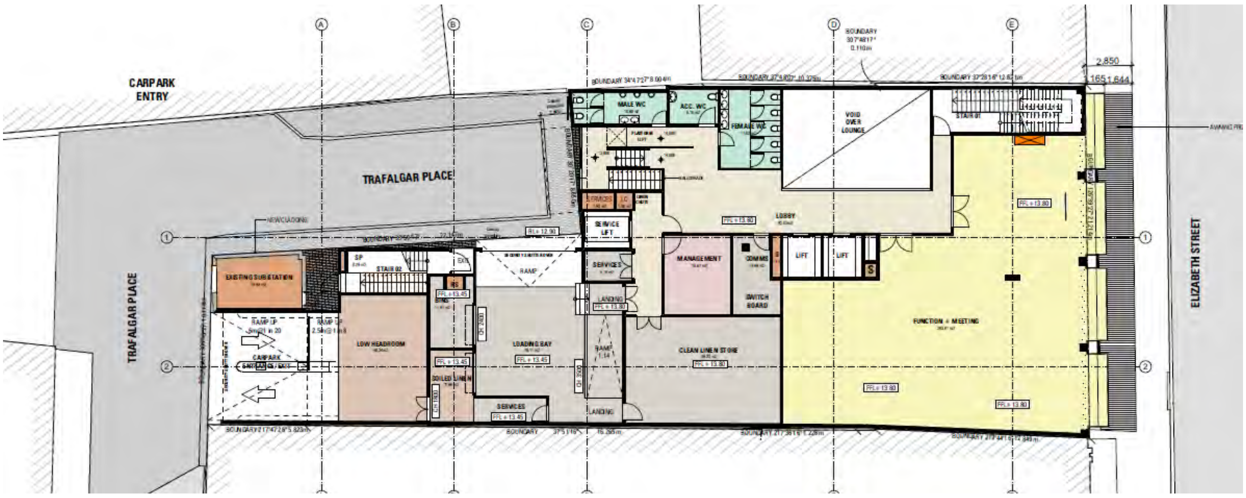


Figure 7 Proposed Development – Level 1

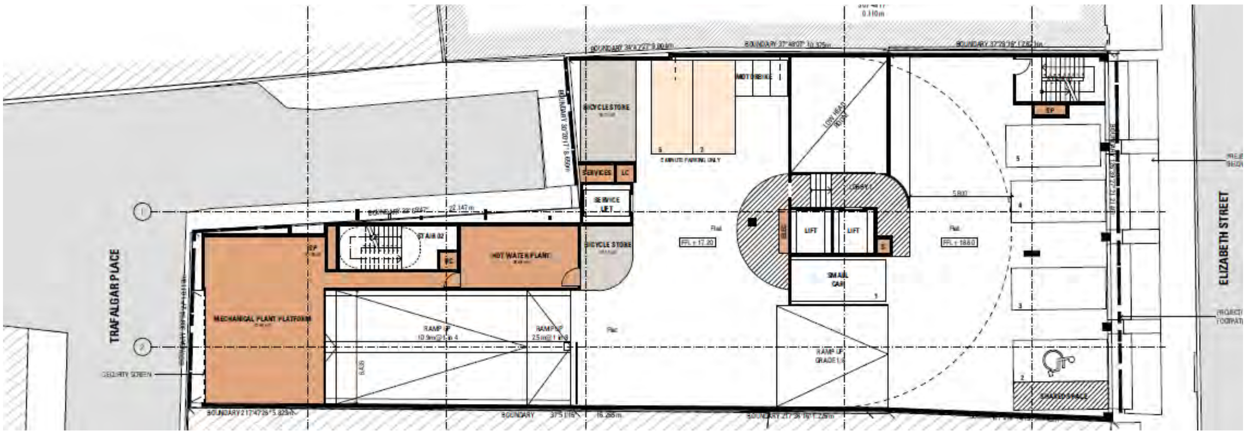


Figure 8 Proposed Development – Levels 2 & 3

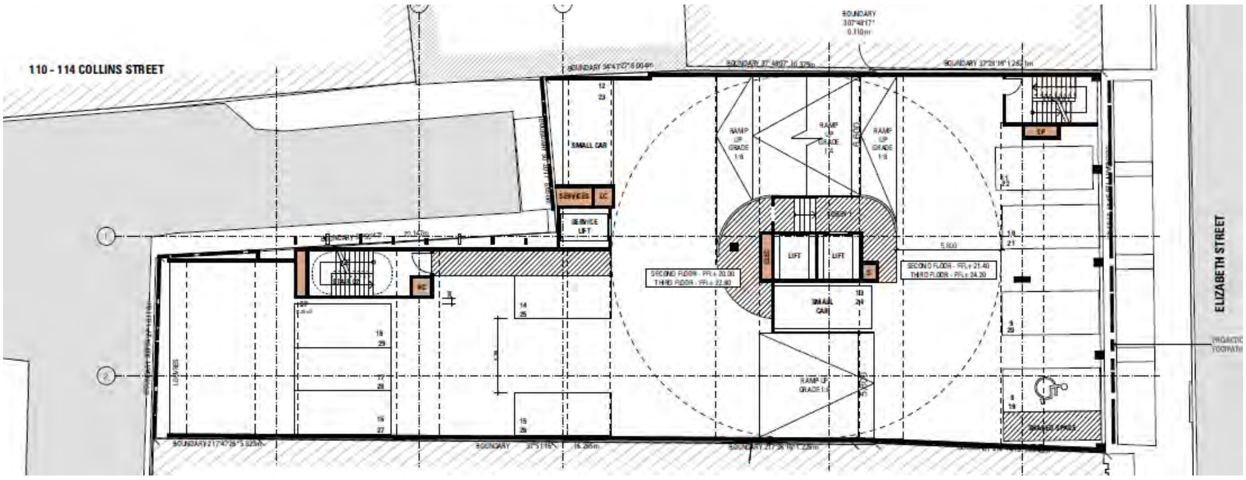
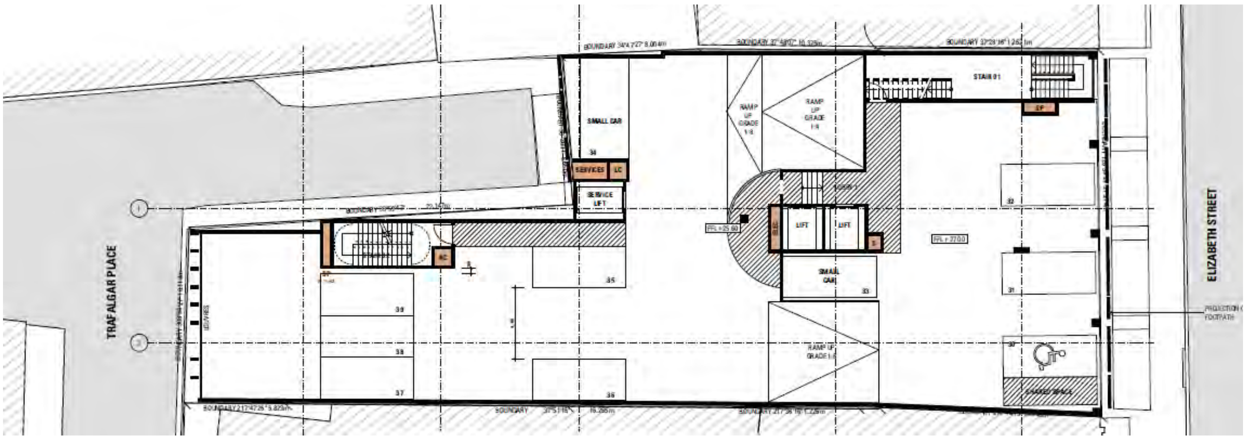


Figure 9 Proposed Development – Level 4



4. Traffic Impacts

4.1 Traffic Generation

The proposed development is an inner city hotel. It will be ideally suited to guests staying in city (such as business people, etc) who do not require a car. The site is very close to public transport (fronting bus mall) and is within close walking distance Sullivans Cove and CBD.

Traffic generation rates have been sourced from the ITE Manual (noting that the standard Australian traffic generation reference, RTA Guide, does not contain data for hotels of this type). The ITE Manual provides detailed trip generation rates for a hotel development as shown in Table 1.

Table 1 ITE Hotel Trip Generation Rates

Unit	Weekday	AM	PM	AM In	AM Out	PM In	PM Out
Rooms – Rate	8.17	0.56	0.59	61%	39%	53%	47%
Staff – Rate	14.34	0.69	0.80	60%	40%	54%	46%
Rooms – Total	1,569 trips	108 trips	113 trips	66 trips	42 trips	60 trips	53 trips
Staff - Total	215 trips	10 trips	12 trips	6 trips	4 trips	6 trips	6 trips
Total	**1,784 trips**	**118 trips**	**125 trips**	**72 trips**	**46 trips**	**67 trips**	**59 trips**

The trip generation rates provided in Table 1 relate to people trips, with mode share between car, pedestrian, bicycle, motorcycle and bus. Traffic generation at the site is restricted by the physical number of parking spaces provided (ie. it would not be possible for the car park to cater for 118 inward and 125 outward vehicle trips during the morning peak for example).

The proposed multi-level car park caters for a maximum occupancy of 39 spaces and 2 motorcycles. (Note that 2 spaces are located in the first level – these are not included in the total parking numbers as they are for short term check in prior to accessing a parking space elsewhere). The maximum traffic generation during the AM and PM peak periods is therefore likely to be in the order of 53 vehicles per hour when the hotel is at full capacity (with the inward and outward splits provided in Table 1).

All vehicle trips to the site will be via Trafalgar Place, which is accessible from Macquarie Street. All approaching traffic must therefore approach the site from Macquarie Street from the south. Vehicles departing exit onto Macquarie Street and travel north, or can then utilise Elizabeth Street to access destinations to the south, or Sullivans Cove.

As stated earlier, being an inner city Hotel, it is expected that it will attract a high proportion of guests who do not arrive by vehicle.

4.2 Access Impacts

Access to the car park is via an existing building entrance in Trafalgar Place. The ramp is 6.4 metres wide and has been designed with kerb on both wall edges to reduce the risk of vehicle impact with the internal walls on the ramp.

A boom gate mechanism is proposed at both ends of the ramp to ensure that only authorised entry is permitted. This also prevents vehicles from entering the car park during times when it is at capacity. The boom gate is operated by a swipe card with an intercom for manual over-ride.

Sight distance is restricted by the walls of the building at the junction with Trafalgar Place for exiting vehicles. At a distance of 2.5 metres back from the kerb (as required by Figure 3.2 of AS2890.1:2004), the available SSD for vehicles approaching from the west is approximately 10 metres. This sight distance increases rapidly as the vehicle moves into Trafalgar Place as part of its exit manoeuvre. Full sight distance is available to the exit of Trafalgar Place car park when the driver's position is located approximately 1.5 metres from the kerb. It is this direction which is considered the most important as the traffic on this approach travels immediately adjacent to the building line.

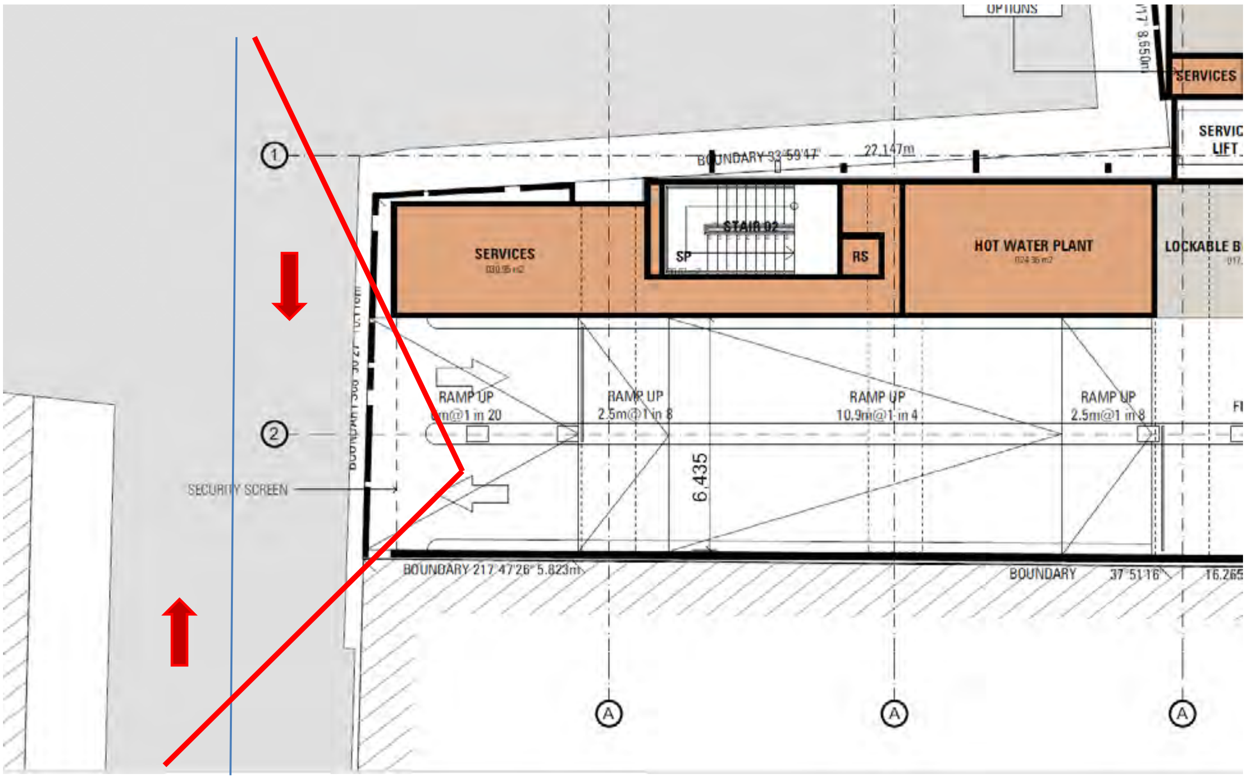
Sight lines to the west are lower, however traffic can move into Trafalgar Place without passing into the conflict area of vehicles in this approach. As with sight lines in to the east, as the vehicle moves into Trafalgar Place, sight distance increases rapidly.

Speeds were observed to be very low in Trafalgar Place. The short distance between the site's access and the 'T' end of Trafalgar Place (at the Trafalgar Car Park's access) is relatively short, thus vehicles do not have sufficient distance to reach reasonable speeds. The 85th percentile speed at the access is likely to be in the order of 30-km/h at the site's access.

Due to the identified sight distance restriction, it is important to ensure that measures are taken to maximise safety at this access location. The following measures are recommended:

- Provide a car park style speed hump at the exit of the car park to ensure vehicles leave the site at very low speed.
- Provide a warning system to alert motorists approaching the access on Trafalgar Place that a vehicle is exiting the site. This can be in the form of a flashing light above the access.
- Provide warning signage (static) on the building structure to advise motorists exiting from Trafalgar Place of exiting traffic from the proposed development's access.

Figure 10 Access Sight Distance



4.3 Pedestrian Impacts

Pedestrian access is available at the Elizabeth Street and Trafalgar Place frontages. Access is available between both frontages, thus enabling guests and visitors to the hotel to access the bus mall and Trafalgar Place.

Within the car park, pedestrian access is available to the central elevator shaft. On the northern car parks on each level, access is via a level path. Access between northern car parks and the elevator access is level. Car parking spaces on the southern side of each level can access the elevator shaft via a small flight of stairs.

A service lift is located on the southern side of the car park on each level. The swept path of vehicles travels in very close proximity to the access to the lift. It is therefore recommended that a warning device be installed above the lift doors to alert approaching motorists that a person may be exiting the lift. Note that the service lift will have very infrequent usage within the car parking levels.

Pedestrian access is not permitted down the main access ramp to the car park to Trafalgar Place.

Pedestrian infrastructure is well provided on both roads connecting to the site. A formal pedestrian footpath is only available on the southern side of Trafalgar Place.

It is noted that development in Collins Place is likely to have an impact on the function of Trafalgar Place in terms of increased pedestrian movements. With potential pedestrian through movements from the

Bus Mall through the subject site connecting to this area, some consideration should be made for future pedestrian planning of the area between Trafalgar Place and Collins Place. There are several potential options to address this, including:

- 10-km/h shared zone signage.
- Improved signage to define higher volume vehicular paths. This may include holding lines defining the short length of Trafalgar Place connecting to the through passage of the Trafalgar Place car park (with Trafalgar Car Park having priority).
- Changes in pavement colour or texture to define areas of higher pedestrian flow.
- Traffic calming measures.

These measures are considered outside the responsibility of the development, however it is in the interests of the development that pedestrian and vehicular conflicts are managed as safely as possible near the subject site.

4.4 Road Safety Impacts

No significant adverse road safety impacts are foreseen for the proposed development, as the predicted future peak traffic generation of 53 vehicles per hour is not significant enough to generate any road safety deficiencies based on the following:

- Access to the site is via Trafalgar Place. This access is a low speed/ low volume environment with a positive road safety performance.
- Access to and from Trafalgar Place at Macquarie Street is via a T-junction. "Keep Clear" markings have been installed
- There is sufficient spare capacity in the surrounding road network to absorb the small predicted increase in peak hour traffic generated from the proposed development.
- The access is located in a commercial environment and as such, traffic movements into and out of the site will not be seen as an unusual event by other motorists.

4.5 Construction Traffic Management

The development is located in a busy central city location and as such, its construction will require careful planning to minimise traffic impacts of adjacent properties and the operation of the surrounding road network (including the bus mall).

The stages of construction of the Palace Hotel will consist of the following:

- Stage 1: Demolition of existing building
- Stage 2: Preliminary excavation works
- Stage 3: Construction

Prior to the commencement of works, a construction management plan (CMP) will be prepared by the contractor and submitted for approval Hobart City Council. This plan will contain a detailed traffic management for all construction stages that have a potential impact on traffic and pedestrian flow on the surrounding transport network.

Importantly, the construction activities should not impact on the normal operation of the bus mall. Consideration will also be required for loading areas in the loading areas located immediately adjacent to the site in Trafalgar Place, along with pedestrian paths and access to the Trafalgar Place Car Park.

5. Parking Assessment

5.1 Parking Provision

The proposed development will provide a total of 39 on-site parking spaces. These spaces are accessed via a ramp connecting to Trafalgar Place. Parking is provided over four levels, with a central circulating ramp connecting the spaces to the access ramp.

Provision for loading is via a service access adjacent to the car park ramp in Trafalgar Place.

5.2 Planning Scheme Requirements

Acceptable Solution A1 of Schedule E6.6.5 of the Planning Scheme states that:

(a) No on-site parking is provided; or

(b) On-site parking is provided at a maximum rate of 1 space per 200m^2 of gross floor area for commercial uses; or

(c) On-site parking is provided at a maximum rate of 1 space per dwelling for residential uses; or

(d) On-site parking is required operationally for an essential public service, including, hospital, police or other emergency service.

Note that with a gross floor area of 8,117m^2, a maximum of up to 41 spaces is permitted under (b). In this case, the proposed development provides a total of 39 parking spaces. This parking therefore complies with (a) and (b) of Acceptable Solution A1 in E6.6.5 (noting that (c) and (d) are not relevant to this proposal).

5.3 Car Parking Layout

The design of the car park has been carefully undertaken to comply with the requirements of the Australian Standards as much as possible.

5.3.1 Car Parking Dimensions

The design of the parking modules at the northern and southern ends of each parking levels have the following dimensions:

- Space width: 2.4 metres
- Space length: 5.4 metres
- Aisle width: 5.8 metres

These spaces therefore comply with the dimension requirements of User Class 1A in Australian Standards, AS2890.1:2004 (Residential, domestic and employee parking).

5.3.2 Small Car Spaces

As the car park has several locations where the space is shorter than the minimum dimensions required under AS2890.1, or spaces are located in positions where it would be undesirable for a vehicle to protrude from the space and impede flow on the circulating ramps (due to structural elements, etc). To overcome this, several spaces are recommended to be signed "Small Car" spaces in accordance with AS2890.1 requirements. AS2890.1 states that *"under certain circumstances it may be appropriate to provide a space for smaller than specified above for small cars. It shall be designated as a space for small cars*". These spaces are typically dimensioned 2.3m wide x 5.0m long as a minimum.

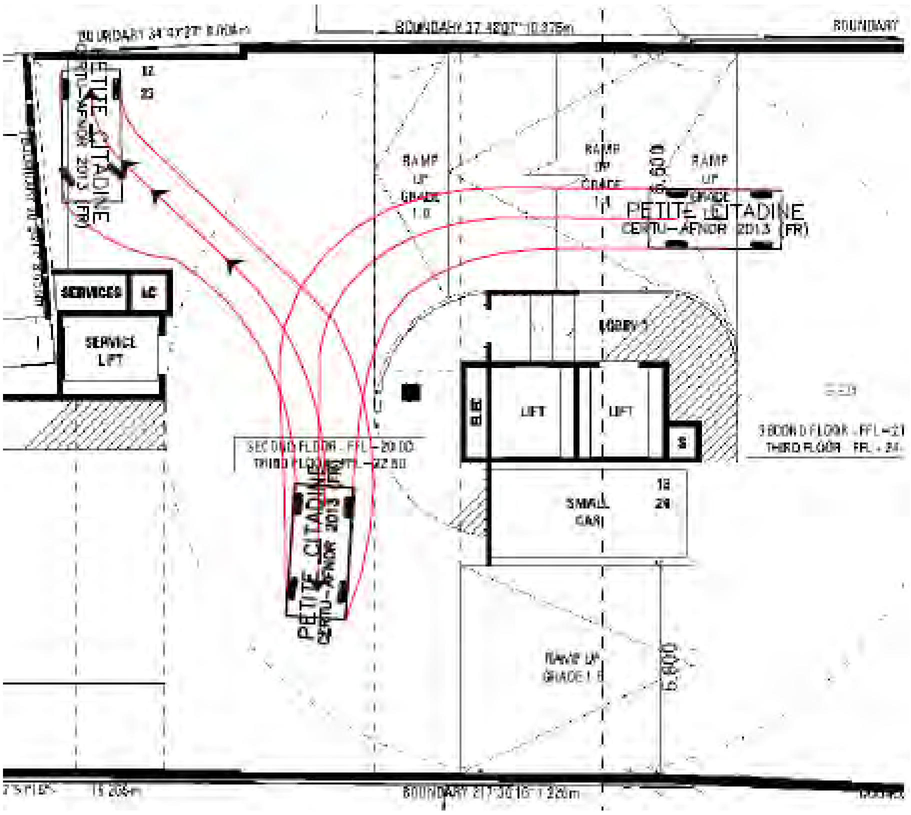
The proposed development requires 7 "Small Car" spaces at the following locations:

- Level 1 – space 1
- Level 2 – spaces 12 & 13
- Level 3 – spaces 23 & 24
- Level 4 – spaces 33 & 34

Spaces 1, 13, 24 and 34 measure 2.4m x 5.4m, but have been designated as 'small car' due to the wall structure associated with the adjacent ramp, and the elevator structure.

Spaces 12, 23 and 33 require a relatively complex reversing manoeuvre, parallel to the circulating aisle. It is recommended that these spaces be reserved for staff to reduce the turnover of the spaces, and to ensure that some driver familiarity is maintained. A swept path assessment was also performed for these spaces. It was noted that whilst a B85 vehicle can access these spaces, the manoeuvre is best performed by a smaller car. This is shown in Figure 11. For this reason, these spaces should be signed as "Small Car Spaces".

Figure 11 Corner Car Park Swept Path Assessment



5.3.3 Circulating Ramp Swept Path Assessment

The relatively confined space within the building results in a car park design that has tight manoeuvring. Vehicles are required to circulate in an almost circular motion to navigate up or down the four car parking levels. The Australian Standards, AS2890.1:2004 states that the minimum radius of a curved circulation roadway is 11.8m for two-way flow, and 7.6m for one-way flow. In this case, the constrained site only enables approximately 9.5m radius. This is wider than the minimum for one-way flow, but less than the requirement of two-way flow.

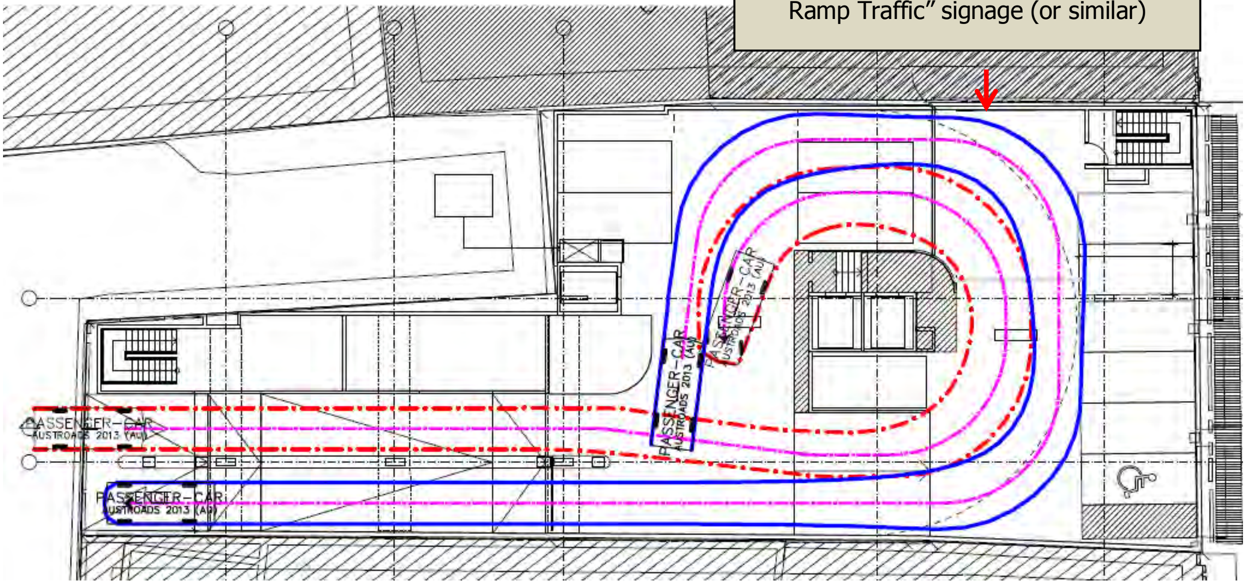
A swept path assessment was undertaken to confirm vehicle manoeuvring within the car park. A swept path assessment of a B85 vehicle travelling up and down the ramps is shown in Figure 12. It can be seen that there is no margin for error when two vehicles are travelling in opposite directions. When a vehicle is travelling in one direction only, there is sufficient room to manoeuvre without concern.

To ensure that safety is maximised within the car park, the following measures are proposed:

- Warning signage: signage at the first internal ramp (adjacent to signage advising of the check in parking spaces) to advise of the narrow nature of the car park, with advisory speed (10-km/h).
- Centre line marking along all ramps and curves on ramp approaches.

- Signage on western walls of the car park (on northern side) advising that up-ramp traffic must give way to down-ramp traffic. This location will be more prominently visible for up-ramp traffic and will therefore have maximum impact (and will also not be obscured by parked vehicles or other potential obstructions). This location is shown indicatively in Figure 12.

Figure 12 Swept Path Assessment



"Up-Ramp Traffic Give Way to Down-Ramp Traffic" signage (or similar)

Note: car parking layout indicative only in this diagram

5.3.4 Ramp grades

The car park is located across 4 levels. This requires ramps at the following locations:

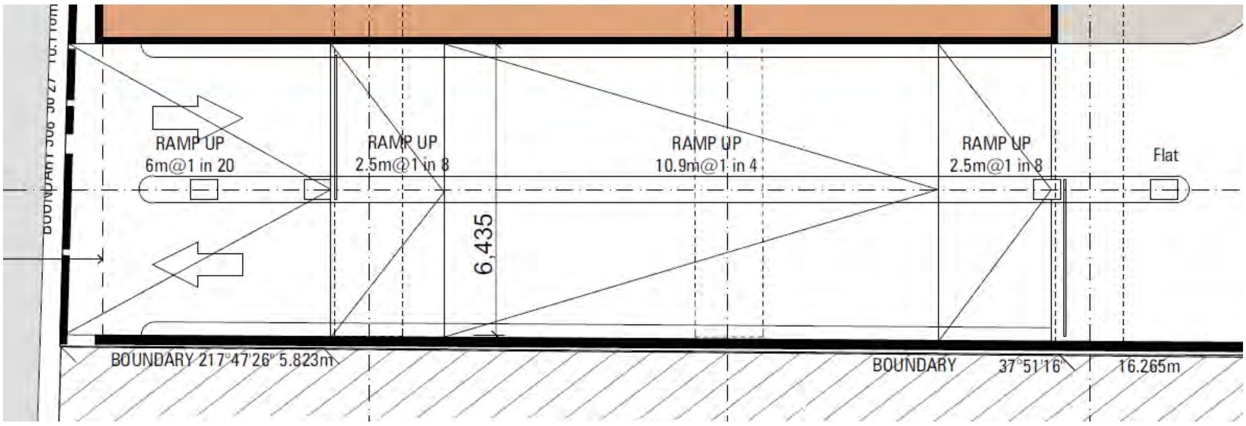
- Entry ramp from Trafalgar Place.
- Ramp either side of lift shaft on each level.

The ramp grades transition as follows:

- Entry: flat
- 6 metres: 1 in 20 (5% grade)
- 2.5 metres: 1 in 8 (12.5% grade)
- 10.9 metres: 1 in 4 (25% grade)
- 2.5 metres: 1 in 8 (12.5% grade)
- Car park level: flat

These grades conform to the requirements of the Australian Standards (AS2890.1:2004) in terms of maximum grade, as well as transitions. Specifically, the requirements of AS2890.1:2004, Section 2.5.3(b)(ii) specifies that the maximum permitted grade is 25% for accesses to car parks that are less than 20 metres in length. The requirements for change in grade are also met as per Section 2.5.3(d), which states that the maximum change in grade of a ramp is 12.5% algebraically. The entry ramp detail is shown in Figure 13.

Figure 13 Car Park Entry Ramp



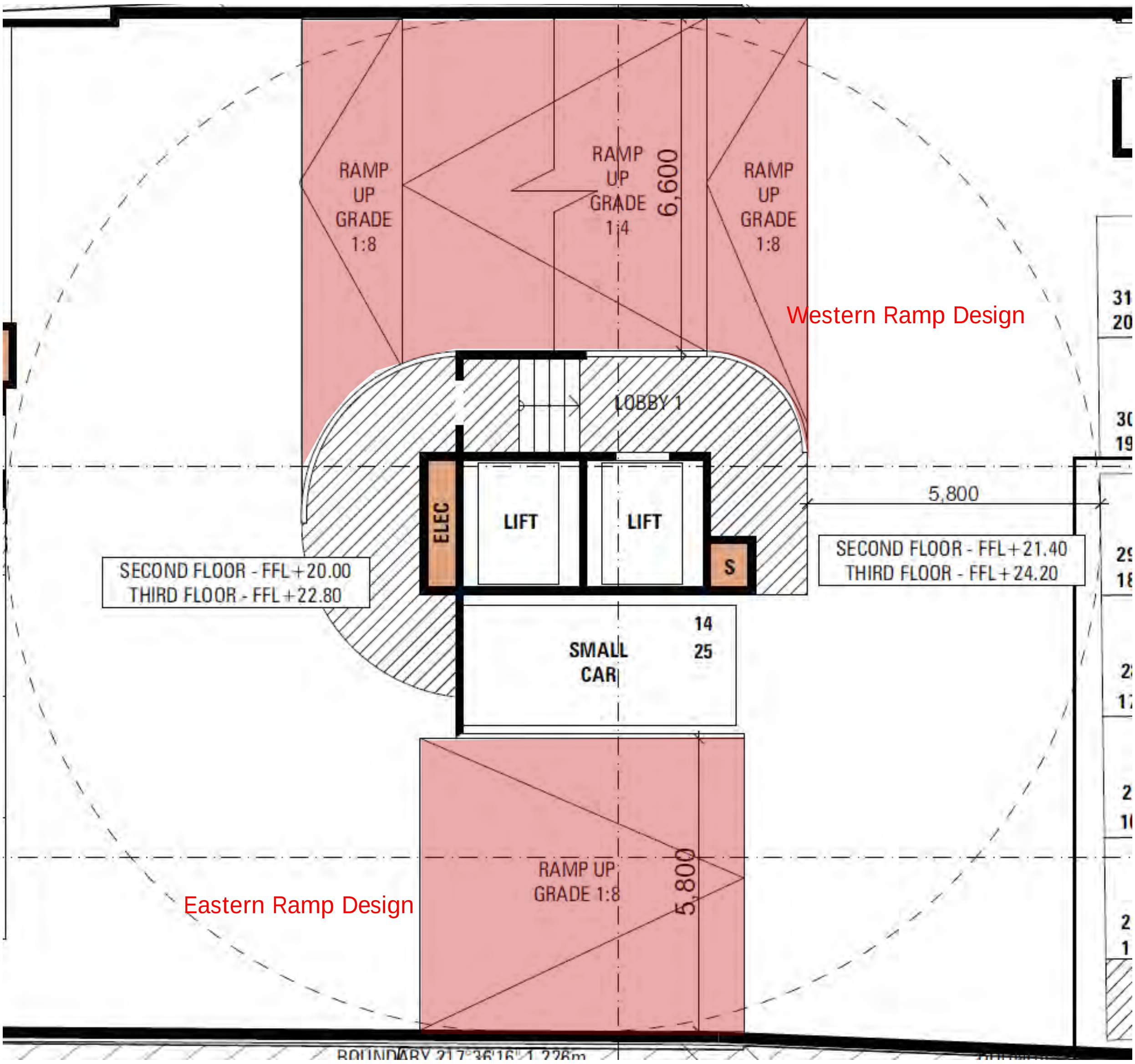
The grades within the car park itself have two designs:

- The eastern ramp is a constant 1 in 8 grade (12.5%).
- The western ramp is 1 in 4 grade (25%) with transitions of 1 in 8 (12.5%) on each approach.

These grades conform to the requirements of the Australian Standards (AS2890.1:2004) in terms of maximum grade, as well as transitions. Specifically, the requirements of AS2890.1:2004, Section 2.5.3(b)(ii) specifies that the maximum permitted grade is 25% for accesses to car parks that are less than 20 metres in length.

The requirements for change in grade are also met as per Section 2.5.3(d), which states that the maximum change in grade of a ramp is 12.5% algebraically. The ramp grade details are shown in Figure 14.

Figure 14 Car Park Internal Ramp Grades



5.4 Hotel Check-In Parking

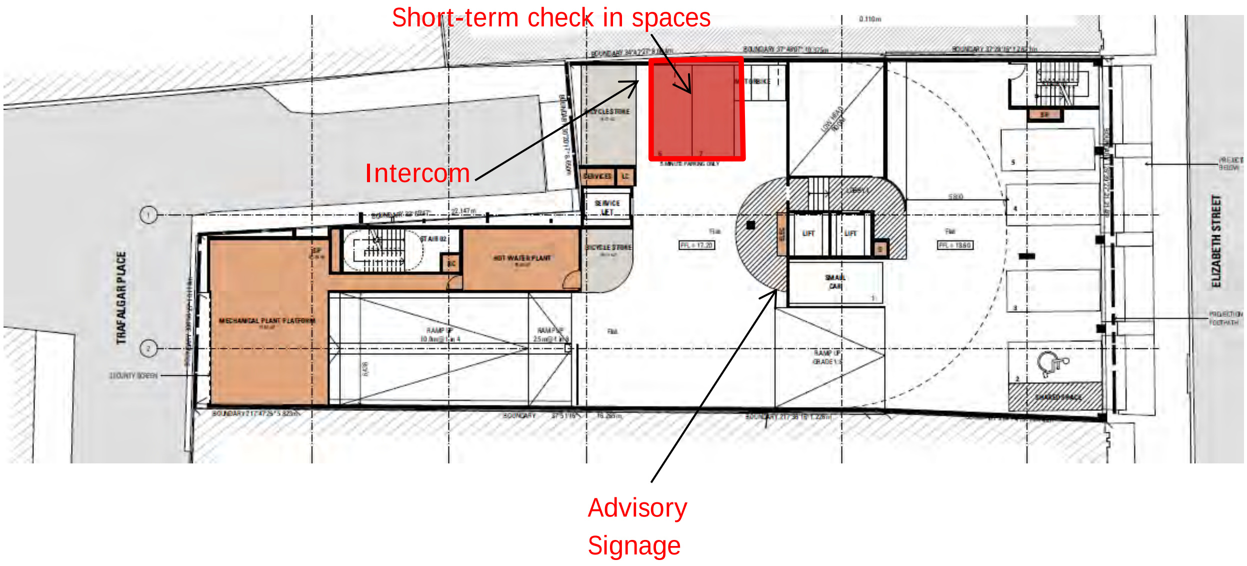
The location of the proposed Hotel is such that there is limited ability for guests to pull onto street to check in before accessing the car park. The Bus Mall does not permit access for Hotel traffic, and there are limited areas in Trafalgar Place for vehicles to stop a vehicle.

A five minute parking zone is proposed as part of the bus mall redevelopment in Collins Street, immediately south of the Elizabeth Street junction. This is proposed to replace the existing drop-off zone located within the bus mall for the Savoy Hotel. This is shown in Figure 4. The proposed five-minute zone would also service the proposed development due to its close proximity to the site (approximately 65 metres walking distance to the bus mall frontage of the site).

A system has therefore been developed, whereby a total of 2 spaces have been reserved on the first parking level for guests to stop and check in. Signage will be located to direct cars to these spaces within the car park ("Check In Spaces [left]/ Hotel Car Park [ahead]), and an intercom will be provided to assist customers with the process. They may then access the hotel to check in before moving their vehicle to the main car parking areas. This is shown in Figure 15. Signage is also proposed on the Macquarie Street/ Trafalgar Place junction to assist motorists.

As with most hotels, advice, internet and maps (standard leaflet style maps that can be written on) should be provided to assist guests to navigate through Hobart's streets if parked in an on-street location remote to the site.

Figure 15 Guest Check-In Parking Arrangements



It is typical of mainland inner city hotels to have limited on-street parking availability for check in. Normally hotels provide information regarding parking accessibility on their website (either through the check-in process or in general information), as well as via confirmation email when a room is booked.

Similar Hotels in Hobart that provide parking information on their websites include Quest Savoy (no parking on-site), Hotel Grand Chancellor (limited parking), Hadleys (limited off-site parking), etc.

5.5 Taxi Parking

There is no provision for taxi parking for the proposed development. The nearest taxi rank for the site is in Collins Street.

Taxis are permitted to enter and travel through the Bus Mall, however parking is not formally available within the bus mall.

5.6 Bus Parking

A mini bus short-term parking area is proposed in Council's bus mall upgrade. This is proposed on the north-western corner of the bus mall and is suitable for use by the proposed hotel. Coordination with the Airport Shuttle bus may be required.

A (non-Metro) bus stop is also located in close proximity to the site in Macquarie Street, between Trafalgar Place and Elizabeth Street.

5.7 Service Vehicles

Service vehicles associated with the hotel will comprise mostly of smaller vans to collect and deliver laundry. Typically laundry services would operate early in the morning. Service vehicles associated with food delivery would also be done through the use of vans with a frequency of 2 to 3 times per day. General deliveries would also be undertaken using vans or utilities, with a frequency of up to 6 times per day.

Refuse management would be undertaken once or twice per week using an 8.8m service vehicle. This activity would be undertaken early during the morning.

Service vehicles have access to the site via the laneway running parallel to the car park ramp. A loading dock is provided beneath the car parking ramp for this purpose. A loading zone is also available in Trafalgar Place (south of the site). This loading zone is shared by nearby commercial properties.

The RTA Guide recommends the provision for commercial vehicles as set out as follows:

- Hotels and Motels (50% of spaces adequate for trucks). [applicable for hotels less than 200 rooms]
  - → 1 space per 50 bedrooms; plus
  - → 1 space per 1,000m^2 of public area set aside for bar, tavern, lounge and restaurant.

The total requirement would therefore be 4 + 1 = 5 spaces in accordance with the RTA Guide.

As well as the provision of a loading dock, the northern section of Trafalgar Place adjacent to the site is used as a loading area by adjacent businesses. The lack of through traffic and pedestrian movements makes this practice acceptable as a 'rear of shop' area.

In practice, the provision of the loading dock, as well as the northern section of Trafalgar Place and the existing loading dock is considered acceptable for the normal operation of the Hotel. It will be important to ensure that loading and unloading activities will not interfere with the normal traffic flow associated with the Trafalgar Place car park. It is therefore recommended that the Hotel adopt a management plan for deliveries to prevent impacts on the normal flow of traffic accessing Trafalgar Car Park.

5.8 Bicycle Parking

The Acceptable Solution, A1, or Schedule E6.6.4 of the Planning Scheme requires the provision of bicycle parking for developments. The requirements of the proposed development are set out in Table 2.

The employee bicycle spaces are classified as 'Class 1' or 'Class 2' spaces, which requires locked compounds with communal access using duplicate keys, or fully enclosed individual lockers.

Two separate bicycle parking areas are proposed on the first level of the car park, along with dedicated change rooms on the ground floor. These change room facilities are proposed to be used by staff (complying the requirements for Class 1 or Class 2 facilities). A total of approximately 40 bicycles can be stored in these lockable facilities, thus satisfying Acceptable Solution A1 of E6.6.4 of the Planning Scheme.

Table 2 Bicycle Parking Requirements

Use	Employee/ Visitor Bicycle Parking Requirement	Class	Required
Community meeting and entertainment	Employee = 1 for each 500m^2 of floor area Visitor = 4 plus 2 for each 200m^2 floor area	1 or 2 3	Function room area = 263m2: total = 1 Total 4+ 2 = 6
Food services	Employee = 1 for each 100m2 of floor area available to public Visitor = 1 for each 200m^2 floor area after the first 200m^2 floor area (min 2)	1 or 2 3	Café area = 59m^2 Restaurant = 109m^2 Total = 2 Total = 2
Hotel Industry	Employee = 1 for each 25m^2 bar floor area plus 1 for each 100m^2 lounge/ beer garden area Visitor = 1 for each 25m^2 bar floor area plus 1 for each 100m^2 lounge, beer garden area	1 or 2 3	Bar and lounge area = 24m^2 bar and 61m^2 lounge, cocktail bar = 12m^2 and 141m^2 lounge Total = 2 + 2 = 4 Total = 4
Visitor Accommodation	Employee = 1 for each 40 accommodation rooms Visitor = 1 for each 30 accommodation rooms	1 or 2 3	Total rooms = 196 Total = 5 Total = 7
TOTAL	**Employee** **Visitor**	1 or 2 3	**12** **19**

5.9 Parking for People with Disabilities

Acceptable Solution A1, of Schedule E6.6.2 of the Planning Scheme requires that 1 satisfy the relevant provisions of the Building Code of Australia. This equates to the provision of 1 space for every 20 car parking spaces.

The provision of 2 parking spaces for persons with a disability is therefore required (rounded to nearest whole number from 2.1 spaces). A total of 4 disabled parking spaces are proposed; one on each level of the car park (located on the north-eastern corner of each level). A level path of travel is available from these spaces to the elevators.

Acceptable Solution A1 of E6.6.2 is therefore met.

5.10 Motorcycle Parking

Acceptable Solution A1, of Schedule E6.6.3 of the Planning Scheme requires that 1 motorcycle space be provided for every 20 car parking spaces.

The provision of 2 motorcycle spaces is therefore required (rounded to nearest whole number from 2.1 spaces). These motorcycle parking spaces are proposed on the bottom level of the car park, adjacent to the 'check-in' parking spaces.

Acceptable Solution A1 of E6.6.3 is therefore met.

6. Conclusions

This traffic impact assessment (TIA) investigated the traffic and parking impacts of a proposed hotel development at 28 Elizabeth Street, Hobart. The hotel provides a total of 39 parking spaces (including 4 disabled parking spaces), 40 bicycle spaces and two motorcycle spaces.

The hotel provides on-site parking in the form of four levels of multi-level parking accessed from Trafalgar Place. Access to the car park is via a ramp located at an existing access to the building. The ramp grades and dimensions conform to the requirements of the Australian Standards. Sight lines for vehicles exiting the car park are of concern however. The following recommendations have been made to ensure safe vehicular access at this location:

- A speed hump placed at the exit of the car park to ensure low vehicle speeds.
- A warning device be installed to alert approaching motorists of vehicles exiting the site.
- Provide warning signage (static) on the building structure to advise motorists exiting from Trafalgar Place of exiting traffic from the proposed development's access.

The internal car park layout it very tight. The dimensions of the car parking spaces generally comply with Australian Standards requirements for Class 1A, with some "Small Car" spaces required.

Two short-term spaces have been provided on the first car parking level for hotel check-in.

The circulation roadway is less than the minimum radius for two-way flow. Swept paths confirm that vehicles can pass in opposing directions (B85 vehicles), however to improve circulation and safety within the car park, signage should be installed to require vehicles travelling up the car park to give way to motorists travelling down. Consideration should also be made for the installation of warning devices when vehicles are travelling in opposing directions within the car park. Note that the selected warning devices should not distract motorists from their driving task.

The proposed development provides sufficient bicycle, motorcycle and disabled parking in accordance with the requirements of the Planning Scheme. Disabled parking is provided on all four parking levels, and level access is available from the parking spaces to the elevator access.

Pedestrian access is available from both Elizabeth Street and Trafalgar Place frontages, with pedestrian connectivity available between the frontages. Bicycle parking in the form of separate lockable storage is available for staff, with appropriate change rooms located immediately adjacent.

A service lift accesses all parking levels, with the swept path of down-ramp traffic located immediately adjacent to the lift doors. Warning in the form of flashing lights should be installed to alert approaching motorists of the presence of a pedestrian exiting the lift. Note that the service lifts would be used very infrequently on the car parking levels.

Service vehicles can access the site in the dedicated loading dock accessed via Trafalgar Place, as well as the existing loading zone located to the south in Trafalgar Place. The northern end of Trafalgar Place is also currently utilised as a service area for adjacent businesses. The function of the road will remain the same for this activity and is considered adequate to service the service vehicle requirements of the development.

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

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2	Keith Midson	Zara Kacic-Midson	18 September 2015
3	Keith Midson	Zara Kacic-Midson	5 November 2015

Attachment 2

ENVIRONMENTAL WIND SPEED MEASUREMENTS ON A WIND TUNNEL MODEL OF THE 28 ELIZABETH STREET HOTEL DEVELOPMENT, HOBART

By
J. Tan
S. H. Chong
and
M. Eaddy

SUMMARY

Wind tunnel tests have been conducted on 1/400 scale model of the proposed 28 Elizabeth Street Hotel, Hobart Development to provide data on environmental wind conditions at ground level. The model of the Development, within surrounding buildings, was tested in a simulated upstream boundary layer of the natural wind. The wind conditions measured have been related to the free stream mean wind speed at a reference height of 300m and compared with criteria developed for the Hobart region as a function of wind direction.

For the Basic Configuration, for which there were no street trees, the pedestrian level wind conditions on the ground level surrounding the proposed development have been shown to be either on or within the criterion for walking comfort for all wind directions or similar to those of the Existing Configuration. As such, the 28 Elizabeth Street development was shown to have little significant adverse effect on the existing pedestrian level wind conditions in the pedestrian realm around the site.

MEL Consultants Report 135/15
September 2015

ENVIRONMENTAL WIND SPEED MEASUREMENTS
28 ELIZABETH STREET HOTEL, HOBART

MEL CONSULTANTS REPORT NO: **135/15**

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CONTENTS

MEL

1. INTRODUCTION

The proposed 28 Elizabeth Street Development will comprise of a 28 level hotel building adjacent to the Deliottes building in the Hobart CBD. The Hotel tower will be set upon a 5 level podium, set back considerably from the Elizabeth Street site boundary.

A wind tunnel model study was commissioned by JAWS Architects on behalf of Elizabeth Tasmania Pty Ltd to undertake measurements of environmental wind conditions around the proposed development and, if necessary, develop wind amelioration features.

These tests were carried out in the MEL Consultants 400kW Boundary Layer Wind Tunnel during September 2015.

2. ENVIRONMENTAL WIND CRITERIA

The advancement of wind tunnel testing techniques, using large boundary layer flows to simulate the natural wind, has facilitated the prediction of wind speeds likely to be induced around a development. To assess whether the predicted wind conditions are likely to be acceptable or not, some form of criteria are required. A discussion of criteria for environmental wind conditions has been made in a paper by Melbourne, Reference 1. This paper notes that it is the forces caused by the peak gust wind speeds and associated gradients which people feel most and criteria have been stated in terms of gust wind speeds. The probabilistic inference of these criteria in relation to hourly mean wind speeds and frequency of occurrence is discussed. The basic criteria can be summarised as follows:

In main public access-ways wind conditions are considered

(a) unacceptable if the peak gust speed during the hourly mean with a probability of exceedence of 0.1% in any 22.5° wind direction sector exceeds 23ms^{-1} (the gust wind speed at which people begin to get blown over);

(b) generally acceptable for walking in urban and suburban areas if the peak gust speed during the hourly mean with a probability of exceedence of 0.1% in any 22.5° wind direction sector does not exceed 16 ms^{-1} (which results in half the wind pressure of a 23 ms^{-1} gust).

For more recreational activities wind conditions are considered

(c) generally acceptable for stationary short exposure activities (refers to activities where people remain in the same location between 5 and 15 minutes. For example: standing or sitting in parks, window shopping and building entrances) if the peak gust speed during the hourly mean with a probability of exceedence of 0.1% in any 22.5^{o} wind direction sector does not exceed 13 ms^{-1};

(d) generally acceptable for stationary, long exposure activities (refers to activities where people remain in the same location a quarter of an hour or more. Examples of this are recreational playgrounds, outdoor dining areas and cafes) if the peak gust speed during the hourly mean with a probability of exceedence of 0.1% in any 22.5^{o} wind direction sector does not exceed 10 ms^{-1}.

The probability of exceedence of 0.1% relates approximately to the annual maximum mean wind speed occurrence for each wind direction sector. These criteria can be developed in terms of hourly mean wind speed versus frequency of occurrence as shown in References 1 and 2.

For the purpose of comparison, or integrating with local wind data, it is necessary to be able to relate the local velocity measurement to a reference velocity well clear of the influence of buildings. Because the wind force is related to wind velocity squared, it is often more convenient to express criteria in terms of velocity ratio squared, or velocity pressure ratio as this becomes. To this end, two velocity pressure ratios referenced to conditions at 300m height in suburban terrain [terrain category 3] (as a convenient reference) are defined as,

mean velocity pressure ratio $$\left|\frac{\overline{V}_{local}}{\overline{V}_{300m}}\right|^{2}$$

and

peak velocity pressure ratio $$\left|\frac{\hat{V}_{local}}{\overline{V}_{300m}}\right|^{2}$$

where the peak velocity is the 3-second mean maximum gust wind speed in full scale conditions.

For wind conditions in Hobart these criteria can be expressed in terms of velocity pressure ratios, calculated from hourly mean wind speed data as per the methodology given in Reference 1. Corrections have been made where long distance approach terrain is different to Terrain Category 3.

The criteria in terms of peak velocity pressure ratios are illustrated in Figure 1 and appear in subsequent figures to enable immediate assessment of the wind conditions as measured on the model.

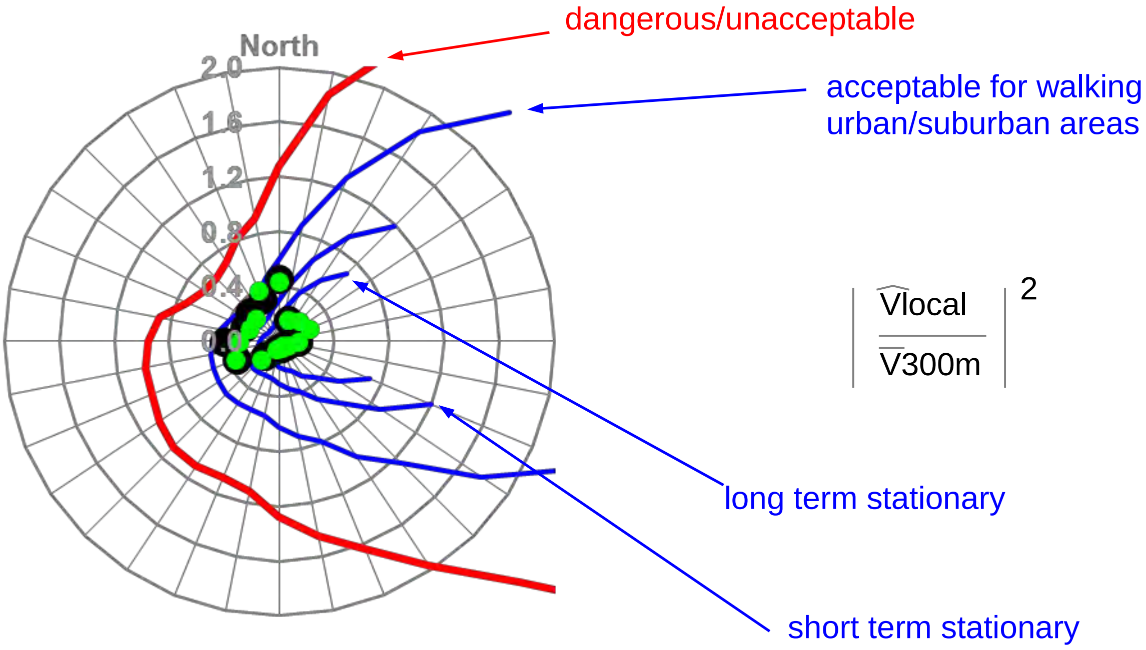


Figure 1 - Environmental wind criteria for the City of Hobart expressed in terms of peak velocity pressure ratios

The velocity pressure ratio values considered as unacceptable in Figure 1 are equivalent to conditions which have existed in some areas in Australian capital cities where people have been blown over by the wind. The velocity pressure ratios considered as acceptable for walking in urban and suburban areas are equivalent to conditions existing at corners in these areas before high rise development commenced.

3. MODEL AND EXPERIMENTAL TECHNIQUES

A 1/400 scale model of the 28 Elizabeth Street Hotel Development was inserted into a proximity model of surrounding buildings out to a minimum radius of 300m. The building model was tested in a model of the natural wind generated by flow over roughness elements augmented by vorticity generators at the beginning of the wind tunnel working section. The basic natural wind model was for flow over suburban terrain roughness, which had a mean velocity power law profile with an exponent of 0.2, i.e. $\overline{V}_z = f(z)^{0.2}$ and a turbulence intensity at a scaled height of 100m of $\sigma_v/\overline{V} = 0.17$, as shown in Figure 2. Photographs of the model building and proximity model are shown in Figures 3 and 4.

The techniques used to investigate the environmental wind conditions and the method of determining the local criteria are given in detail in Reference 2. The MEL Consultants hot-wire system is a custom wind engineering specific system that is calibrated in house using our own custom velocity and thermal calibration wind tunnel. Measurements were made at various locations in and around the development, for different wind directions at 22.5° intervals (16 wind directions). The data was acquired at a sampling frequency of 1250 Hz with a low-pass filter at the Nyquist frequency to avoid aliasing effects on the acquired data. Turbulent gusty wind flows, caused by separated flows, were generally observed with a combination of low and high mean wind speeds. To quantify this, peak gust wind speeds were measured, using the hot wire anemometer, and related to the environmental wind criteria via the calculated peak velocity squared ratios. Wind speed data were acquired and filtered to give an equivalent full scale 3 second peak gust wind speed and sampled for the equivalent of one hour in full scale. In summary, measurements were made of the peak gust wind velocity with a hot wire anemometer at various stations and expressed as a squared ratio with the mean wind velocity at a scaled reference height of 300m. This gives the peak velocity squared ratio

$$\left(\hat{V}_{local} / \overline{V}_{300m}\right)^2$$

as defined in Section 2. This peak velocity squared ratio can then be compared with the velocity squared ratio criteria for Hobart given in Figure 1.

4. DISCUSSION OF RESULTS

The Basic Configuration, for which there were no street trees, was for the proposed 28 Elizabeth Street Hotel Development as defined by JAWS Architects drawings dated to July 2015. The Level 1 canopy along the Elizabeth St frontage was included as part of the Basic Configuration. The following Sections detail the results for the various areas tested.

4.1. Summary of discussion (Figure 6)

To assist with the assessment of the wind conditions, summaries of the highest wind conditions for the Basic Configuration, at each Test Location for all wind directions at ground level public realm have been provided in Figure 6. Different colours have been used to represent the highest wind criteria achieved at each Test Location. Where the wind conditions at a Test Location were distributed across two criteria, the two criteria colours have been graduated.

4.2 Elizabeth Street (Figures 7, 8 and 9)

The wind conditions for the Basic Configuration along the south side of Elizabeth Street (Test Locations 1, 2, 3, 4 and 14) have been shown to be either on or within the criterion for walking comfort for all wind directions with the north-north-east through east to south-south-west wind directions achieving the stationary criteria. The presence of the development was shown to have little impact on the existing wind conditions at these Test Locations, as shown by the comparison with Existing wind conditions along Elizabeth Street.

For the Basic Configuration, wind conditions along the north side of Elizabeth Street (Test Locations 5, 6, 7, 8, 13 and 15) have been shown to be either within or on the criterion for walking comfort for all wind directions except for the southwest through west to north-north-west wind directions at Test Location 7 which were above the walking comfort criterion. However, the wind conditions at this Test Location were shown to be similar to Existing Conditions, therefore the proposed development did not appear to cause any significant adverse impact on the existing wind conditions at this location.

In summary, the wind conditions for the majority of the Test Locations along Elizabeth Street have been shown to be similar to Existing Conditions.

4.3 Trafalgar Place (Figure 10)

For the Basic Configuration, wind conditions along Trafalgar Place (Test Locations 9, 10, 11 and 12) have been shown to be either within or on the criterion for walking comfort for all wind directions except for the northwest, north-north-west and north wind directions at Test Location 9 which were above the walking comfort criterion. However, the wind conditions were shown to be similar to Existing Conditions and so the proposed development appears to be having little significant adverse effect on the wind conditions at this location.

5. CONCLUSIONS

Wind tunnel tests have been conducted on 1/400 scale model of the proposed 28 Elizabeth Street Hotel, Hobart Development to provide data on environmental wind conditions at ground level. The model of the Development, within surrounding buildings, was tested in a simulated upstream boundary layer of the natural wind. The wind conditions measured have been related to the free stream mean wind speed at a reference height of 300m and compared with criteria developed for the Hobart region as a function of wind direction.

For the Basic Configuration, for which there were no street trees, the pedestrian level wind conditions on the ground level surrounding the proposed development have been shown to be either on or within the criterion for walking comfort for all wind directions or similar to those of the Existing Configuration. As such, the 28 Elizabeth Street development was shown to have little significant adverse effect on the existing pedestrian level wind conditions in the pedestrian realm around the site.

J. Tan
MEL Consultants Pty Ltd
September 2015

REFERENCES

1. W. H. Melbourne, Criteria for environmental wind conditions, Journal of Industrial Aerodynamics, Volume 3, 1978, pp. 241-249
2. W. H. Melbourne, Wind environment studies in Australia, Journal of Industrial Aerodynamics, Volume 3, 1978, pp. 201-214

FIGURES

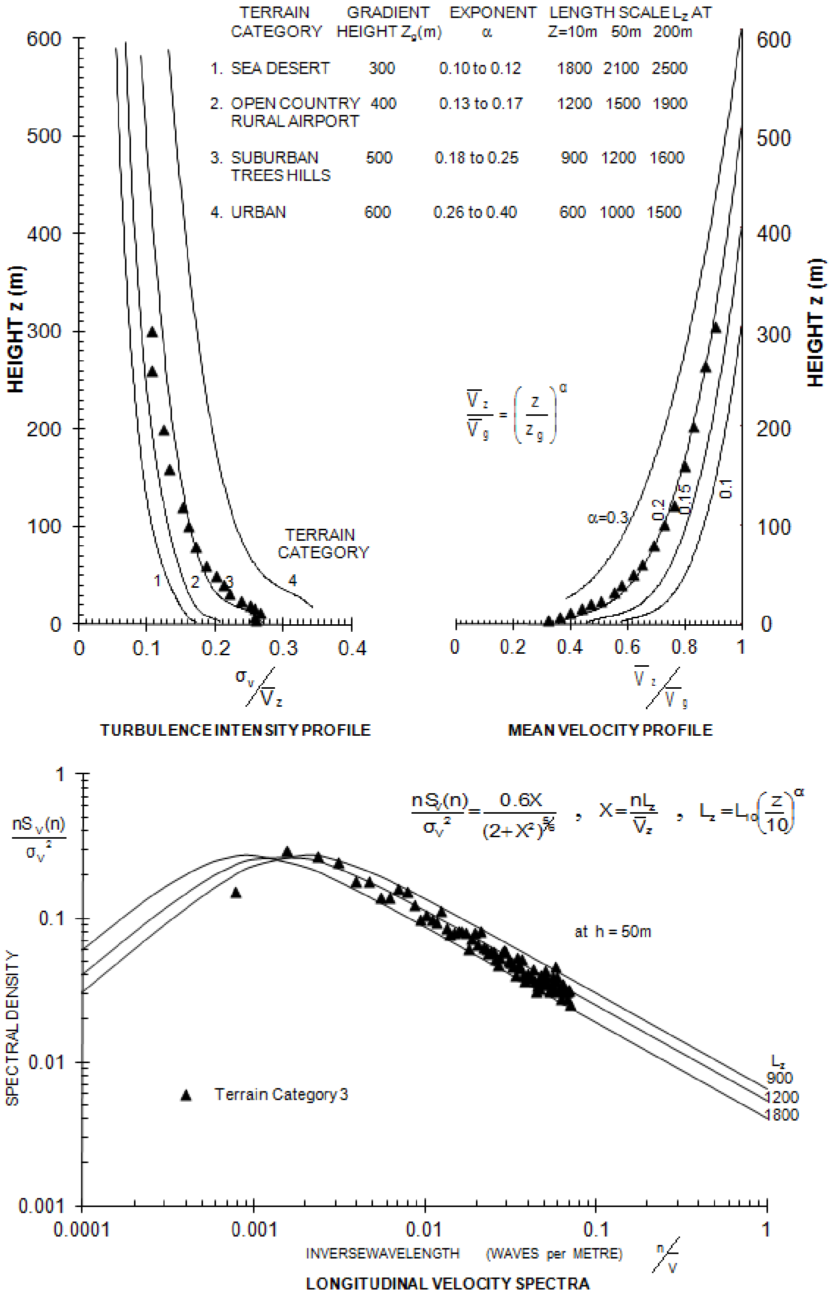


Figure 2 – 1/400 scale Terrain Category 3 boundary layer turbulence intensity and mean velocity profiles and spectra in the MEL Consultants Boundary Layer Wind Tunnel 4m x 2m working section, scaled to full scale dimensions

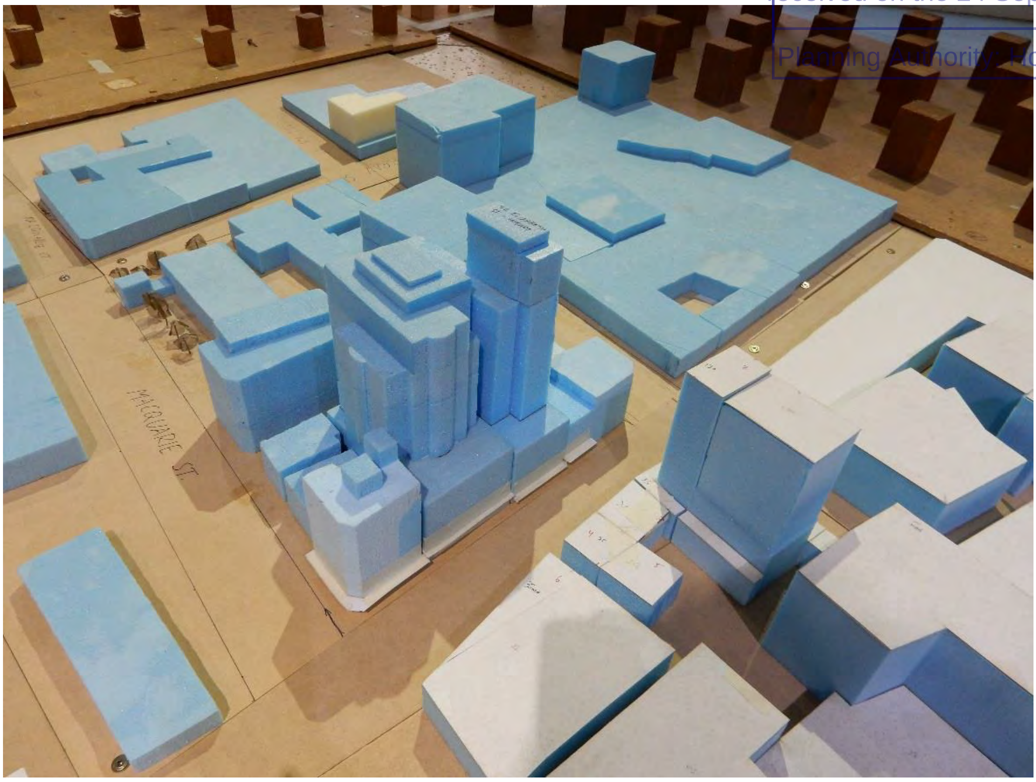


Figure 3 – 1/400 scale model of the 28 Elizabeth Street Hotel, Hobart Development viewed from the northeast direction.

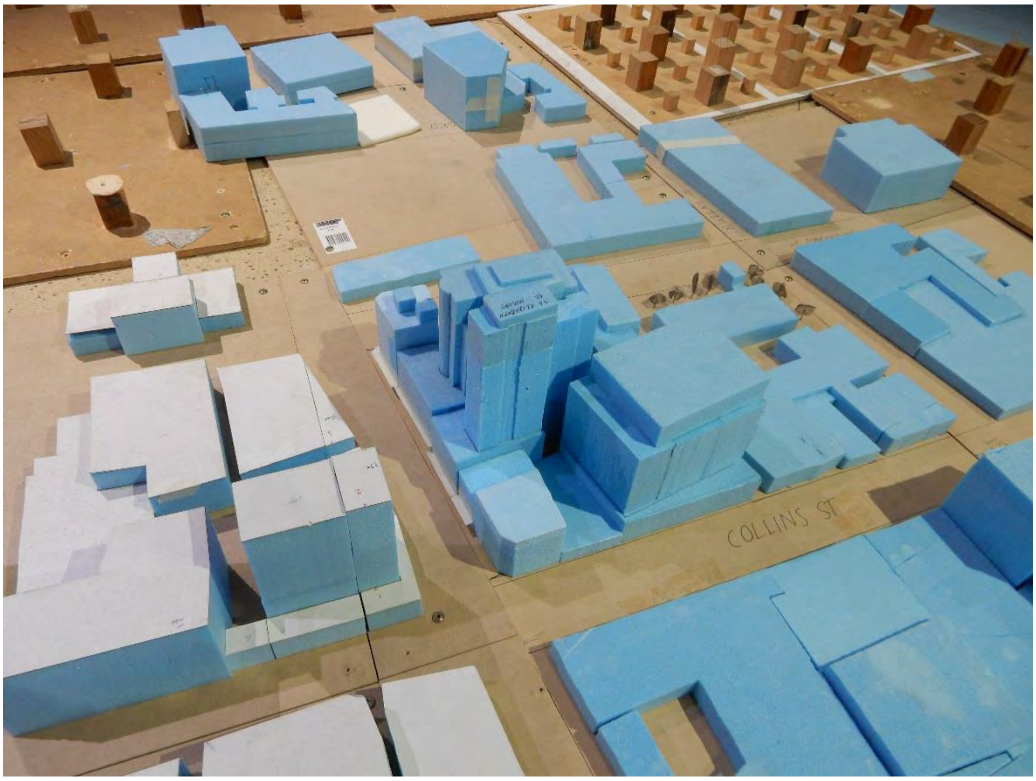


Figure 4 – 1/400 scale model of the 28 Elizabeth Street Hotel, Hobart Development viewed from the northwest direction

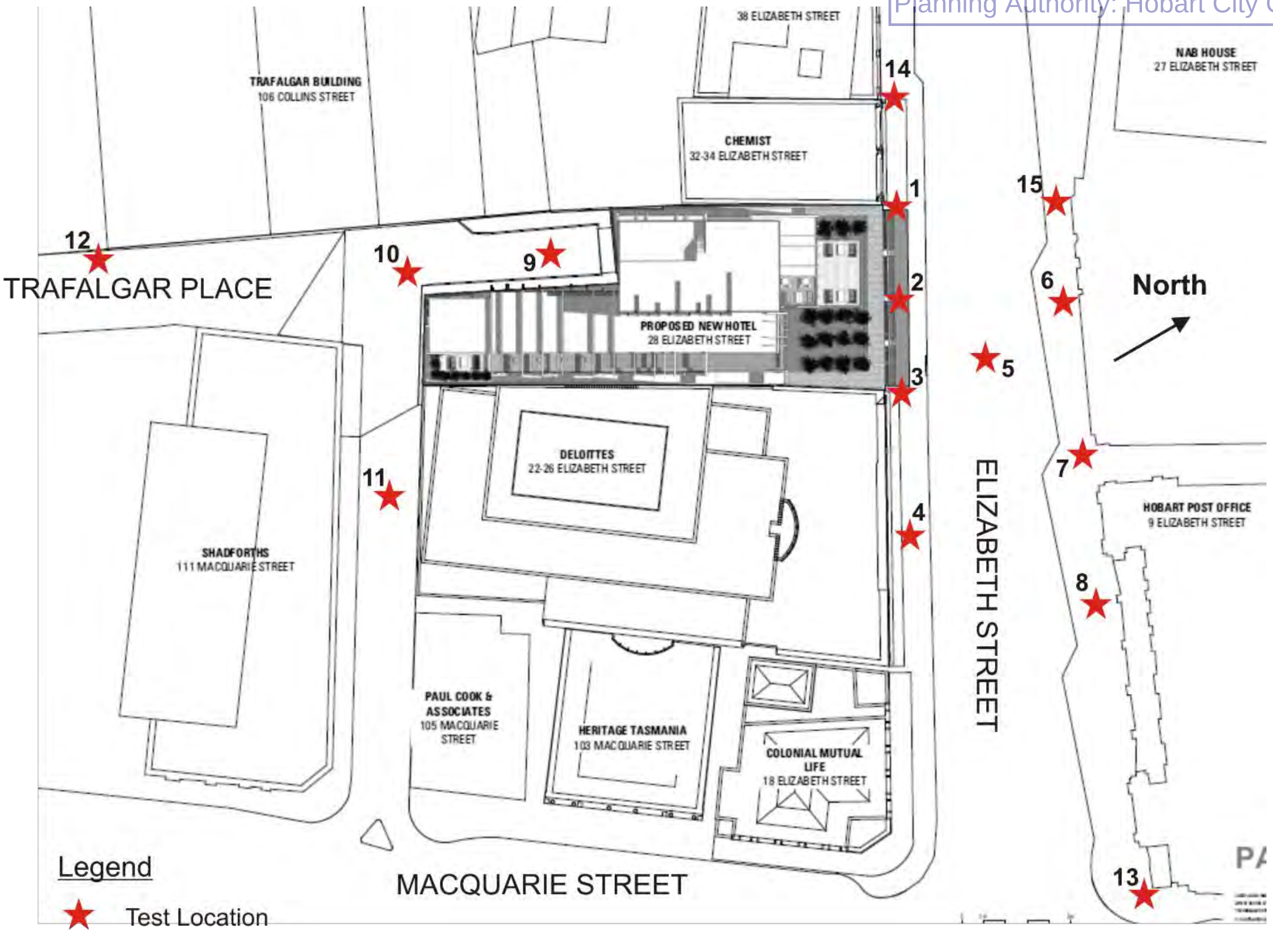
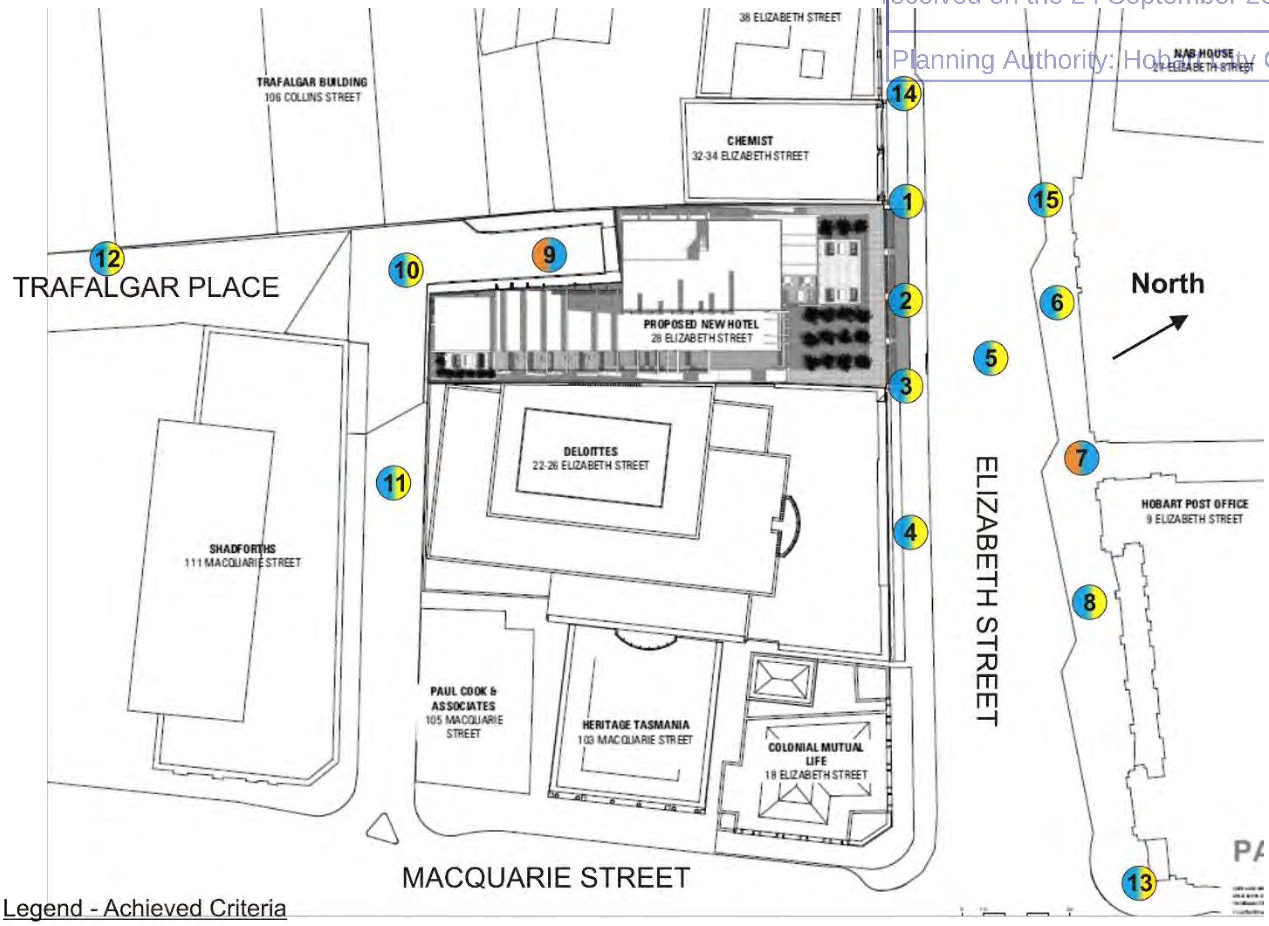


Figure 5 – Ground Level Test Locations



Legend - Achieved Criteria

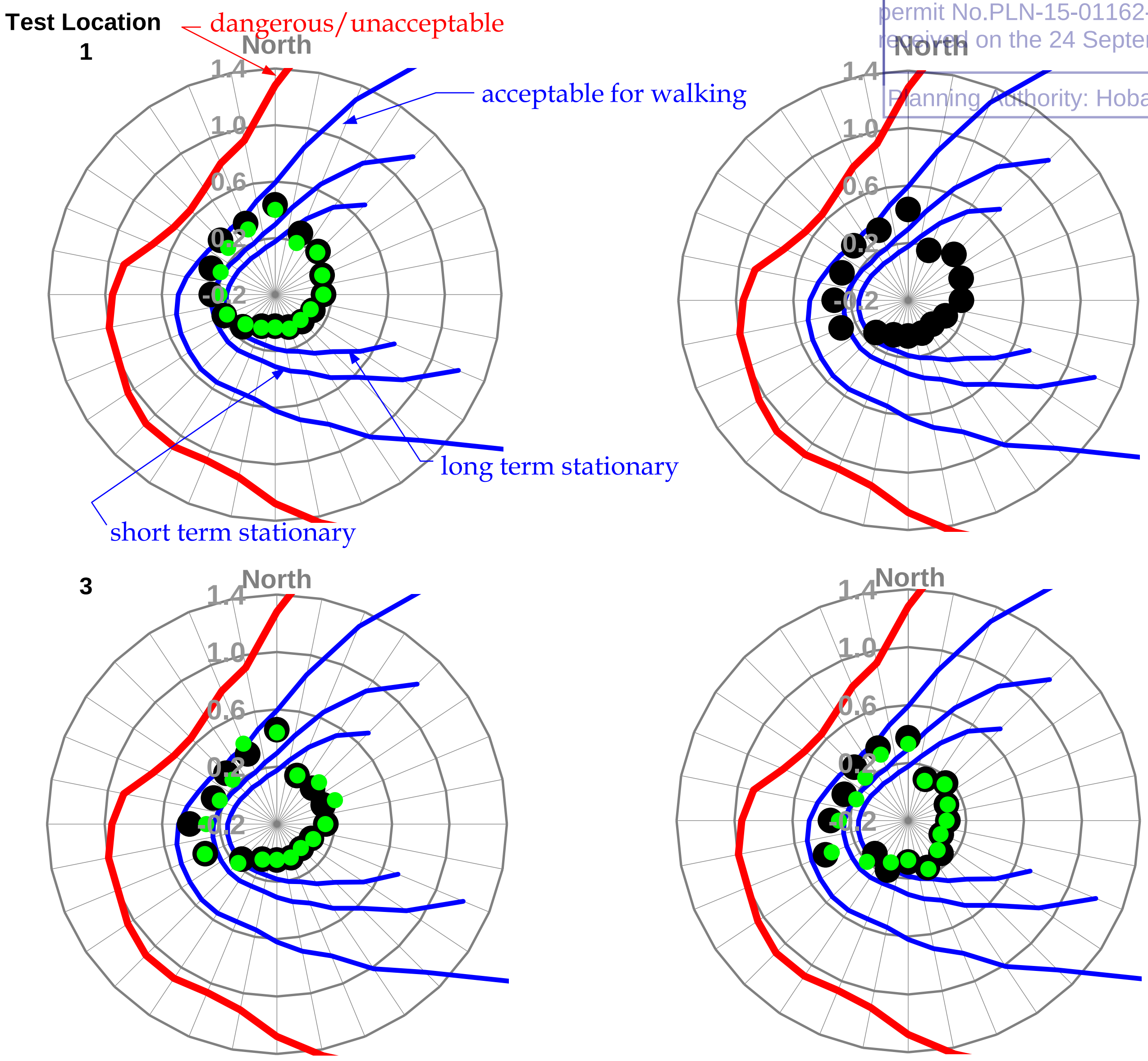
● Walking criteria

● Short term stationary criteria

● Above walking criteria

● Long term stationary criteria

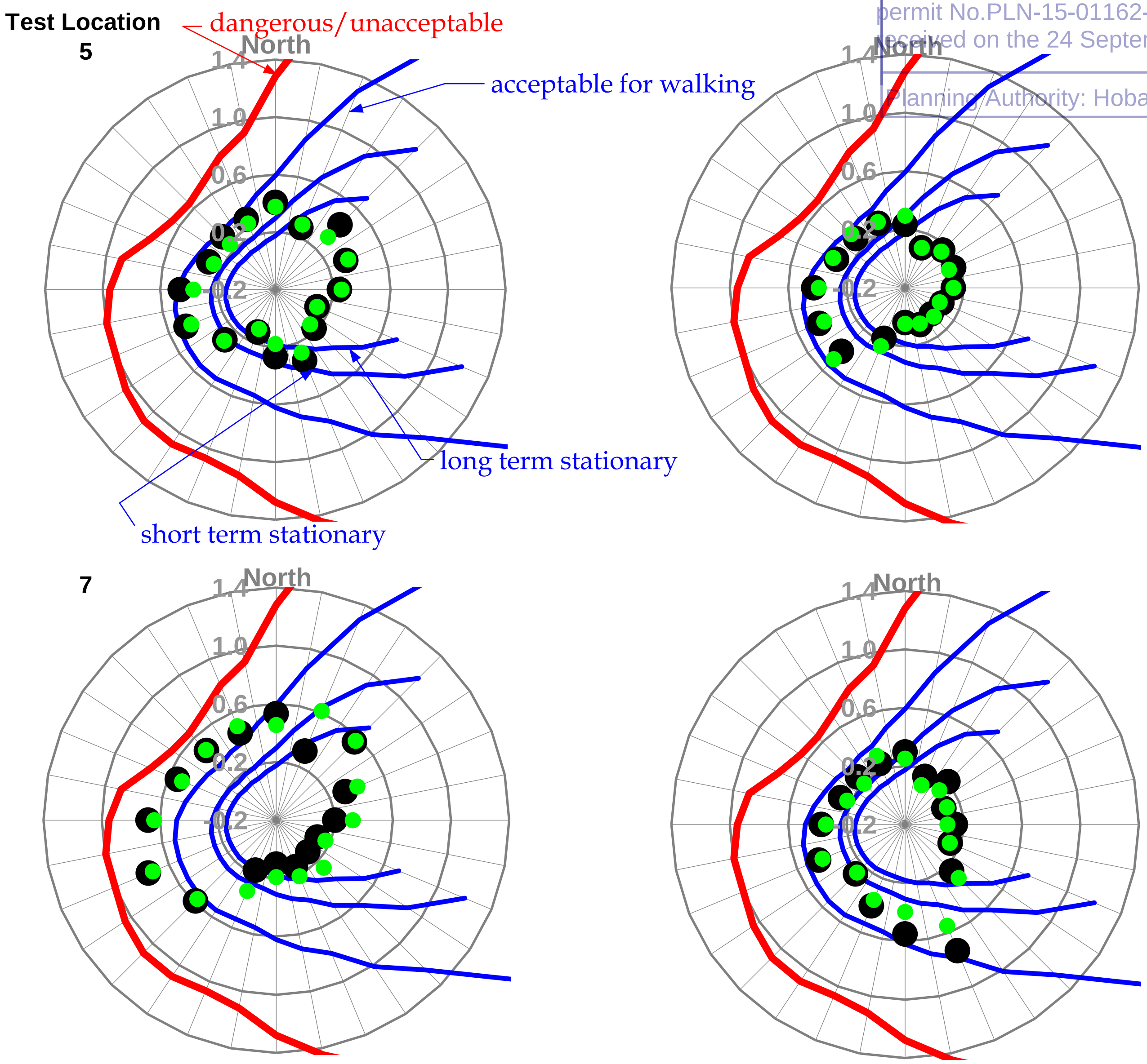
Figure 6 – Ground level Test Locations and corresponding highest wind conditions for 360° of wind direction in the Basic Configuration.



Peak velocity squared ratio $\left|\frac{\widehat{V}_{local}}{\overline{V}_{300m}}\right|^2$ as a function of wind direction

Basic Configuration ●
Existing Conditions 🟢

Figure 7 - Elizabeth Street



Peak velocity squared ratio $\left|\frac{\hat{V}_{local}}{\overline{V}_{300m}}\right|^{2}$ as a function of wind direction

Basic Configuration	●
Existing Conditions	🟢

Figure 8 - Elizabeth Street (continued)

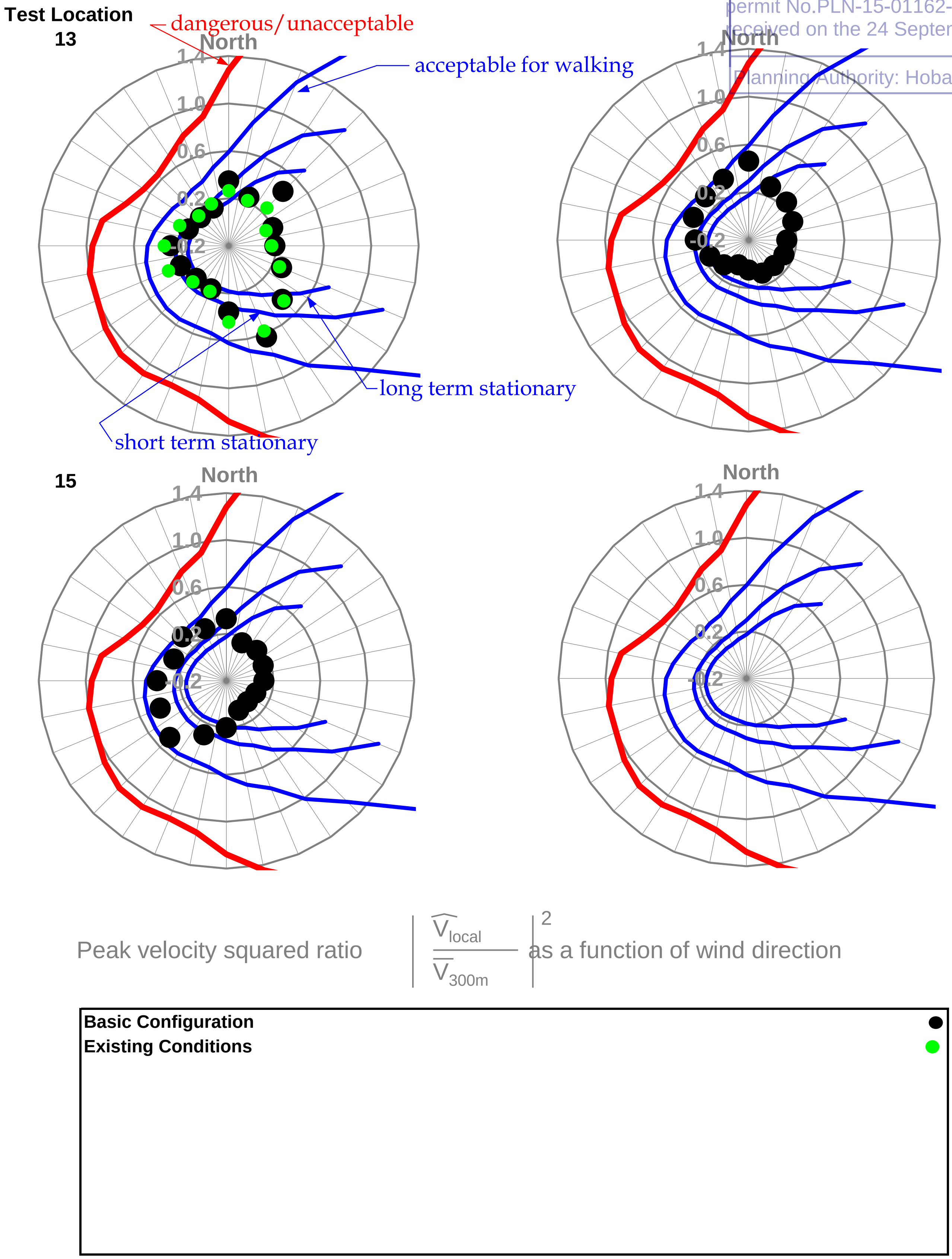


Figure 9 - Elizabeth Street (continued)

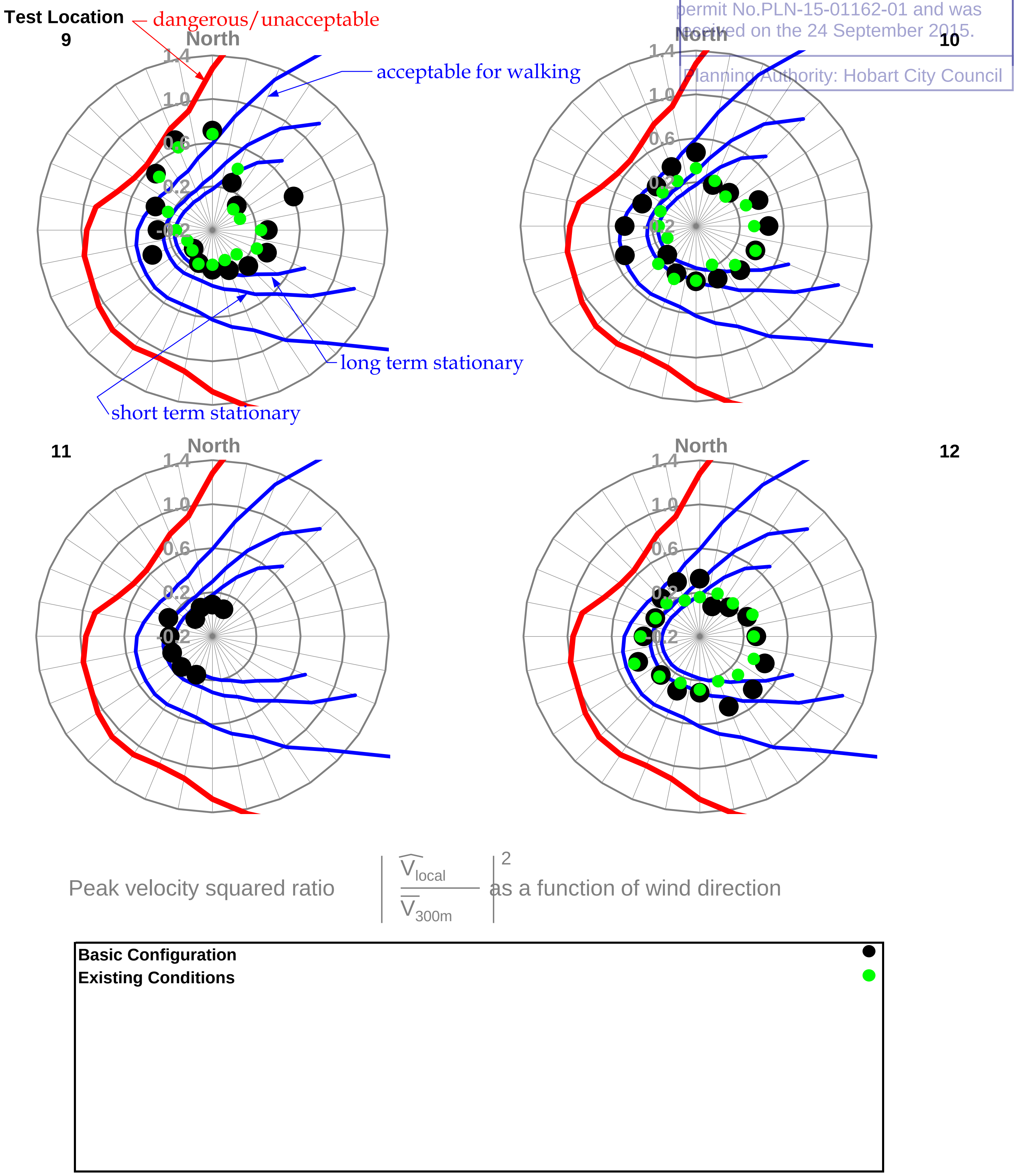


Figure 10 - Trafalgar Place

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Paper 12

CRITERIA FOR ENVIRONMENTAL WIND CONDITIONS

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(Received October 18, 1977)

Summary

Since 1971 a number of authors have published criteria for the acceptability of environmental wind conditions for human comfort for a range of activities.

This paper notes that it is the forces caused by peak gust wind speeds and associated gradients which people feel most and discusses the relation between peak gust and mean wind speeds. Melbourne's criteria, which have been stated in terms of maximum gust speeds per annum, are shown to define a range of wind-speed probabilities, in particular, the frequency of occurrence of mean wind speeds, which then facilitates comparison between the various published criteria.

It is shown that, in spite of the apparent numerical differences in published wind speed criteria and the various subjective assumptions used in their development, there is remarkably good agreement when they are compared on a proper probabilistic basis.

1. Introduction

In recent literature and at the 4th International Conference on Wind Effects on Buildings and Structures, London, 1975, there has been some debate as to the quantitative values of wind speed to be used in criteria for environmental conditions around new building developments. It was noted by several of the authors at the above-mentioned conference, that in spite of the seeming numerical differences in wind-speed criteria quoted by a number of authors, the differences were, in fact, relatively small [1]. The problem is that the phenomenon of wind and frequency of occurrence is very complex and the numerical values developed for these criteria depend on the statistical framework in which they are set.

It is the purpose of this paper to discuss the physical nature and effect of wind on people in respect of the relationship between mean wind speeds and peak gusts produced in turbulent conditions and the statistical inference of the various ways of expressing the frequency of occurrence of given wind speeds, and hence to permit a comparison of the various published environmental wind criteria.

2. The reason for needing environmental wind-speed criteria

Whilst involved in the technical argument about criteria, it is important to remember the reason for trying to establish environmental wind-speed criteria.

Briefly, the need has arisen because unacceptable wind speeds can be induced around building developments and one way of avoiding these problems is to conduct wind-tunnel tests from which wind speeds around a proposed development can be estimated. Having obtained the facility for predicting likely wind conditions in a given area, it becomes necessary to develop some criteria as to the frequency of occurrence of wind speeds which are acceptable and unacceptable for a variety of activities.

3. How people feel the effects of wind

There seems little doubt that wind speed and rate of change of wind speed are the primary parameters in any assessment of how wind affects people, Melbourne [2], Hunt et al. [3]. There are, of course, other factors such as temperature, humidity, degree of shade and mode of dress, which are also significant; however, these are factors which can be superimposed on or used to modify the effects of wind speed and as such will not be dealt with here.

Wind gustiness, or fluctuation of wind speed with time, is a random process and whilst the mean wind speed is a meaningful and simple parameter to obtain, the rate of change of wind speed is not. Fortunately, the effect of rate of change of wind speed can be covered generally by the parameter of turbulence intensity of wind speed, that is the standard deviation over the mean of wind speed. Further, in terms of what people feel, it is often convenient to talk in terms of a gust wind speed, that is a wind speed averaged over the smallest periods of time to which a person can respond, of the order of seconds. The mean 2- or 3-second-gust wind speed has become a useful reference in this respect, because it is roughly equivalent to the peak gust speed recorded by the Dines anemometer and the larger cup anemometers.

The wind force felt by a person is related to dynamic pressure. Hence, whilst it may be convenient in one sense to relate criteria directly to wind speed, it must be appreciated that the force felt by a person is proportional to wind speed squared. For this reason a more rational feel for the problem is gained if comparative data are presented in terms of velocity pressures rather than velocities. However, the referring of criteria to wind speed has gained popular acceptance and values of wind speed are more easily remembered than numbers based on the square of wind speed, hence, criteria will be discussed in terms of wind speed.

In concluding this section, it is worth re-casting the opening sentence by now saying that it is the peak gust wind speeds and associated gradients which people feel most.

4. Relationships between peak gust and the mean wind speeds

The peak gust wind speed $\hat{u}$ is dependent on turbulence intensity and can be given in terms of the mean $\overline{u}$ and standard deviation σ_u as

$$\hat{u} = \overline{u} + 3.5\,\sigma_u \qquad (1)$$

For example, for a turbulence intensity $(\sigma_u/\overline{u})$ of 15%, $\hat{u} = 1.5\,\overline{u}$, and for 30%, $\hat{u} = 2.0\,\overline{u}$, etc.

As noted, it is the peak gust wind speeds and associated gradients which people feel most and as such it is of interest to know under what conditions they occur. The observations of Melbourne and Joubert [4] indicated that the areas in full scale which have been classed as having unpleasant or unacceptably high wind speeds were all associated with high mean wind speeds. Later, model- and full-scale measurements by Isyumov and Davenport [5] and Melbourne [6] continued to show that the windiest areas were associated with high mean wind speeds, but that the turbulence intensity was important in determining the peak gust wind speeds. In the case of the former, the ratio of peak gust wind speed over mean wind speed $\hat{u}/\overline{u}$ for the three windiest conditions respectively were 1.5, 2.7 and 2.8 and for the latter 1.9, 1.9 and 2.4. For areas and wind directions with lower wind conditions, and obviously for much greater turbulence intensities, this ratio was typically as high as 5.0. This means that to get an accurate prediction of peak gust wind speeds from wind-tunnel model tests, it is essential that mean and rms or peak values for a given probability level be actually measured.

Although it is possible to have unpleasant areas with low mean wind speeds and high turbulence intensities, the evidence to date does seem to indicate that for areas likely to have unacceptably high wind conditions, such as near corners, in narrow alleys and in arcades, the turbulence intensity is relatively low and that in these areas it would be reasonable to assume that the peak gust wind speeds will be about twice the mean wind speed. This means that wind-tunnel investigations, in terms of exploring and improving likely areas of high wind conditions, can often be reasonably based on very simple and inexpensive model measurements of mean wind speed. However, this does not mean that the need to model the turbulence characteristics of the incident wind stream can be overlooked, as a low turbulence stream would produce quite different flow fields and erroneous information.

5. Melbourne's criteria for environmental wind speeds

Notwithstanding the usefulness of the above very simple tests, to maintain flexibility in the application of environmental wind-speed criteria to all levels of turbulence, the author believes it is necessary to frame the definition in terms of gust wind speeds related to some meaningful return period or frequency of occurrence. Criteria which are defined only by mean wind speeds need to be qualified with respect to turbulence to have any general application.

Melbourne's criteria [2, 7] were based on two levels of wind speed, an unacceptable level at which wind gusts would be strong enough to knock people over and a level generally acceptable in main public access-ways based on conditions which had existed in the main Australian cities during the first half of the 20th century, when building was dense but heights restricted to about 30 m. Temperatures are typically between 10° C and 30° C with people appropriately dressed for the outside temperature conditions. These criteria simply state that in main public access-ways wind conditions are

(a) completely unacceptable if the annual maximum gust exceeds 23 m/s (the gust speed at which people begin to get blown over),

(b) generally acceptable if the annual maximum gust does not exceed 16 m/s (which results in half the wind pressure of a 23 m/s gust). Along the lines of Davenport's [8, 9] suggestions for comfort for activities less than walking in a main public access-way, two additional comfort criteria have been added to the original criteria as follows:

(c) generally acceptable for stationary short-exposure activities (window shopping, standing or sitting in plazas), if the annual maximum gust does not exceed 13 m/s,

(d) generally acceptable for stationary, long-exposure activities (outdoor restaurants, theatres), if the annual maximum gust does not exceed 10 m/s.

From these basic criteria a probability distribution, or frequency of occurrence, can be developed to suit any turbulence conditions. An example of such a distribution is given in Fig.1, for a turbulence intensity of 30%, where the distributions of the maximum gust speeds per annum, of 23 m/s, 16 m/s, 13 m/s and 10 m/s are shown as normal distributions back to the maximum hourly mean wind speed per annum (i.e. $\hat{u} = 2.0\,\overline{u}$ for $\sigma_u = 0.3\,\overline{u}$, which as discussed in Section 4 is a very typical situation). The upper part of Fig.1 shows the distribution of hourly mean wind speeds for these conditions using a Rayleigh distribution, and the expected maximum wind speeds for periods of a day, week, month and year have been calculated using a method by Davenport [10].

Davenport showed that the number of storms, on occasions during which a wind speed $\overline{u}$ is exceeded, can be expressed as

$$N_u = \sqrt{2\pi}\,\nu T \left[\Gamma\left(1+\frac{2}{k}\right) - \Gamma^2\left(1+\frac{1}{k}\right)^{\frac{1}{2}} k\,\{-\ln P_{(>\overline{u})}\}\right]^{(k-1)/k} P_{(>\overline{u})} \qquad (2)$$

where $P_{(>\overline{u})}$ is the probability of exceeding the mean wind speed $\overline{u}$ (based on the Weibull distribution), k is one of the Weibull parameters, Γ is the Gamma function and νT is the number of independent events per annum. The value of k varies about 1.5 to 2 and νT varies between 500 and 1000, depending on the local wind climate. From an evaluation of Davenport's eq. (2) [5] the ranges given in Table 1 can be obtained which express the relation between probability of exceeding a certain hourly mean wind speed and the number of storms per annum during which that mean wind speed is exceeded. Apart from

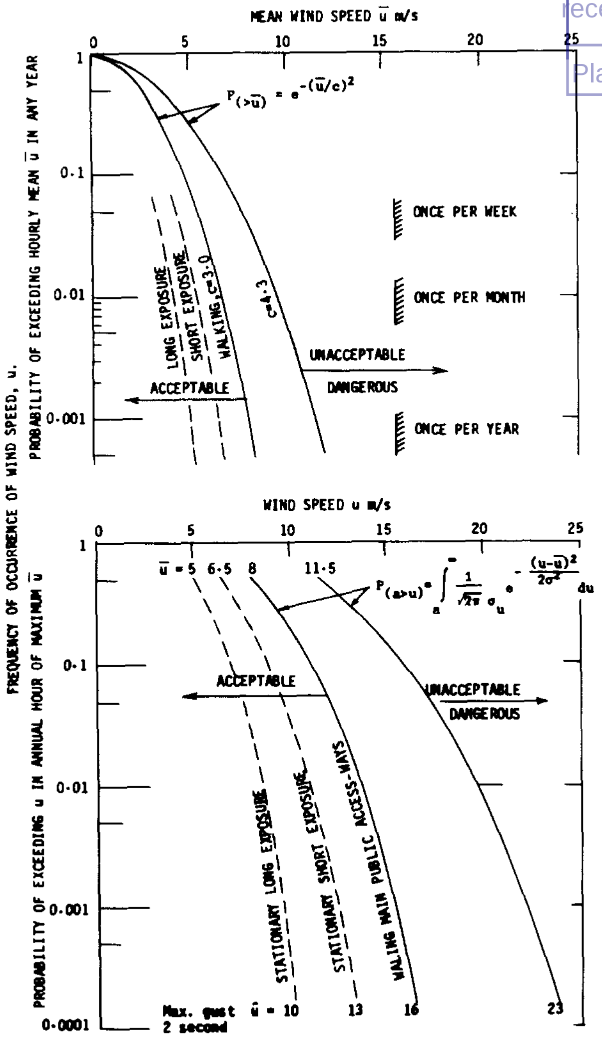


Fig. 1. Probability distributions of Melbourne's criteria for environmental wind conditions for daylight hours, for a turbulence intensity of 30%. $\sigma_u = 0.30\overline{u}$, $\hat{u} = 2.0\overline{u}$.

providing a very important link to give information about the maximum wind speeds likely to occur on average for various periods, such as once per year, once per month, etc., this also provides the necessary link to enable the various environmental wind speed criteria to be compared.

One other complication arises in respect of the number of storms per annum which are relevant to the assessment of environmental wind conditions for human comfort. It is obviously conservative to include winds which blow for all hours of the year, day and night, when most areas under consideration will only be occupied for half of the time or less. Although it does not make

TABLE 1

Relationship between probability of exceeding a mean wind speed and the average number of storms per annum during which that mean wind speed is exceeded

Number of storms per annum during which $\overline{u}$ is exceeded ($N_{\overline{u}}$)	Probability of exceeding an hourly mean wind speed $\overline{u}$ ($P_{(>\overline{u})}$)	
	All hours	Daylight hours
1, once per annum on average	0.00025—0.0005	0.0005—0.001
12, once per month on average	0.003—0.006	0.006—0.012
52, once per week on average	0.015—0.03	0.03—0.06

a great deal of difference, the author prefers to relate criteria and assessment to approximately half the total time, by relating the probability of exceedence to half the yearly cycling rate (i.e. 250—500 independent events per annum) and calling this procedure an assessment of environmental wind conditions relating to "daylight hours"; these ranges are also given in Table 1. Strictly speaking, the cycling rate and evaluation of the wind speed probability distributions should be related to the relevant occupancy times (i.e. daylight hours, afternoon hours, etc.), and in many parts of the world seasonal distributions are also significant. However, for the purposes of this comparison of criteria the simplistic assumptions above described as relating to "daylight hours" will be used in this paper.

6. Comparison of various criteria

Since 1971 several forms of criteria for environmental wind conditions have been published. The criteria developed by Wise [11], Penwarden [12, 13] Davenport [8,9], Lawson [14] and one by Hunt, Poulton and Mumford [3] are given in terms of mean wind speed at some stated or implied level of turbulence intensity between 15% and 20%. Comparison of these criteria can be made in Fig.2 with Melbourne's criteria which have been plotted for a turbulence intensity of 15%, i.e. for $\sigma_u/\overline{u} = 0.15$ and from eqn. (1) $\overline{u} = \hat{u}/1.5$.

Wise [11], in 1971, commented in relation to the Beaufort scale "that wind speeds much above about 5 m/s are likely to give unpleasant disturbance to clothing and hair" and "making reasonable assumptions about metabolic rate, and the thermal resistance of body layers and clothing, speeds of some 5 m/s appeared tolerable at 10° C in normal winter clothing". Penwarden [12] in 1973 and again in collaboration with Wise [13] in 1975 prepared a summary of wind effects on people based on a modified version of the Beaufort Scale from which the following three points can be extracted

discomfort begins	$\overline{u}$ = 5 m/s
unpleasant	$\overline{u}$ = 8—10 m/s
dangerous	$\overline{u}$ = 15—20 m/s.

Penwarden and Wise [13] quoted a criterion which they had used at the Building Research Station, that conditions were regarded as acceptable, or no remedial action was required, if $\overline{u} < 5$ m/s for 80% or more of the time and vice versa, that remedial action would be taken if $\overline{u} > 5$ m/s for more than 20% of the time. In probability terms this criterion is interpreted as being acceptable if $P_{(\overline{u} > 5)} \leqslant 0.2$.

Davenport [8, 9] in 1972 amalgamated work by Wise, Melbourne and Joubert and suggested criteria for a range of activities; these were related to a Beaufort scale for open-country mean wind speeds at 10 m. These criteria also noted that the relative comfort level might be expected to be reduced by one Beaufort number for every 20° C reduction in temperature. In particular Davenport nominated the following hourly mean wind speeds (converted to 2 m) conditions as being tolerable if not exceeded more than once per week, which in probability terms are interpreted as being acceptable for

walking fast	if $P_{(\overline{u} > 10)} \leqslant 0.05$
strolling, skating	if $P_{(\overline{u} > 7½)} \leqslant 0.05$
standing, sitting, short exposure	if $P_{(\overline{u} > 5½)} \leqslant 0.05$
standing, sitting, long exposure	if $P_{(\overline{u} > 3½)} \leqslant 0.05$

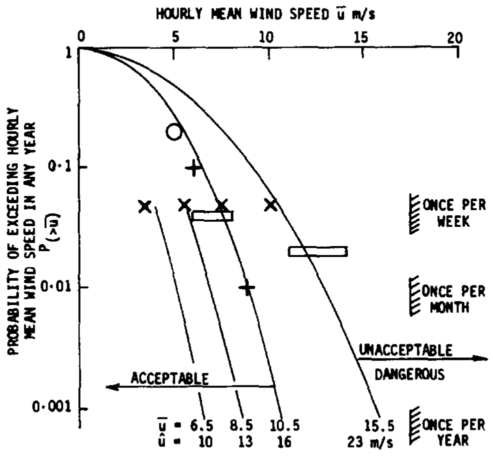
Lawson [14] in 1973 used the same Beaufort scale as Penwarden and developed a figure to take into account the effects of turbulence. A value of $\hat{u}$ = 1.7 $\overline{u}$ was used, which from eq. (1) implies a turbulence intensity of about 20%. Lawson quotes Beaufort 4 wind speeds (6—8 m/s) as being tolerable if not exceeded for more than 4% of the time; and Beaufort 6 wind speeds (11—14 m/s) as being unacceptable if exceeded for more than 2% of the time. In probability terms these criteria are interpreted as being

acceptable	if $P_{(\overline{u} > 6-8)} \leqslant 0.04$
unacceptable	if $P_{(\overline{u} > 11-14)} \geqslant 0.02$

Hunt, Poulten and Mumford [3] in 1976 described a range of wind-tunnel tests which were conducted to show how wind affects people's abilities to perform simple tasks, including a simulation of turbulence. Two criteria were developed, firstly that if wind conditions are to be tolerable and for most kinds of performance to be unaffected

$$\overline{u} < 9/(1 + 3 \text{ turbulence intensity})$$

for turbulence intensity of 15% this becomes $\overline{u} < 6.2$ m/s, and secondly, for safe and sure walking that there must be a low probability (say 1%) of a gust lasting over a few paces (say 5—10 m) exceeding 13 m/s. For a turbulence intensity of 15% the 13 m/s gust becomes a mean wind speed of 13/1.5 = 8.7 m/s. (Hunt used a conversion from Durst to give 9 m/s.) In probability terms



CRITERIA		SYMBOL
MELBOURNE AS NOTED ON LINES IN GRAPH		—
PENWARDEN AND WISE		
ACCEPTABLE	IF $P_{(\bar{u} > 5)} < 0.2$	○
DAVENPORT		
ACCEPTABLE FOR WALKING FAST	IF $P_{(\bar{u} > 10)} < 0.05$	×
STROLLING	IF $P_{(\bar{u} > 7\frac{1}{2})} < 0.05$	×
STANDING,SITTING SHORT EXPOSURE	IF $P_{(\bar{u} > 5\frac{1}{2})} < 0.05$	×
STANDING,SITTING LONG EXPOSURE	IF $P_{(\bar{u} > 3\frac{1}{2})} < 0.05$	×
LAWSON		
ACCEPTABLE	IF $P_{(\bar{u} > 6 \text{ to } 8)} < 0.04$	▭
UNACCEPTABLE	IF $P_{(\bar{u} > 11 \text{ to } 14)} > 0.02$	▭
HUNT,POULTON & MUMFORD		
ACCEPTABLE FOR STROLLING	IF $P_{(\bar{u} > 6)} < 0.1$	+
ACCEPTABLE FOR WALKING	IF $P_{(\bar{u} > 9)} < 0.01$	+

Fig. 2. Comparison of various criteria for environmental wind conditions for daylight hours for a turbulence intensity of 15%. $\sigma_u = 0.15\overline{u}$, $\hat{u} = 1.5\overline{u}$.

for 15% turbulence intensity, this is interpreted as being

acceptable for strolling if $P_{(\overline{u} > 6)} \leqslant 0.1$
acceptable for walking if $P_{(\overline{u} > 9)} \leqslant 0.01$

These criteria in probability terms have been compared in Fig.2 with Melbourne's criteria plotted for a turbulence intensity of 15%.

7. Conclusions

It remains to conclude that the degree of agreement between the criteria when presented in probabilistic terms is quite remarkable for a phenomenon which relies almost completely on subjective assessment. This is particularly so for the earlier attempts by Wise, Melbourne and Penwarden where the criteria were developed entirely independently and in quite different ways. The agreement of the later published criteria, whilst supportive, is not quite so remarkable as there has been a certain amount of influence from the earlier attempts. It seems reasonable to conclude that assessments based on any of these criteria could be said to be made with some consensus of international opinion. However, assessment of the viability of any area in terms of wind environment still relies heavily on the assessment of the use to which the area is to be put and the cost-effectiveness of providing protection from the wind.

References

1 Discussion Session 7, Proc. 4th Int. Conf. Wind Effects on Buildings and Structures, Cambridge University Press, London, 1975, pp. 665—666.

2 W.H. Melbourne, Ground level winds caused by large buildings, Monash University, Dept. Mech. Eng., MMER 4, 1971.

3 J.C.R. Hunt, E.C. Poulton and J.C. Mumford, The effects of wind on people; new criteria based on wind tunnel experiments, Building and Environment, II (1976) 15—28.

4 W.H. Melbourne and P.N. Joubert, Problems of wind flow at the base of tall buildings, Proc. 3rd Int. Conf. Wind Effects on Buildings and Structures, Tokyo, 1971, pp. 105—114.

5 N. Isyumov and A.G. Davenport, The ground level wind environment in built up areas, Proc. 4th Int. Conf. Wind Effects on Buildings and Structures, Cambridge University Press, London, 1975, pp. 403—422.

6 W.H. Melbourne, Wind effect measurements on the BHP Building, Melbourne and full scale wind measurements below tall buildings, Symp. Full Scale Measurements of Wind Effects on Tall Buildings, University of Western Ontario, London, Canada, 1974.

7 W.H. Melbourne, Wind tunnel test expectations, Int. Conf. Planning and Design of Tall Buildings, Lehigh University, ASCE, Vol. DS, 1972, pp. 301—304.

8 A.G. Davenport, An approach to human comfort criteria for environmental wind conditions, Colloquium on Building Climatology, Stockholm, 1972.

9 A.G. Davenport, Approaches to the design of tall buildings against wind, Theme Report at Int. Conf. on Planning and Design of Tall Buildings, Lehigh University, Vol. 1b-7, 1972, pp. 1—22.

10 A.G. Davenport, On the statistical prediction of structural performance in the wind environment, Preprint 1420 ASCE National Structural Eng. Meeting, Baltimore, Maryland, 1971.

11 A.F.E. Wise, Wind effects due to groups of buildings, Philos. Trans. R. Soc. (London), A269 (1971) 469—485.

12 A.D. Penwarden, Acceptable wind speeds in towns, Building Sci., 8 (1973) 259—167.

13 A.D. Penwarden and A.F.E. Wise, Wind environment around buildings, Building Research Establishment Report, H.M.S.O., 1975.

14 T.V. Lawson, The wind environment of buildings: a logical approach to the establishment of criteria, University of Bristol, Dept. of Aeronautical Engineering, Report No. TVL 7321, 1973.

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Paper 9

WIND ENVIRONMENT STUDIES IN AUSTRALIA

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(Received November 30, 1977)

Summary

The assessment of prospective environmental wind conditions about proposed building developments in Australia has been discussed. Assessment techniques, making use of wind tunnel studies, have been illustrated with examples from a study of two possible building configurations for a very exposed site on the north side of the City of Melbourne.

A method of predicting the probability of occurrence of a given wind speed at a particular location has been detailed, and examples have been given of the integration of model measurements of local velocities with the wind speed probability distribution for the geographic area. The comparisons of these probabilistic estimates with environmental wind speed criteria have been discussed and illustrated.

A method of measuring peak gust wind speeds at model scale in situations of high turbulence intensity has been given and a comparison is given with a full scale situation.

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1. Introduction

An assessment of prospective environmental wind conditions is now carried out for virtually all major building developments in Australia; for several of the major cities it is a mandatory requirement of the licensing authority. Some of the proposed developments become the subject of wind tunnel studies because of their size and particular exposure to strong wind directions, or when the architect wants an evaluation of several possible schemes, or where the development of a particularly well protected recreational area or shopping precinct is required. Because of a steady build-up of experience in architects' offices of how to design to avoid undesirable environmental wind conditions, there has been a significant reduction in the number of wind tunnel studies required and most are now occasioned by an architect or client wanting to create configurations with better than average environmental wind conditions.

Feedback from developments which have been the subject of wind tunnel tests, and some full scale studies, have permitted the development of the criteria discussed by Melbourne [1]. Much of the techniques used in conducting these wind tunnel tests in Australia by Melbourne at Monash University and Vickery at the University of Sydney have been reported in the text Architectural Aerodynamics [2]. This text concentrated more on examples for architects, in particular how environmental wind problems are caused and how they can be avoided. Hence it would seem to be more appropriate in this paper to discuss the probabilistic techniques used in Australia to assess prospective environmental wind conditions about a proposed development from wind tunnel tests. To illustrate these techniques, examples will be drawn from an investigation carried out at Monash University on the relative merits of two possible configurations for a very exposed site on the north side of the City of Melbourne, one proposal was made up of rectangular building towers and the alternative proposal was based on towers with a circular planform.

2. Wind tunnel techniques

As discussed in both Refs. [1] and [2], it is the wind pressures caused by peak gust wind speeds and associated gradients which people feel most. Although it is possible to have unpleasant areas with low mean wind speeds and high turbulence intensities, the evidence to date does seem to indicate that in areas likely to have unacceptably high wind conditions, such as near corners, in narrow alleys and in arcades, the turbulence intensities are relatively low (20 to 30%) and that in these areas it is reasonable to assume that the peak gust wind speeds will be about twice the mean wind speed. In many cases these problems can be assessed adequately through measurements of local mean wind speeds referenced to a probability distribution of wind speeds for the area. Measurements of mean wind speeds can be simply made with either small pitot static tubes or hot wire anemometers. The exception can occur when assessment is required of an area, such as a recreational plaza for long exposure, which is surrounded by buildings. The turbulence intensity in these situations can be high and the criteria for comfort very strict and in these cases it is necessary to measure peak gust wind speed with a hot wire anemometer.

The measurement of mean velocity pressures with a pitot static tube and the measurement of mean wind speeds with a hot wire both have advantages and disadvantages. The hot wire technique has problems in that the measurement of mean and standard deviation in turbulence intensities above 20% become increasingly suspect and eventually meaningless. However, if only peak gust wind speeds without local directional information are required, then the hot wire technique is relatively satisfactory. The peak gust wind speeds can be obtained from an on line probability analysis of the signal from the hot wire equipment. If the equivalent to a 2 to 3 second gust, as measured by a cup or Dines anemometer in full scale is required, the signal must be appropriately filtered and the velocity with a probability of exceedance of about 2×10^{-4} (i.e. 3.5 standard deviations above the mean for a normally distributed process) taken as the equivalent gust wind speed.

For the majority of wind tunnel investigations the author prefers to use the technique of measuring mean velocity pressures with pitot static tubes as shown diagramatically in Fig.1. The mean velocity pressure can be simply

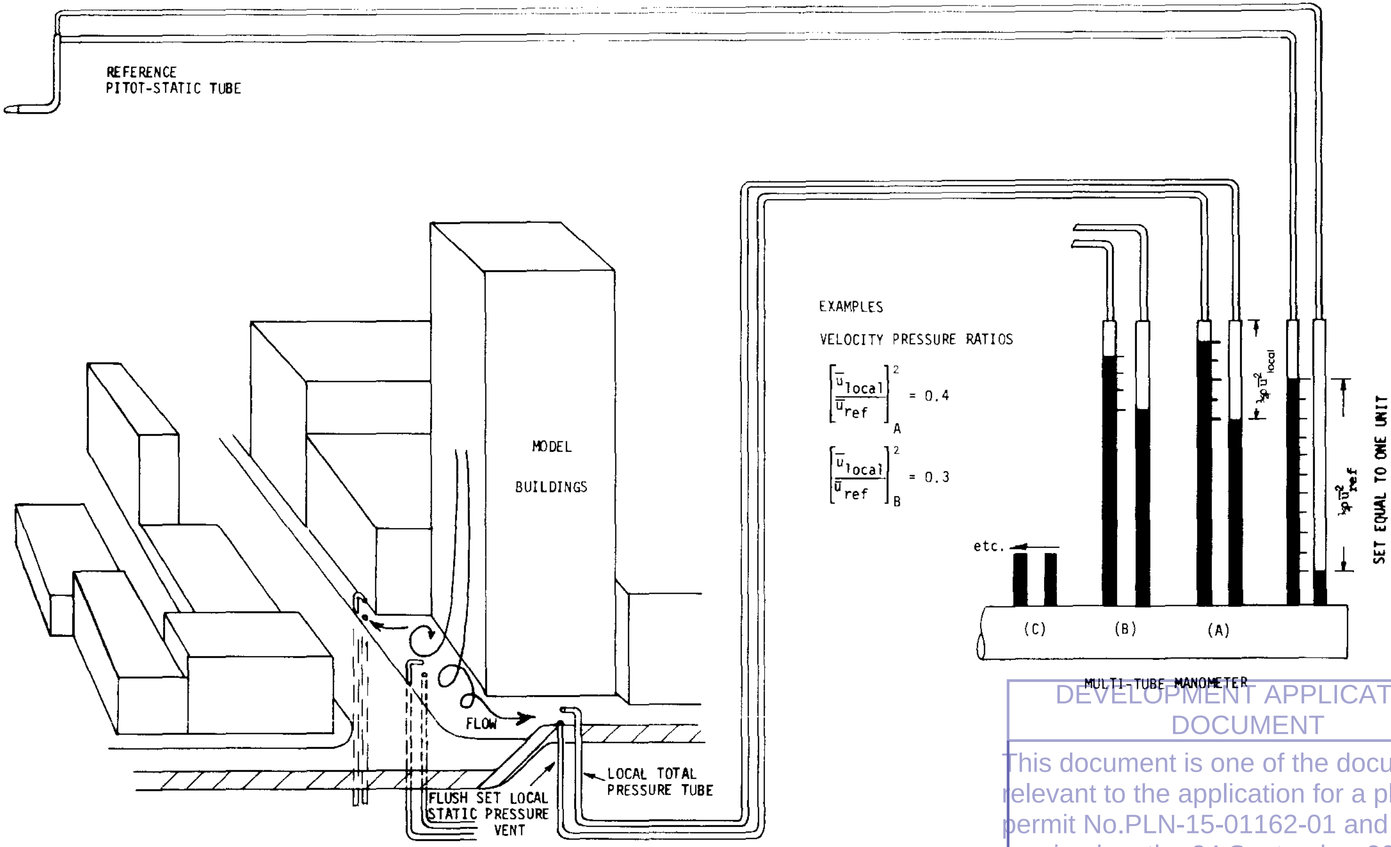


Fig. 1. Experimental arrangement for measuring mean velocity pressure ratios.

measured by using a length of small diameter tubing bent in the horizontal plane to measure total pressure in conjunction with a surface static vent. The mean velocity pressures at a number of stations can be measured at the same time by displaying the velocity pressure on a multitube manometer. The disadvantage of this technique is that the total pressure tubes have to be aligned to face directly into wind to get the maximum reading (which does have the benefit of indicating the local wind direction), and peak gust wind speed readings cannot be satisfactorily obtained even if a pressure transducer is used. It is more satisfactory to use a hot wire anemometer to measure peak gust wind speed.

Both techniques require that measured local velocity pressures or wind speeds be referred as a ratio to some reference velocity pressure or wind speed, such as at or near gradient height, which can in turn be related to a full probability distribution of wind speeds for the area. These techniques and probabilistic analysis will be illustrated in the following example.

3. Assessment of prospective environmental wind conditions

The assessment of prospective environmental wind conditions about a proposed development in Australia goes through a series of stages of which the following are typical:

(i) The client and architect discuss broad principles with a number of specialist consultants, one of whom is the wind enginner or aerodynamicist.

(ii) Several configurations or themes on one configuration are developed for the assessment of environmental wind conditions.

(iii) A probability distribution of wind speeds with direction, relative to the site, is compiled.

(iv) Wind tunnel tests are made on the various configurations and modifications developed at the time the models are in the wind tunnel.

(v) The wind tunnel data are integrated with the wind speed data to facilitate a final assessment of the environmental wind conditions.

In practice, the integration of the wind tunnel and wind speed data is done continuously throughout the wind tunnel test programme, to facilitate continuous assessment and decisions by the client and architect to dictate the direction of the test programme. The author will only conduct wind tunnel tests of this type when senior client and architect representation at the wind tunnel can be guaranteed. There are some very simple ways in which the wind tunnel data can be assessed with respect to the wind speed data and these will be illustrated in the following example.

3.1 Example of wind tunnel testing and initial assessment procedure

The example chosen is that of a major development proposal to be located on the northern edge of the Central Business District of the City of Melbourne. The architects were particularly aware of the fact that such a development would be exposed to the wind directions from which come the strongest and most frequent winds. Similarly, they were aware that there was little likelihood of any significant shielding being developed for these directions in the foreseeable future. Accordingly, they developed two proposals for assessment of environmental wind conditions. The first was based on three rectangular tower buildings with extensive canopy arrangements near ground level and the second was based on three circular towers of similar size and arrangement with the ground level area left completely open. Photographs of these two models are shown in Fig. 2.

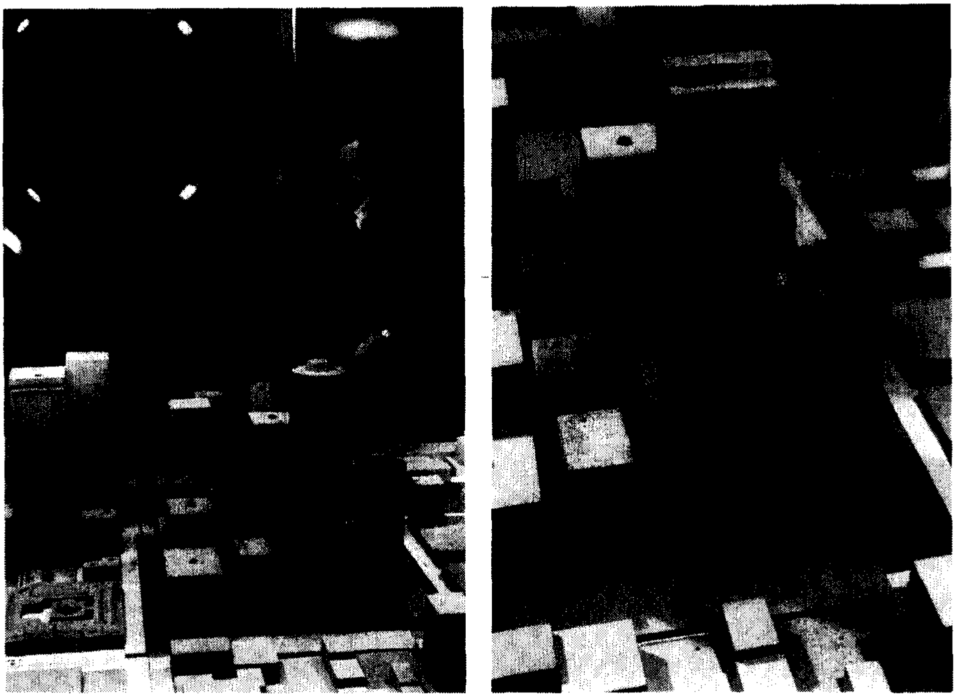


Fig. 2. 1/400 scale models of a development proposed for the City of Melbourne.

Before the commencement of the wind tunnel test, it is necessary to prepare a probability distribution of wind speeds. An example of such a distribution is given in the first part of Table 1 in the form of the raw data as were obtained from records of measurements made with a Dines anemometer located at a height of 10 m at Essendon Airport some 10 km north of the City of Melbourne. The cumulative probability distribution for each of the 16 wind directions (θ) can be fitted to a Weibull distribution, which takes the form,

$$P_{(> \overline{u})\theta} = A_\theta \ \exp-(\overline{u}/c_\theta)^{k_\theta} \qquad (1)$$

which then can be presented in a polar plot with lines of constant probability

TABLE 1

Probability distribution of hourly mean wind speeds measured at 10 m height in open country terrain at Essendon Airport, Melbourne, Australia, 1959—71 for daylight hours 0730 to 1930, and environmental wind criteria per 22½° sector

	Band of wind speeds, $\overline{u}$ (m/s)					
$\overline{u}$ at 10 m over open country terrain	0.5 to 2.1	2.1 to 3.6	3.6 to 5.65	5.65 to 8.75	8.75 to 11.3	11.3 to 14.4
$\overline{u}$ at 300 m over suburban terrain *	0.8 to 3.2	3.2 to 5.5	5.5 to 8.6	8.6 to 13.4	13.4 to 17.3	17.3 to 22.0
Wind direction	Probability of being in band × 10^6					
N	11973	15323	37400	64368	31085	15543
NNE	3900	4340	8238	12468	4943	2800
NE	6535	3185	2855	1538	440	110
ENE	5218	1813	660	165	55	
E	7800	2800	1098	330		
ESE	4340	2690	2088	1318	330	
SE	9008	7745	9720	7635	1593	440
SSE	8733	11698	16423	12138	933	165
S	18948	32898	64753	68543	9063	933
SSW	9338	10490	18180	17630	3680	1043
SW	11080	12633	20485	18508	6205	2418
WSW	5823	6700	11588	14280	5548	2965
W	9555	11040	7963	21968	7690	2528
WNW	4558	5273	7963	7360	1703	715
NW	6480	7853	10215	12578	7223	1868
NNW	5878	8073	12633	17025	7280	2418
Calm	88788					
Total	1000000					

$$^{*}\overline{u}_{300,\text{ suburban}} = \overline{u}_{10,\text{ open country}} \left[\frac{400}{10}\right]^{0.15} \left[\frac{300}{500}\right]^{0.25} = 1.53\,\overline{u}_{10,\text{ open country}}.$$

**For a lower turbulence intensity of $\sigma_u = 0.15\overline{u}$, $\hat{u} = 1.5\overline{u}$, the numerical criteria become Unacceptable/dangerous, annual maximum $\overline{u} > 15.5$; Acceptable/walking, annual maximum $\overline{u} < 10.5$.

		Average annual hourly maximum wind speed at 300 m for each sector from line with $P_{(>\bar{u})} = 0.001$ in Fig.3	Environmental wind criteria based on Melbourne's criteria for $\sigma_u = 0.3\bar{u}$, $\hat{u} = 2.0\bar{u}$**			
			Unacceptable/ dangerous annual maximum $\bar{u} > 11.5$ m/s		Acceptable for walking annual maximum $\bar{u} < 8.0$ m/s	
14.4 to 17.5	17.5 to 21.1		For $\bar{u}_{local} = 11.5$		For $\bar{u}_{local} = 8.0$	
22.0 to 26.7	26.7 to 32.3		$\frac{\bar{u}_{local}}{\bar{u}_{300}}$	$\left[\frac{\bar{u}_{local}}{\bar{u}_{300}}\right]^2$	$\frac{\bar{u}_{local}}{\bar{u}_{300}}$	$\left[\frac{\bar{u}_{local}}{\bar{u}_{300}}\right]^2$
2910	275	24	0.48	0.23	0.33	0.11
330		20	0.58	0.33	0.40	0.16
		12	0.96	0.91	0.67	0.44
		6	1.9	3.7	1.3	1.8
		6	1.9	3.7	1.3	1.8
		10	1.2	1.3	0.8	0.64
		14	0.82	0.67	0.57	0.33
		14	0.82	0.67	0.57	0.33
55		18	0.64	0.41	0.44	0.20
110		17	0.68	0.46	0.47	0.22
165		19	0.61	0.37	0.42	0.18
605	55	20	0.58	0.33	0.40	0.16
440		20	0.58	0.33	0.40	0.16
165		18	0.64	0.41	0.44	0.20
165	55	19	0.61	0.37	0.42	0.18
330		20	0.58	0.33	0.40	0.16

level as shown in Fig. 3. In this particular plot the mean hourly wind speed has been factored to refer to a height of 300 m over suburban terrain by the relationship,

$$\bar{u}_{300\text{, suburban}} = \bar{u}_{10\text{, open country}} \left[\frac{400}{10}\right]^{0.15} \left[\frac{300}{500}\right]^{0.25}$$

$$= 1.53\,\bar{u}_{10\text{, open country}} \qquad (2)$$

In the wind tunnel model tests, the local velocity pressures, or local wind

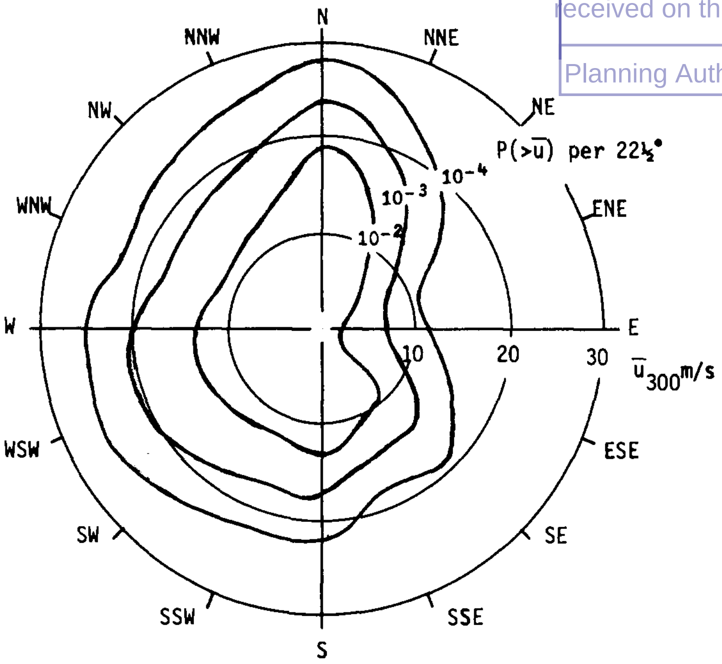


Fig.3. Probability distribution of hourly mean wind speeds at 300 m over suburban roughness at Essendon Airport Melbourne for daylight hours 0730 to 1930.

speeds, will be measured as a ratio with the similar measurement at 300 m over the model suburban approaches. Hence, if the annual maximum hourly wind speeds at 300 m can be obtained for each wind direction sector, then Melbourne's criteria [1] can be expressed for each sector as a ratio against which any measurements can be directly compared at the time of measurement. The annual maximum hourly wind speed for each sector can be obtained using the probabilities given in [1] and in this case, where the distribution is for daylight hours, the average maximum hourly wind speed can be approximated by reading around the contour with a probability $P_{(>\overline{u})} = 10^{-3}$ in Fig.3 as tabulated in Table 1. With this information the criteria, in ratio form, can be calculated as shown in the last part of Table 1 for the most general case of the peak gust wind speed equal to twice the hourly mean wind speed ($\hat{u} = 2\overline{u}$) for two levels as defined in [1] as being

(a) unacceptable/dangerous if the annual maximum gust wind speed, $\hat{u} > 23$ m/s;

(b) acceptable/for walking if the annual maximum gust wind speed, $\hat{u} < 16$ m/s.

The curves of these two criteria can then be plotted as background information on the data sheets on which the wind tunnel measurements are directly recorded as shown in Fig.4. Obviously this information forms the background for any test series and once it has been obtained for an area, it serves for tests

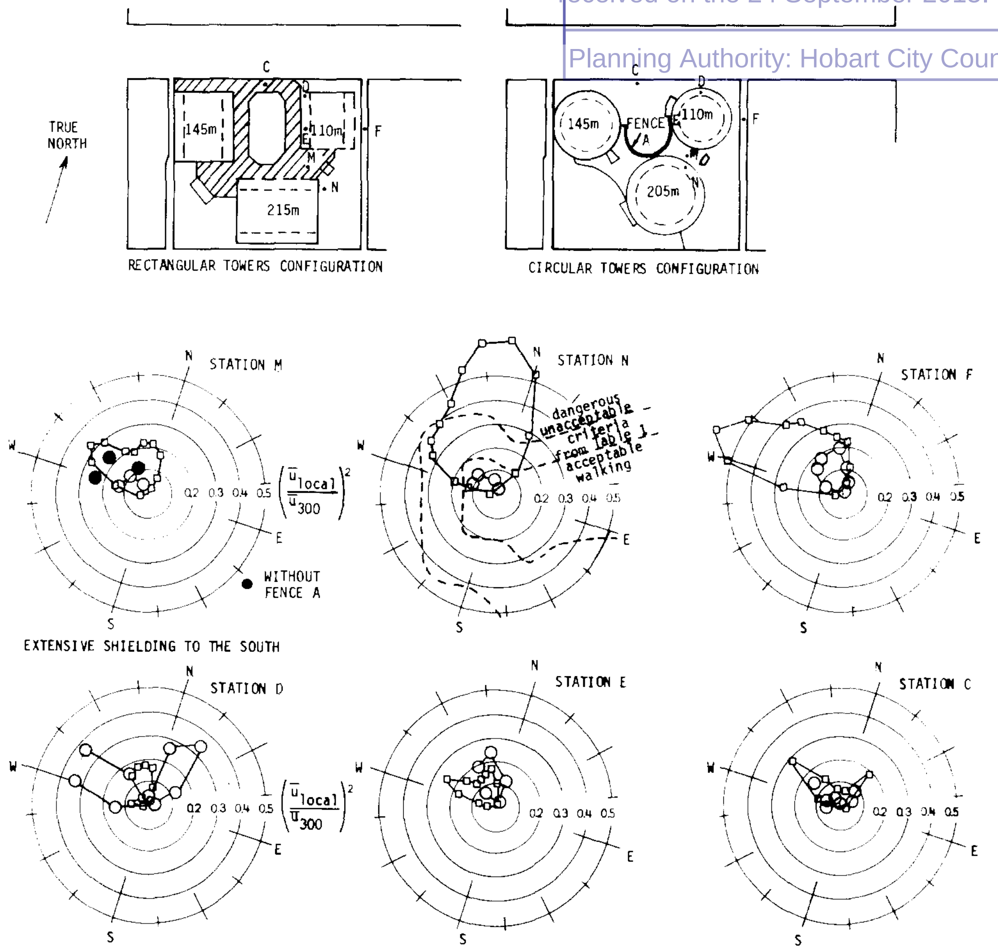


Fig. 4. Mean velocity pressure ratios from wind tunnel model tests.

on all projects in that area. In this particular case, some small modification has to be made to reduce the effect of topographical funnelling which peaks the distribution for northerly wind directions at Essendon Airport, but the effect of which reduces further south over the downtown area of the City of Melbourne and southern suburbs.

Examples of polar plots of velocity pressure ratio as a function of wind direction are given in Fig.4, for 6 of about 30 stations, at which measurements were made to facilitate the assessment of environmental wind conditions for these two configurations. At Stations M, N and F, the very adverse effects of the rectangular buildings inducing flow down to ground level is shown to result in quite unacceptably high velocity pressure ratios (for this geographic region) in critical points of public access. These adverse effects can be offset to some extent by the use of local wind break fences or overcome completely by providing air locked connections under the canopy between the main towers at ground level. The circular tower configuration is shown to induce much less wind flow at ground level and to provide conditions within the "acceptable criterion" at Stations M and N. However, in the absence of surrounding buildings over 30 m height to the north and west, there is still a need for the local protection provided by the 50% porous Fence A shown in Fig.1 and 4. Similarly, wind conditions at Stations D, E and C, for the completely open circular tower configuration, are shown to border on unacceptable levels (and certainly are well in excess of acceptable levels). These very local conditions can be ameliorated with the use of porous wind breaks (planter boxes of shrubs and trees) or by the planned layout of architectural features and main access-ways which keep pedestrian traffic away from local regions where high wind speeds are likely to occur.

In concluding this example of how, during wind tunnel testing, a very quick assessment can be made of prospective environmental wind conditions for various configurations, a word of caution must be made in respect of interpreting the measurements.

First of all, the criteria shown in Fig.4 are for each 22½ degree sector; that is if the velocity pressure ratio (or wind speed ratio, whichever approach is being used) reaches, for example, the criterion for unacceptable/dangerous conditions for one sector, it means that once per annum, on average, the peak gust wind speed of 23 m/s will be exceeded. If the criterion is reached for two sectors, it means the probability of exceeding the criterion will double and so on. To make a proper assessment of the probability of exceeding certain wind speeds for all wind directions, a full analysis for all wind directions must be compiled, as shown in Section 3.2.

Secondly, an assessment has to be made by the experimenter as to when the local turbulence intensity reaches a level which invalidates the use of mean velocity pressures or mean wind speeds, whichever technique is being used. If this stage is reached, the simple technique of relying on mean measurements has to be abandoned and the more sophisticated technique of measuring peak gust wind speeds has to be used. A further word of warning here is that it is not sufficient to rely on mean and standard deviation readings from a hot wire anemometer to indicate when a turbulence level of say 25% is reached, because the errors inherent in the hot wire tend to increase the mean and reduce the standard deviation, hence lulling the unwary into thinking that the turbulence intensity is not all that high. A much safer way to determine whether high turbulence, low mean velocity conditions are present, is to observe the signal on a cathode ray oscilloscope and run out a probability distribution to check on the peak values. One consolation, in a sense, of relying on mean wind speeds measured with a hot wire anemometer to higher turbulence intensities is that the mean wind speeds measured are high, and in most cases excessively conservative decisions are more likely to be made on the basis of this incorrect information. An example of the measurement of peak gust wind speeds will be given in Section 3.3.

3.2 Probability distributions of wind speed for all wind directions

In the majority of situations, high wind speeds induced at a particular station are confined to a relatively narrow band of wind directions and an assessment can be made on the basis of criteria for a given sector as described in Section 3.1. For situations where either a more accurate assessment is required (perhaps for a marginal situation), or high wind speeds occur for a broad range of wind directions, it becomes necessary to prepare a full probability distribution of wind speeds which accounts for all, or all the significant, wind directions. Such a distribution can be prepared as follows:

(a) From a distribution such as given in Table 1, a cumulative probability distribution of wind speeds at the reference point (in this case 300 m over suburban terrain) can be prepared which expresses the probability of exceeding a given wind speed for a given wind direction sector, $P_{(>\bar{u})\,\theta,\ \text{reference}}$. One convenient method of doing this is to use the Weibull distribution noted previously.

(b) For each station an average value of the wind speed ratio, $\bar{u}_{\text{local}}/\bar{u}_{\text{ref.}}$ can be obtained from the model tests for each wind direction sector. Using this wind speed ratio, the cumulative probability distribution can be prepared expressing the probability of exceeding a given wind speed for a given wind direction sector at the local station, $P_{(>\bar{u})\theta,\ \text{local}}$.

(c) The value of $P_{(>\bar{u})\,\theta,\,\text{local}}$ must be obtained for all or all significant wind directions and integrated to give the total probability of exceeding a given mean wind speed for all directions, i.e.

$$P_{(>\bar{u})\ \text{all directions, local}} = \int_{0}^{360} P_{(>\bar{u})\,\theta,\,\text{local}}\ \mathrm{d}\theta \tag{4}$$

(d) The whole process can be done conveniently with a digital computer, but it is not a particularly long task to do it manually for a few stations, simply because if the relatively coarse 22½° sectors are used, it is very unusual in practice to have to do the integration of more than three or four sectors. An example of the final stages of this process is given in Table 2 for Station M of the previous example.

(e) Finally, a graph of the probability of exceeding a given wind speed can be superimposed on criteria expressed in the same probabilistic form such as given in [1] and an example of which is given in Fig.5, for several of the stations from the previous example. Whilst such a presentation confirms just how unacceptable conditions would be at Stations M and N for the Rectangular Towers proposal, it is more useful in quantitatively indicating how acceptable the conditions at Station C are likely to be, which can only be very generally assessed from observing the information in Fig.4.

3.3. Measurement of peak gust wind speeds

If, as described in Section 3.1, it is deemed necessary to make an assessment of an area subjected to wind flows with high turbulence intensities, a

TABLE 2

Example of last part of the development of the probability distribution of mean wind speeds at Station M, Rectangular Towers Configuration (Fig.4)

Wind direction	$\overline{u}_{local}$ (m/s)	4	6	8	10	12
	$\frac{\overline{u}}{\overline{u}_{300}}$ frim Fig.4	Probability of being greater than $\overline{u}$ for 22½° sectors of wind direction $P_{(>\overline{u})\theta} \times 10^6$				
N	0.42	80,000	45,000	11,000	1,300	100
NNW	0.47	20,000	12,000	3,000	500	50
NW	0.47	20,000	12,000	3,000	500	50
WNW	0.57	13,000	6,000	2,000	600	150
W	0.40	18,000	7,000	1,000	50	
All other wind directions	< 0.2	Not significant				
Total $P_{(>\overline{u})}$ *		0.15	0.082	0.020	0.0029	0.00035

*These values are plotted in Fig.5.

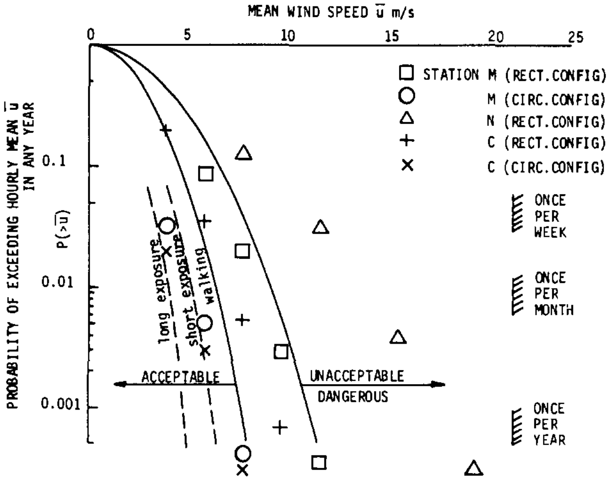


Fig.5. Probability distributions of mean wind speeds at several stations compared with Melbourne's criteria for environmental wind conditions (Daylight hours, $\sigma_u = 0.3\overline{u}$, $\hat{u} = 2\overline{u}$).

measurement of the peak gust wind speeds can be made using a hot wire anemometer as follows:

(a) If it is required to compare model scale peak wind speed measurements with criteria [1] based on peak gusts measured over two to three seconds in full scale, it is first necessary to low-pass filter the hot wire anemometer linearised output, so that it looks like the scaled down version of the output from a typical cup or Dines anemometer.

(b) The next step in the process is to obtain a probability distribution of the filtered hot wire anemometer signal; this can be conveniently obtained using on-line digital analysis techniques.

(c) It is then necessary to determine the probability level equivalent to 2—3 second peak gust in full scale. Many observers of wind data collected from cup or Dines anemometers in open country situations have observed that the peak gust wind speeds are between 1.5 and 1.8 times the mean, and from a knowledge of the turbulence intensities in these situations, it is possible to deduce that the 2—3 second mean wind gust wind speed is approximately 3.5 standard deviations above the mean, i.e.

$$\hat{u}_{2-3\ \mathrm{sec}} = \overline{u} + 3.5\ \sigma_u \qquad (4)$$

For a normally distributed process, the probability of exceeding 3.5 standard deviations above the mean is 2.3×10^{-4}. It is suggested that the value of the velocity with a probability of exceedance of 2.3×10^{-4} is an appropriate approximation to use as being equivalent to a 2—3 second mean maximum gust wind speed.

(d) The gust wind speed so obtained can then be expressed as a ratio with the reference mean wind speed and compared with the environmental wind criteria as previously outlined.

The measurement of peak gust wind speeds can be illustrated by the following comparison of a full scale measurement at a city corner, at an intersection near, but not directly adjacent, to tall buildings, and a model measurement for the same situation. The model measurements were made using a hot wire anemometer and the procedure as outlined above.

		Full scale	Model scale
$\dfrac{\text{local peak gust wind speed}}{\text{local mean wind speed}}$,	$\dfrac{\hat{u}}{\overline{u}}$	4.1	1.8
$\dfrac{\text{local mean wind speed}}{\text{reference mean wind speed}}$,	$\dfrac{\overline{u}}{\overline{u}_{300}}$	0.21	0.50
$\dfrac{\text{local peak gust wind speed}}{\text{reference mean wind speed}}$,	$\dfrac{\hat{u}}{\overline{u}_{300}}$	0.8	0.9

It can be seen that the model measurement of the mean wind speed is a very significant overestimate and on its own would be quite misleading. The reason is apparent when one observes that the ratio of local peak to mean wind speed is over four, indicating very high turbulence, and which the hot wire anemometer records at less than two. However, when only the peak gust wind speed is used from a hot wire anemometer in this situation, the comparison between peak and reference mean wind speed ratios compares relatively well.

4. Conclusions

The assessment of prospective environmental wind conditions about a typical proposed building development in Australia has been discussed. Measurement techniques have been described and illustrated with examples. In particular, examples of the probabilistic assessment of local wind speeds and comparison with environmental wind speed criteria have been given in detail. A method of measuring peak gust wind speeds in situations of high turbulence intensity has been given.

Acknowledgements

The author wishes to acknowledge the kind permission of Meldrum and Partners to include examples from studies on one of their projects. The author is indebted also to the Australian Bureau of Meteorology for the full scale wind data made available, not only for this report, but for countless studies of a similar kind in various Australian locations.

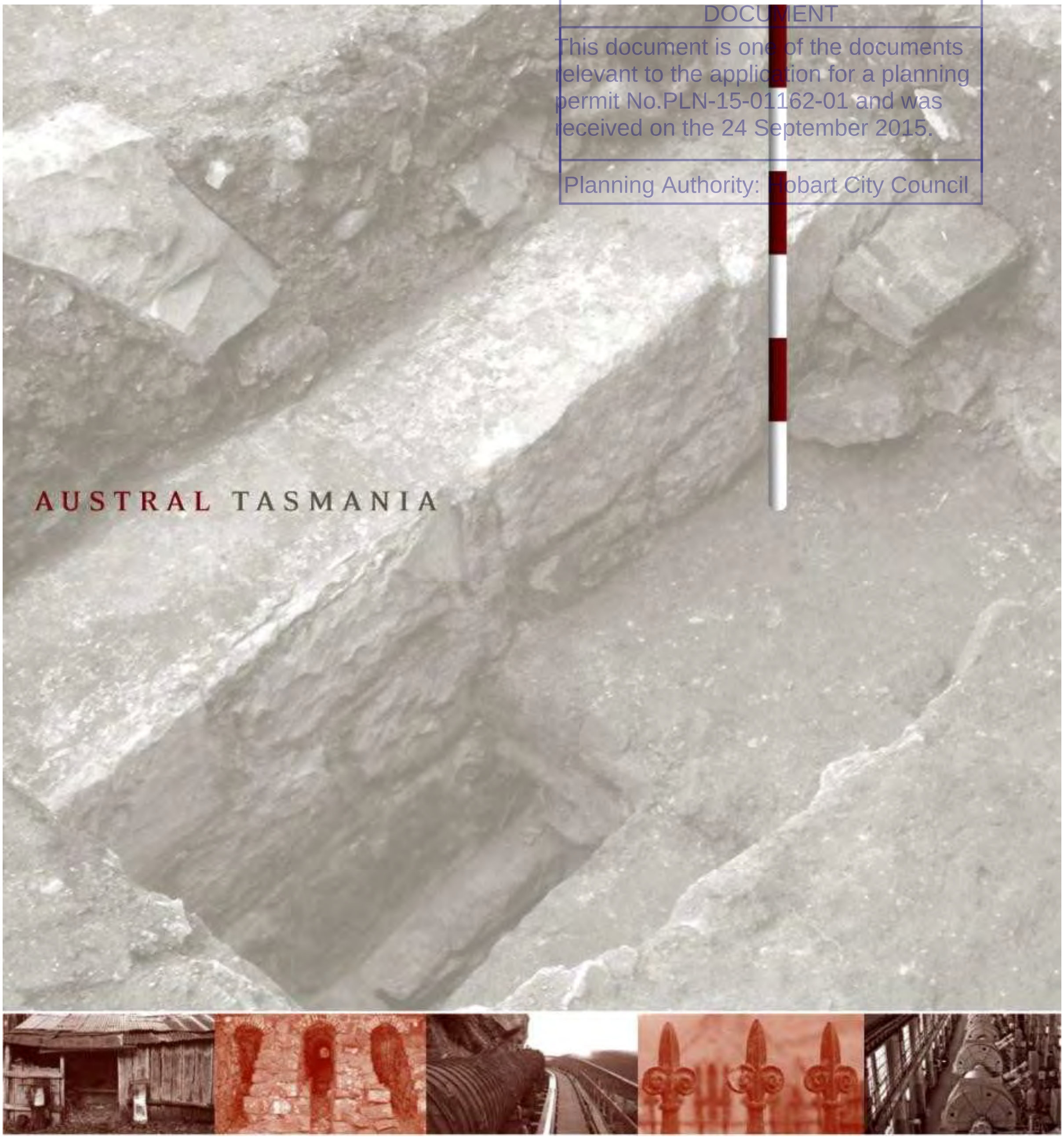
References

1 W.H. Melbourne, Criteria for environmental wind conditions, J. Ind. Aerodyn., 3 (1978) 241—249

2 R.M. Aynsley, W.H. Melbourne and B.J. Vickery, Architectural Aerodynamics, Applied Science Publishers, Barking, 1977.

Attachment 3

DEVELOPMENT APPLICATION DOCUMENT
This document is one of the documents relevant to the application for a planning permit No.PLN-15-01162-01 and was received on the 24 September 2015.
Planning Authority: Hobart City Council



28-32 Elizabeth Street, Hobart

Statement of Archaeological Potential, Impact Assessment & Method Statement

Final Report prepared for Elizabeth Tasmania Pty Ltd

AT0190

6 August 2015

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EXECUTIVE SUMMARY

Introduction

This report presents the results of a desktop assessment of the historical archaeological potential of the property at 28-32 Elizabeth Street, Hobart. It has been prepared as part of the proposed redevelopment of the site by Elizabeth Tasmania Pty Ltd for a multi-storey hotel. The assessment and management of potential archaeological values is required by the *Hobart Interim Planning Scheme 2015* (*HIPS 2015*). This report has been prepared with regard to the application standards and definitions contained in the *HIPS 2015* and consists of three key components: a Statement of Archaeological Potential, an Archaeological Impact Assessment and an Archaeological Method Statement.

Site History

The property is located within Hobart's central business district and being in such a prime location, has been developed and redeveloped multiple times as part of the evolution of the city. Definitive evidence of European use and development began during the 1820s, and by the 1840s the property included substantial buildings used for commercial and mercantile purposes. Major redevelopments began during the early twentieth century, commencing with the construction of the Bank of New South Wales in 1912, followed in 1914 with the Palace Theatre, one of Hobart's early cinemas. At the time, both buildings were praised for their architectural merit. The buildings remained in place until the 1980s when they were demolished to make way for the current building, used by Westpac until 2014.

Archaeological Potential and Significance

Following an investigation of the site history, an analysis was made of the current site, and the sequential development and disturbance of the area was mapped. Preparatory ground works for the existing former bank building are highly likely to have removed or substantially affected all previous phases of development on the site. The likelihood of the place retaining substantial or meaningful archaeological evidence of earlier use and development is assessed as low.

Because of this low archaeological potential, the site is assessed as not having archaeological significance at either State or local levels. The site does have some historical interest and association with significant developments or individuals and for demonstrating the continued evolution of Hobart's central business district. However, these associations are considered to be of historical interest and not historical significance within formal assessment frameworks.

Archaeological Impact Assessment

Detailed information related to the proposed development is not currently available. However, sufficient information does exist to quantify the likely extent of ground works which will be required for the proposed hotel. Footings will generally be located approximately 2 m below the existing ground levels. Footings adjacent to existing buildings will need to be deeper, extending to depths of approximately 4 m. At this stage, it is anticipated that pad footings varying in size up to 3 x 3 m^2 and larger pads under stairs and lift cores will be required.

The extent of likely excavations required for this development will be substantial in both area and depth. They are likely to extend beyond the depths of excavation carried out for the c.1981 building. The footings within the interior of the building and its perimeter will require the area of new excavation to be significant. Excavations will also be required for lifts, stairs, pump room and a basement level on Elizabeth Street.

Despite the substantial nature of the proposed ground works, the likelihood of them impacting on archaeological features or deposits is assessed as being low. This conclusion is based on the low likelihood of significant archaeology having survived the construction of the c.1981 works. Some potential exists for the proposed hotel works to encounter archaeology associated with the 1912 and 1914 buildings along the Elizabeth Street frontage. However, such archaeology should it exist is likely to have already been highly compromised.

Archaeological Method Statement Recommendations

The disturbance history, assessment of archaeological potential, and the assessment of archaeological significance indicate that the place has been highly disturbed with a low potential of containing archaeological features or deposits, and as a result, does not have archaeological significance.

The following recommendations have been prepared in response to this assessment of low archaeological potential.

Recommendation 1: Statutory Compliance

This Statement of Archaeological Potential, Impact Assessment and Method Statement should form part of the Development Application to Hobart City Council for the proposed development.

Recommendation 2: Aboriginal Heritage

The Unanticipated Discovery Plan for managing Aboriginal heritage (Appendix 1) should form part of the project specifications.

Recommendation 3: Precautionary Approach to Excavations

For precautionary purposes, notification protocols should be included in the project specifications whereby archaeological advice is sought in the unlikely event that features or deposits of an archaeological nature[1] are uncovered during excavations as part of the proposed development or where doubt exists concerning the provenance of any strata revealed during excavations. In such instances, excavation should immediately cease pending attendance on site and receipt of advice from a qualified archaeologist, at which point, depending on the findings, it may also be necessary to involve Hobart City Council in discussions.

Recommendation 4: Managing Unanticipated Discoveries

Archaeological management will be required in the unlikely event that significant archaeological features or deposits are located during excavation works. Dependent on the nature and significance of the archaeological feature or deposit, consideration should be given as to whether the archaeological material can be conserved *in situ* as part of the development. Where this is not prudent and feasible, significant features or deposits should be archaeologically excavated, recorded and analysed in accordance with Parts 4 to 8 of the Tasmanian Heritage Council's Practice Note 2: *Managing Historical Archaeological Significance in the Works Application Process*. Archaeological management approaches should be endorsed by Hobart City Council.

Recommendation 5: Interpretation Opportunities

Consideration should be given to creative interpretation responses to present the history of the place as part of the proposed development.

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[1] This may include but not be limited to the exposure of hand made clay bricks or sandstone blocks forming walls or surfaces, or artefacts such as fragments of ceramic, bottle glass, bone, shell or other items.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Client and project details

The Elizabeth Tasmania Pty Ltd proposes to construct a multi-storey hotel development at 28-32 Elizabeth Street, Hobart (Figure 1). The site currently contains the former Westpac Bank building, constructed during the 1980s.

Archaeological assessment and management of the site is required under the *Hobart Interim Planning Scheme 2015* (*HIPS 2015*). The *HIPS 2015* requires a desktop assessment analysis of the archaeological potential of a place prior to carrying out excavations.

This report consists of three key components:

1. A Statement of Archaeological Potential: which is an illustrated desktop investigation of the site's history, past disturbances and assesses its archaeological potential and significance;
2. An Archaeological Impact Assessment which describes the potential for impact to the archaeological sensitivity of the place from the proposed works; and
3. An Archaeological Method Statement which sets out, in practical terms the processes for archaeological management.

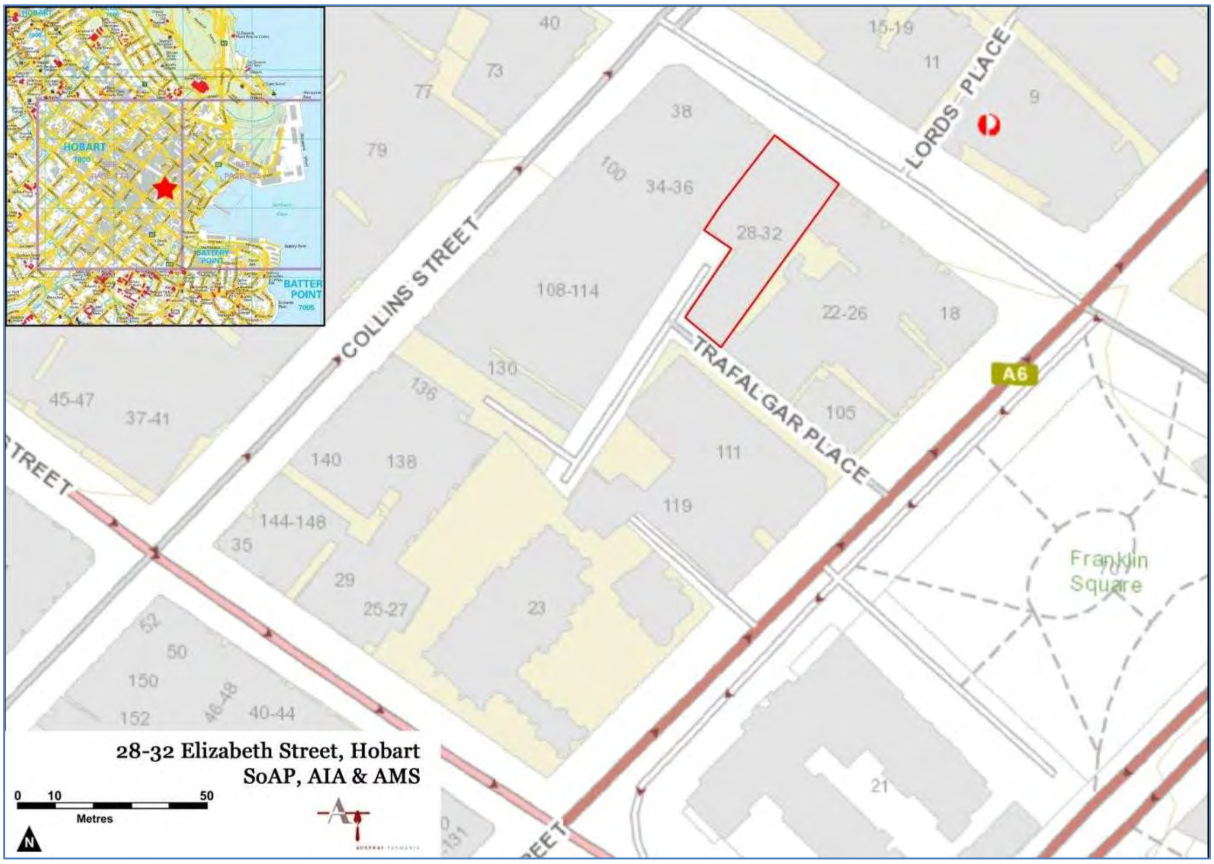

Figure 1: 28-32 Elizabeth Street, Hobart. Property boundaries shown in red (LIST Map, © State of Tasmania).

1.2 Authorship

This report was written by Justin McCarthy and James Puustinen.

1.3 Limitations and constraints

This assessment is limited to consideration of historical archaeological values within a scope defined by the *Hobart Interim Planning Scheme 2015*. The assessment of Aboriginal cultural values, built heritage and social values is beyond the scope of this study.

An Aboriginal heritage assessment has not been undertaken as part of this work, although preliminary enquiries were made to Aboriginal Heritage Tasmania (AHT), DPIPWE and the results incorporated into the recommendations made in this report.[2]

Detailed original research has been carried out for this project utilising both public and private collections. All sources cited in this report are included in the reference list.

The results and judgements contained in this report are constrained by the limitations inherent in overview type assessments, namely accessibility of historical information within a timely manner. Whilst every effort has been made to gain insight to the historic heritage profile of the subject study area, Austral Tasmania Pty Ltd cannot be held accountable for errors or omissions arising from such constraining factors.

All maps are oriented with North at the top of the page unless otherwise assigned.

1.4 Acknowledgements

The assistance of the following people and organisations is gratefully acknowledged:

- Ms Kris Ho, Elizabeth Tasmania Pty Ltd;
- Mr Neal Macintosh, JAWS Architects;
- Mr Richard Lawrence, Gandy and Roberts;
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- Mr Samuel Dix, Aboriginal Heritage Tasmania, DPIPWE;
- Mr Graeme Harrington, Information and Land Services, DPIPWE;
- Ms Jo Huxley, Tasmanian Museum and Art Gallery;
- Ms Heather Excell, Library, University of Tasmania;
- Staff of the Tasmanian Archives and Heritage Office.

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[2] Email, Samuel Dix (Aboriginal Heritage Tasmania) to James Puustinen (Austral Tasmania), 19 May 2015: AHTP2293 - Archaeological Potential, Impact & Method Statement - 28-32 Elizabeth Street, Hobart

2.0 REQUIREMENTS FOR HISTORICAL ARCHAEOLOGICAL MANAGEMENT

2.1 Desktop review of registered and listed heritage places

Both Commonwealth and State Acts of Parliament may have a bearing on the management of cultural heritage within or adjacent to the site. Key legislation is summarised below. The summary is intended as a guide only and should be confirmed with the administering agency and, where necessary, specialist legal opinion.

2.2 National Heritage Management Provisions

2.2.1 World/National/Commonwealth Heritage Lists

There is an established framework for the identification, protection and care of places of significance to the nation and/or Commonwealth. Entry in the National and/or Commonwealth Heritage Lists triggers statutory processes under the terms and provisions of the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Actions which will or may have a significant impact upon the recognised values of a listed place are required to be referred to the Australian Government Minister for the Environment, after which a judgement will be made as to whether the proposed action will require formal assessment and approval. The Act also provides for consideration of actions that may occur outside of a listed place that may have significant impact upon national heritage values, or actions taken on Commonwealth land or by Commonwealth agencies that are likely to have a significant impact on the environment (anywhere). Listing occurs by nomination, which may be made by any one at any time. The Act also provides for emergency listing where National Heritage values are considered to be under threat.

As at June 2015, the property is not included or nominated to the World, National or Commonwealth Heritage Lists.

2.3 State Heritage Management

2.3.1 The *Historic Cultural Heritage Act 1995* and the Tasmanian Heritage Register

The *Historic Cultural Heritage Act 1995* (*HCHA 1995*) is the key piece of Tasmanian legislation for the identification, assessment and management of historic cultural heritage places.

The *HCHA 1995* establishes the Tasmanian Heritage Register (THR) as an inventory of places of State significance; to recognise the importance of these places to Tasmania; and to establish mechanisms for their protection. 'State historic cultural heritage significance' is not defined, however the amended Act allows for the production of Guidelines, which presumably will use the existing assessment guidelines for the purposes of defining State level significance.[3]

A place of historic cultural heritage significance may be entered in the THR where it meets one of eight criteria. The criteria recognise historical significance, rarity, research potential, important examples of certain types of places, creative and technical achievement, social significance, associations with important groups or people, and aesthetic importance.

Works to places included in the THR require approval, either through a Certificate of Exemption for works which will have no or negligible impact, or through a discretionary permit for those works which may impact on the significance of the place.

Discretionary permit applications are lodged with the relevant local planning authority. On receipt, the application is sent to the Heritage Council, which will firstly decide whether they have an interest in determining the application. If the Heritage Council has no interest in the matter, the local planning authority will determine the application.

If the Heritage Council has an interest in determining the application, a number of matters may be relevant to its decision. This includes the likely impact of the works on the significance of the place;

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[3] *Assessing historic heritage significance for Application with the Historic Cultural Heritage Act 1995*

any representations; and any regulations and works guidelines issued under the *HCHA 1995*. The Heritage Council may also consult with the planning authority when making a decision.

In making a decision, the Heritage Council will exercise one of three options: consent to the discretionary permit being granted; consent to the discretionary permit being granted subject to certain conditions; or advise the planning authority that the discretionary permit should be refused.

The Heritage Council's decision is then forwarded to the planning authority, which will incorporate the decision into any planning permit.

As at June 2015, the property is not included or nominated to the THR.[4]

2.3.2 *Aboriginal Relics Act 1975*

The *Aboriginal Relics Act 1975* (*ARA 1975*) is the key Tasmanian Act providing for the preservation of Aboriginal 'relics'. The Act defines 'relic' to include:

(a) any artefact, painting, carving, engraving, arrangement of stones, midden, or other object made or created by any of the original inhabitants of Australia or the descendants of any such inhabitants;

(b) any object, site, or place that bears signs of the activities of any such original inhabitants or their descendants; or

(c) the remains of the body of such an original inhabitant or of a descendant of such an inhabitant who died before the year 1876 that are not interred in –

  (i) any land that is or has been held, set aside, reserved, or used for the purposes of a burial-ground or cemetery pursuant to any Act, deed, or other instrument; or

  (ii) a marked grave in any other land.[5]

All relics are protected under the provisions of the *ARA 1975*, including those found during works. Permits are required for a range of activities, including:

(a) destroy, damage, deface, conceal, or otherwise interfere with a relic;

(b) make a copy or replica of a carving or engraving that is a relic by rubbing, tracing, casting, or other means that involve direct contact with the carving or engraving;

(c) remove a relic from the place where it is found or abandoned;

(d) sell or offer or expose for sale, exchange, or otherwise dispose of a relic or any other object that so nearly resembles a relic as to be likely to deceive or be capable of being mistaken for a relic;

(e) take a relic, or cause or permit a relic to be taken, out of this State; or

(f) cause an excavation to be made or any other work to be carried out on Crown land for the purpose of searching for a relic.[6]

Preliminary consultation has taken place with Aboriginal Heritage Tasmania (AHT), DPIPWE, to determine if the property contains any previously recorded Aboriginal heritage sites, or if there is any potential for heritage sites to exist at the place. AHT has advised that there are no Aboriginal heritage sites recorded within the place. Due to the site being highly disturbed it is believed that the area has a low probability of Aboriginal heritage being present. On this basis, there were no requirements for an Aboriginal heritage investigation.[7]

AHT also advised that the provisions of the *Aboriginal Heritage Act 1975* will apply should Aboriginal heritage be discovered or suspected during works. An Unanticipated Discovery Plan should be implemented should Aboriginal Heritage be discovered or suspected during ground disturbance works.[8] This Unanticipated Discovery Plan is included at Appendix 1.

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[4] Email, Kym Plischke (Heritage Tasmania) to James Puustinen (Austral Tasmania), 3 June 2015

[5] *Aboriginal Relics Act* 1975, s2(3)

[6] *Ibid*, s14

[7] Email, Samuel Dix (Aboriginal Heritage Tasmania) to James Puustinen (Austral Tasmania), 19 May 2015: AHTP2293 - Archaeological Potential, Impact & Method Statement - 28-32 Elizabeth Street, Hobart

[8] *Ibid*

2.4 Local Management Provisions

2.4.1 *Hobart Interim Planning Scheme 2015*

The property is located within the planning area of the *Hobart Interim Planning Scheme 2015* (*HIPS 2015*). The place is not included in Table E13.1 'Heritage Places', but is located within the Heritage Precinct 'H1 - City Centre'.

The specific archaeological provisions of the *HIPS 2015* are applicable to this project. The property is located within the Place of Archaeological Potential defined by Figure E13.4.1. The objective for the management of archaeological values as part of Building, Works and Demolition is to:

> To ensure that building, works and demolition at a place of archaeological potential is planned and implemented in a manner that seeks to understand, retain, protect, preserve and otherwise appropriately manage significant archaeological evidence.[9]

The relevant performance criteria are:

Acceptable Solutions	Performance Criteria
A1 Building and works do not involve excavation or ground disturbance.	**P1** Buildings, works and demolition must not unnecessarily impact on archaeological resources at places of archaeological potential, having regard to: (a) the nature of the archaeological evidence, either known or predicted; (b) measures proposed to investigate the archaeological evidence to confirm predictive statements of potential; (c) strategies to avoid, minimise and/or control impacts arising from building, works and demolition; (d) where it is demonstrated there is no prudent and feasible alternative to impacts arising from building, works and demolition, measures proposed to realise both the research potential in the archaeological evidence and a meaningful public benefit from any archaeological investigation; (e) measures proposed to preserve significant archaeological evidence 'in situ'.

Table 1: *HIPS 2015*: Development Standards for Places of Archaeological Potential - E13.10.1 Building, Works and Demolition

These Performance Criteria have been considered in the Archaeological Impact Assessment.

The *HIPS 2015* establishes a series of Application Requirement for Buildings and Works within the Place of Archaeological Potential. Three specific archaeological standards are set, which are:

statement of archaeological potential	Means a report prepared by a suitably qualified person that includes all of the following: (a.) a written and illustrated site history; (b.) overlay plans depicting the main historical phases of site development and land use on a modern base layer; (c.) a disturbance history; (d.) a written statement of archaeological significance and potential accompanied by an archaeological sensitivity overlay plan depicting the likely surviving extent of important archaeological evidence (taking into consideration key significant phases of site development and land use, and the impacts of disturbance).
archaeological impact	Means a report prepared by a suitably qualified person that includes a design review and describes the impact of proposed works upon archaeological sensitivity (as defined in a

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[9] *HIPS 2015*, cl.13.10.1

assessment	statement of archaeological potential).
archaeological method statement	means a report prepared by a suitably qualified person that includes the following where relevant to the matter under consideration: (a.) strategies to identify, protect and/or mitigate impacts to known and/or potential archaeological values (typically as described in a Statement of Archaeological Potential); (b.) collections management specifications including proposed storage and curatorial arrangements; (c.) identification of measures aimed at achieving a public benefit; (d.) details of methods and procedures to be followed in implementing and achieving (a), (b) and (c) above; (e.) expertise to be employed in achieving (d) above; (f.) reporting standards including format/s and content, instructions for dissemination and archiving protocols.

This report has been prepared with regard to the application standards and definitions contained in the *HIPS 2015*.

2.5 Other Heritage Lists

2.5.1 Register of the National Estate

The Register of the National Estate (RNE) was established in 1976 as a list of natural, Indigenous and historic heritage places throughout Australia, with limited statutory mechanisms relating to actions taken by the Commonwealth. As of February 2007, the RNE ceased to be an active register, with places no longer able to added or removed and the expectation that the States and Territories would consider places included on the RNE for management under relevant State legislation. The RNE ceased to exist as a statutory register on 19 February 2012 and references to the RNE were removed from the *EPBC Act*. The RNE continues to exist as a non-statutory information source. Coincidence with other heritage lists and registers (including the THR and planning scheme heritage schedules) is not uncommon.

The property is not included on the RNE.

3.0 ILLUSTRATED SITE HISTORY

3.1 Introduction

The Planning Scheme requires a Statement of Archaeological Potential to include an illustrated site and disturbance history. This consists of a series of overlay plans that depict key periods or phases (as dictated by the availability of archival evidence), together with explanatory text and illustrations.

This historical overview begins with a brief introduction to the Aboriginal people of the Hobart area, followed by information related to the early European settlement and development of Hobart and the study area. Historical information has been sourced from key primary and secondary sources to inform archaeological judgments. The site history has been arranged chronologically addressing the following key phases of use and development:

- The Aboriginal People of the Hobart Area and Contact History;
- 1804-c.1830: the European Settlement of Hobart and the Study Area;
- 1830s-1912: Consolidation of Development in the Study Area;
- 1912-1981: Twentieth Century Redevelopment; and
- 1981-present: Demolition and Construction of the Current Building.

3.2 The Aboriginal People of the Hobart Area & Contact History

Before European settlement, Ryan has described Tasmanian Aboriginal society as consisting of nine tribes, each containing multiple social units or bands. Tribal boundaries could vary between well-defined borders based on geographical features, to broader transitional zones existing between two friendly tribes.[10]

The western shore of the Derwent formed part of the lands of the South East Tribe. Their territory covered an area of approximately 3,100km^2 to encompass the western shore of the Derwent north to New Norfolk, the D'Entrecasteaux Channel and Bruny Island, and south to South Cape, extending west to the Huon Valley. Ryan writes that prior to European contact, the area probably contained seven bands, each with about 70 to 80 people. The Hobart area was home to the Mouheneener band. They knew the area as Nibberloone or Linghe.

The coastal fringe provided rich food resources - both plants and animals. The coast provided a wide range of shellfish: large and small whelks, werreners, mussels, periwinkles, limpets, chitons, oysters, crayfish and crabs. Shellfish were gathered along the shoreline, but also from deeper water, with Aboriginal women noted for their diving skills.

In the hinterland, birds, possums, kangaroos and wallabies could be found, as too were edible plant and fungus species. Land management through regular burning encouraged 'green pick' (new growth and grasslands) that in turn, supported native game in numbers.

Unlike other groups, the South East Tribe did not move inland during Spring and Summer. Their lands provided sufficient food throughout the year, travelling up and down the coast with the seasons, and to outlying islands using bark catamarans. Seasonal changes would also bring new food such as seals, mutton birds and swan eggs.[11]

The Nuenonne band from Bruny Island was visiting the area when David Collins arrived in 1804. Woorady, of the Nuenonne later recalled how the people reacted and interpreted the events of early settlement, describing how:

> ...when the first people settled they cut down trees, built houses, dug the ground and planted; that by and by more ships came, then plenty of ships; that the natives went to the mountains [*Mount*

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[10] Ryan, L, *The Aboriginal Tasmanians*, Allen & Unwin: St Leonards, 1996, p.12

[11] *Ibid*, pp.39-43; Officer, I, *Survey of Derwent River Aboriginal Midden and Quarry Sites*, unpublished dissertation to the Environmental Department of the Division of Teacher Education, October 1980, no page numbers; Maynard, L, *A Report on the Social, Cultural & Historical Connection of Aboriginal People to Hobart and it's Surrounds*, unpublished report for Housing Tasmania, TALSC, TAC, AHT, July 2010, pp.3-5

> *Wellington*], went and looked at what the white people did, went and told other natives and they came and looked also.[12]

Brief details of contact between the Aboriginal people and the British can be found in the diary of the Reverend Robert Knopwood. An entry in March 1804 records his observations on encountering 'a great many native hutts [*sic*] and the fires they made' on the western shore of the Derwent, north of Hobart. Two days later he noted many Aboriginal people were around the camp at Sullivans Cove, but could not be persuaded to enter. On numerous occasions, Knopwood wrote of the fires lit by the Aboriginal people for both land management and hunting.[13]

Initial contact between the Mouheneener and Europeans was positive. Although not visiting the settlement, the Aboriginal people were friendly with small groups of Europeans they met at more isolated areas. Such relations were not to last, as by 1806, violence had already began to emerge. Conflict over food resources was one of the triggers in the deteriorating relationship. By necessity, the European settlers sought to augment their meagre stores with fresh caught game, mainly kangaroos, thereby placing them in direct competition with the Aboriginal people. So insatiable was the European demand for kangaroos, that by late 1808 this food resource had largely been exhausted from the immediate surrounds of Hobart, with hunting parties having to venture further afield.[14]

This period saw a fundamental shift in colonial society with the relocation of Norfolk Islanders to Van Diemen's Land, beginning in 1805 and intensifying from 1807. Gradually, farms spread out along the shores of the Derwent as a burgeoning agricultural economy began to take shape. Over the coming years, more land was granted and brought into production, and the population grew, albeit slowly at first.

The period 1804 to 1824 has been described as one of 'uneasy coexistence' between Aboriginal people and Europeans. Certainly, there were outbreaks of hostilities, but by comparison with what occurred post-1824, the first two decades since the coming of the Europeans were relatively calm.[15] Notwithstanding the increase in conflict, groups of Aboriginal people continued to occasionally visit Hobart into the early 1820s. One such group was known by the Europeans as the 'Hobart-Town tribe', visiting the growing town for food and other items.[16]

Robinson wrote of groups of Aboriginal people visiting Hobart Town in November 1824 and October 1825. Of the latter, he described:

> At ½ 3 pm 64 black natives came into town. They were naked. Under the protection of the government. Went to see them. At 8 pm they were placed in the market house. They were formed into 3 circles with a fire in the middle of each. On one side of each circle elevated about 3 feet above the rest sat a person whom I supposed were their chief. One out of the 3 of these chiefs could speak broken English. They were all committed to the care of Mr Mansfield the Wesleyan missioner [*sic*]. One of them had a white feather stuck in his ear.[17]

Such relative peace was not to last. During the 1820s, the European population grew rapidly, accompanied by an explosion in the issuing of land grants over the most valuable grass plains. These actions created disputes over access to native game, hunting grounds and the connection of Aboriginal people with their traditional tribal lands. What followed was unprecedented violence.[18]

Attempts at using force to remove Aboriginal people from the areas settled by Europeans invariably failed. More success was had by George Augustus Robinson who led a series of expeditions aimed at enticing the remaining Aboriginal people to leave their country. In January 1832, Robinson arrived in Hobart Town in the company of 26 surviving members of the Big River Tribe. Apparently, the

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[12] *Ibid*, p.77

[13] Nicholls, Mary (ed.), *The Diary of the Reverend Robert Knopwood 1803-1808. First Chaplain of Tasmania*, Tasmanian Historical Research Association: Hobart, 1977, p.46; Brown, S, *Aboriginal Archaeological Resources in South East Tasmania. An Overview of the Nature and Management of Aboriginal Sites*, National Parks & Wildlife Service Tasmania, Occasional Paper No. 12, April 1986, pp. 171-172

[14] Ryan, *op. cit.*, pp.76-78

[15] Boyce, J, *Van Diemen's Land*, Black Inc.: Melbourne, 2008, pp. 67-68, 105-106; McFarlane, I, 'Frontier Conflict', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

[16] *The Hobart Town Courier*, Saturday 5 January 1828, p.2; TAHO, CSO1/1/323/7578, Evidence of Robert Jones to Thomas Anstey, 15 March 1830; *Hobart Town Gazette and Van Diemen's Land Advertiser*, Friday 5 November 1824, p.1

[17] Plomley, NJB, (ed.), *Friendly Mission. The Tasmanian Journals and Papers of George Augustus Robinson 1829-1834*, Tasmanian Historical Research Association: Kingsgrove, NSW, 1966, p.100, f.n. 3

[18] Boyce, *op. cit.*, pp.140-146

Aboriginal people were accommodated in the basement of Robinson's house until sent to establishments in the Furneaux Islands ten days later.[19]

In 1847, the 47 remaining Aboriginal people at the mission on Flinders Island were transported to the former convict station at Oyster Cove, south of Hobart. Back on the Tasmanian mainland, the people would often leave Oyster Cove for weeks at a time to hunt, camp and collect traditional foods, with occasional trips to Hobart.[20]

3.3 1804-c.1830: The European Settlement of Hobart and the Study Area

The first decade of European settlement in Hobart was marked by the close relationship between development and the waterfront. After the failure of the settlement at Risdon Cove and the relocation to Sullivans Cove on the western shore in February 1804, the early occupants of Hobart Town spent their first decade in a struggle for survival, building upon the camp clustered on the western boundary of the cove.[21]

On his first visit to Hobart in 1811, Governor Macquarie found that the settlement was being developed in a haphazard way without any proper plan. In response, he ordered a near regular grid to be prepared by Surveyor Meehan. Leading up from Sullivans Cove, Meehan's plan had some street alignments skewed to avoid wide scale demolition of buildings which were located within intended streets.[22] The study area is located on a block which was crossed by one of these early streets, roughly following an alignment to the east of what later became Collins Street (Figure 2). Meehan did not depict any built development along these early roads, but his survey notes do describe houses located along their alignments.[23] Given its central location, it is likely that some form of early land use and development occurred within the study area, but this is not documented in historical records.

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[19] Ryan, *op. cit.*, pp.157-158; Bonwick, J, *The Last of the Tasmanians; or, the Black War of Van Diemen's Land*, Sampson Low, Son & Marston: London, 1870, pp.228-229; *The Tasmanian Mail*, 22 August 1896, p.17

[20] Gough, J, 'Oyster Cove', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005, pp.261-262; *The Mercury*, Friday 20 December 1861, p.2; *The Mercury*, Friday 25 May 1866, p.4; *The Mercury*, Friday 18 February 1870, p.2

[21] Walker, JB, 'The English at the Derwent and the Risdon Settlement', *Early Tasmania: Papers Read before the Royal Society of Tasmania during the Years 1888 to 1899*, John Vail Government Printer, Hobart, p.59

[22] Solomon, R.J. *Urbanisation: the Evolution of an Australian Capital*, Angus and Robertson Publishers, Sydney, 1976, p.29

[23] TAHO, LSD355/1/7, Surveyor Meehan's Survey Notes, 1811, 1813

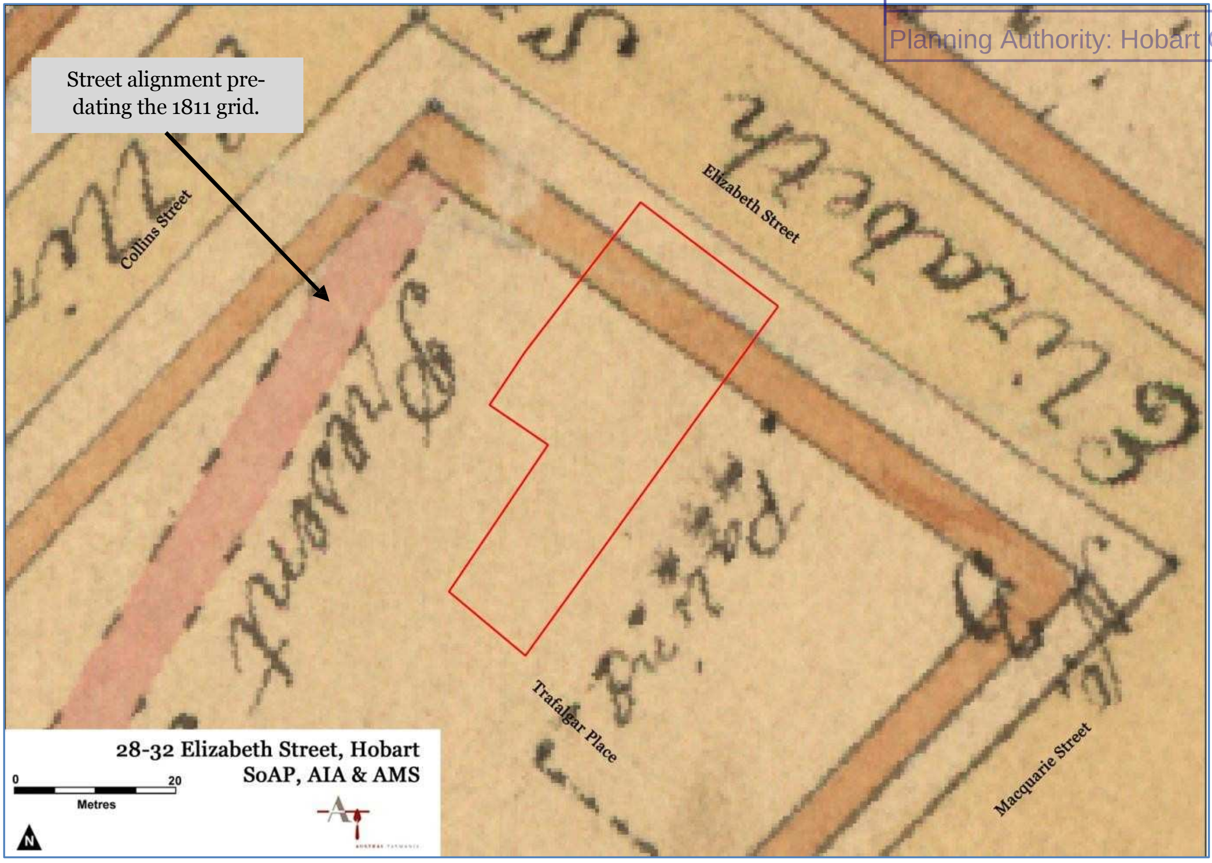

Figure 2: Detail from Meehan's 1811 plan with indicative study area overlay. Meehan's survey established Hobart's central street grid, including the alignment of Elizabeth Street (CPO, Hobart Plan 131. Reproduced with the permission of the Department of Primary Industries, Parks, Water and Environment, Land Tasmania © State of Tasmania).

Built development during the first few years of settlement was generally basic. When he arrived in Hobart in February 1817, new settler William Thornley observed that the town had:

> ...a straggling, irregular appearance; a pretty good house here and there, and the intervening spaces either unbuilt on or occupied by mean little dwellings, little better than rude huts.[24]

Another new settler, George Thomas Lloyd, similarly recorded that most of the buildings could only be '...classed as huts, being constructed of various materials, such as split palings, wicker-work bedaubed with clay, and log and turf cabins of all orders of low architecture.'[25]

With the opening up of the Hobart port to private vessels, the 1820s witnessed a boom in the population and development. Hobart emerged as a major port for the developing wool and whale oil trades. During the decade, the population grew from about 2,000 to 6,000 inhabitants, whilst the number of houses in Hobart increasing from 421 in 1821 to over 600 three years later. Elizabeth Street developed as the main commercial area of the town.[26] By the close of the decade Hobart's houses were described as being much improved, constructed:

> ...of wood with a small garden before them...Almost all new buildings are either of brick or stone; the former appear of good quality...many houses are built of a rough-hewn stone, and then cemented with stucco; when this is well done it makes a very handsome and durable building.[27]

3.3.1 Early Land Use and Development within the Study Area

Although it is likely that some form of use or development within the study area occurred in the early years following colonisation, documentary evidence of this use does not begin until the late 1810s, early 1820s. Land alienation and the establishment of property boundaries is the first suggestion of

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[24] Thornley, W, *The Adventures of an Emigrant in Van Diemen's Land*, Rigby Ltd: Australia, 1842, republished 1973, p. 6
[25] Lloyd, GT, *Thirty-three years in Tasmania and Victoria*, Houlston and Wright: London, 1862, p. 8
[26] Alexander, A, Petrow, S, 'Hobart', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005; Solomon, *op. cit.*, pp.29-31, 42, 45
[27] Widowson, H, *Present State of Van Diemen's Land*, S Robinson, W Joy, J Cross, J Birdsall: London, 1829, p. 22

development. The study area crosses two early properties first held by John Clarke and William Jemott (Figure 3).

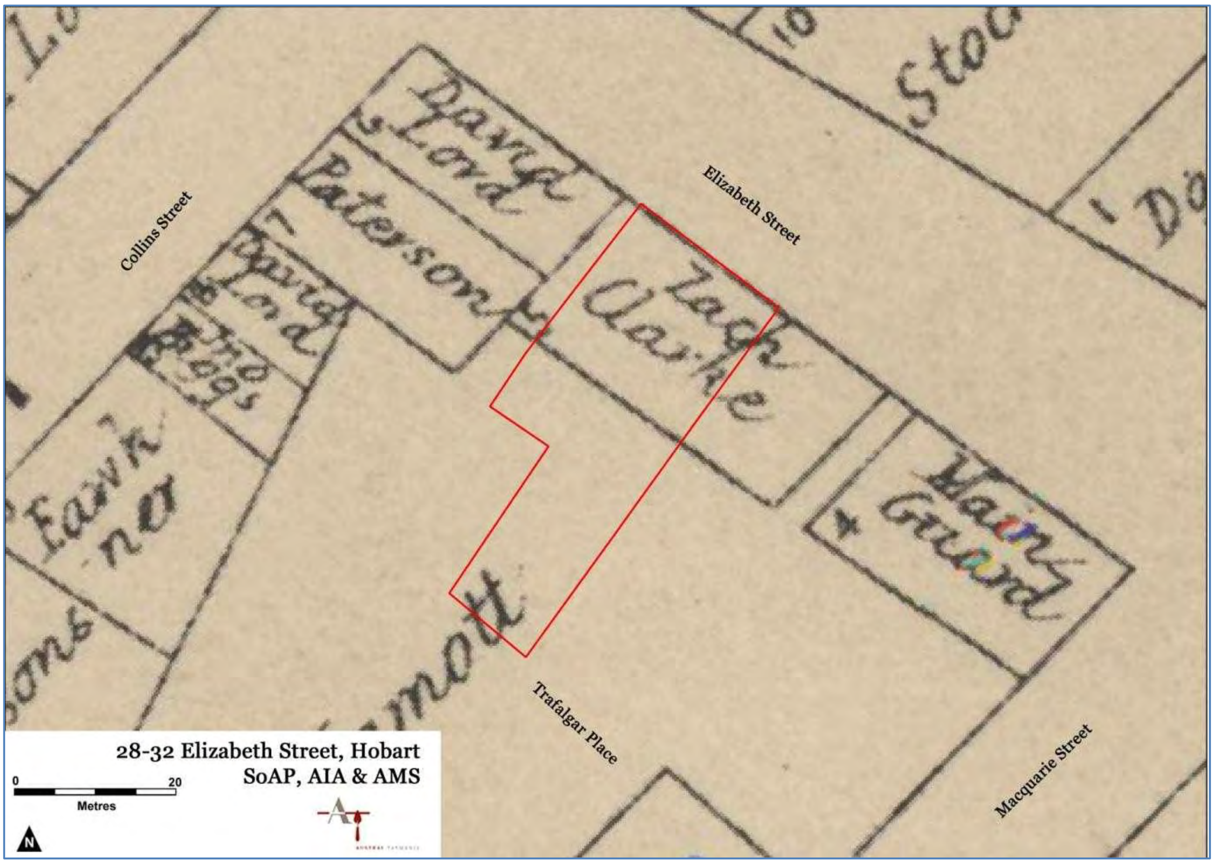

Figure 3: Detail from c.1826-28 plan of Hobart showing early parcel boundaries and lease or grant holders. Note that the notation of 'Zach Clarke' is incorrect and the Elizabeth Street property was held by John Clarke (CPO, Hobart Plan 104. Reproduced with the permission of the Department of Primary Industries, Parks, Water and Environment, Land Tasmania © State of Tasmania).

John Clarke's property fronted Elizabeth Street and was rectangular in shape containing approximately 846m² (i.e., approximately 0.20 acres). The date at which Clarke acquired the land is not currently known, but an 1820s register noted that he held a 14 year lease over the property. Very little is known of how Clarke used his property although the 1831 Almanack records a baker called John Clarke operating from Elizabeth Street.[28]

To the rear of Clarke's property was a large lot of some 5,734 m² (i.e., approximately 1.41 acres) held by William Jemott.[29] This parcel was irregularly shaped and largely internal to the block formed by Macquarie, Elizabeth, Collins and Murray streets. Street frontage was provided on Macquarie Street and via a scringleway (narrow passage) connecting the site with Elizabeth Street. Again, the date at which Jemott acquired the property has not been established, although like his neighbour Clarke, Jemott also held a lease over the land, in this instance for 21 years. Given its internal location and irregular shape, it is likely that Jemott acquired the land after the lots directly fronting the streets had already been leased or granted.[30]

Jemott was an emancipated convict who had originally been sentenced to death by the Admiralty for stealing the cargo from a vessel he was responsible for and selling the proceeds in America. His death sentence was commuted to transportation for life, arriving in Hobart Town in 1812. He received a conditional pardon in 1816 and gained some wealth and success in the colony, acquiring land at

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[28] TAHO, LSD417/1/19, Register of Lots in Hobart 1804-24, John Clarke. Note that various historic documents use both 'Clark' and 'Clarke'; Ross, J, *Van Diemen's Land Anniversary and Hobart Town Almanack for the Year 1831*, James Ross: Hobart-Town, Van Diemen's Land, 1829, p.64

[29] Note: a range of spellings of Jemott are found in historical documents.

[30] TAHO, LSD417/1/29, Register of Lots in Hobart 1804-24, John Clarke.

Kangaroo Point (Bellerive) and Richmond, supplying meat to the commissariat and later public appointments as a pound keeper and town surveyor in Campbell Town.[31]

The first definitive evidence of built development within the study area comes from a late 1820s, early 1830s map of Hobart, by which time both lots had passed from their original lease holders (Figure 4). Development in the towns at this time was governed by newly-formed regulations. These regulations applied to land divided into three classes: up to three acres (1st Class), ½ acre to one acre (2nd Class) and ¼ acre to ½ acre (3rd Class).[32]

The buildings within the study area demonstrate adherence to some – but not all - of these regulations. Clarke's former allotment was of the 3rd class, meaning the landowner had to agree to construct a footpath on the side of their lot and commence construction of a brick or stone building within twelve months of acquisition. This building was to be no less than 12 feet (i.e., approximately 3.7 metres) from the street.[33] Figure 4 shows a building as being set back from the Elizabeth Street frontage, but constructed from timber, which was contrary to the regulations. The lot is also shaded, indicating that the building was in the process of being constructed at the time the plan was being prepared. By this time the property had passed to Ann McCarthy. How McCarthy acquired the land has not been established. She did apply for the title to the property to be issued to her in 1837. However, unfortunately the application which may have established early ownership, transactions and development has not been retained in archival collections. It is known though that a counter-claim was made by William Orr acting as an executor for Clarke, and who also owned the neighbouring property. The matter was resolved in McCarthy's favour, who received the title in 1838.[34]

To the rear, Jemott's allotment had passed to Captain John Briggs, who traded between Hobart Town and Sydney and more distant ports in England, India and Mauritius. A large timber building was erected on Brigg's lot, with its north-western end partially entering the study area. Briggs applied for the title to his property in 1837, but unfortunately again no application has been located. As a 1st class property, the owner was required to construct a building with a frontage not less than 65 feet long (i.e., approximately 19.81 m).[35]

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[31] Smith, B, *Australia's Birthstain: the Startling Legacy of the Convict Era*, Allen and Unwin, Crows Nest, NSW, 2008, p.219; *Hobart Town Gazette and Van Diemen's Land Advertiser*, Saturday 12 May 1821, p.1; *Hobart Town Gazette and Van Diemen's Land Advertiser*, Saturday 13 April 1822, p.1S; *Colonial Times*, Tuesday 7 October 1834, p.8; *The Hobart Town Courier*, Friday 1 May 1835, p.1; *The Hobart Town Courier and Van Diemen's Land Gazette*, Friday 29 May 1840, p.2

[32] Ross, *op. cit.*, 1829, pp. 118-123

[33] *Ibid*, p.119

[34] TAHO, SC309/1/343, Applications for Grants: Ann McCarthy. Note that Orr's counter-claim has also been removed from the archival file TAHO SC286/1/13, Application for the issue of Titles to Disputed Land

[35] TAHO, SC309/1/125, Applications for Grants: John Briggs. *The Hobart Town Gazette and Southern Reporter*, Saturday 10 July 1819, p.1; *The Hobart Town Gazette and Southern Reporter*, Saturday 19 June 1819, p.1S; *Hobart Town Gazette and Van Diemen's Land Advertiser*, Saturday 23 November 1822, p.1S; *Hobart Town Gazette*, Saturday 25 June 1825, p.4; *Hobart Town Gazette*, Saturday 22 October 1825, p.2; Ross, *op. cit.*, 1829, p.118

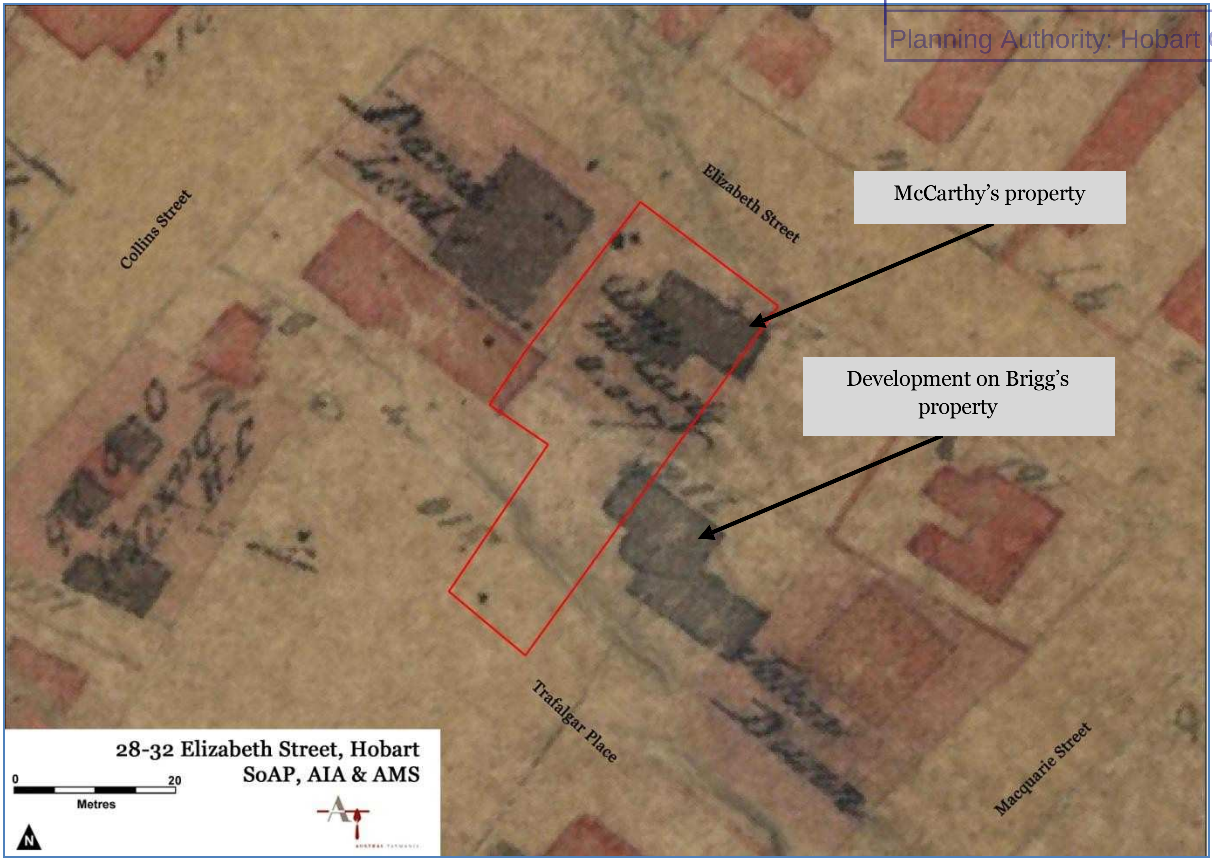

Figure 4: Detail from c.1828-30 plan of Hobart showing first definitive phase of built development within the study area. McCarthy's property is shaded, indicating that the building was under construction at the time the plan was being prepared. This plan also suggests the study area partially includes a property which fronted Collins Street, although this is most likely an error in the overlay and not confirmed through later, more accurate plans (CPO, Hobart Plan 5. Reproduced with the permission of the Department of Primary Industries, Parks, Water and Environment, Land Tasmania © State of Tasmania).

3.4 1830s-1912: Consolidation of Development within the Study Area

Being in such a prime location, the study area has been developed and redeveloped multiple times as part of the evolution of Hobart's central business district. McCarthy continued to own the property until the early 1840s at which time she subdivided the land into two lots, each containing 8.5 perches (i.e., approximately 214.98 m^2). In 1841 she sold the north-western lot for £385 to David Lord who owned the neighbouring property on the corner of Elizabeth and Collins streets, whilst the following year the south-eastern lot was purchased by William Orr, also for £385. By this time, Orr had acquired Brigg's land, and the purchase provided him with greater frontage on Elizabeth Street.[36]

It is likely that redevelopment of the Elizabeth Street frontage followed this subdivision with the old timber building being replaced with more substantial masonry commercial premises. The first tenant of the north-western lot may have been John Charles Stracey. Formerly of the 11th Dragoons, Captain Stracey was an auctioneer with premises on Collins Street. In addition to the sale of land, cattle and household goods, he also published and printed a short-lived newspaper called the *Trumpeter General*. He advertised the March opening of his 'new sale rooms and offices' at 6 Elizabeth Street in 1845, and it would seem probable that the building shown on plans and later photographs dates to this period. During the late 1840s the premises were taken by Robert Worley who was also an auctioneer, land agent and merchant's broker.[37]

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[36] Deed, 2/5150, Memorial of Indenture, Ann McCarthy, David Lord and George Frederick Read, 31 January and 1 February 1841; Deed, 2/5075(2), Memorial of Indenture, Ann McCarthy, William Morgan Orr, 31 January and 1 February 1842

[37] Chapman, P, 'Bethune, Walter Angus (1794–1885)', *Australian Dictionary of Biography*, National Centre of Biography, Australian National University, http://adb.anu.edu.au/biography/bethune-walter-angus-1775/text1991, published first in hardcopy 1966; *Colonial Times*, Tuesday 11 June 1833, p.1; *The Hobart Town Courier*, Friday 3 January 1834, p.1; *Trumpeter General*, Friday 28 March 1834, p.4; *Colonial Times*, Saturday 15 February 1845, p.2; *Colonial Times*, Friday 12 January 1849, p.3

Redevelopment of the south-eastern end of the Elizabeth Street frontage is also likely to have occurred during this period. Orr only held the land for a number of months. In September 1842 he sold the property to William Hamilton. As part of this sale, Hamilton also acquired land to the rear, facing Trafalgar Place. The expanded lot covered 25 perches (i.e., approximately 632.32 m²) and was purchased for £700.[38]

Hamilton was a cabinet maker, upholsterer and undertaker. Previously operating from Argyle Street, he established his new business on Elizabeth Street, and was trading from the site by c.1846. In addition to importing furniture and household goods, he also made furniture on the premises, with workshops located in the rear yard.[39]

Sprent's highly accurate survey plan shows this 1840s redevelopment. It indicates the subdivision of McCarthy's original lot with the two new masonry buildings constructed hard against the street edge (Figure 5). A number of buildings are shown to the rear, some of which are likely to relate to redevelopment of the site by William Hamilton. Some of these Trafalgar Place boundaries survive to the present, defining the southern end of the study area, although the south-eastern boundary has slightly expanded beyond its original alignments, partially encroaching onto the neighbouring allotments and the footprints of other buildings.

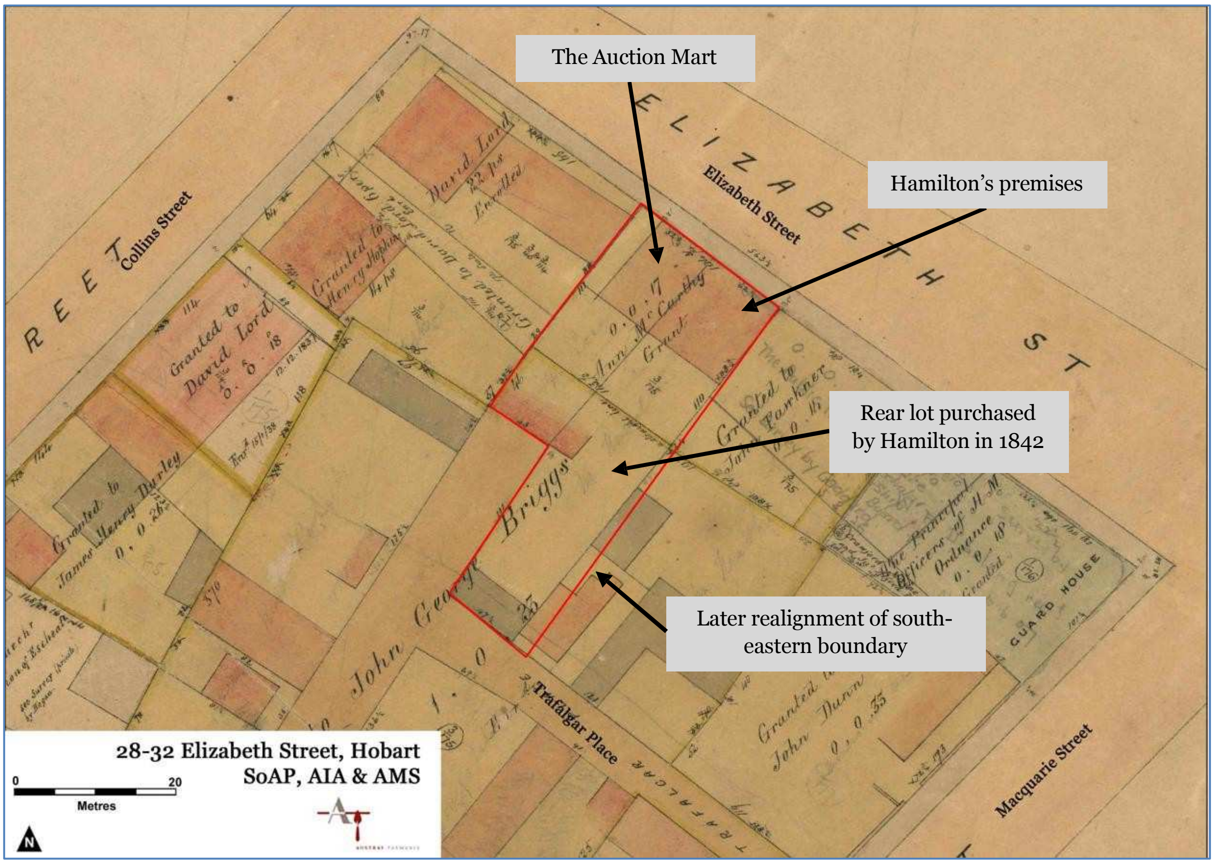

Figure 5: Detail from Sprent's survey diagram of the 1840s. These plans are spatially accurate allowing for effective overlay plans. Masonry buildings are shaded red, timber buildings are shown in grey. Sprent shows the subdivision of the McCarthy allotment and the formalisation of Trafalgar Place. Note the later expansion of the study area boundaries on its south-eastern alignment, encroaching into the neighbouring allotment (CPO, Sprent's Book Page 63. Reproduced with the permission of the Department of Primary Industries, Parks, Water and Environment, Land Tasmania © State of Tasmania).

Stracey's, later Worley's auction mart is depicted in photographs from the latter part of the nineteenth century. They show a two-storey rendered building, four bays wide and constructed hard against the street edge. It included pilasters extending to the parapet (Figure 6).

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[38] Deed, 2/5755, Memorial of Indenture, William Morgan Orr and William Hamilton, 1 & 2 September 1842

[39] *The Hobart Town Courier*, Friday 15 December 1837, p.1; *Colonial Times*, Friday 29 January 1847, p.2; *The Mercury*, Friday 9 December 1870, p.2

Figure 6: c.1886 view of Elizabeth Street, looking north-west. The auction mart building is partially shown and highlighted (TAHO, Elizabeth St. from Macquarie St. [Hobart], AUTAS001126183102, Allport Library and Museum of Fine Arts. Reproduced with permission).

The furniture business of William Hamilton continued to operate from the site until the 1870s. Although the property remained in the ownership of the Hamilton family, the nature of the enterprise changed in c.1878 with the establishment of the firm of John Hamilton and Co. who were merchants, importers and insurance agents.[40] Modifications to the premises were made in 1882, with *The Mercury* writing:

> Messrs. J Hamilton and Co. having during the past month had such alterations made to the front and interior of their establishment as to completely change the appearance of it. The work has been performed by Mr. Gregory, builder, who has lost no time in getting it through, a month only being occupied in doing so. The lower portion of the front of the building was pulled down and re-erected and the upper part was raised 4ft., [*i.e., approximately 1.21 m*] and the whole of the front has been cemented, the bottom portion, after the style architecturally called rustic, with mullion windows, and the upper part with raised quoins, mouldings round the windows and cornices. At the top of each storey is an entablature on which the name of the firm and nature of business are placed in raised cement letters. The outside of the building looks very neat, and is certainly a great improvement on the old front. The interior of the establishment has also undergone considerable alterations in the way of removal of partitions, laying new floors, setting up doors and office fittings, and so forth. The branches of the business have been separated, the insurance office being set apart from the general merchandise department. The offices have been made commodious, and look very complete.[41]

The building was photographed a few years later, showing the rendered front of the premises, expanded windows on the ground floor and the name of the business formed in raised text on both levels (Figure 7). Figure 8 shows both the Hamilton building and the former auction mart together in the same view.

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[40] *The Mercury*, Friday 1 March 1878, p.1; *The Mercury*, Thursday 4 April 1878, p.2

[41] *The Mercury*, Tuesday 3 October 1882, p.2

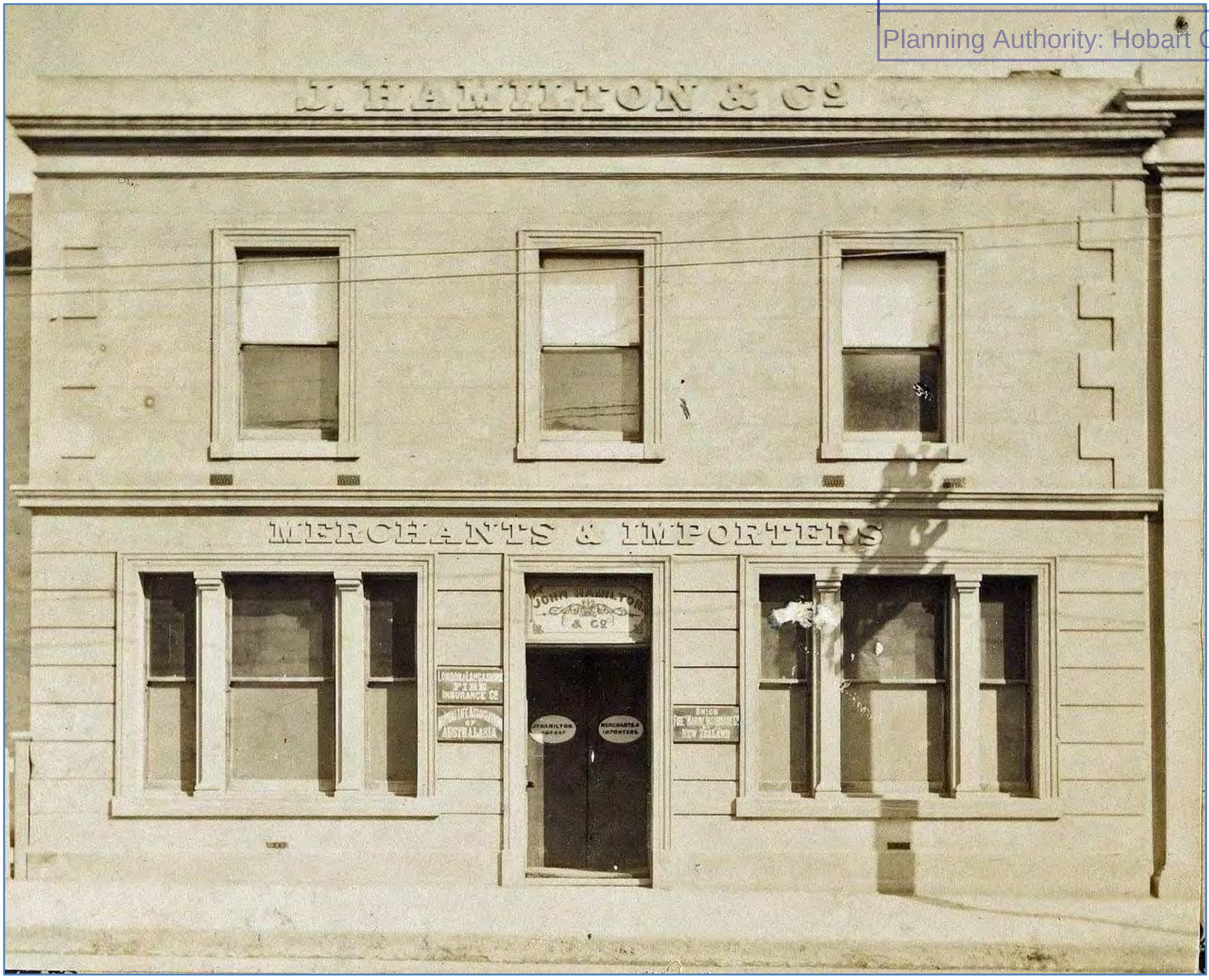

Figure 7: c.1886 view of the J Hamilton & Co. building, Elizabeth Street. The photograph was taken after the 1882 modifications which substantially changed the appearance of the building. The pilaster of the adjacent former auction mart building can just be seen on the far right (TAHO, PH10/1B, Photographs (2) - Nickolls & Simmonds - 16 Elizabeth Street and John Hamilton & Co - Merchants & Importers, 6 Elizabeth Street. Reproduced with permission).

Figure 8: late nineteenth, early twentieth century view looking to the north-west, up Elizabeth Street. The buildings within the study area are highlighted. The Hamilton building is on the left, and the former auction mart on the right (TAHO, Hobart Streets Elizabeth collection of postcards, AUTAS0016125413211, Tasmaniana Library. Reproduced with permission).

Both buildings continued to be used as sole occupant commercial premises over the coming years, but during the 1890s Hamilton's building were subdivided into a number of individual offices and a similar process took place next door soon after. Numerous tenants occupied the offices within the two buildings, but perhaps most interesting is the number of prominent architects who ran their businesses from the site. This appears to have begun in the 1890s with Robert Flack Ricards whose office was located at was then registered as 14A Elizabeth Street. The firm was established by Ricards in 1887, going on to design numerous buildings including the Temperance Hall in Melville Street, works on the Treasury Chambers in Davey Street, St Mark's Church in Port Cygnet and bank buildings in Devonport and Burnie. In 1895 he was joined by Douglas Salier and working from their Elizabeth Street office, the partnership went on to design a number of buildings including St Stephen's Church in Sandy Bay, Fitzgerald and Co.'s premises in Collins Street and the Commercial Bank in Zeehan, as well as a large number of houses around Hobart.

From around 1905, Wilhelm Koch established his office in the same building. Koch was a founding member and president of the Tasmanian Institute of Architects, and helped to establish the Southern Tasmanian Town Planning Association in 1915. He was responsible for the design of a number of significant domestic, commercial and institutional buildings around Tasmania including works on the Richmond Town Hall, the children's hospital in Hobart, the Hobart Teacher's College (Philip Smith building), the AG Webster building in Liverpool Street and St James the Apostle Church in New Town.[42]

Buildings occupied nearly all of the two lots by the early twentieth century (Figure 9). The two buildings facing Elizabeth Street remained extant to this time, with secondary buildings to the rear. This included a large two-storey warehouse or store building to the rear of the Hamilton building and fronting onto Trafalgar Place. A construction date for this building has not been established with

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[42] *Cyclopedia of Tasmania (illustrated) : an historical and commercial review: descriptive and biographical etc*, Maitland and Krone: Hobart, 1900, p.338; Koch, C, Winter, G, 'Koch, Wilhelm Rudolph Waldemar (1874–1952)', *Australian Dictionary of Biography, National Centre of Biography*, Australian National University, http://adb.anu.edu.au/biography/koch-wilhelm-rudolph-waldemar-13031/text23561, published first in hardcopy 2005

accuracy, but Assessment and Valuation Rolls begin to describe the site as an 'office and warehouse' from 1879 which could suggest it was built during this period.[43]

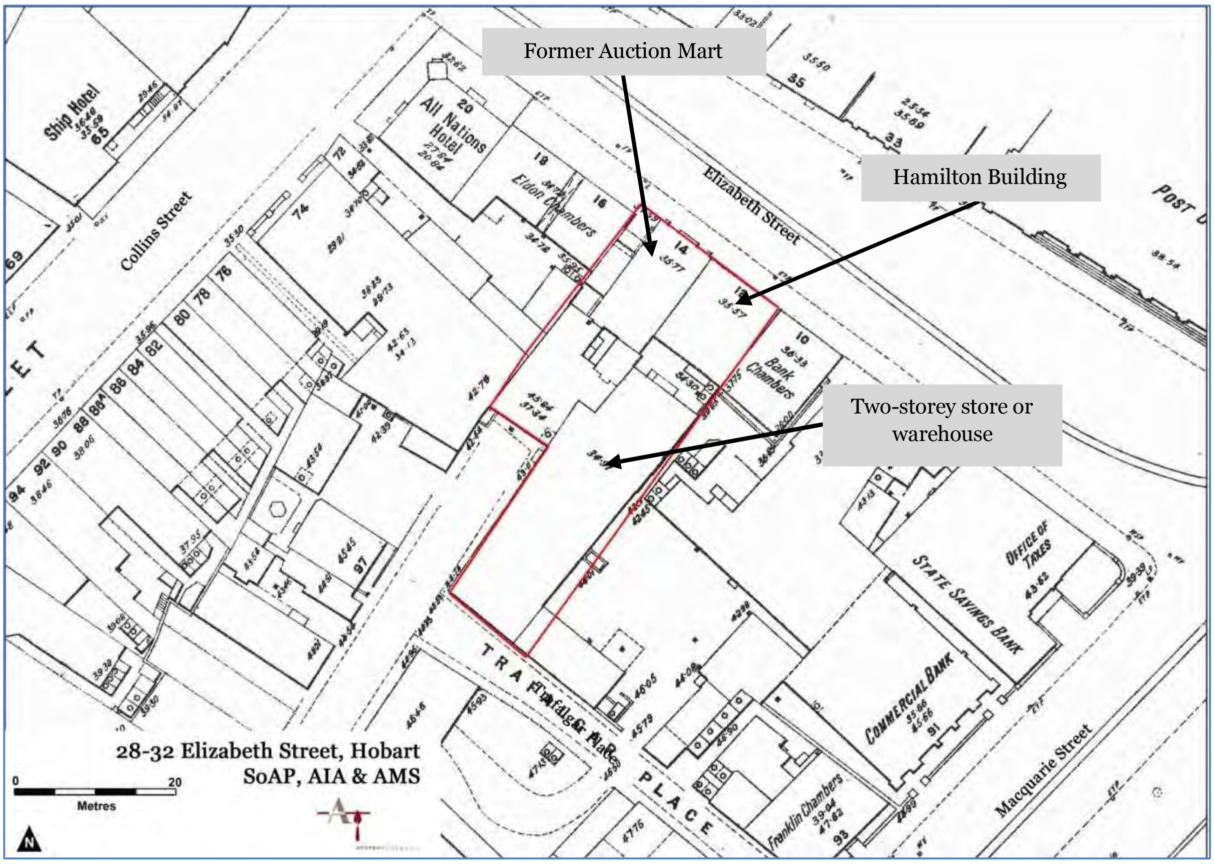

Figure 9: Detail from 1905 Drainage Board plan showing the study area, note the large store building to the rear of 12 Elizabeth Street (TAHO, Hobart City Council Metropolitan Drainage Board, Hobart Detail Plan No.04 (City Centre), 1905. Reproduced with permission).

3.5 1912-1981: Twentieth Century Redevelopment

The study area was subject to three phases of major twentieth century redevelopment, commencing during the 1910s. The following sections summarise this development, prior to the construction of the current building during the 1980s.

3.5.1 1912: The Establishment of the Bank of New South Wales (later Westpac) in Hobart

The Bank of New South Wales (now Westpac) is Australia's oldest banking institution. Branches were established throughout Australia and the Pacific during the nineteenth century, but Tasmania was the last State into which the bank expanded its operations. For many years it had operated through arrangements with its Tasmanian agent, the Commercial Bank. However, by the early twentieth century, growing business resulted in the establishment of its own specific branches. This began in Launceston, followed by Hobart in 1912.[44]

The Hobart site was the Hamilton building, occupying what was then 28-30 Elizabeth Street and purchased in 1911.[45] The old building fronting the street was rapidly demolished to be replaced with a new bank building which opened in 1912. The building was designed by Walker and Johnston which began a long association between this architecture firm and the bank. Although original plans have not been located, early photographs (Figure 10) and written descriptions provide some detailed information. On its opening it was reported:

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[43] Assessment and Valuation Rolls, 1879
[44] *The Mercury*, Thursday 10 August 1911, p.5
[45] Certificate of Title 193/16, 2 May 1911

> The outside is full American Romanesque, with rough walls, and carving in keeping with this particular style of work. It is extremely striking to the eye, and is the only building of its kind in Tasmania. The edifice is a two-storeyed one, and is very ornamental. The name of the bank is cut out of solid stone, and adds to the effect. Approach to the ground floor, which is given over entirely to the business of the bank, is gained through a heavy doorway or remarkably strong appearance. In the banking chamber all the fittings, counters, panels and dados are of Tasmanian blackwood, and in keeping with the Romanesque treatment of the building. The ceilings throughout are panelled in embossed zinc, and there is a deep dado all round, also in zinc. On the first floor there are four large living rooms for the staff, with bathroom and sanitary fittings. The roof is approached by a staircase leading from the main hall, and is reinforced malthoid. From here a magnificent view of the harbour is gained. The bank owns the whole of the property immediately behind its new building right through to Trafalgar-place, and it is understood extensions are to be made later on.[46]

Figure 10: 1912 photograph showing the completed Bank of New South Wales. The pilaster of the adjacent former auction mart building can just be seen on the far right (TAHO, *Tasmanian Mail*, 15 August 1912, p.18. Reproduced with permission).

Common to many banks, accommodation was also provided on-site for the manager, with Mr JR Chapman taking up residence. The new building was located hard against the street edge but did not extend back the entire length of the lot. The large two-storey brick warehouse built during the previous phase of ownership was retained as part of the bank redevelopment (Figure 11).

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[46] *The Mercury*, Saturday 23 March 1912, p.5

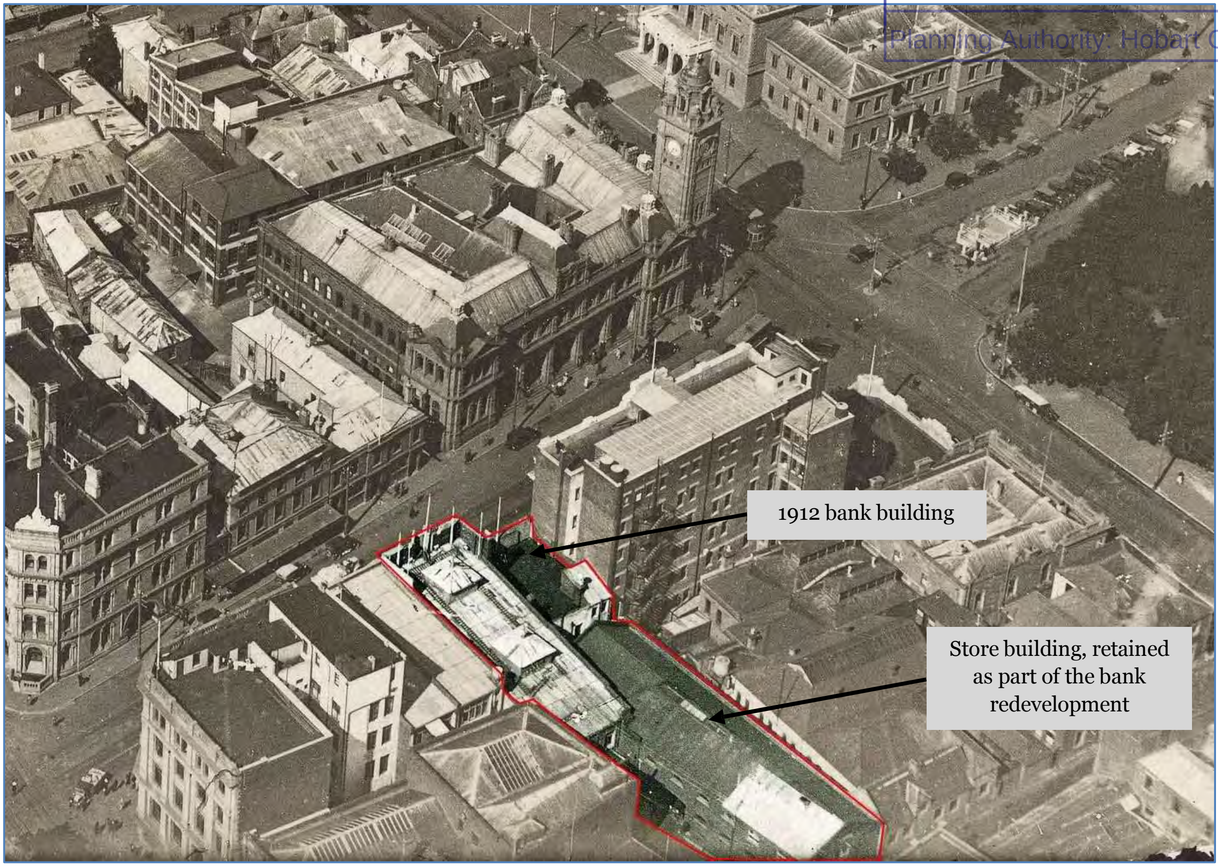

Figure 11: 1920s oblique aerial photograph with study area highlighted, looking towards the north (TAHO, NS892/1/64, Photograph - Hobart - aerial view over city bounded by Wharves, Domain, Elizabeth and Collins Street looking towards wharves from above intersection of Collins and Elizabeth Street. Reproduced with permission).

Although the bank had indicated its intent to develop the rear of the lot in 1912, it was to take several decades for this to occur, and this redevelopment allowed for the old store building to be partially retained. An application was made in 1936 to add an extension to the rear of the bank. These works required the removal of approximately half of the old store building, and excavations of about 3 feet (i.e., approximately 91 cm) to provide level access all the way through from Elizabeth Street. The site is likely to have already naturally risen towards the south-west, but these works resulted in the remaining section of the store building on Trafalgar Place being substantially elevated above the bank building (Figure 12).[47]

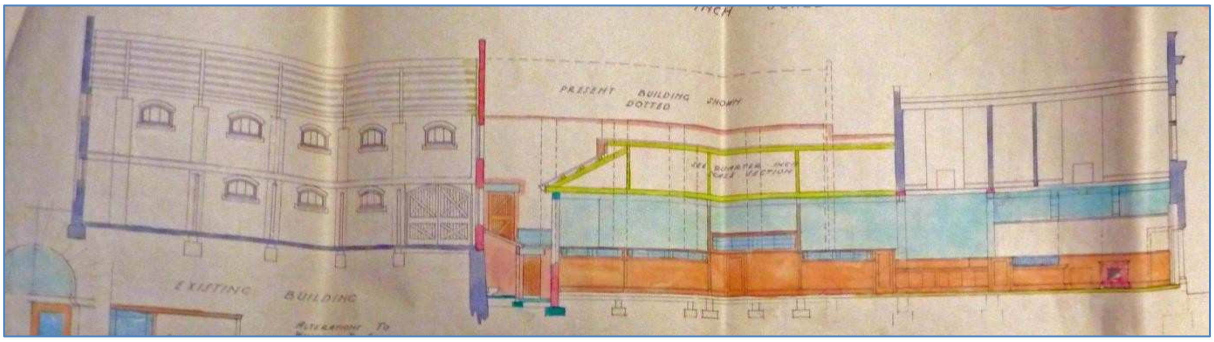

Figure 12: Sectional elevation from 1936 application for alterations to the bank. The 1912 bank premises are on the far right and the old store building on Trafalgar place is shown on the left. The dotted lines indicate the extent of the store building to be removed for the extension to the bank. Note also the height differential between the Elizabeth Street and Trafalgar Place levels (TAHO, AE417/1/1936, 28 Elizabeth Street (Bank), 6326: Alterations and Additions to Bank of New South Wales, Hobart - Long Section. Reproduced with permission).

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[47] TAHO, AE417/1/1936, 28 Elizabeth Street (Bank), 6326

Further alterations were made over the coming decades; all was the work of the original architectural firm and its various incarnations. Most alterations were of a fairly minor scale.[48] The 1912 banking chamber and the remaining section of the old store building remained in place until their demolition in the 1980s.

3.5.2 1914: The Palace Theatre

During the early twentieth century a number of purposely built cinemas were erected in Tasmania for the presentation of silent newsreels and later films to the fascination of eager audiences. One such early cinema was the Palace Theatre. The Theatre was constructed on the site of the old Auction Mart building at 32 Elizabeth Street, and next door to the recently completed bank. The property was purchased in 1913 for £7,650 and little time was wasted on clearing the site for the new and grand building.[49]

The Palace was designed by the partnership of George Stanley Crisp and Julian Whyte. Crisp was one of the more notable Tasmanian architects of the period. He served his articles with Douglas Salier and also had direct contact with CFA Voysey in England, bringing knowledge of Arts and Crafts design back to Tasmania on his return. Significant public works included Heathorn's Motor Garage, the Huon Co-Operative Association building, and the Hobart Savings Bank branches in Moonah and Burnie. In addition to the Palace, he was also responsible for two other notable theatres including His Majesty's (1910-11) and the Strand, later Odeon (1914-15), both in Liverpool Street. Prominent examples of domestic architecture include the Arts and Crafts influenced Waimea (1909) and Greystanes (1914), both in Sandy Bay and extant.[50]

Unfortunately no original plans of the theatre have been located. The best understanding of the building comes from articles and advertisements, which are full of self promotion as to the splendour of the design and detailing, technology and safety precautions. As eminent theatre historian Ross Thorne notes, the majority of Tasmania's cinemas never matched the opulence and grandeur of the major picture palaces found in the mainland capital cities. Nonetheless, the Palace was one of the few Tasmanian cinemas featured in his nationwide survey.[51]

The Palace was nearing completion by April 1914, with a shareholders meeting being informed that every safety precaution was being taken to guard against fire and that special attention was being paid to the ventilation. The interior decoration had been designed by Mr Beiler of Melbourne and carried out by local contractors. The manager claimed that the theatre would be equal to any on the mainland and that full orchestras would play during each performance.[52]

The theatre was officially opened by the Mayor on 2 June, who described it as 'an addition to the architectural beauties of the city', with a 'daring distinctiveness' in design not seen before in Hobart (Figures 13-14). Hundreds were turned away on opening night. Located on such a narrow lot, the building was of three levels on its Elizabeth Street elevation. The facade was pure white, inset with green tiles and the name the 'Palace Theatre' picked out in gold. The full width of the street frontage was left open as the entrance to the cinema, with a marble staircase leading through arches to the ticket office, surmounted by a leadlight dome with ornamental metal work. The theatre had capacity for 700 people in gold plush chairs in the stalls and dress circle. The films were projected onto a white cement screen surrounded by gilded decoration. The orchestra was located on an elevated platform in front of the screen. To guard against fire, the projection room was constructed from concrete and lined with asbestos. A safety exit led from the theatre to Trafalgar Place behind. To distinguish itself from other cinemas, the Palace operated continuous picture shows from 11 a.m., allowing the public to come and go as they pleased. Opening at the start of the First World War, like other theatres, the

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[48] See: TAHO AE417/1/6135, 28 Elizabeth Street (11032): 1948 works related to internal fit out and creation of new access to the former store building; AE417/3/2596, 28 Elizabeth Street, Alterations (18861): 1962 alterations to the ground floor; AE417/3/3450, 28 Elizabeth Street, Garage (19739): 1964 construction of a new garage off Trafalgar Place; AE417/4/52, 28 Elizabeth Street, Alterations (19828): 1964 alterations to the banking chamber; AE417/6/1446, 30 Elizabeth Street, Bank of New South Wales, Additions (76488): 1976 modifications to the facade of the bank building, extending the height of the windows.

[49] Deed, 13/1707, Memorial of Indenture Clyde Hamilton & Ors, Palace Theatres, 30 October 1913; Jacobson, A, 'Picture Theatres', in *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

[50] McNeill, B, Woolley, L, *Architecture from the Edge. The 20th Century in Tasmania*, Montpelier Press, North Hobart, 2002, pp.27-28; *The Mercury*, Monday 31 July 1933, p.6

[51] Thorne, R, *Cinemas of Australia: via USA*, Architecture Department, Sydney University, 1981, p.353

[52] *The Mercury*, Thursday 30 April 1914, p.3

Palace participated in the war effort, with special presentations to raise money for the Patriotic Fund, and later that year the Belgium relief fund.[53]

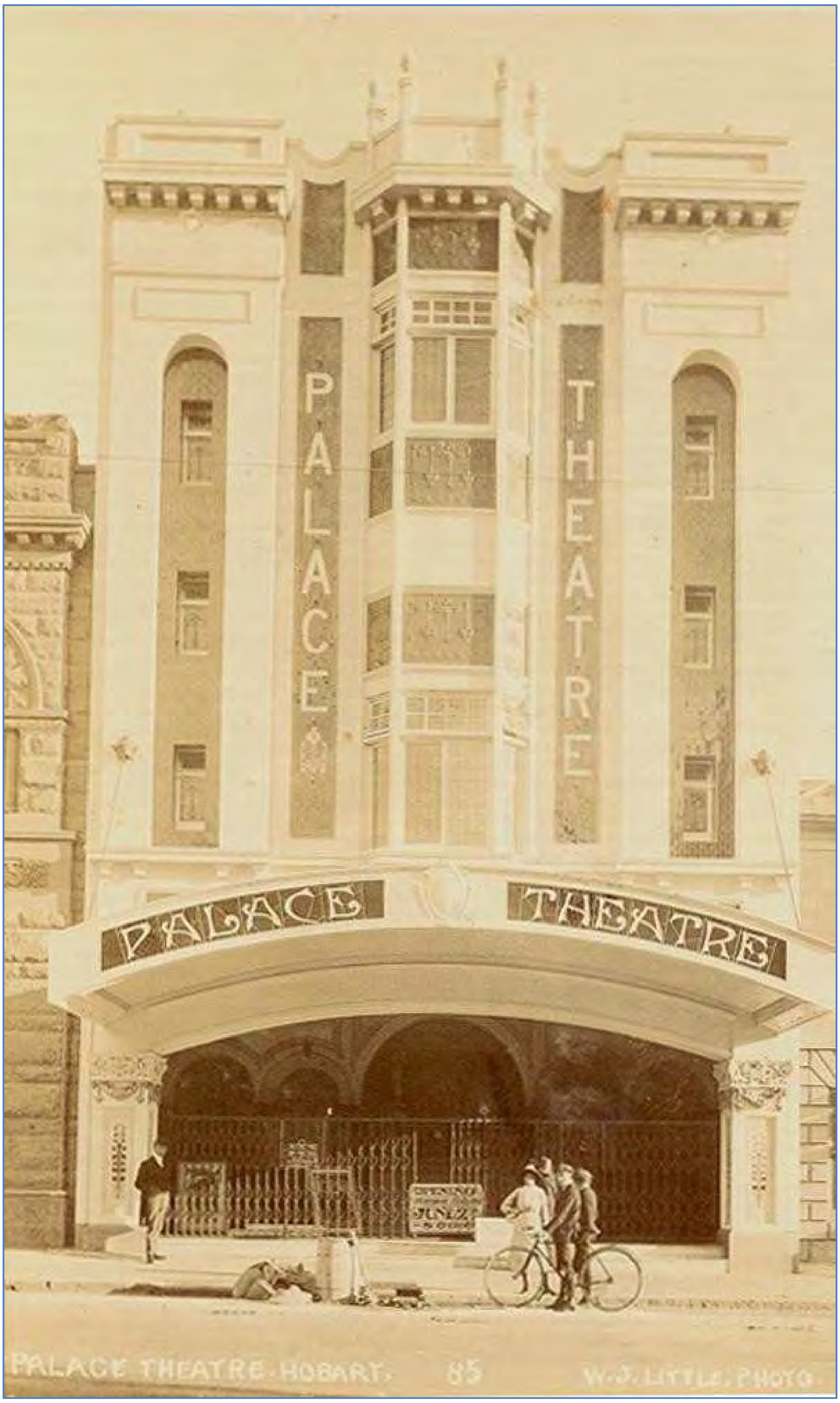

Figure 13: Facade of the Palace Theatre. Note the arched entrance behind the iron screens. The bank building can be seen on the far left (TAHO, Hobart buildings theatrical and recreational : collection of postcards, Tasmaniana Library, AUTAS0016125395681. Reproduced with permission).

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[53] *The Mercury*, Monday 1 June 1914, p.3; *The Mercury*, Wednesday 3 June 1914, p.8; *The Examiner*, 3 June 1914, p.5; *Daily Telegraph*, Wednesday 3 June 1914, p.4; *Daily Telegraph*, Saturday 6 June 1914, p.8; *Daily Telegraph*, Friday 25 September 1914, p.8

Figure 14: Photograph of the ground floor of the Palace Theatre. The marble stair case, decorative tile work and Art Nouveau pressed metal gable infill can all be made out. The photograph was taken during the construction of the Commercial Bank on the corner of Elizabeth and Collins streets (TAHO, NS869/1/425, Photograph - Hobart - Palace Theatre - Elizabeth Street - c 1920s. Reproduced with permission).

The only plan that has been located for the building is a schematic showing the upper level seating arrangement (Figure 15), containing 212 seats. The remaining 488 seats would have been located in the stalls.

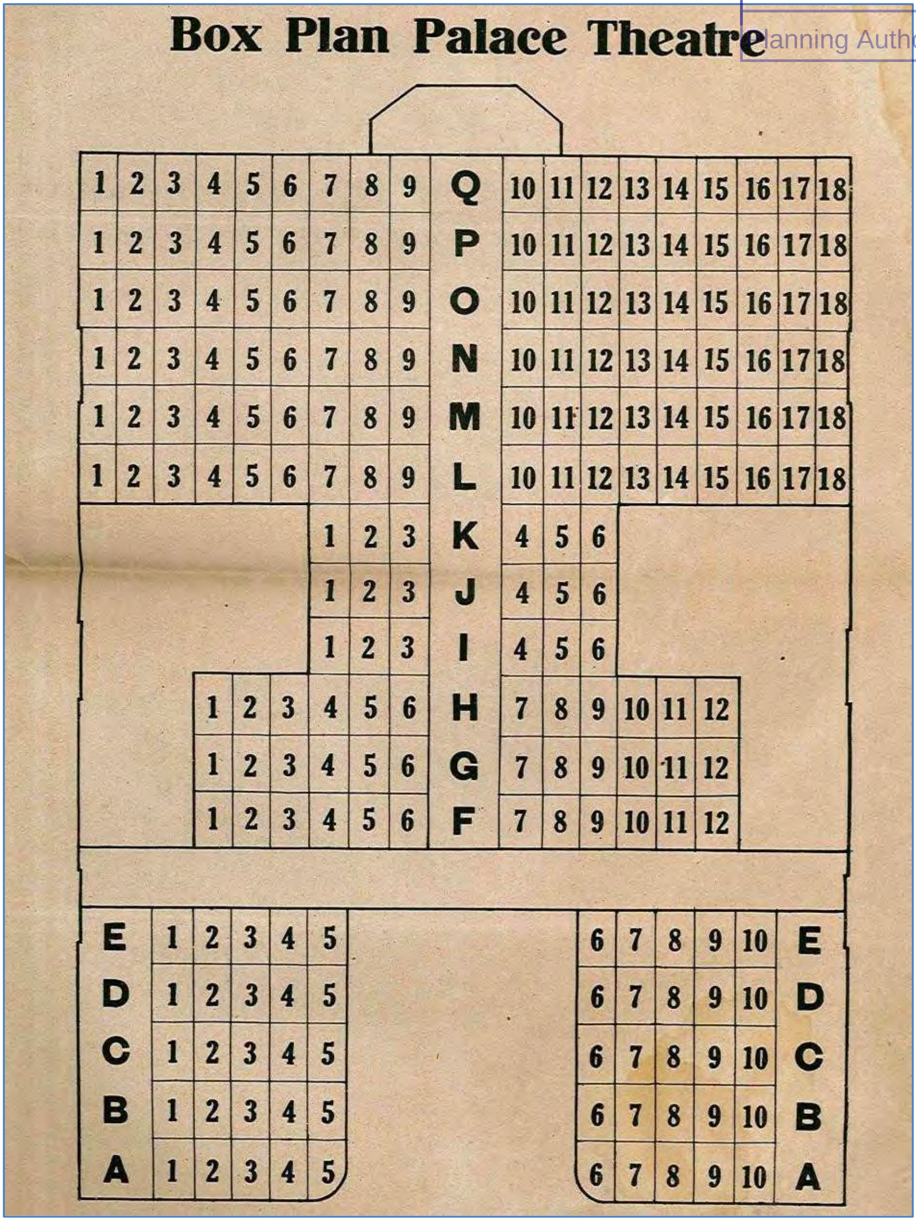

Figure 15: Undated schematic showing the upper level seating plan, providing seating for 212 patrons (Courtesy of The Royal Society Collection, University of Tasmania Special & Rare Collections – RS73).

Thorne's detailed work on the subject looked at the influences of American architecture on Australian cinemas. The Palace would appear to differ from these broader patterns, describing its design as 'very European, almost French', having a highly three dimensional tri-partite central bay extending through its upper levels. He also identified Art Nouveau influences, most notably through leadlight lettering over the awning.[54]

Despite opening to great acclaim and large crowds, the Palace was beset by problems, most notably a series of fires, a real danger for the emerging technology. The first such fire broke out in the projection room in January 1917. Some 400 to 500 people were in the cinema at the time, but the crowd kept calm, safely emerging from the building, whilst the orchestra continued to play. The fire brigade quickly attended, and although the cement and asbestos lined projection room prevented the destruction of the entire building, flames and smoke had spread into other areas. Approximately £1,250 worth of damage was done, most of which related to the loss of valuable film. More minor fires

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[54] Thorne, *op. cit.*, p.355

broke out in 1920 and 1923. Investigations by the Fire Brigade into Hobart's theatres and cinemas also revealed some alarming finds, with exits being blocked or locked at the Palace.[55]

The Palace only operated for a few more years, closing at the beginning of 1924. At the time there were three cinemas operating in Hobart, but unlike its competitors, the narrow site of the Palace prevented expansion and the addition of more seating. The cinema closed on 5 January 1924, and was sold the following year. The building was completely remodelled to contain three shops and was purchased by Henry Round who ran a supermarket from the premises. So associated was he with the site, that the old cinema became known as Round's building. During the 1970s the building was taken over by the Bank of New South Wales who expanded operations from their premises next door, with the old cinema converted to become the offices for the travel agency division of the business.[56]

3.6 1981-present: Demolition and Construction of the Current Building

By the late twentieth century the existing two buildings were no longer adequate for banking purposes. In 1981 an application was lodged to expand the Hobart premises with the construction of a new bank on Elizabeth Street. The new building was to merge the separate properties which contained both the 1912 bank and the 1914 former cinema next door. The following year, the Bank of New South Wales and the Commercial Bank of Australia merged to form the Westpac Banking Corporation.[57]

Unfortunately the plans for the development have been removed from the archived building application file. These would have provided detailed information about the building, and from an archaeological perspective, important information related to the extent of excavations carried out. Some information however can be gleaned from written accounts and the building itself.

The new bank was designed by the Melbourne company of Von Schramek & Dawes working in collaboration with local architects Crawford, Cripps & Wegman, continuing the long tradition of this firm (and its predecessors) working for Westpac, a history which commenced with the design of the old building in 1912.

Geotechnical investigations were carried out in advance of the development. At the Trafalgar Place end of the site, the first 65 cm was fill, followed by 45 cm of sandy clay, 50 cm of clayey sand and 13.4 m of sandstone below. The stratigraphy on Elizabeth Street was simpler, with 1.4 m of fill, followed by moderately soft sandstone to a depth of 6.12 m.[58]

The application was to construct a new three storey brick and concrete framed building along the Elizabeth Street frontage, and a two storey 'mews-type' building at the rear off Trafalgar Place, which contained ground level parking, and other service and storage areas. Public banking and travel facilities were to be provided on the ground level, and offices, staff amenities and plant were located on the floors above. The structural system for the building was reinforced concrete using columns and perimeter beams with a flat slab floor system supported on spread footings. Although specifications for the earth works or depths of columns have not been located, the architect recalls that excavations within the middle of the building were substantial. The cost of the development was estimated at $1.7 million dollars.[59]

A level of criticism was expressed by Council officers and aldermen on the heritage impacts of the development. The assessment officer noted that the buildings were not listed by the National Trust, but were located within a conservation area and had been identified as unlisted elements of significance. Notes on the application suggest a particular concern for the 1912 bank building and the 'pleasant' former store building at the rear. There was less interest in the former cinema, described as being 'nondescript'. It was felt that scope existed to retain and modify the existing buildings, or that a

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[55] *The Mercury*, Tuesday 9 January 1917, p.4; *The Mercury*, Monday 2 February 1920, p.6; *The Mercury*, Wednesday 23 March 1921, p.7; *The Mercury*, Monday 27 August 1923, p.7

[56] *The Mercury*, Saturday 5 January 1924, p.8; *The Mercury*, Saturday 30 May 1925, p.13; TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109): HCC, Application under Draft Planning Scheme, 28-30 Elizabeth Street, Hobart, File No. ET14/470, 12 February 1981; AE417/6/1446, 30 Elizabeth Street, Bank of New South Wales, Additions (76488): 1976

[57] http://www.westpac.com.au/about-westpac/westpac-group/company-overview/our-history/

[58] TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109): Report on New Hobart Office for Bank of New South Wales, No. 28-30 Elizabeth Street, Hobart

[59] TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109): HCC, Application under Draft Planning Scheme, 28-30 Elizabeth Street, Hobart, File No. ET14/470, 12 February 1981; notes on street plan; Report on New Hobart Office for Bank of New South Wales, No. 28-30 Elizabeth Street, Hobart; Email, N Mackintosh (JAWS Architects) to James Puustinen (Austral Tasmania), 26 May 2015

more sensitive infill development should be pursued, including providing a pedestrian arcade linking Elizabeth Street to Trafalgar Place. These concerns however were not sufficient to warrant refusal. Some aldermen also raised their doubts, noting that the buildings added to the character of Hobart's central city, with Ald Broadby stating 'places were too easily allowed to be knocked down, simply because they were not given the chance to get old enough'.[60]

The accompanying design report suggests that the architects had responded to the context of the site, in height, proportion and surface finish which would 'harmonise' with adjacent buildings and the streetscape of Elizabeth Street. External surfaces were to be reconstituted stone, which would be acid treated, and result in an appearance reminiscent of cut or sawn stone. The cornice would provide a contemporary interpretation of the classical feeling of important neighbouring buildings.[61]

The application was approved in March 1981 and the site was cleared for the new building (Figures 16-17). Westpac continued to trade from the site until 2014, when the bank relocated to new premises on Liverpool Street.

Figure 16: the existing site, with the three level banking building on Elizabeth Street, and the two-storey rear section on Trafalgar Place (LIST Map, © State of Tasmania).

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[60] TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109): HCC, Application under Draft Planning Scheme, 28-30 Elizabeth Street, Hobart, File No. ET14/470, 12 February 1981; notes on street plan; *The Mercury*, Wednesday 25 March 1981, p.30; Report on New Hobart Office for Bank of New South Wales, No. 28-30 Elizabeth Street, Hobart

[61] TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109):; Report on New Hobart Office for Bank of New South Wales, No. 28-30 Elizabeth Street, Hobart

Figure 17: Elizabeth Street elevation of the former Westpac Bank building (Austral Tasmania, 2015).

4.0 ARCHAEOLOGICAL ASSESSMENT – DISTURBANCE HISTORY, SIGNIFICANCE AND SENSITIVITY ZONING

The management recommendations made in this report (see section 6.0) are predicated on three core factors: the archaeological potential of the area, the level of disturbance these features and deposits may have incurred, and the significance of the archaeological resource. The following section comprises a discussion of these three elements in the context of the site. It begins with an analysis of the current site; the sequential development and disturbance of the area; and an assessment of archaeological significance.

4.1 The site in 2015

The following section provides a description of the site as it currently exists and for the purposes of the archaeological assessment. It was informed by a site visit carried out on 23 April 2015 and should be read in conjunction with the detail plan which shows existing finished floor levels, and the outside street levels (Figure 24).

The site covers 874m^2 with buildings covering the entire lot. The main section of the former Bank is located on the Elizabeth Street frontage of the site. It consists of a three storey brick and concrete framed building constructed hard against the street edge, with a two-storey section at the rear of the site, off Trafalgar Place (Figures 18-19). The south-eastern end of the site contains the two-storey 'mews' section, with ground level undercover car parking beneath the building (Figure 20). The main access is off Elizabeth Street and extends as a single level back towards the rear of the building on Trafalgar Place (Figure 21). The former banking chamber occupies the majority of the ground floor.

The changes in ground levels between Elizabeth Street and Trafalgar Place are not readily apparent from the exterior of the building, but are substantial. Bulk excavation was carried out to achieve a single level of access from Elizabeth Street. The extent of this excavation is significant, particularly at the south-western end of the building with the finished floor level approximately 2.11 m below the Trafalgar Place ground level outside. A flight of stairs provides access descending from Trafalgar Place to the ground floor (Figure 22). This depth of excavations would not account for further areas of excavation associated with the lift wells, footings, services and so on. Excavations at the Elizabeth Street end could be expected to be less than those at Trafalgar Place, but were also likely to have been substantial.

Although occupying a smaller footprint and of a lower height, the rear two-storey section on Trafalgar Place has also been subject to substantial excavations. The lower ground floor is accessed via a short flight of stairs from the ground floor, descending by approximately a further 75 cm (Figure 23). Within this section of the building, the difference between the internal finished floor levels and Trafalgar Place above would be somewhere in the vicinity of 2.7 - 3.3 m.

Figure 18: Elizabeth Street elevation of the former Westpac bank building, 28-32 Elizabeth Street. Looking south-west.

Figure 19: Rear of the bank building, with the two-storey 'mews' section on the right. Looking north-east from Trafalgar Place.

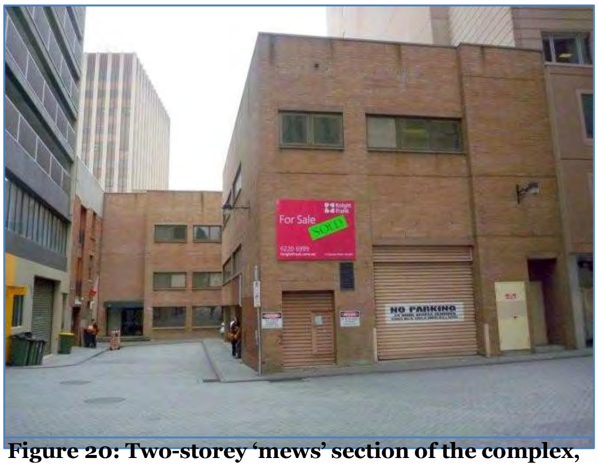


Figure 20: Two-storey 'mews' section of the complex, right. Looking north-east from Trafalgar Place.

Figure 21: Elizabeth Street ground level of the former Bank. Looking north-east.

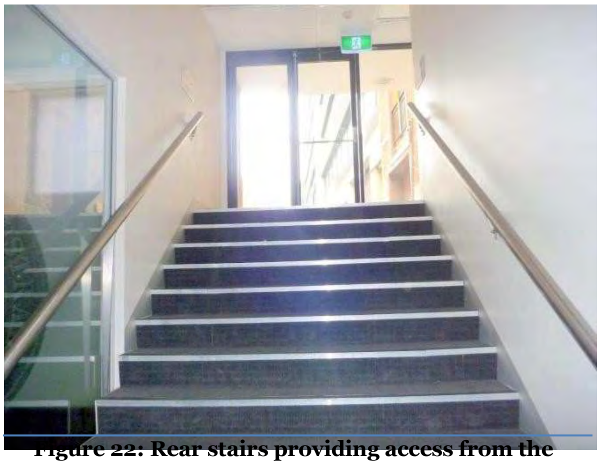
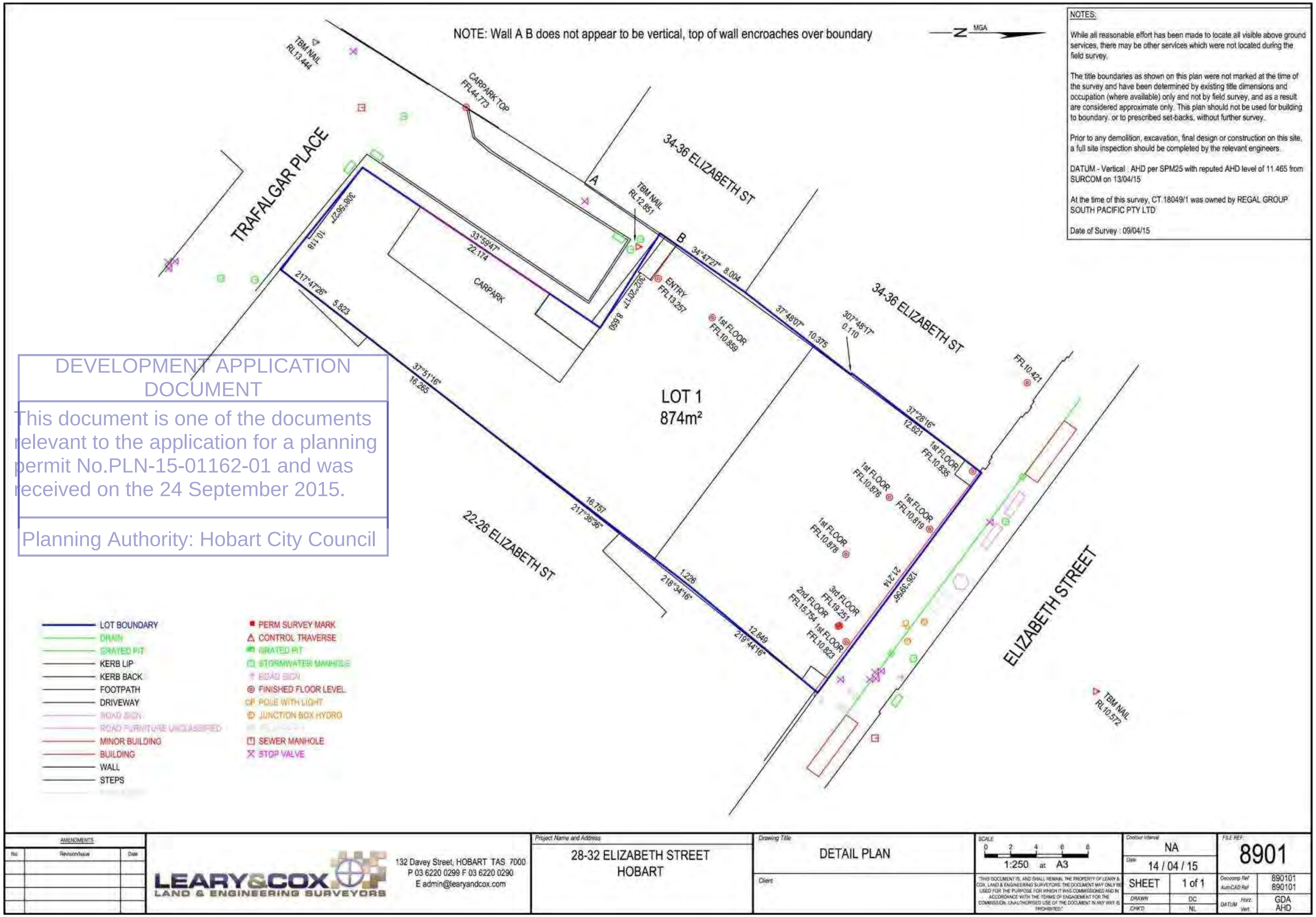


Figure 22: Rear stairs providing access from the Elizabeth Street level, up to Trafalgar Place. The finished floor level is approximately 2.11 m below the Trafalgar Place level at the south-western end of the site.

Figure 23: Lower ground level beneath the mews section. The finished floor level is approximately 75 cm below the Elizabeth Street ground level, as indicated by the stairs.



NOTES:

While all reasonable effort has been made to locate all visible above ground services, there may be other services which were not located during the field survey.

The title boundaries as shown on this plan were not marked at the time of the survey and have been determined by existing title dimensions and occupation (where available) only and not by field survey, and as a result are considered approximate only. This plan should not be used for building to boundary, or to prescribed set-backs, without further survey.

Prior to any demolition, excavation, final design or construction on this site, a full site inspection should be completed by the relevant engineers.

DATUM - Vertical : AHD per SPM25 with reputed AHD level of 11.465 from SURCOM on 13/04/15

At the time of this survey, CT.18049/1 was owned by REGAL GROUP SOUTH PACIFIC PTY LTD

Date of Survey : 09/04/15

Figure 24: Detail plan of the existing site showing ground and floor levels.

4.2 Disturbance History

The following sections discuss the potential for survival of archaeological features and deposits within the study area from each key phase of development. In doing so, it takes into account the disturbance history as gleaned from documentary sources and inspection of the site in the present. It attempts to establish how one phase of development may have affected a previous phase.

The history identifies five key phases of site development, with definitive evidence of built development commencing by 1828-30, replaced by more substantial masonry buildings by the 1840s and substantial redevelopment during the early and late twentieth century.

For clarity, the built evolution has been divided into each key phase depicting site development to a particular point in time. In the following plans, each phase is provided a separate colour, with building sites allocated a number which cross-references with the explanatory tables. Most of the individual properties included multiple buildings. Secondary structures (where known) are identified by a letter suffix, e.g., '1a'.

Previous phases are also depicted (in grey) to show where one phase of development may have occurred on the same site. The result of these multiple phases is indeed complex. In addition, parts of the study area which do not directly contain buildings are likely to have been used or developed for domestic or commercial activity, such as associated yards, gardens, laneways and outdoor workspaces, or unmapped outbuildings.

The conclusion drawn from this analysis is that the site is highly disturbed with a low potential to contain significant archaeological deposits. The scale of previous developments, most notably the existing c.1981 building required substantial bulk excavation of the site to create level access off Elizabeth Street. Whilst cutting and levelling exercises had previously occurred, the scale of the 1980s works is likely to have removed the majority, if not all evidence of previous phases of development.

4.2.1 Phase 1: 1804-c.1828-30

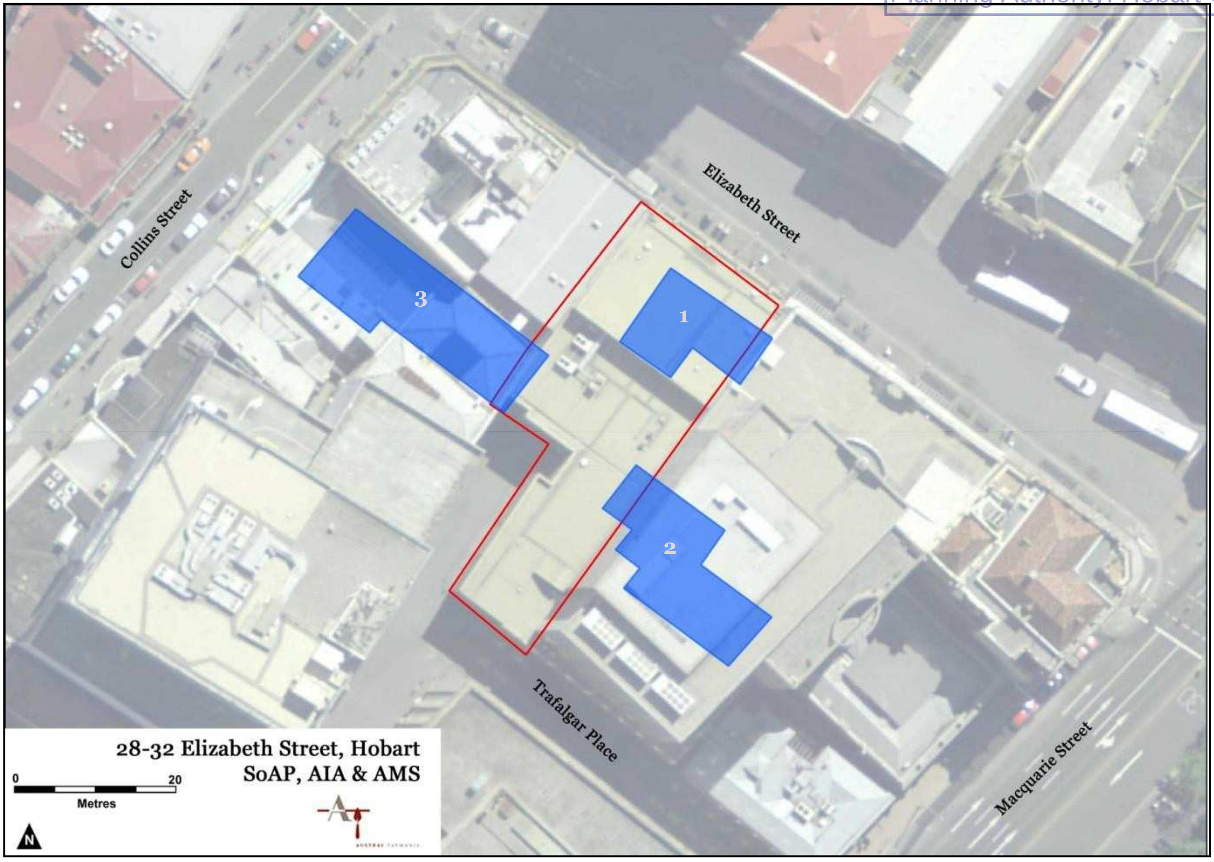


Figure 25: Overlay showing development in the study area from 1804-c.1828-30 (LIST Map, © State of Tasmania).

No.	Development/Phase	Disturbances on Previous Phases
1	Given the central location of the site, it is likely that some use or development of the property occurred in the years following European settlement. However, documentary evidence of such use has not been located. The first definitive phase of development occurred in 1828-30 with the construction of a timber building located on Elizabeth Street frontage [1]. The 1828-30 plan indicates that the building was being built at the time the plan was being prepared, providing precise information as to its period of construction. Its use has not been determined, although it may have been used as a bakery by John Clarke. By this time the property had been acquired by Ann McCarthy.	First phase of built development and no previous phases established.
2	Timber building [2]. The function of this building is not known but it may have combined both residential and commercial functions which would seem likely for this central location. The building had been completed by 1828-30.	First phase of built development and no previous phases established.
3	Masonry building [3]. The 1828-30 plan indicates that the south-eastern end of the building was located within the study area. However this is not confirmed by any other plans and it is probable that the inclusion of this building within the study area is	Building [3] is unlikely to have been located within the study area.

No.	Development/Phase	Disturbances on Previous Phases
	the likely result of scaling error.	

Table 2: Phase 1 Development

4.2.2 Phase 2: 1830-1840s

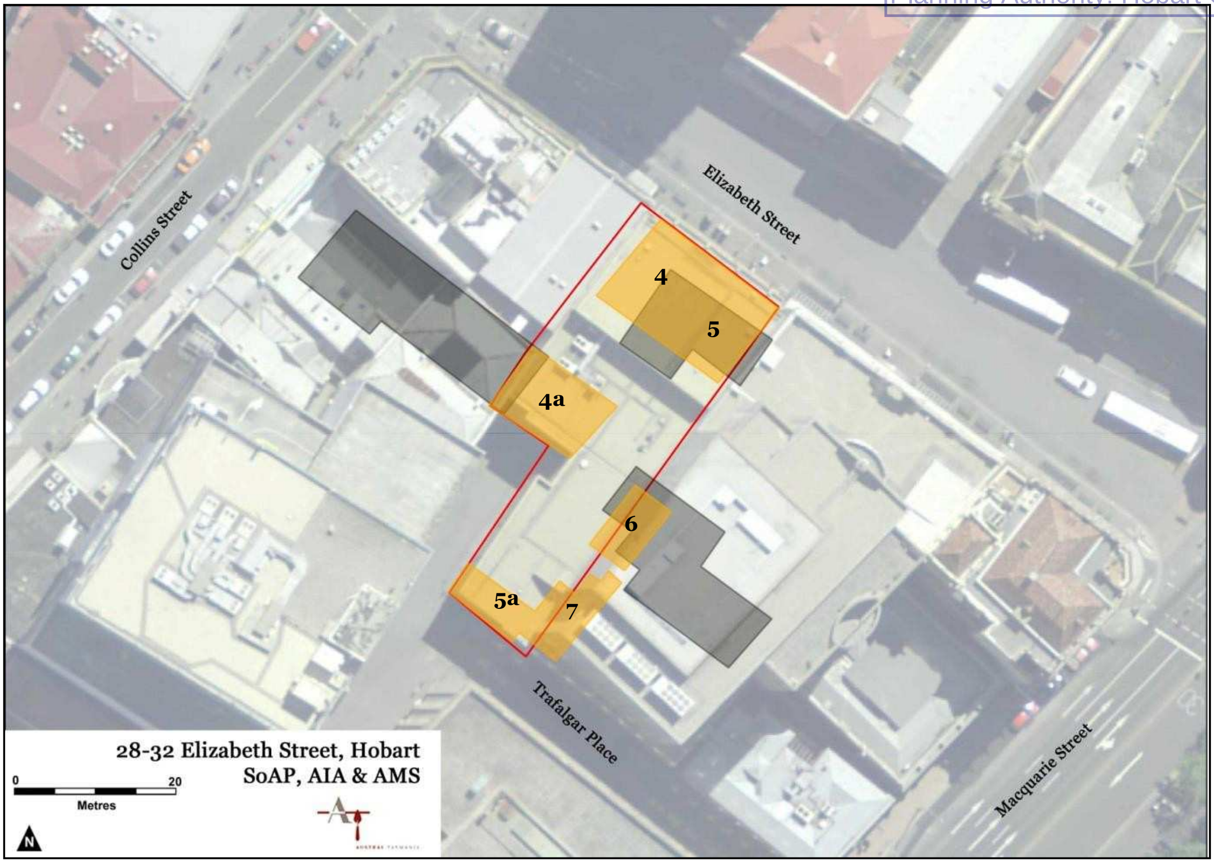


Figure 26: Overlay showing development in the study area from c.1828-30-1840s (LIST Map, © State of Tasmania).

No.	Development/Phase	Disturbances on Previous Phases
4, 4a	Auction Mart [4]. Sprent's survey plan is the first accurate depiction of the site depicting two buildings on the street frontage. [4] was a substantial two-storey masonry building which may have been constructed during the 1830s, but definitively appears on maps from the 1840s. [4a] is likely to have been an outbuilding associated with [4].	[4] is likely to have had a substantial impact on the timber building [1], with a high level of coincidence between the building footprints. The survival of archaeological evidence of timber buildings is variable and determined by a number of factors. Timber buildings that were erected on timber stumps usually leave little surviving evidence, save perhaps the stump holes. However, timber buildings supported on brick or stone footings are more likely to leave tangible remnants, if demolished prior to the 1940s when the use of earthmoving equipment for demolition became common.[62] The construction of [4] is unlikely to have substantially impacted on rear yard spaces or infrastructure, such as drains, cess or rubbish pits related to phase [1] development.
5, 5a	Hamilton's Business Premises [5]. Hamilton acquired the Elizabeth Street frontage and the rear Trafalgar Place lot in 1842. It is likely that he was trading from the site as a cabinet maker, upholsterer and undertaker by 1846.	[5] is likely to have had a substantial impact on the timber building [1], with a high level of coincidence between the building footprints. The survival of structural archaeological evidence of building [1] would be variable, and dependent

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[62] Austral Archaeology, *Archaeological Investigation of the Hobart Magistrates' Court*, report prepared for the Tasmanian Department of Justice, Hobart, 1994, p.7

No.	Development/Phase	Disturbances on Previous Phases
	[5a] is likely to have been an outbuilding or workshop associated with [5].	upon its construction and footings material as discussed above. The construction of [5] is unlikely to have substantially impacted on rear yard spaces or infrastructure, such as drains, cess or rubbish pits related to phase [1] development.
6, 7	Timber Building [6] & Masonry Building [7]. These two buildings were historically located on the adjacent lot, but are now partially located within the study area because of boundary adjustments. The precise function of these buildings has not been established, although the 1853 Assessment and Valuation Rolls indicate a combined house and store and three houses located on Trafalgar Place by this time. Given their scale and the location of [6] setback from Trafalgar Place, it would seem probable that these were service or outbuildings associated with larger built development located nearby.	Building [6] was a timber building with a level of coincidence between its footprint and the previous building [2]. Given its small scale, it is unlikely that [6] destroyed all previous evidence of [2]. Building [7] was the first documented phase of built development in this location.

Table 3: Phase 2 Development

4.2.3 Phase 3: 1840s-1912

Figure 27: Overlay showing development in the study area from c.1840s-1912 (LIST Map, © State of Tasmania).

No.	Development/Phase	Disturbances on Previous Phases
4	Former Auction Mart [4]. The building remained extant during this period, although it was used for a variety of different commercial purposes. The footprint shown in Phase 2 largely remained the same, with the exception of an extension off its north-western elevation and lean-to additions to the rear. The likely outbuilding [4a] had been removed by this time, and its location remained largely undeveloped.	[4] is a continuation of the previous phase although the nature of the business carried out on the premises changed substantially during the latter part of the nineteenth century.
5, 8	Former Hamilton's .Business Premises [5]. The building remained extant during this period, but was substantially modified during the 1880s. The commercial uses of the place continued and the footprint of the building remained largely unchanged. Store Building [8]. The date of construction of this large building has not been established with certainty, although Assessment and Valuation Rolls do begin to describe the site as an 'office and warehouse' from 1879. Photographs and plans show that the rear building was a substantial two storey brick store or warehouse structure.	[5] is a continuation of the previous phase although the nature of the business carried out on the premises changed substantially during the latter part of the nineteenth century. [8] is a new phase of development, coinciding with the footprints of previous structures in the rear yard: [5a], [6] and [7]. The construction of [8] is likely to have had some impact on the previous structures as well as yard surfaces, infrastructure or artefact deposits. More extensive impacts however are likely to have resulted from preparatory ground works for the construction of [8]. The study area would have originally sloped towards the south-west and providing ground floor access to [8] from the rear

No.	Development/Phase	Disturbances on Previous Phases
		yard of [5] would have required cutting into the ground level.
9	Masonry Building [9]. Development off Trafalgar Place intensified during the late nineteenth and early twentieth centuries. Residential uses were supplanted by offices, stores and warehouses. Building [9] was a two-storey building fronting the street.	Building [9] may have had some impact on the previous building [7] in this location but is unlikely to have removed all archaeological evidence of previous phases of development.

Table 4: Phase 3 Development

4.2.4 Phase 4: 1912-c.1981

Figure 28: Overlay showing development in the study area from 1912-c.1981 (LIST Map, © State of Tasmania).

No.	Development/Phase	Disturbances on Previous Phases
10, 8	Bank of New South Wales [10]. The former Hamilton Building [5] was demolished and replaced by a two-storey masonry building in 1912 [10]. Former Store Building [8]. The Store Building was retained as part of the Bank development. Its northern end was removed in c.1936 to provide for extensions to the rear of the bank building [10]. These works resulted in built development covering the entire lot. The southern end of [8] was retained as part of these works, although it would appear that further ground works were carried out to provide level access off Elizabeth Street.	[10] was the second phase of substantial masonry development on the site. It is likely to have had a significant impact on archaeology related to the former Hamilton Building [5], and to have removed any evidence of the original timber building [1], had it survived to this date. Rear extensions (and associated preparatory ground works) to [10] in c.1936 are likely to have impacted yard surfaces and associated archaeological deposits from previous phases. The southern half of the store building [8] was retained in this period, although previous phases of archaeology in this location are likely to have already been compromised through preparatory works associated with the construction of [8].
11	Palace Theatre [11]. The old Auction Mart building [4] was demolished and replaced by a three-storey masonry cinema in 1914 [11]. Small single storey brick buildings were located at the rear of the Theatre.	[11] was the second phase of substantial masonry development on the site. The large scale of the building is likely to have had a significant impact on archaeology related to the former Auction Mart [4], and to have removed any evidence of the original timber building [1], had it survived to this date. [11] and associated lean-to structures covered the entire lot and are likely to have impacted yard surfaces and associated archaeological deposits

No.	Development/Phase	Disturbances on Previous Phases
		from previous phases.

Table 5: Phase 4 Development

4.2.5 Phase 5: c.1981-2015

Figure 29: Overlay showing development in the study area from c.1981-2015 (LIST Map, © State of Tasmania).

No.	Development/Phase	Disturbances on Previous Phases
12, 13	Westpac Building [12]. The old bank [10] and former cinema [11] were demolished in the early 1980s and replaced by the current three-storey brick and concrete framed building [12]. A two-storey 'mews' type building at the rear of the site formed part of the development [13]. Building plans for the c.1981 bank have not been retained within archival collections and therefore detailed information regarding excavation depths for [12] and [13] are not known.	Although detailed plans or specifications have not been located, the construction of [12] and [13] are likely to have removed all substantial archaeological evidence of previous phases of use and development on the site. Some remnant structural evidence (e.g., footings) of the 1912 bank [10] and cinema [11] may have survived these works at the Elizabeth Street end of the site where less excavation was required. However evidence of [10] and [11] in this locality is likely to relatively minor and compromised. Differences between street and finished floor levels indicate the scale of excavation works carried out on the site in preparation for the construction of the current building [12] and [13]. The extent of excavations was substantial, particularly towards the south-western end of the site, where the finished ground floor level of [12] is approximately 2.11 m below the Trafalgar Place street level outside. This depth of excavations would not account for further areas of excavation associated with the lift wells, footings, services and so on. Deeper excavations occurred within [13], with the finished floor level approximately 75 cm deeper than the ground floor of [12].

Table 6: Phase 5 Development

4.3 Assessment of Archaeological Potential

An assessment of archaeological potential attempts to establish the likelihood of archaeological features or deposits to exist at a particular place, and provide a level of judgment as to their likely surviving integrity.

In this case it is a question of whether evidence of previous phases of development have survived the twentieth century redevelopment. The likelihood of the place retaining substantial or meaningful evidence of earlier use and development is assessed as low.

The 1912 bank building and 1914 cinema are likely to have disturbed or destroyed structural evidence of the two masonry buildings which existed on the site and fronted Elizabeth Street. However these works may not have removed all archaeological evidence towards the rear of the site which may have contained yard surfaces and deposits, infrastructure such as drains, and areas of excavation such as cess or rubbish pits.

Preparatory ground works for the existing c.1981 former bank building are highly likely to have removed or substantially impacted all previous phases of development on the site. This judgment has been based on the extent of cutting undertaken, particularly at the south-western end of the lot where cuttings in excess of 2.11 m are evident between the finished floor levels and the Trafalgar Place street level above. Excavations at the Elizabeth Street end of the site are likely to have been shallower, and remnant, albeit highly disturbed evidence of the 1912 bank and 1914 cinema may be located towards the street frontage. However, archaeology from these two buildings is likely to be highly compromised, nor would such evidence meaningfully contribute to the knowledge of the site and its history of banking and places of entertainment.

Given the scale of the 1980s works the only archaeological features which may have partially survived would have been very deep services or infrastructure, such as wells or deep cess pits. However there is no historical evidence to suggest that infrastructure such as wells existed on the site, whilst the 1981 geotechnical investigations found no evidence of groundwater in subsurface conditions, which also indicates a low probability of wells ever existing on the site.

The *Hobart Interim Planning Scheme 2015* (*HIPS 2015*) identifies that a Statement of Archaeological Potential should contain an archaeological sensitivity overlay plan depicting the extent of likely surviving important archaeological evidence. No important archaeological evidence is likely to survive at 28-32 Elizabeth Street and therefore an archaeological sensitivity plan is not warranted in this instance.

4.4 Archaeological Significance

The assessment of significance is a key part the historic heritage assessment process. Through the historical research it is possible to build up an understanding of the study area, plotting where buildings or activities may have once been (potential), understanding how they may have evolved across the course of the historic period, or to what specific people or events they may be related. Through this process of contextualisation it is possible to gauge the importance of a site or place, thereby forming judgements about its significance (including its research potential), which provides the basis for determining management actions.

The *HIPS 2015* defines ‘historic cultural heritage significance’ as having the same meaning as provided in *Historic Cultural Heritage Act 1995* (*HCHA 1995*), which defines significance in terms of eight registration criteria.[63] These criteria relate to places of ‘State’ heritage significance, but can equally be used for the purposes of assessing places of ‘local’ heritage significance. Threshold levels for distinguishing between places of State and local level significance are defined by way of assessment guidelines.[64]

Criterion (c.), is the most commonly used criterion for assessing archaeological values, requiring an evaluation of the research potential of the place to yield information that will contribute to an understanding of Tasmania’s history. However, archaeological sites will commonly also have significance against a range of other criteria.

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[63] *HIPS 2015*, cl.E13.3; *HCHA 1995*, s.3

[64] Tasmanian Heritage Council, *Assessing historic heritage significance for Application with the Historic Cultural Heritage Act 1995*

4.4.1 Statement of Archaeological Significance

The site is assessed as not having archaeological significance at either State or local levels. Late twentieth century redevelopment of the property is likely to have destroyed or substantially impacted on previous phases of historic use and development. The place has low potential to provide new and important information related to Tasmania's history, and in particular the continued evolution of Hobart's central business district for commercial purposes.

The site has some historical interest and association with significant developments or individuals. This includes important commercial enterprises (the Auction Mart, Hamilton building, 1912 Bank of New South Wales), places of entertainment (the short-lived Palace Theatre), and associations with prominent architects who either worked from buildings located on the site, or were responsible for the design of such buildings.

The nature of these associations are only evident through the historical record and are not demonstrated by, or are highly unlikely to be demonstrated by any significant fabric which has been removed by subsequent developments. These associations are considered to be of historical interest and not historical significance within formal assessment frameworks.

5.0 ARCHAEOLOGICAL IMPACT ASSESSMENT

5.1 Planning Scheme Requirements

In addition to any other application requirements, the planning authority may require the applicant to provide an archaeological impact assessment to determine compliance with the performance criteria. An 'archaeological impact assessment' is defined by the *HIPS 2015* to mean:

> A report prepared by a suitably qualified person that includes a design review and describes the impact of proposed works upon archaeological sensitivity (as defined in a statement of archaeological potential).[65]

These requirements are considered below.

5.2 Design Review and Assessment of Archaeological Impacts

A Design Review is a means of quantifying the extent of impacts to areas of archaeological potential which assists in determining an archaeological strategy and management techniques.

At the time of reporting, detailed information related to the proposed development is not available. However sufficient information does exist to quantify the likely extent of ground works which will be required for the proposed hotel.

Based on knowledge of geotechnical conditions, footings will generally be founded approximately 2 m below the existing ground levels. Footings on the side property boundaries adjacent to existing buildings will need to be deeper, extending to depths of approximately 4 m. At this stage, it is anticipated that pad footings varying in size up to 3 x 3 m^2 and larger pads under stairs and lift cores will be required.[66]

The extent of these footings is shown in the preliminary plan below (Figure 30). It indicates strip footings located around the perimeter of the site, pad footing sites located within the interior of the space and areas of excavation required for the three lifts and stair network. Excavations will also be required for an underground pump room to be located along the south-eastern boundary of the lot, and a basement level on Elizabeth Street (Figure 31).

The proposed finished ground floor level will be between 10.45 - 10.80 m, which is similar to the floor level for the existing building and will maintain the largely level access off Elizabeth Street.

The extent of likely excavations required for this development will be substantial in both area and depth. They are likely to extend beyond the depths of excavation carried out for the c.1981 building. The footings within the interior of the building and its perimeter will require the area of new excavation to be significant.

Despite the substantial nature of the proposed ground works, the likelihood of them impacting on archaeological features or deposits is assessed as being low. This conclusion is based on the low likelihood of significant archaeology having survived the construction of the c.1981 works. Some potential exists for the proposed hotel works to encounter archaeology associated with the 1912 and 1914 buildings along the Elizabeth Street frontage. However, such archaeology should it exist is likely to have already been highly compromised.

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[65] *HIPS 2015*, cl.E13.3

[66] Email, Richard Lawrence (Gandy and Roberts) to James Puustinen (Austral Tasmania) 12 July 2015; Email, Richard Lawrence (Gandy and Roberts) to James Puustinen (Austral Tasmania) 29 2015

Figure 30: Ground Floor Plan (Jaws Architects).

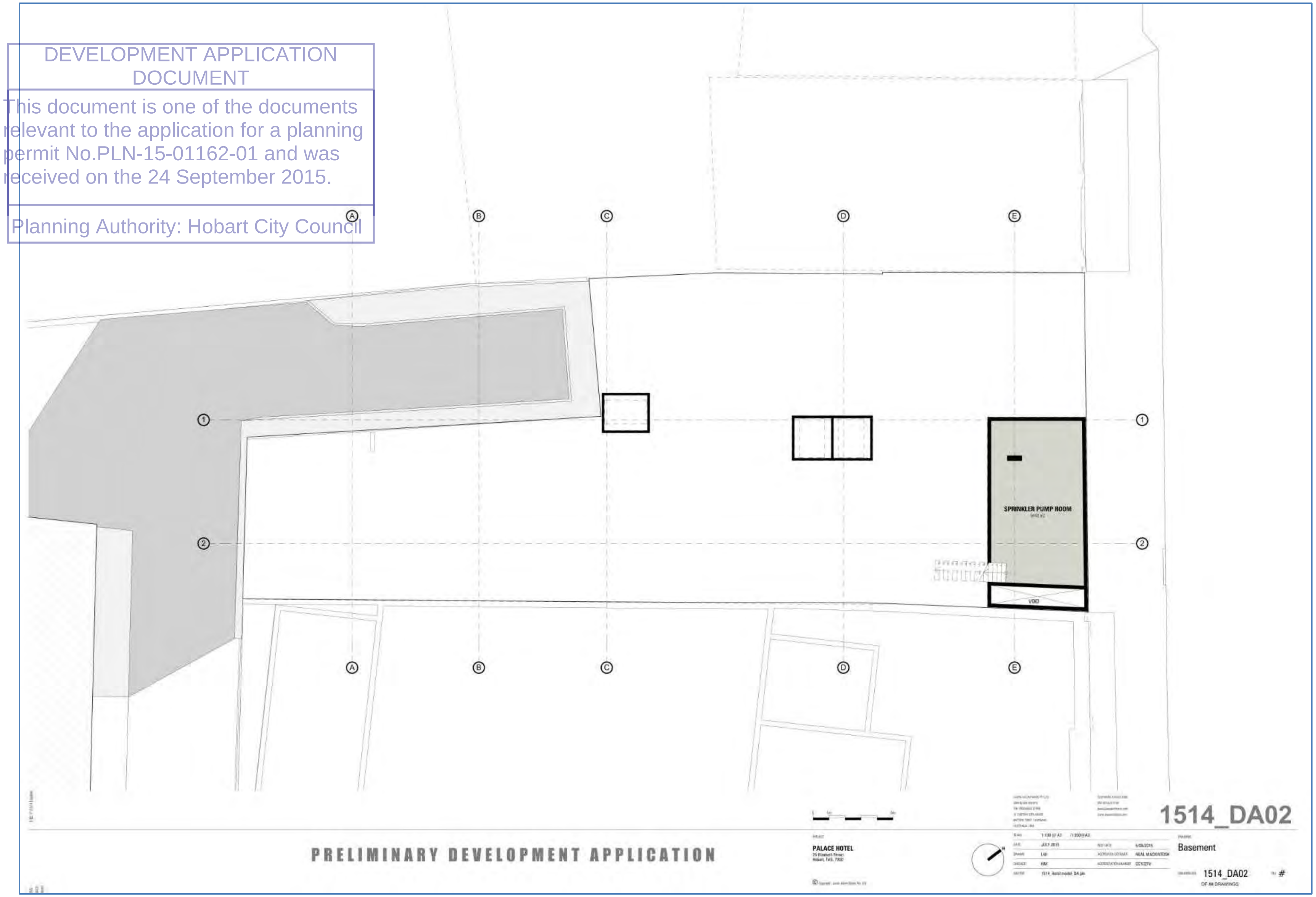

Figure 31: Location of Basement on Elizabeth Street frontage (Jaws Architects).

5.3 Assessment against the Performance Criteria

The proposal does not satisfy the acceptable solution of the development standards for 'Building, Works and Demolition'.[67] It must therefore be assessed against the performance criteria provided in clause E13.10.1. The standards emphasise the importance of protecting or managing places of archaeological potential. Each criterion is assessed in Table 7 below.

Performance Criteria	Response
Buildings, works and demolition must not unnecessarily impact on archaeological resources at places of archaeological potential, having regard to:	
(a) the nature of the archaeological evidence, either known or predicted;	• The assessment of archaeological potential for 28-32 Elizabeth Street is a predictive statement that has not been confirmed through physical investigations. • The assessment concludes that the place has a low likelihood of significant archaeological evidence surviving at the place, a result of the ground disturbances carried out in c.1981 for the construction of the current building which would have had substantial impacts on the archaeological resource of the place.
(b) measures proposed to investigate the archaeological evidence to confirm predictive statements of potential;	• No measures are proposed to investigate the predictive statements of potential as the place has been assessed as having low archaeological potential. • Management responses have been proposed in the Archaeological Method Statement (section 6.0), commensurate to this low level of potential and the unlikely scenario that significant archaeological features or deposits are located during works.
(c) strategies to avoid, minimise and/or control impacts arising from building, works and demolition;	• The Archaeological Method Statement recommends notification protocols to control potential impacts should archaeological features or deposits be located during works.
(d) where it is demonstrated there is no prudent and feasible alternative to impacts arising from building, works and demolition, measures proposed to realise both the research potential in the archaeological evidence and a meaningful public benefit from any archaeological investigation;	• Archaeological impacts arising from the proposed building are unlikely and therefore it is not necessary to define measures to realise research potential and derive a public benefit. • Management measures are considered appropriate for the low level of archaeological potential at the site.
(e) measures proposed to preserve significant archaeological evidence 'in situ'.	• Significant archaeological evidence is unlikely to exist at the site and therefore *in situ* preservation is not applicable.

Table 7: Assessment against the Performance Criteria of E13.10.1

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[67] *HIPS 2015*, cl.E13.3

6.0 ARCHAEOLOGICAL METHOD STATEMENT

6.1 Planning Scheme Requirements

In addition to any other application requirements, the planning authority may require the applicant to provide an archaeological method statement to determine compliance with the performance criteria. An 'archaeological method statement' is defined by the *HIPS 2015* to mean:

> a report prepared by a suitably qualified person that includes the following where relevant to the matter under consideration:
>
> a) strategies to identify, protect and/or mitigate impacts to known and/or potential archaeological values (typically as described in a Statement of Archaeological Potential);
> b) collections management specifications including proposed storage and curatorial arrangements;
> c) identification of measures aimed at achieving a public benefit;
> d) details of methods and procedures to be followed in implementing and achieving (a), (b) and (c) above;
> e) expertise to be employed in achieving (d) above;

The disturbance history (section 4.2), assessment of archaeological potential (section 4.3), and the assessment of archaeological significance (section 4.4) indicate that the place has been highly disturbed with a low potential of containing archaeological features or deposits, and as a result, does not have archaeological significance.

The recommendations made in this Method Statement have been prepared in response to this assessment of low archaeological potential. They address the *HIPS 2015* definition requirements as relevant.

6.2 Management Recommendations

Recommendation 1: Statutory Compliance

This Statement of Archaeological Potential, Impact Assessment and Method Statement should form part of the Development Application to Hobart City Council for the proposed development.

Reason for Recommendation

The property at 28-32 Elizabeth Street is located within the Place of Archaeological Potential defined by Figure E13.4.1 of the *HIPS 2015*. The proposed development does not satisfy the acceptable solution of the development standards for 'Building, Works and Demolition'. It must therefore be assessed against the performance criteria provided in clause E13.10.1.

Recommendation 2: Aboriginal Heritage

The Unanticipated Discovery Plan for managing Aboriginal heritage (Appendix 1) should form part of the project specifications.

Reason for Recommendation

Aboriginal Heritage Tasmania, DPIPWE have recommended that the Unanticipated Discovery Plan should be implemented should Aboriginal heritage be discovered or suspected during ground disturbance works.

Recommendation 3: Precautionary Approach to Excavations

For precautionary purposes, notification protocols should be included in the project specifications whereby archaeological advice is sought in the unlikely event that features or deposits of an archaeological nature[68] are uncovered during excavations as part of the proposed development or where doubt exists concerning the provenance of any strata revealed during excavations. In such instances, excavation should immediately cease pending attendance on site and receipt of advice from a qualified archaeologist, at which point, depending on the findings, it may also be necessary to involve Hobart City Council in discussions.

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[68] This may include but not be limited to the exposure of hand made clay bricks or sandstone blocks forming walls or surfaces, or artefacts such as fragments of ceramic, bottle glass, bone, shell or other items.

Reason for Recommendation

The site is assessed as having low archaeological potential because of previous impacts. Some caution should however be exercised during excavations and appropriate archaeological expertise employed to appropriately identify, assess and propose management techniques as required.

Recommendation 4: Managing Unanticipated Discoveries

Archaeological management will be required in the unlikely event that significant archaeological features or deposits are located during excavation works. Dependent on the nature and significance of the archaeological feature or deposit, consideration should be given as to whether the archaeological material can be conserved *in situ* as part of the development. Where this is not prudent and feasible, significant features or deposits should be archaeologically excavated, recorded and analysed in accordance with Parts 4 to 8 of the Tasmanian Heritage Council's Practice Note 2: *Managing Historical Archaeological Significance in the Works Application Process*. Archaeological management approaches should be endorsed by Hobart City Council.

Reason for Recommendation

To ensure that significant archaeological features or deposits are appropriately managed as part of the development, and are subject to approval from Hobart City Council. The Heritage Council's Practice Note 2 establishes the broadly accepted standards and framework for archaeological excavation, recording and analysis in Tasmania.

Recommendation 5: Interpretation Opportunities

Consideration should be given to creative interpretation responses to present the history of the place as part of the proposed development.

Reason for Recommendation

The place is not assessed as having archaeological or historical significance within a formal assessment framework. However the history of the site is of some historical interest as a demonstration of the continued evolution of Hobart's central business district. Opportunities to creatively present this history to users and visitors should be considered.

7.0 REFERENCES

7.1 Secondary Materials

7.1.1 Published & Unpublished Sources

Aboriginal Heritage Tasmania, Department of Primary Industries, Parks, Water and Environment, *Unanticipated Discovery Plan for proponents and consultants dealing with Aboriginal Heritage in Tasmania*

Aboriginal Relics Act 1975

Alexander, A, Petrow, S, 'Hobart', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

Austral Archaeology, *Archaeological Investigation of the Hobart Magistrates' Court*, report prepared for the Tasmanian Department of Justice, Hobart, 1994

Bonwick, J, *The Last of the Tasmanians; or, the Black War of Van Diemen's Land*, Sampson Low, Son & Marston: London, 1870

Boyce, J, *Van Diemen's Land*, Black Inc.: Melbourne, 2008, pp. 67-68, 105-106; McFarlane, I, 'Frontier Conflict', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

Brown, S, *Aboriginal Archaeological Resources in South East Tasmania. An Overview of the Nature and Management of Aboriginal Sites*, National Parks & Wildlife Service Tasmania, Occasional Paper No. 12, April 1986

Chapman, P, 'Bethune, Walter Angus (1794–1885)', *Australian Dictionary of Biography*, National Centre of Biography, Australian National University, http://adb.anu.edu.au/biography/bethune-walter-angus-1775/text1991, published first in hardcopy 1966

Cyclopedia of Tasmania (illustrated): an historical and commercial review: descriptive and biographical etc, Maitland and Krone: Hobart, 1900

Environment Protection and Biodiversity Conservation Act 1999

Gough, J, 'Oyster Cove', in Alexander, A, (ed.), *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

Historic Cultural Heritage Act 1995

Hobart Interim Planning Scheme 2015

Jacobson, A, 'Picture Theatres', in *The Companion to Tasmanian History*, Centre for Tasmanian Historical Studies, University of Tasmania: Hobart, 2005

Koch, C, Winter, G, 'Koch, Wilhelm Rudolph Waldemar (1874–1952)', *Australian Dictionary of Biography, National Centre of Biography*, Australian National University, http://adb.anu.edu.au/biography/koch-wilhelm-rudolph-waldemar-13031/text23561, published first in hardcopy 2005

Maynard, L, *A Report on the Social, Cultural & Historical Connection of Aboriginal People to Hobart and it's Surrounds*, unpublished report for Housing Tasmania, TALSC, TAC, AHT, July 2010

McNeill, B, Woolley, L, *Architecture from the Edge. The 20th Century in Tasmania*, Montpelier Press, North Hobart, 2002

Officer, I, *Survey of Derwent River Aboriginal Midden and Quarry Sites*, unpublished dissertation to the Environmental Department of the Division of Teacher Education, October 1980

'Our History', http://www.westpac.com.au/about-westpac/westpac-group/company-overview/our-history/

Ryan, L, *The Aboriginal Tasmanians*, Allen & Unwin: St Leonards, 1996

Smith, B, *Australia's Birthstain: the Startling Legacy of the Convict Era*, Allen and Unwin, Crows Nest, NSW, 2008

Solomon, R.J. *Urbanisation: the Evolution of an Australian Capital*, Angus and Robertson Publishers, Sydney, 1976

Tasmanian Heritage Council, *Assessing historic heritage significance for Application with the Historic Cultural Heritage Act 1995*

Thorne, R, *Cinemas of Australia: via USA*, Architecture Department, Sydney University, 1981

Walker, JB, 'The English at the Derwent and the Risdon Settlement', *Early Tasmania: Papers Read before the Royal Society of Tasmania during the Years 1888 to 1899*, John Vail Government Printer, Hobart

7.1.2 Newspapers

Colonial Times, Tuesday 11 June 1833, p.1

Colonial Times, Tuesday 7 October 1834, p.8

Colonial Times, Saturday 15 February 1845, p.2

Colonial Times, Friday 29 January 1847, p.2

Colonial Times, Friday 12 January 1849, p.3

Daily Telegraph, Wednesday 3 June 1914, p.4

Daily Telegraph, Saturday 6 June 1914, p.8

Daily Telegraph, Friday 25 September 1914, p.8

The Examiner, 3 June 1914, p.5

The Hobart Town Courier, Saturday 5 January 1828, p.2

The Hobart Town Courier, Friday 3 January 1834, p.1

The Hobart Town Courier, Friday 1 May 1835, p.1

The Hobart Town Courier, Friday 15 December 1837, p.1

The Hobart Town Courier and Van Diemen's Land Gazette, Friday 29 May 1840, p.2

The Hobart Town Gazette and Southern Reporter, Saturday 19 June 1819, p.1S

The Hobart Town Gazette and Southern Reporter, Saturday 10 July 1819, p.1

Hobart Town Gazette and Van Diemen's Land Advertiser, Saturday 23 November 1822, p.1S

Hobart Town Gazette and Van Diemen's Land Advertiser, Saturday 12 May 1821, p.1

Hobart Town Gazette and Van Diemen's Land Advertiser, Saturday 13 April 1822, p.1S

Hobart Town Gazette and Van Diemen's Land Advertiser, Friday 5 November 1824, p.1

Hobart Town Gazette, Saturday 25 June 1825, p.4

Hobart Town Gazette, Saturday 22 October 1825, p.2

The Mercury, Friday 20 December 1861, p.2

The Mercury, Friday 25 May 1866, p.4

The Mercury, Friday 18 February 1870, p.2

The Mercury, Friday 9 December 1870, p.2

The Mercury, Friday 1 March 1878, p.1

The Mercury, Thursday 4 April 1878, p.2

The Mercury, Tuesday 3 October 1882, p.2

The Mercury, Thursday 10 August 1911, p.5

The Mercury, Saturday 23 March 1912, p.5

The Mercury, Thursday 30 April 1914, p.3

The Mercury, Monday 1 June 1914, p.3

The Mercury, Wednesday 3 June 1914, p.8

The Mercury, Tuesday 9 January 1917, p.4

The Mercury, Monday 2 February 1920, p.6

The Mercury, Wednesday 23 March 1921, p.7

The Mercury, Monday 27 August 1923, p.7

The Mercury, Saturday 5 January 1924, p.8

The Mercury, Saturday 30 May 1925, p.13

The Mercury, Monday 31 July 1933, p.6

The Mercury, Wednesday 25 March 1981, p.30

The Tasmanian Mail, 22 August 1896, p.17

Trumpeter General, Friday 28 March 1834, p.4

7.2 Primary Materials

7.2.1 Published Sources

Lloyd, GT, *Thirty-three years in Tasmania and Victoria*, Houlston and Wright: London, 1862 Nicholls,

Mary (ed.), *The Diary of the Reverend Robert Knopwood 1803-1808. First Chaplain of Tasmania*, Tasmanian Historical Research Association: Hobart, 1977

Plomley, NJB, (ed.), *Friendly Mission. The Tasmanian Journals and Papers of George Augustus Robinson 1829-1834*, Tasmanian Historical Research Association: Kingsgrove, NSW, 1966

Ross, J, *Van Diemen's Land Anniversary and Hobart Town Almanack for the Year 1831*, James Ross: Hobart-Town, Van Diemen's Land, 1829

Thornley, W, *The Adventures of an Emigrant in Van Diemen's Land*, Rigby Ltd: Australia, 1842, republished 1973

Widowson, H, *Present State of Van Diemen's Land*, S Robinson, W Joy, J Cross, J Birdsall: London, 1829

7.2.2 Archival Materials

TAHO, AE417/1/1936, 28 Elizabeth Street (Bank), 6326

TAHO, AE417/1/6135, 28 Elizabeth Street (11032)

TAHO, AE417/3/2596, 28 Elizabeth Street, Alterations (18861)

TAHO, AE417/3/3450, 28 Elizabeth Street, Garage (19739)

TAHO, AE417/4/52, 28 Elizabeth Street, Alterations (19828)

TAHO, AE417/6/1446, 30 Elizabeth Street, Bank of New South Wales, Additions (76488)

TAHO, AE417/8/499, 28-32 Elizabeth Street, Westpac Banking Corp, Alterations (84109)

TAHO, CSO1/1/323/7578, Evidence of Robert Jones to Thomas Anstey, 15 March 1830

TAHO, LSD355/1/7, Surveyor Meehan's Survey Notes, 1811, 1813

TAHO, LSD417/1/19, Register of Lots in Hobart 1804-24

TAHO, SC309/1/125, Applications for Grants: John Briggs

TAHO, SC309/1/343, Applications for Grants: Ann McCarthy

TAHO SC286/1/13, Applications for Grants - Disputed Claims

7.2.3 Deeds and Title Documents

Deed, 2/5150, Memorial of Indenture, Ann McCarthy, David Lord and George Frederick Read, 31 January and 1 February 1841

Deed, 2/5075(2), Memorial of Indenture, Ann McCarthy, William Morgan Orr, 31 January and 1 February 1842

Deed, 2/5755, Memorial of Indenture, William Morgan Orr and William Hamilton, 1 & 2 September 1842

Deed, 13/1707, Memorial of Indenture Clyde Hamilton & Ors, Palace Theatres, 30 October 1913

Certificate of Title 193/16, 2 May 1911

7.2.4 Historic Plans, Images etc

CPO, Hobart Plan 131

CPO, Hobart Plan 104

CPO, Hobart Plan 5

CPO, Sprent's Book Page 63

Royal Society Collection, University of Tasmania Special and Rare Collections, , Palace Theatre - Box Plan, RS73

TAHO, Elizabeth St. from Macquarie St. [Hobart], AUTAS001126183102, Allport Library and Museum of Fine Arts

TAHO, PH10/1B, Photographs (2) - Nickolls & Simmonds - 16 Elizabeth Street and John Hamilton & Co - Merchants & Importers, 6 Elizabeth Street

TAHO, Hobart Streets Elizabeth collection of postcards, AUTAS0016125413211, Tasmaniana Library

TAHO, Hobart City Council Metropolitan Drainage Board, Hobart Detail Plan No.04 (City Centre), 1905

TAHO, *Tasmanian Mail*, 15 August 1912, p.18

TAHO, NS892/1/64, Photograph - Hobart - aerial view over city bounded by Wharves, Domain, Elizabeth and Collins Street looking towards wharves from above intersection of Collins and Elizabeth Street

TAHO, Hobart buildings theatrical and recreational: collection of postcards, Tasmaniana Library, AUTAS0016125395681

TAHO, NS869/1/425, Photograph - Hobart - Palace Theatre - Elizabeth Street - c 1920s

7.2.5 Personal Communications

Email, Kym Plischke (Heritage Tasmania) to James Puustinen (Austral Tasmania), 3 June 2015

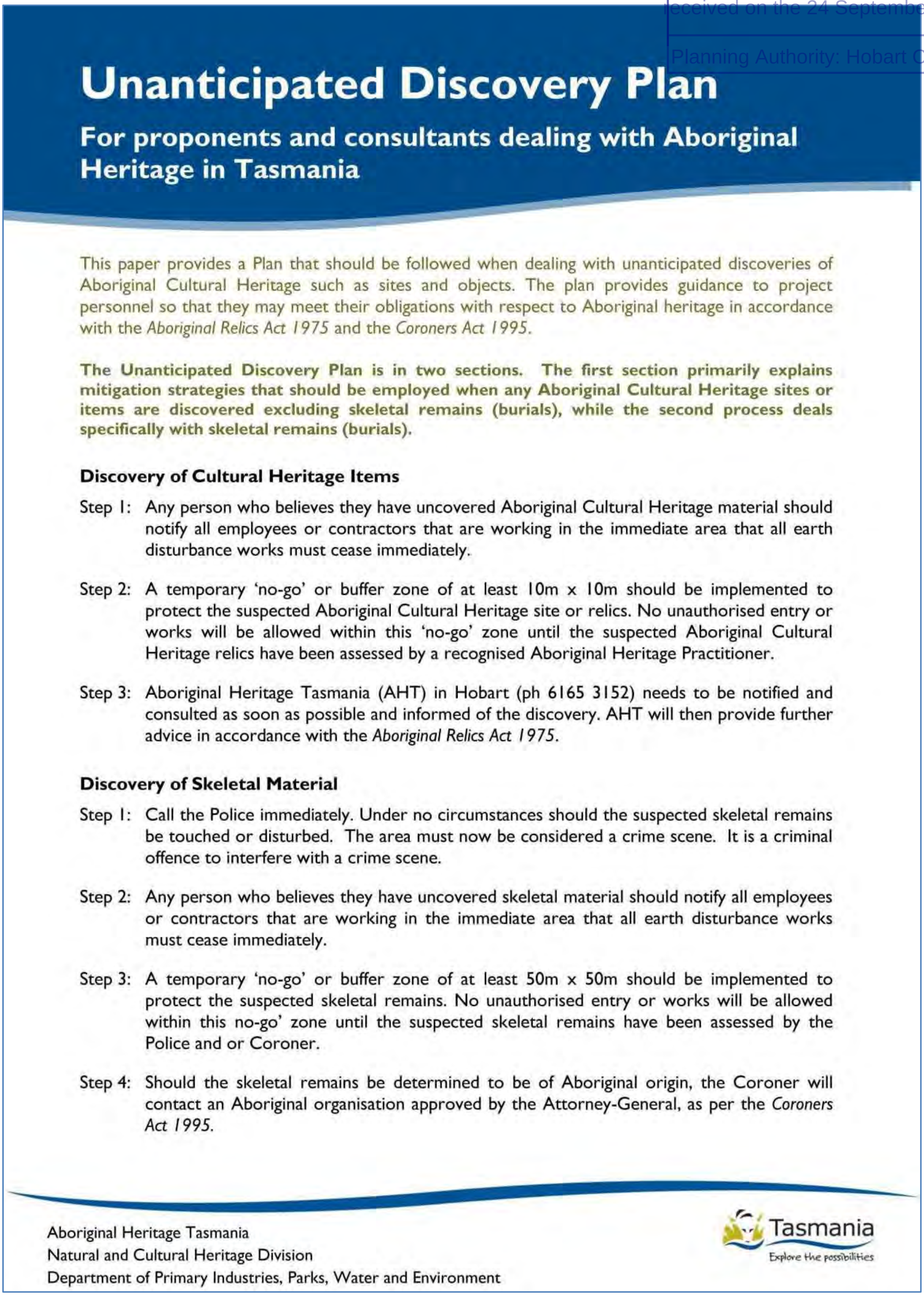
Email, Neal Mackintosh (JAWS Architects) to James Puustinen (Austral Tasmania), 26 May 2015

Email, Richard Lawrence (Gandy and Roberts) to James Puustinen (Austral Tasmania) 12 July 2015

Email, Richard Lawrence (Gandy and Roberts) to James Puustinen (Austral Tasmania) 29 July 2015

Email, Samuel Dix (Aboriginal Heritage Tasmania) to James Puustinen (Austral Tasmania), 19 May 2015: AHTP2293 - Archaeological Potential, Impact & Method Statement - 28-32 Elizabeth Street, Hobart

APPENDIX 1: UNANTICIPATED DISCOVERY PLAN



Unanticipated Discovery Plan

For proponents and consultants dealing with Aboriginal Heritage in Tasmania

This paper provides a Plan that should be followed when dealing with unanticipated discoveries of Aboriginal Cultural Heritage such as sites and objects. The plan provides guidance to project personnel so that they may meet their obligations with respect to Aboriginal heritage in accordance with the *Aboriginal Relics Act 1975* and the *Coroners Act 1995*.

The Unanticipated Discovery Plan is in two sections. The first section primarily explains mitigation strategies that should be employed when any Aboriginal Cultural Heritage sites or items are discovered excluding skeletal remains (burials), while the second process deals specifically with skeletal remains (burials).

Discovery of Cultural Heritage Items

Step 1: Any person who believes they have uncovered Aboriginal Cultural Heritage material should notify all employees or contractors that are working in the immediate area that all earth disturbance works must cease immediately.

Step 2: A temporary 'no-go' or buffer zone of at least 10m x 10m should be implemented to protect the suspected Aboriginal Cultural Heritage site or relics. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected Aboriginal Cultural Heritage relics have been assessed by a recognised Aboriginal Heritage Practitioner.

Step 3: Aboriginal Heritage Tasmania (AHT) in Hobart (ph 6165 3152) needs to be notified and consulted as soon as possible and informed of the discovery. AHT will then provide further advice in accordance with the *Aboriginal Relics Act 1975*.

Discovery of Skeletal Material

Step 1: Call the Police immediately. Under no circumstances should the suspected skeletal remains be touched or disturbed. The area must now be considered a crime scene. It is a criminal offence to interfere with a crime scene.

Step 2: Any person who believes they have uncovered skeletal material should notify all employees or contractors that are working in the immediate area that all earth disturbance works must cease immediately.

Step 3: A temporary 'no-go' or buffer zone of at least 50m x 50m should be implemented to protect the suspected skeletal remains. No unauthorised entry or works will be allowed within this no-go' zone until the suspected skeletal remains have been assessed by the Police and or Coroner.

Step 4: Should the skeletal remains be determined to be of Aboriginal origin, the Coroner will contact an Aboriginal organisation approved by the Attorney-General, as per the *Coroners Act 1995*.

Aboriginal Heritage Tasmania
Natural and Cultural Heritage Division
Department of Primary Industries, Parks, Water and Environment

Tasmania
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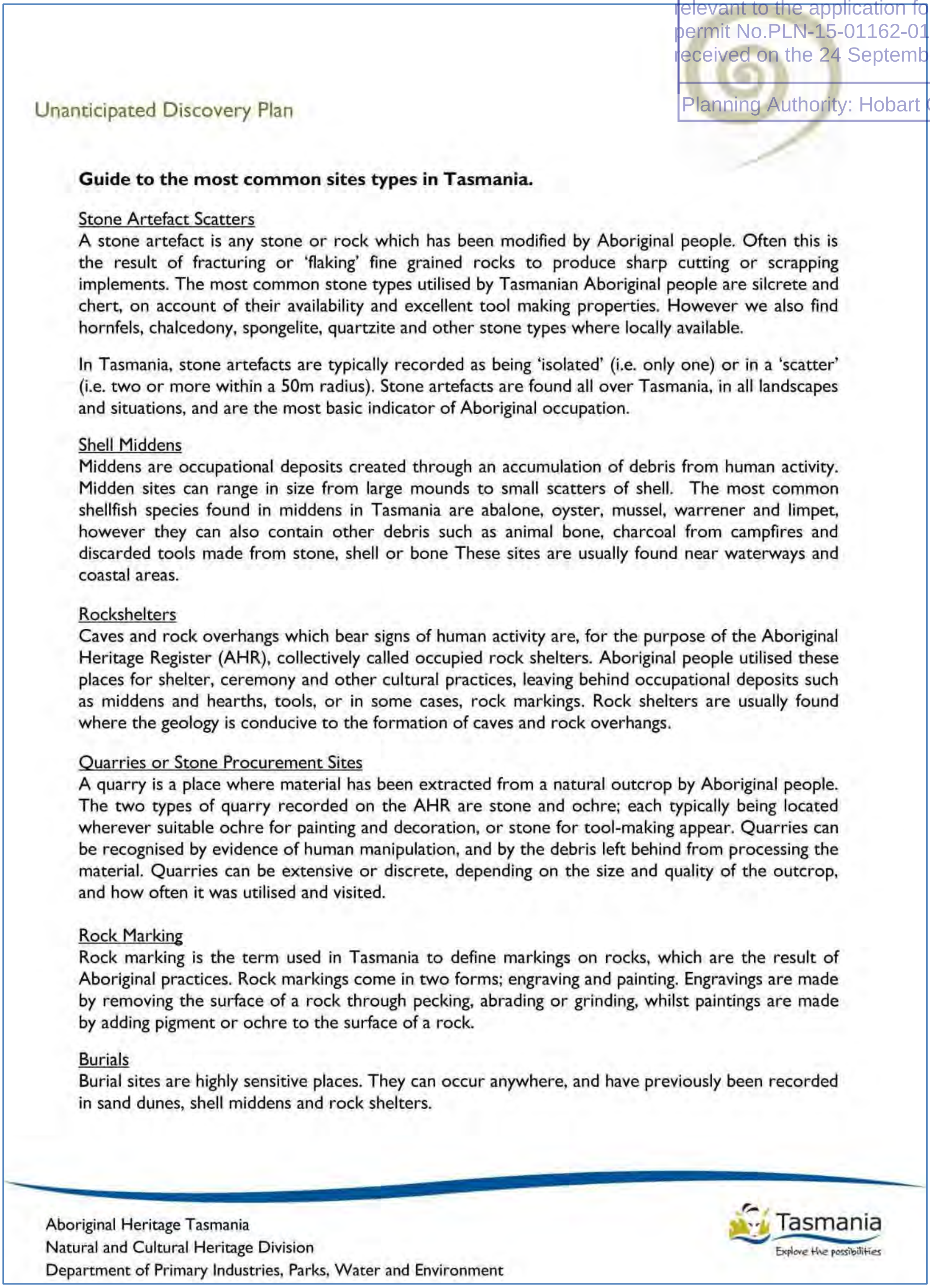

Unanticipated Discovery Plan

Guide to the most common sites types in Tasmania.

Stone Artefact Scatters

A stone artefact is any stone or rock which has been modified by Aboriginal people. Often this is the result of fracturing or 'flaking' fine grained rocks to produce sharp cutting or scrapping implements. The most common stone types utilised by Tasmanian Aboriginal people are silcrete and chert, on account of their availability and excellent tool making properties. However we also find hornfels, chalcedony, spongelite, quartzite and other stone types where locally available.

In Tasmania, stone artefacts are typically recorded as being 'isolated' (i.e. only one) or in a 'scatter' (i.e. two or more within a 50m radius). Stone artefacts are found all over Tasmania, in all landscapes and situations, and are the most basic indicator of Aboriginal occupation.

Shell Middens

Middens are occupational deposits created through an accumulation of debris from human activity. Midden sites can range in size from large mounds to small scatters of shell. The most common shellfish species found in middens in Tasmania are abalone, oyster, mussel, warrener and limpet, however they can also contain other debris such as animal bone, charcoal from campfires and discarded tools made from stone, shell or bone These sites are usually found near waterways and coastal areas.

Rockshelters

Caves and rock overhangs which bear signs of human activity are, for the purpose of the Aboriginal Heritage Register (AHR), collectively called occupied rock shelters. Aboriginal people utilised these places for shelter, ceremony and other cultural practices, leaving behind occupational deposits such as middens and hearths, tools, or in some cases, rock markings. Rock shelters are usually found where the geology is conducive to the formation of caves and rock overhangs.

Quarries or Stone Procurement Sites

A quarry is a place where material has been extracted from a natural outcrop by Aboriginal people. The two types of quarry recorded on the AHR are stone and ochre; each typically being located wherever suitable ochre for painting and decoration, or stone for tool-making appear. Quarries can be recognised by evidence of human manipulation, and by the debris left behind from processing the material. Quarries can be extensive or discrete, depending on the size and quality of the outcrop, and how often it was utilised and visited.

Rock Marking

Rock marking is the term used in Tasmania to define markings on rocks, which are the result of Aboriginal practices. Rock markings come in two forms; engraving and painting. Engravings are made by removing the surface of a rock through pecking, abrading or grinding, whilst paintings are made by adding pigment or ochre to the surface of a rock.

Burials

Burial sites are highly sensitive places. They can occur anywhere, and have previously been recorded in sand dunes, shell middens and rock shelters.

Aboriginal Heritage Tasmania
Natural and Cultural Heritage Division
Department of Primary Industries, Parks, Water and Environment

Tasmania
Explore the possibilities

APPENDIX 2: ASSESSMENT AND VALUATION ROLLS (SELECT)

(Original spellings reproduced)

1853

Address	Description	Occupier	Owner	Ratable Value	Capital Value
Elizabeth Street	Shop	W Hamilton	W Hamilton	£157	-
Elizabeth Street	Auction Mart	Robert Worley	J Solomon	£100	-

1855

Address	Description	Occupier	Owner	Ratable Value	Capital Value
Elizabeth Street	House and stores	William Casper and Henry Wolff	-	£200	-
Elizabeth Street	Auction Mart	Robert Worley & Thomas Frodsham	-	£140	-

1860

Address	Description	Occupier	Owner	Ratable Value	Capital Value
6 Elizabeth Street	House and shop	William Hamilton	William Hamilton	£80	-
8 Elizabeth Street	Auction Mart	Robert Worley	Joseph Solomon	£130	-

1865

Address	Description	Occupier	Owner	Ratable Value	Capital Value
6 Elizabeth Street	House and shop	William Hamilton	William Hamilton	£90	-
8 Elizabeth Street	Auction Mart	Robert Worley	Joseph Solomon	£85	-

1869

Address	Description	Occupier	Owner	Ratable Value	Capital Value
6 Elizabeth Street	Dwelling house and shop	William Hamilton	William Hamilton	£82	-
8 Elizabeth Street	Dwelling house and shop	Alfred Perry	Joseph Solomon, Liverpool Street	£15	-
8 Elizabeth Street	Auction Mart and Office	Thomas Alfred Dossitor	As Above	£52	

1875

Address	Description	Occupier	Owner	Ratable Value	Capital Value
6 Elizabeth Street	Dwelling house and shop	William Hamilton	William Hamilton	£82	-
8 Elizabeth Street	Dwelling house and shop	Thomas A Dossetor	Joseph Solomon, Liverpool Street	£15	-
8A Elizabeth Street	Auction Mart and Office	Thomas A Dossetor	As Above	£52	

1879

Address	Description	Occupier	Owner	Ratable Value	Capital Value
4 Elizabeth Street	Office and warehouse	John Hamilton	William Hamilton, New Town	£100	-
6 Elizabeth Street	Office and warehouse	Empty	Joseph Solomon, Liverpool Street	£80	-

1884

Address	Description	Occupier	Owner	Ratable Value	Capital Value
4 Elizabeth Street	Office and warehouse	John Hamilton	William Hamilton, Colville Road, E	£150	-
6 Elizabeth Street	Office and warehouse	Edward Chancellor	Joseph Solomon, Liverpool Street	£90	-

1889

Address	Description	Occupier	Owner	Ratable Value	Capital Value
12 Elizabeth Street	Office and warehouse	Clyde Hamilton & Albert EL McGregor	Mrs Hamilton, Colville Road	£140	-
14 Elizabeth Street	Office and warehouse	Edward Chancellor	Joseph Solomon, Argyle Street	£90	-

1895

Address	Description	Occupier	Owner	Ratable Value	Capital Value
12 Elizabeth Street	Office and warehouse	L McGregor & Alex. McGregor jun.	John G McGregor	£100	-
	Office	Horatio F Bourne	As above	£40	
	Office	Empty	As above	£13	
	Office	Empty	As above	£13	
	Office	Empty	As above	£26	
	Office	David T Brownlie	As above	£26	
	Office	George F Lovett	As above	£15	
14A Elizabeth Street	Office	R Flack Ricards	Joseph Solomon's estate	£30	-
14 Elizabeth Street	Office and warehouse	John Hamilton	As Above	£90	

1898

Address	Description	Occupier	Owner	Ratable Value	Capital Value
12 Elizabeth Street	Office and warehouse	Albert E McGregor & Alex. McGregor jun.	John G McGregor, Runnymede Street	£120	-
	Office	Horatio F Bourne	As above	£40	
	Office	Perceval Newton	As above	£13	
	Office	Thomas A Okines	As above	£13	
	Office	Thomas A Okines	As above	£26	
	Office	David T Brownlie	As above	£21	
	Office	Empty	As above	£13	
14A Elizabeth Street	Office	R Flack Ricards and Douglas G Salier	Joseph Solomon's estate	£30	-
	Office	John Hamilton, Secretary Grand Lodge of Tasmania	As Above	£12	
14 Elizabeth Street	Office and warehouse	Clyde Hamilton	As Above	£90	

1901

Address	Description	Occupier	Owner	Ratable Value	Capital Value
12 Elizabeth Street	Office and warehouse	Albert E McGregor & Alex. McGregor jun.	John G McGregor, Runnymede Street	£150	£5,000
	Office	Thomas A Okines	As above	£45	

	Office	Empty	As above	£13	
	Office	Empty	As above	£10	
	Office	Major L Hood	As above	£20	
	Office	Horatio F Bourne	As above	£21	
	Office	Empty	As above	£13	
14A Elizabeth Street	Office	Empty	Joseph Solomon's estate	£40	£2,200
	Office	John Hamilton, Secretary Grand Lodge of Tasmania	As Above	£10	
14 Elizabeth Street	Office and warehouse	John & Clyde. William Dickenson & Samuel Scollick	As Above	£90	
1905					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
12 Elizabeth Street	Office and warehouse	Albert E McGregor & Alex. McGregor	John G McGregor's estate; Albert EL and Alex. McGregor & Ronald Gunn, trustees	£150	£5,500
	Office	Thomas A Okines	As above	£45	
	Office	Empty	As above	£13	
	Office	Empty	As above	£10	
	Office	Rudolph Koch	As above	£20	
	Office	Frederick L Langford	As above	£21	
	Office	Major L Hood	As above	£20	
14A Elizabeth Street	Office	R Flack Ricards	Joseph Solomon's estate	£40	£2,600
	Office	John Hamilton, Secretary Grand Lodge of Tasmania	As Above	£10	
16 Elizabeth Street	Office and warehouse	John & Clyde. William Dickenson & Samuel Scollick	As Above	£90	
1910					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Office	Thomas A Okines	John G McGregor's estate; Albert EL and Alex. McGregor & Ronald Gunn, trustees	£45	£7,000
	Office	Empty	As above	£10	
	Office	Rudolph Koch	As above	£28	
	Office	Frederick L Langford	As above	£21	
	Office	T.A. Okines	As above	£10	
30 Elizabeth Street	Office and warehouse	Albert E McGregor & Alex. McGregor	As above	£150	
32 Elizabeth Street	Office and warehouse	John and Clyde Hamilton	Clyde Hamilton	£70	£4,000
	Office	Samuel Scollick	As Above	£50	
	Office	R Flack Ricards and Frank J Heyward	As Above	£40	
	Office	John Hamilton,	As Above	£10	

		Secretary Grand Lodge of Tasmania			
1915					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	James R Chapman	Bank of New South Wales	£335	-
	Part used as dwelling	As above	As Above	£25	
32 Elizabeth Street	Palace Theatre	-	Palace Pictures Ltd	£658	-
1920					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	James R Chapman	Bank of New South Wales	£350	-
	Part used as dwelling	As above	As Above	£25	
32 Elizabeth Street	Palace Theatre	-	Palace Pictures Ltd	£658	-
1924					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	GA Greenwood	Bank of New South Wales	£525	-
	Part used as dwelling	-	As Above	£25	
32 Elizabeth Street	Palace Theatre	-	Palace Pictures Ltd	£658	-
1930					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	G.A Whitehouse	Bank of New South Wales	£550	-
	Part used as dwelling	-	As Above	£25	
30 Elizabeth Street	Shop	Tasmanian Motor Tours and Eva Rust	Barnett Bros., Collins Street; CR Barnett, public officer	£278	-
32 Elizabeth Street	Shop	Henry E Round	As Above	£370	
	Shop	Mrs E Woolley	As Above	£175	
1934					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	G.H Whitehouse	Bank of New South Wales	£550	-
	Part used as dwelling	-	As Above	£25	
30 Elizabeth Street	Shop	Tasmanian Motor Tours and Eva Rust	Barnett Bros., Collins Street; CR Barnett, public officer	£278	-
32 Elizabeth Street	Shop	Henry E Round	As Above	£370	
	Shop	Mrs E Woolley	As Above	£175	
1939					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	GA Whitehouse	Bank of New South Wales	£675	-
	Part used as dwelling	MD Jeffrey	As Above	£25	

30 Elizabeth Street	Shop	Tasmanian Motor Tours and Eva Rust	Rita Dobson, c/o Perpetual Trustees	£281	-
32 Elizabeth Street	Shop	Henry E Round	As Above	£370	
	Shop	Miss E Woolley	As Above	£188	
1946					
Address	**Description**	**Occupier**	**Owner**	**Ratable Value**	**Capital Value**
28 Elizabeth Street	Bank of New South Wales	Bank of New South Wales	Bank of New South Wales	£675	-
	Part used as dwelling	MD Jeffrey	As Above	£25	
30 Elizabeth Street	Shop	Henry E Round	Rita Dobson, c/o Perpetual Trustees	£188	-
32A Elizabeth Street	Shop	Miss E Woolley	As Above	£166	
32 Elizabeth Street	Shop	Henry E Round	As Above	£437	

APPENDIX 3: TASMANIAN POST OFFICE DIRECTORIES 1890-1949 (SELECT)

1890-91

Address	Occupier	Business/Description
12 Elizabeth Street	Hamilton, McGregor & Co. (Clyde Hamilton & Albert McGregor)	Merchants
12 Elizabeth Street	John Hamilton, MHA	Agent for London & Lancashire Insurance Co.; Union Fire & Marine Insurance Co.; Mutual Life Association of Australia; also manger of Cascade Brewery & Hobart Gas Co.
14 Elizabeth Street	Robert F Ricards	Architect
14 Elizabeth Street	Edward Chancellor	Wine & Spirit merchant

1894-95

Address	Occupier	Business/Description
12 Elizabeth Street	DT Brownlie	Share broker
12 Elizabeth Street	HF Bourne	Share broker
12 Elizabeth Street	GF Lovett	Surveyor
12 Elizabeth Street	McGregor Brothers	Merchants
14 Elizabeth Street	Hamilton & Co (John)	Insurance Agents
14 Elizabeth Street	R Flack Ricards	Architect

1900

Address	Occupier	Business/Description
12 Elizabeth Street	DT Brownlie	Share broker
12 Elizabeth Street	Thomas A Okines	Solicitor
12 Elizabeth Street	HF Bourne	Share broker, Norwich Union Fire Office
12 Elizabeth Street	McGregor Brothers	Merchants &c. (& at Trafalgar Place). Victoria Insurance Co., McGregor Bros. agents
14 Elizabeth Street	Hamilton & Co (John)	Merchants & Insurance Agents. Agents for: London & Lancashire Insurance Co.; Manchester Fire Assurance Co.; Alliance Mutual & General Assurance Co.; Mutual Life Association of Australia; Ocean Accident & Guarantee Co.
14 Elizabeth Street	John Hamilton, Secretary	Grand Lodge of Tasmania (Freemasons)
14 Elizabeth Street	Douglas G Salier	Architect

1905

Address	Occupier	Business/Description
12 Elizabeth Street	R Koch	Architect (late Ulverstone)
12 Elizabeth Street	Thomas A Okines	Solicitor
12 Elizabeth Street	Major L Hood	Estate & commercial agent, Norwich Union Fire Insurance Society (F Leslie Langford, agent)
12 Elizabeth Street	McGregor Brothers	Merchants
12 Elizabeth Street	AEL McGregor	Consul for Belgium
14 Elizabeth Street	Hamilton & Co (John)	Merchants & Insurance Agents. Agents for: London & Lancashire Insurance Co.; Manchester Assurance Co.; Alliance

		Mutual & General Assurance Co.; Mutual Life Association of Australia; Ocean Accident & Guarantee Co.
14 Elizabeth Street	John Hamilton, Secretary	Grand Lodge of Tasmania (Freemasons)
14 Elizabeth Street	Hobart Fire Brigade	
14 Elizabeth Street	Richard R Flack	Architect
1910		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	Rudolph W Koch	Architect, FRVIA
28 Elizabeth Street	Thomas A Okines	Solicitor
28 Elizabeth Street	Leslie F Langford	Share broker
28 Elizabeth Street	Norwich Union Fire Insurance Society	F Leslie Langford, agent
28-30 Elizabeth Street	McGregor Brothers	Merchants
30 Elizabeth Street	AEL McGregor	Consul for Belgium
32 Elizabeth Street	EG Tempest Warman	Optician
32 Elizabeth Street	Hamilton & Co. (Jno)	Merchants & Insurance Agents. London & Lancashire Insurance Co.; Manchester Assurance Co
32 Elizabeth Street	John Hamilton, Secretary	Grand Lodge of Tasmania (Freemasons)
32 Elizabeth Street	Samuel Sollick	Manufacturers' Agent
32 Elizabeth Street	Richard R Flack	Architect
32 Elizabeth Street	Ricards & Heyward	Architects
32 Elizabeth Street	FJ Heywood [*sic*]	Tasmanian Association of Architects
1915		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	James R Chapman, Manager	Bank of New South Wales
32 Elizabeth Street	-	Hobart Picture Palace
1921		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	James R Chapman, Manager	Bank of New South Wales
32 Elizabeth Street	-	Hobart Picture Palace
1925		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	George A Greenwood, Manager	Bank of New South Wales
32 Elizabeth Street	-	Palace Picture Theatre
1930		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	George A Greenwood, Manager	Bank of New South Wales
30 Elizabeth Street	Webster, Rometch, Astor Motors Pty Ld	Booking Office
30 Elizabeth Street	-	Astor Motor Service
32 Elizabeth Street	Mrs ER Watts	Confectioner
32 Elizabeth Street	Annears Sedans	Booking Office
32 Elizabeth Street	New Norfolk Motor Service	Booking Office
32a Elizabeth Street	HE Round Pty Ltd	Grocers

1935		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	George A Whitehouse, Manager	Bank of New South Wales
30 Elizabeth Street	-	Tasmanian Motor Tours
30 Elizabeth Street	-	Blue Bird Luncheon Rooms
32 Elizabeth Street	Mrs E Woolley	Confectioner
32 Elizabeth Street	HE Round Pty Ltd	Grocers
1939		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	-	Bank of New South Wales
30 Elizabeth Street	-	Blue Bird Luncheon Rooms
32 Elizabeth Street	Miss E Woolley	Fruiterer & Confectioner
32 Elizabeth Street	HE Round Pty Ltd	Grocers
1945		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	G.E Hale, Manager	Bank of New South Wales
30-32 Elizabeth Street	HE Round Pty Ltd	Grocers
32 Elizabeth Street	Miss E Woolley	Fruiterer & Confectioner
1948		
Address	**Occupier**	**Business/Description**
28 Elizabeth Street	G.E Hale, Manager	Bank of New South Wales
30-32 Elizabeth Street	HE Round Pty Ltd	Grocers
32 Elizabeth Street	Miss E Woolley	Fruiterer & Confectioner
32 Elizabeth Street	Cook's Sedans	Motor Hire Service

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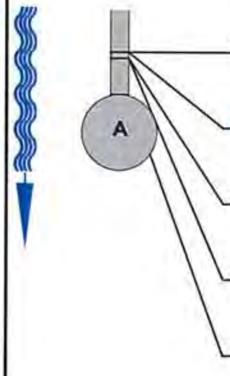
Inspection Report / Inspection: 1

Date : **26/08/2015**	Job number :	Weather : **No**	Operator : **Stu Knight**	Counter : **1**	Pipe Asset Id :
Present :	Vehicle :	Camera :	Preset :	Cleaned : **cleaned**	Rate :



1:252	Position	Code	Observation	MPEG	Photo	Str Rate
	33.50	JDA	Joint displaced angular , at 12 o'clock	00:13:38		
	33.50	JDL	Joint displaced longitudinaly, longitudinal displacement 21-30mm	00:13:40	1_17A	2
	33.70	CNPO	Connection, poor workmanship, connection appears to be open , height 100mm , PVC / PVC	00:14:04		
	33.70	CI	Intruding connection, magnitude of intrusion: <5% , at 11 o'clock	00:14:07	1_19A, b	
	34.90	FHMH	Finish node, maintenance hole, Nodename: A , at Bus Mall / at Bus Mall	00:14:40	1_20A, b	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
12	20	1.68	58.5	3	1	5	0.14	5	2

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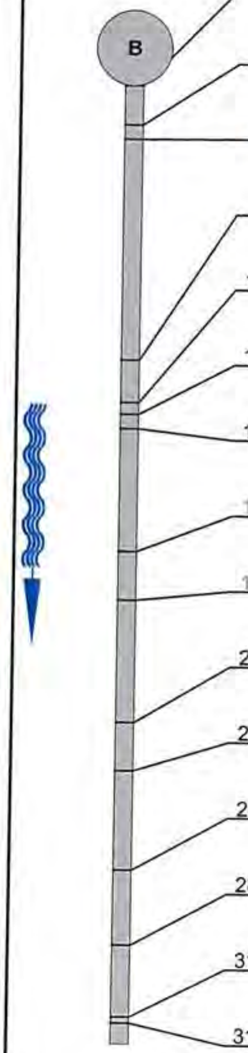
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **1**	Pipe Asset Id: **1**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Inside Face of the Wall**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**B**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**downstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**A**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**34.90 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**375.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**Reinforced concrete**

Remarks :



1:252 Position	Code	Observation	MPEG	Photo	Str Rate
0.00	STMH	Start node, maintenance hole, Nodename: B , rnd gatic lid (at Red Jelly entrance) / rnd gatic lid (at Red Jelly entrance)	00:00:00		
1.30	FC	Circumferential fracture , width 3mm , from 12 to 12 o'clock	00:02:45	1_2A	8
1.80	JDL	Joint displaced longitudinaly, longitudinal displacement 21-30mm	00:03:28		2
9.20	FC	Circumferential fracture, at joint, width 4mm , from 7 to 9 o'clock	00:05:41	1_4A	8
10.60	CNGO	Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock	00:06:23	1_5A, b	
11.00	CNGO	Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock	00:06:56	1_6A, b	
11.50	JDL	Joint displaced longitudinaly, longitudinal displacement 10-20mm	00:07:30		0.5
15.60	FC	Circumferential fracture , width 3mm , from 12 to 12 o'clock	00:08:20		8
17.20	FC	Circumferential fracture , width 5mm , from 12 to 12 o'clock	00:08:58	1_8A	8
21.30	JDL	Joint displaced longitudinaly, longitudinal displacement 10-20mm	00:10:05		0.5
22.90	SS	Spalling of the conduit fabric, localized chipping of one or more of each , Obstruction: <5% , from 12 to 2 o'clock	00:10:27	1_11A, b	20
26.20	JDL	Joint displaced longitudinaly, longitudinal displacement 10-20mm	00:11:32		0.5
28.70	JDL	Joint displaced longitudinaly, longitudinal displacement 10-20mm	00:12:07		0.5
31.10	JDL	Joint displaced longitudinaly, longitudinal displacement 10-20mm	00:12:36		0.5
31.30	RPH	Point repair, hole repaired , length: 300mm , from 1 to 5 o'clock	00:12:52	1_15A, b	

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Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

Photo: 1_2A, MPEG #: 260815_1, 00:02:45
1.3m, Circumferential fracture , width 3mm , from 12 to 12 o'clock

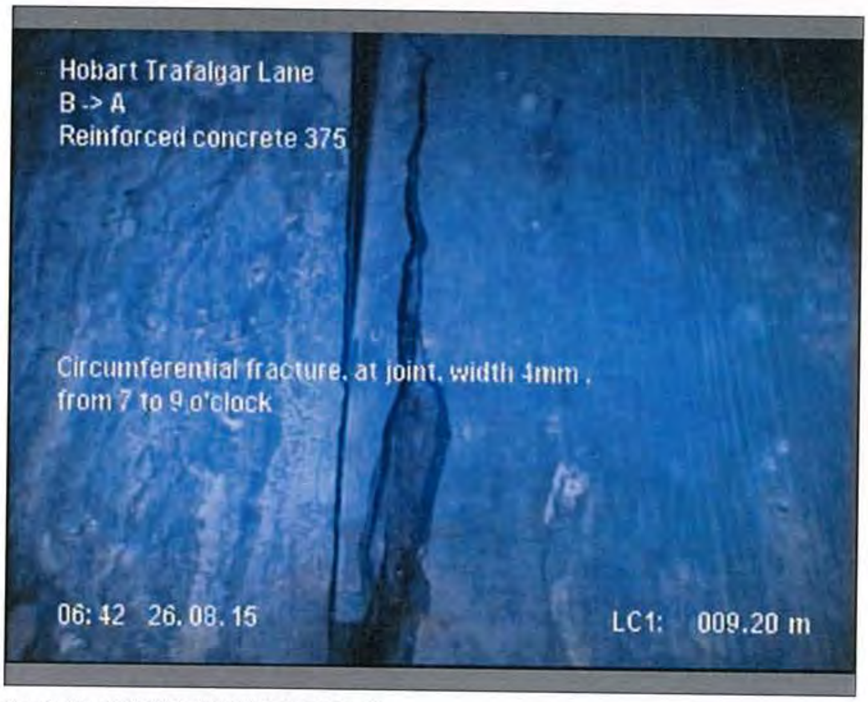

Photo: 1_4A, MPEG #: 260815_1, 00:05:41
9.2m, Circumferential fracture, at joint, width 4mm , from 7 to 9 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		26/08/2015	1	1

Photo: 1_5A, MPEG #: 260815_1, 00:06:23
10.6m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock

Photo: 1_5B, MPEG #: 260815_1, 00:06:23
10.6m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock

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Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

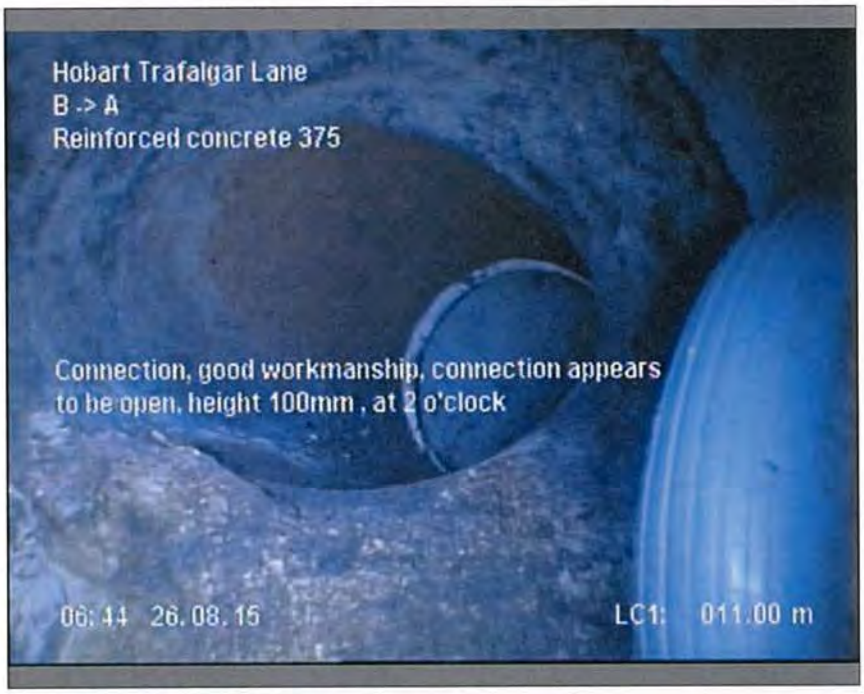

Photo: 1_6A, MPEG #: 260815_1, 00:06:56
11m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock

Photo: 1_6B, MPEG #: 260815_1, 00:06:56
11m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

Photo: 1_9A, MPEG #: 260815_1, 00:08:58
17.2m, Circumferential fracture , width 5mm , from 12 to 12 o'clock

Photo: 1_11A, MPEG #: 260815_1, 00:10:27
22.9m, Spalling of the conduit fabric, localized chipping of one or more of each , Obstruction: <5% , from 12 to 2 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

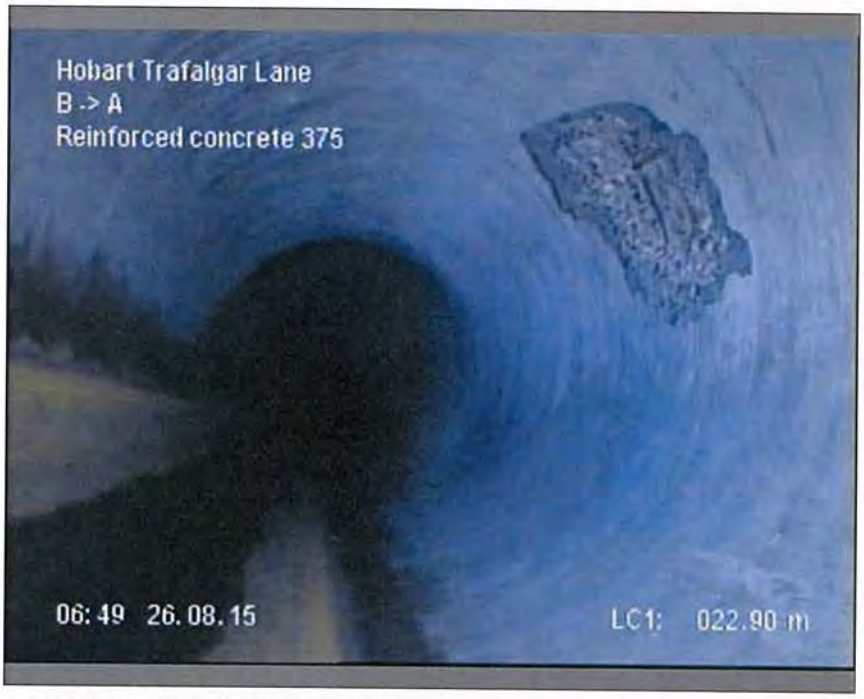

Photo: 1_11B, MPEG #: 260815_1, 00:10:27
22.9m, Spalling of the conduit fabric, localized chipping of one or more of each , Obstruction: <5% , from 12 to 2 o'clock

Photo: 1_15A, MPEG #: 260815_1, 00:12:52
31.3m, Point repair, hole repaired , length: 300mm , from 1 to 5 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

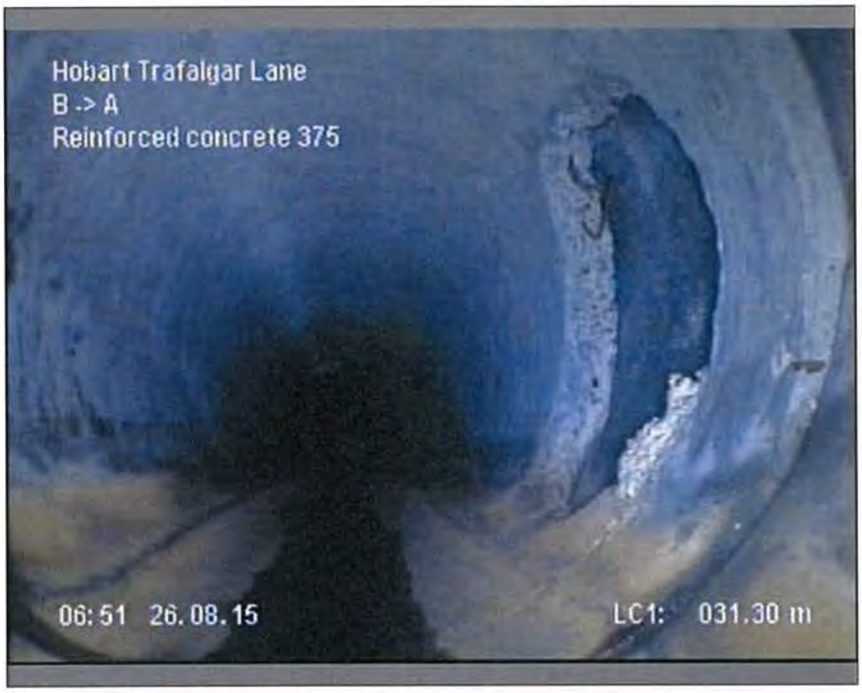

Photo: 1_15B, MPEG #: 260815_1, 00:12:52
31.3m, Point repair, hole repaired , length: 300mm , from 1 to 5 o'clock

Photo: 1_17A, MPEG #: 260815_1, 00:13:40
33.5m, Joint displaced longitudinaly, longitudinal displacement 21-30mm

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

Photo: 1_19A, MPEG #: 260815_1, 00:14:07
33.7m, Intruding connection, magnitude of intrusion: <5% , at 11 o'clock

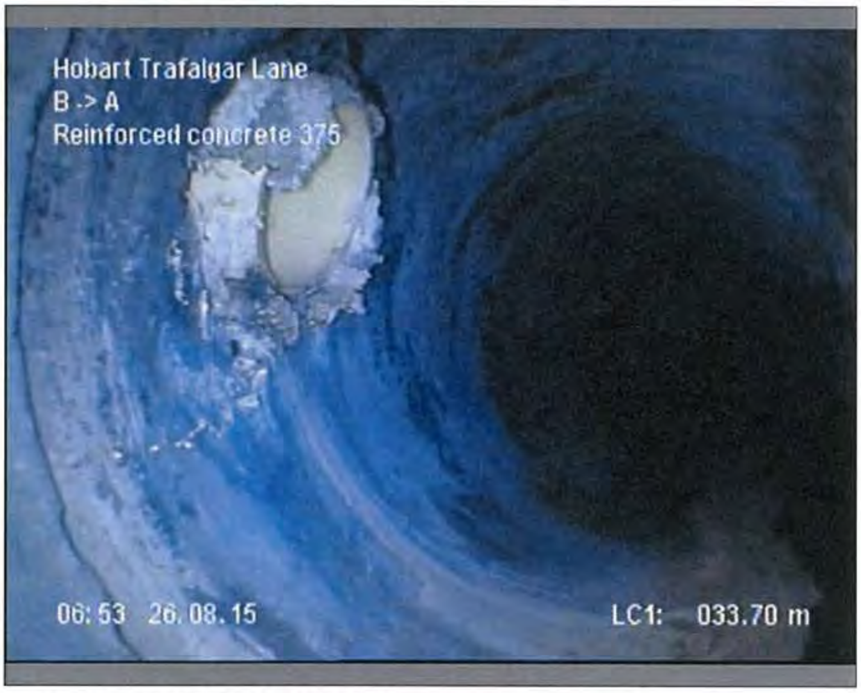

Photo: 1_19B, MPEG #: 260815_1, 00:14:07
33.7m, Intruding connection, magnitude of intrusion: <5% , at 11 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**1**	**1**

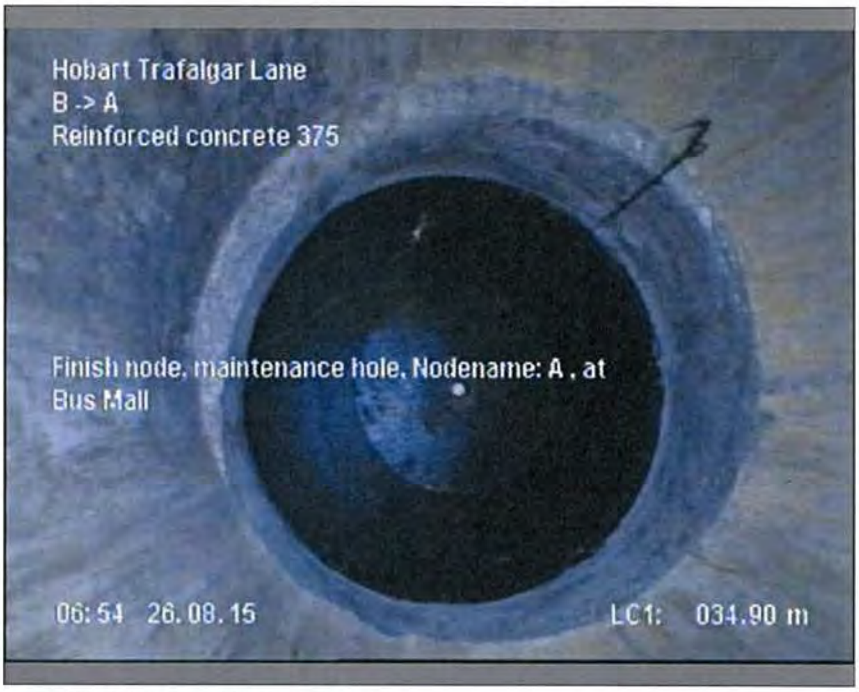

Photo: 1_20A, MPEG #: 260815_1, 00:14:40
34.9m, Finish node, maintenance hole, Nodename: A , at Bus Mall

Photo: 1_20B, MPEG #: 260815_1, 00:14:40
34.9m, Finish node, maintenance hole, Nodename: A , at Bus Mall

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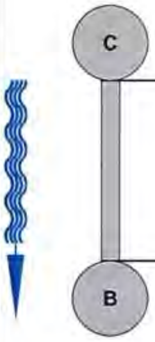
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **2**	Pipe Asset Id: **2**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**C**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**downstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**B**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**1.20 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**300.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**Reinforced concrete**

Remarks :



1:50	Position	Code	Observation	MPEG	Photo	Str Rate
	0.00	STMH	Start node, maintenance hole, Nodename: C , Rnd gatic lid (at Red Jelly entrance) / Rnd gatic lid (at Red Jelly entrance)	00:00:00		
	1.20	FHMH	Finish node, maintenance hole, Nodename: B	00:02:00	2_2A	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**2**	**2**

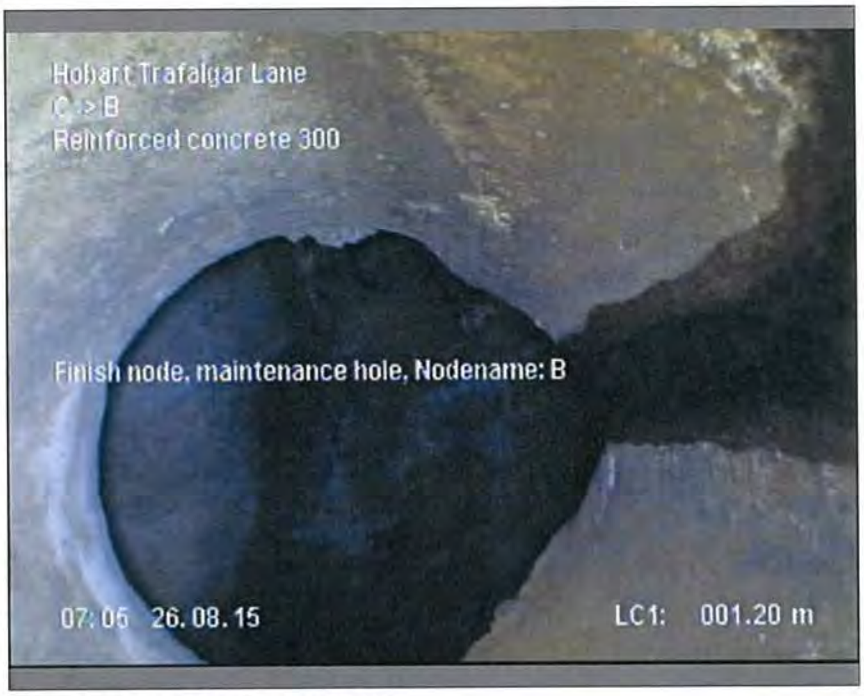


Photo: 2_2A, MPEG #: 260815_1, 00:02:00
1.2m, Finish node, maintenance hole, Nodename: B

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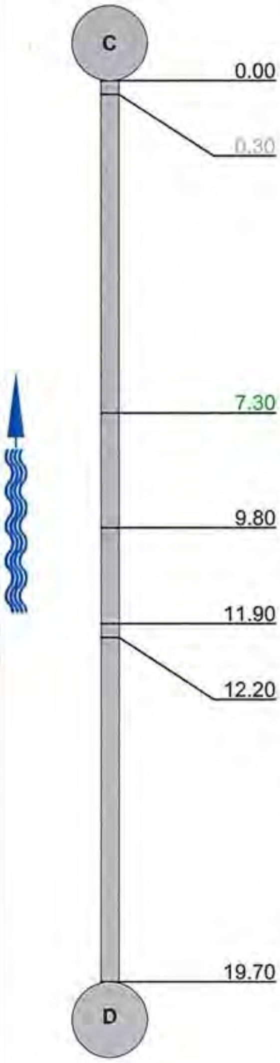
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **3**	Pipe Asset Id: **3**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**D**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**upstream**
Street:	**Trafalgar Lane**	Precipitation.:		DS MH:	**C**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**19.70 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**300.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**Reinforced concrete**

Remarks :



1:165	Position	Code	Observation	MPEG	Photo	Str Rate
	0.00	STMH	Start node, maintenance hole, Nodename: C , rnd gatic lidc (at entrance Red Jelly) / rnd gatic lidc (at entrance Red Jelly)	00:00:00		
	0.30	FC	Circumferential fracture , width 2mm , from 12 to 12 o'clock	00:02:08		8
	7.30	CCW	Circumferential wall crack, at joint, width 1mm , from 7 to 8 o'clock	00:04:19		1
	9.80	CLS	Longitudinal surface crack, at joint, width 1mm , at 8 o'clock	00:05:16		0.1
	11.90	CNPO	Connection, poor workmanship, connection appears to be open , height 100mm , PVC / PVC	00:06:08	3_5A, b	
	12.20	SS	Spalling of the conduit fabric, localized chipping of one or more of each, at joint, Obstruction: <5% , from 8 to 9 o'clock	00:06:54		20
	19.70	FHMH	Finish node, maintenance hole, Nodename: D	00:10:01	3_7A, b	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
4	20	1.48	29.1	3	0	0	0	0	1

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**3**	**3**

Photo: 3_5A, MPEG #: 260815_1, 00:06:08
11.9m, Connection, poor workmanship, connection appears to be open , height 100mm , PVC

Photo: 3_5B, MPEG #: 260815_1, 00:06:08
11.9m, Connection, poor workmanship, connection appears to be open , height 100mm , PVC

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**3**	**3**

Photo: 3_7A, MPEG #: 260815_1, 00:10:01
19.7m, Finish node, maintenance hole, Nodename: D

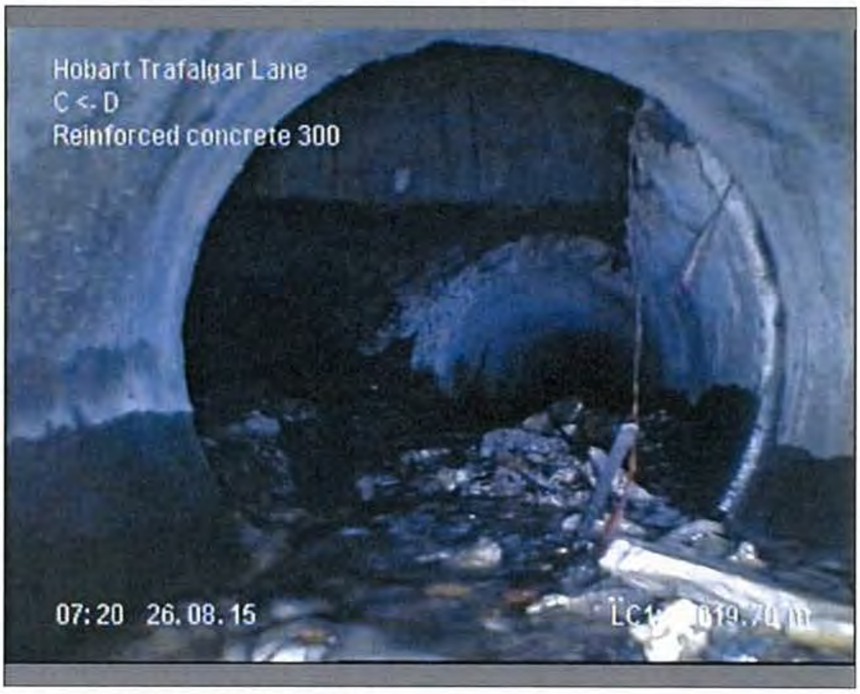


Photo: 3_7B, MPEG #: 260815_1, 00:10:01
19.7m, Finish node, maintenance hole, Nodename: D

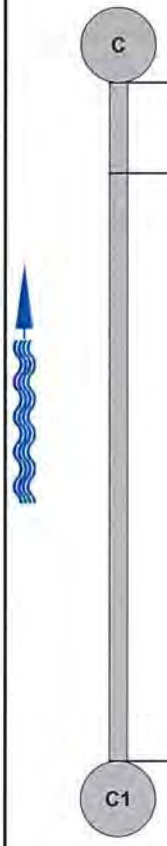
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **4**	Pipe Asset Id: **4**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**C1**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**upstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**C**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**4.50 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**225.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**PVC-Plasticised**

Remarks :



1:50	Position	Code	Observation	MPEG	Photo	Str Rate
	0.00	STMH	Start node, maintenance hole, Nodename: C , Rnd gatic lid (entrance of Red Jelly) / Rnd gatic lid (entrance of Red Jelly)	00:00:00		
	0.60	CNPO	Connection, poor workmanship, connection appears to be open , height 100mm , PVC / PVC	00:01:49	4_2A	
	4.50	FHDE	Finish node, dead end, Nodename: C1 %	00:03:10	4_3A	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

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Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**4**	**4**

Photo: 4_2A, MPEG #: 260815_1, 00:01:49
0.6m, Connection, poor workmanship, connection appears to be open , height 100mm , PVC

Photo: 4_3A, MPEG #: 260815_1, 00:03:10
4.5m, Finish node, dead end, Nodename: C1 %

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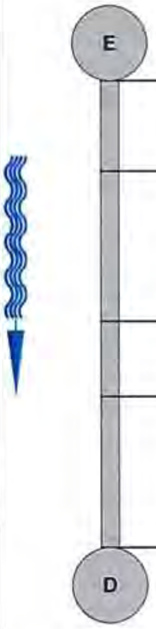
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **5**	Pipe Asset Id: **5**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**E**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**downstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**D**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**3.10 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**300.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**PVC-Plasticised**

Remarks :



1:50	Position	Code	Observation	MPEG	Photo	Str Rate
	0.00	STGP	Start node, grated inlet pit, Nodename: E , at corner / at corner	00:00:00		
	0.60	JDA	Joint displaced angular , at 12 o'clock	00:02:48		
	1.60	FC	Circumferential fracture , width 2mm , from 8 to 4 o'clock	00:03:19		80
	2.10	FC	Circumferential fracture , width 2mm , from 9 to 3 o'clock	00:03:47		80
	3.10	FHMH	Finish node, maintenance hole, Nodename: D , in front of car park entrance / in front of car park entrance	00:04:55	5_5A, b	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	160	51.61	160	5	0	0	0	0	1

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Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**5**	**5**

Photo: 5_5A, MPEG #: 260815_1, 00:04:55
3.1m, Finish node, maintenance hole, Nodename: D , in front of car park entrance

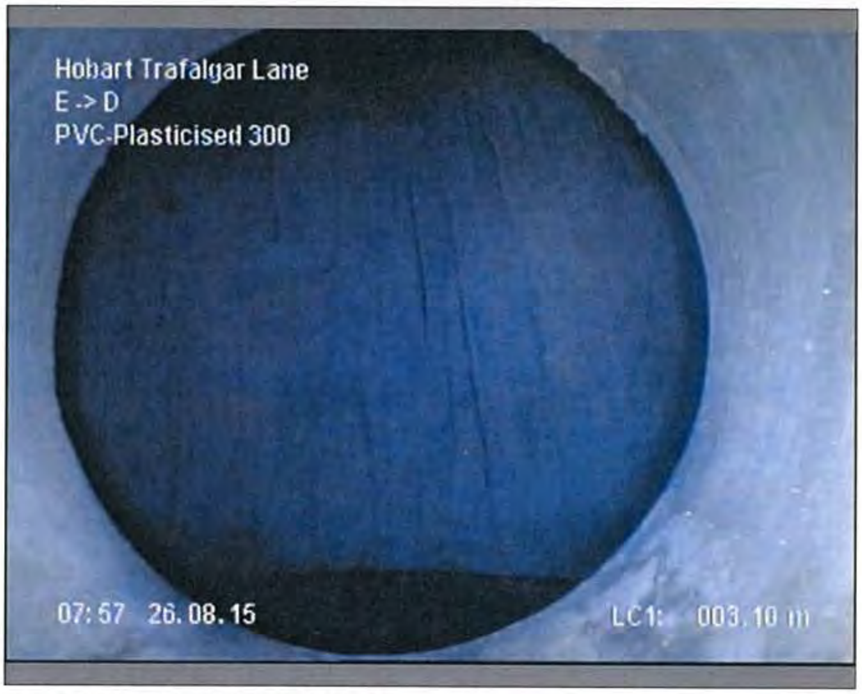

Photo: 5_5B, MPEG #: 260815_1, 00:04:55
3.1m, Finish node, maintenance hole, Nodename: D , in front of car park entrance

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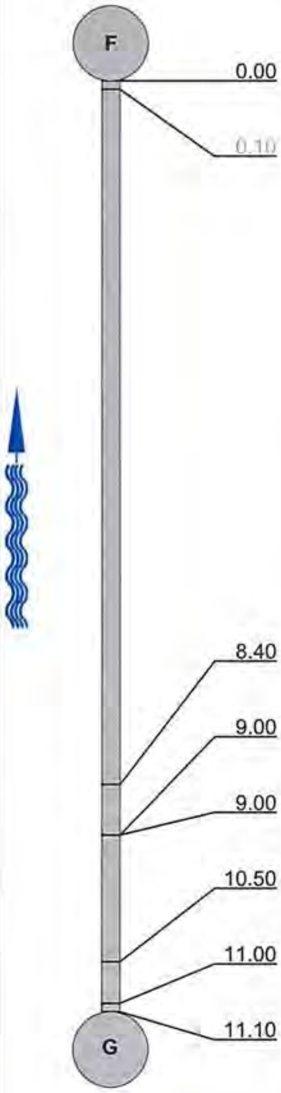
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **6**	Pipe Asset Id: **6**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**G**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**upstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**F**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**11.10 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**225.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**Concrete pipe**

Remarks :



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	0.00	STGP	Start node, grated inlet pit, Nodename: G , at cnr / at cnr	00:00:00	6_1A	
	0.10	FC	Circumferential fracture , width 2mm , from 11 to 5 o'clock	00:02:38		8
	8.40	CNGO	Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC / PVC	00:10:29	6_3A, b	
	9.00	CNGO	Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC (connecting line may be damaged) / PVC (connecting line may be damaged)	00:12:02	6_4A, b	
	9.00	CNGO	Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock, PVC / PVC	00:12:54	6_5A, b	
	10.50	FM	Multiple or complex fracturing, width 4mm , from 8 to 4 o'clock	00:13:55	6_6A	40
	11.00	CNGO	Connection, good workmanship, connection appears to be open, height 150mm , at 10 o'clock	00:14:52	6_7A, b	
	11.10	FHJ	Finish node, junction or connection with another conduit, Nodename: G , M/H at surface, invert not exposed (Deloitte entrance) / M/H at surface, invert not exposed (Deloitte entrance)	00:00:00	6_8A, b	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	40	4.32	48	4	0	0	0	0	1

NU-JET
Bathurst Street
HOBART
Tel: 0438120552
Website: www.nujet.com.au
Email: admin@nujet.com.au

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_1A, MPEG #: 260815_1, 00:00:00
0m, Start node, grated inlet pit, Nodename: G , at cnr

Photo: 6_3A, MPEG #: 260815_1, 00:10:29
8.4m, Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC

NU-JET
Bathurst Street
HOBART
Tel: 0438120552
Website: www.nujet.com.au
Email: admin@nujet.com.au

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_3B, MPEG #: 260815_1, 00:10:29
8.4m, Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC

Photo: 6_4A, MPEG #: 260815_1, 00:12:02
9m, Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC (connecting line may be damaged)

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_4B, MPEG #: 260815_1, 00:12:02
9m, Connection, good workmanship, connection appears to be open, height 100mm , at 10 o'clock, PVC (connecting line may be damaged)

Photo: 6_5A, MPEG #: 260815_1, 00:12:54
9m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock, PVC

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_5B, MPEG #: 260815_1, 00:12:54
9m, Connection, good workmanship, connection appears to be open, height 100mm , at 2 o'clock, PVC

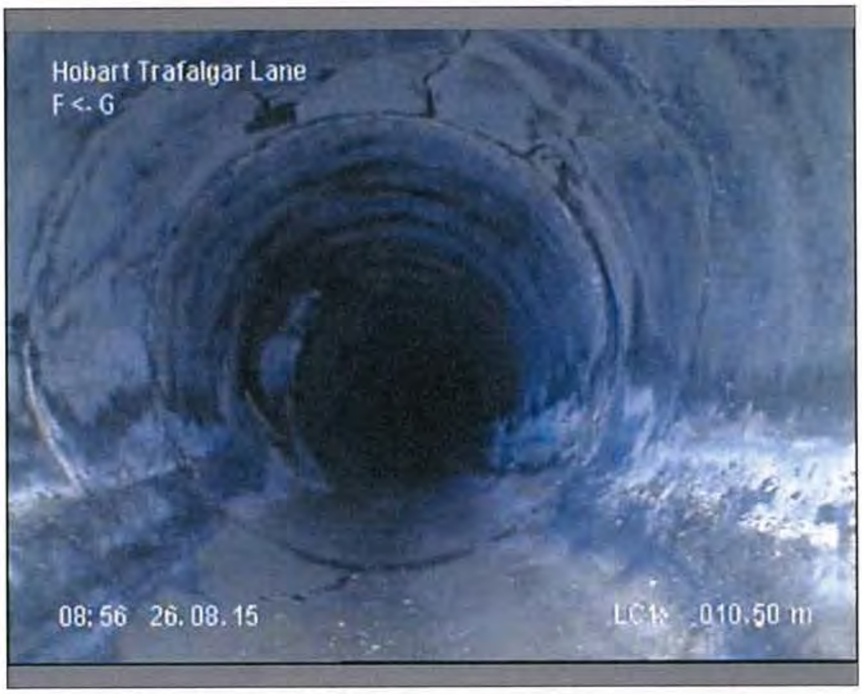


Photo: 6_6A, MPEG #: 260815_1, 00:13:55
10.5m, Multiple or complex fracturing, width 4mm , from 8 to 4 o'clock

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_7A, MPEG #: 260815_1, 00:14:52
11m, Connection, good workmanship, connection appears to be open, height 150mm , at 10 o'clock

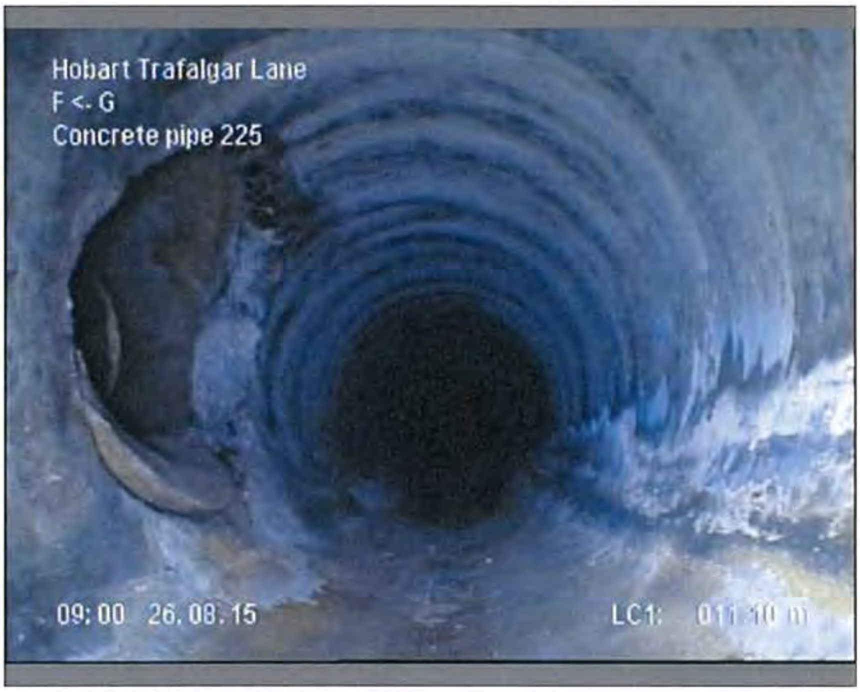


Photo: 6_7B, MPEG #: 260815_1, 00:14:52
11m, Connection, good workmanship, connection appears to be open, height 150mm , at 10 o'clock

NU-JET
Bathurst Street
HOBART
Tel: 0438120552
Website: www.nujet.com.au
Email: admin@nujet.com.au

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**6**	**6**

Photo: 6_8A, MPEG #: 260815_1, 00:00:00
11.1m, Finish node, junction or connection with another conduit, Nodename: G , M/H at surface, invert not exposed (Deloitte entrance)

Photo: 6_8B, MPEG #: 260815_1, 00:00:00
11.1m, Finish node, junction or connection with another conduit, Nodename: G , M/H at surface, invert not exposed (Deloitte entrance)

NU-JET
Bathurst Street
HOBART
0363726129 0438120552
www.nujet.com.au
Email: admin@nujet.com.au

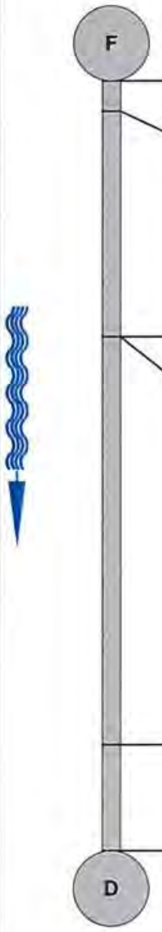
WSA assessment / Inspection: 1

Date: **26/08/2015**	Asset owner's job ref.:	Asset Owner: **Gandy & Roberts**	Operator : **Stu Knight**	Section number: **7**	Pipe Asset Id: **7**
Time of inspection: **hh:mm:ss**	Cleaning: **cleaned**	Standard: **WSA 05-2008 2.2**	LRP **Ins**	Conduit Unit Length	Method of Inspection **Television Camera**

Town:		Catchment:		US MH:	**F**
Suburb:	**Hobart**	Asset Owner:	**Gandy & Roberts**	Survey Dir:	**downstream**
Street:	**Trafalgar Lane**	Precipitation.:	**No**	DS MH:	**D**
Asset Location	**Footpath or verge**	Flow control	**No measures**	Inspect Lenght :	**5.10 m**

Purpose of inspection :	**Structural Condition Inspection**	Shape :	**Circular**
Use of Conduit:	**Drain**	Dia/Height:	**300.00 mm**
Type of Conduit:	**Storm water drain**	Lining:	
Lining Method:		Pipe Material:	**Concrete pipe**

Remarks :



1:50	Position	Code	Observation	MPEG	Photo	Str Rate
	0.00	STGP	Start node, grated inlet pit, Nodename: F , at corner / at corner	00:00:00		
	0.20	FC	Circumferential fracture , width 2mm , from 8 to 4 o'clock	00:02:34		8
	1.70	FC	Circumferential fracture , width 3mm , from 12 to 12 o'clock	00:03:10		8
	1.70	DEC	Hard or compacted material in the invert , Obstruction: <5% , from 5 to 7 o'clock	00:03:30		
	4.40	FC	Circumferential fracture , width 2mm , from 12 to 12 o'clock	00:04:38		8
	5.10	FHMH	Finish node, maintenance hole, Nodename: D , gatic lid in front of car park / gatic lid in front of car park	00:05:08	7_6A, b	

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
3	8	4.71	24	4	1	5	0.98	5	2

Inspection Pictures / Inspection: 1

Location/Street	Town or suburb:	Date :	Section number:	Sewer Ref.:
Trafalgar Lane		**26/08/2015**	**7**	**7**

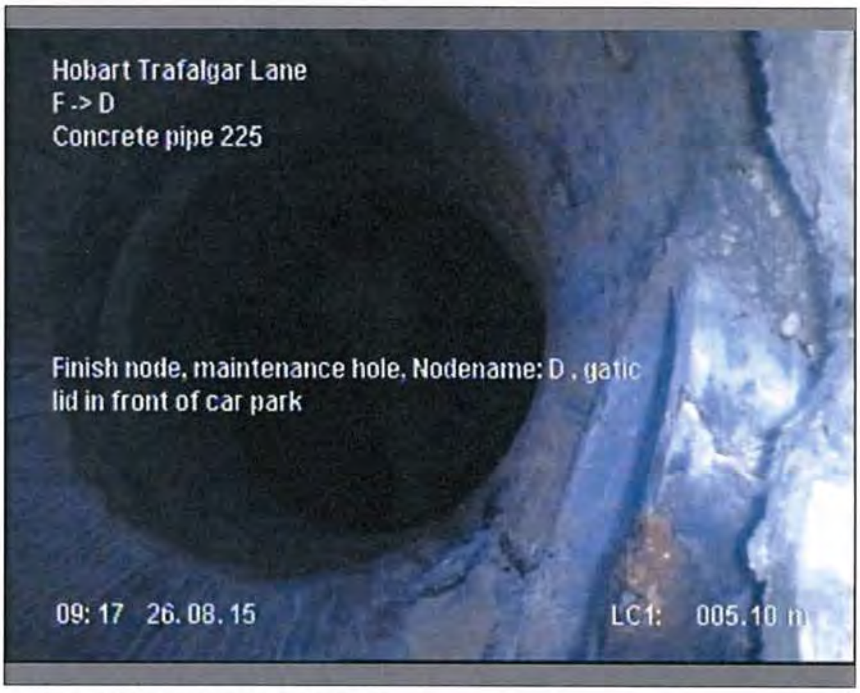
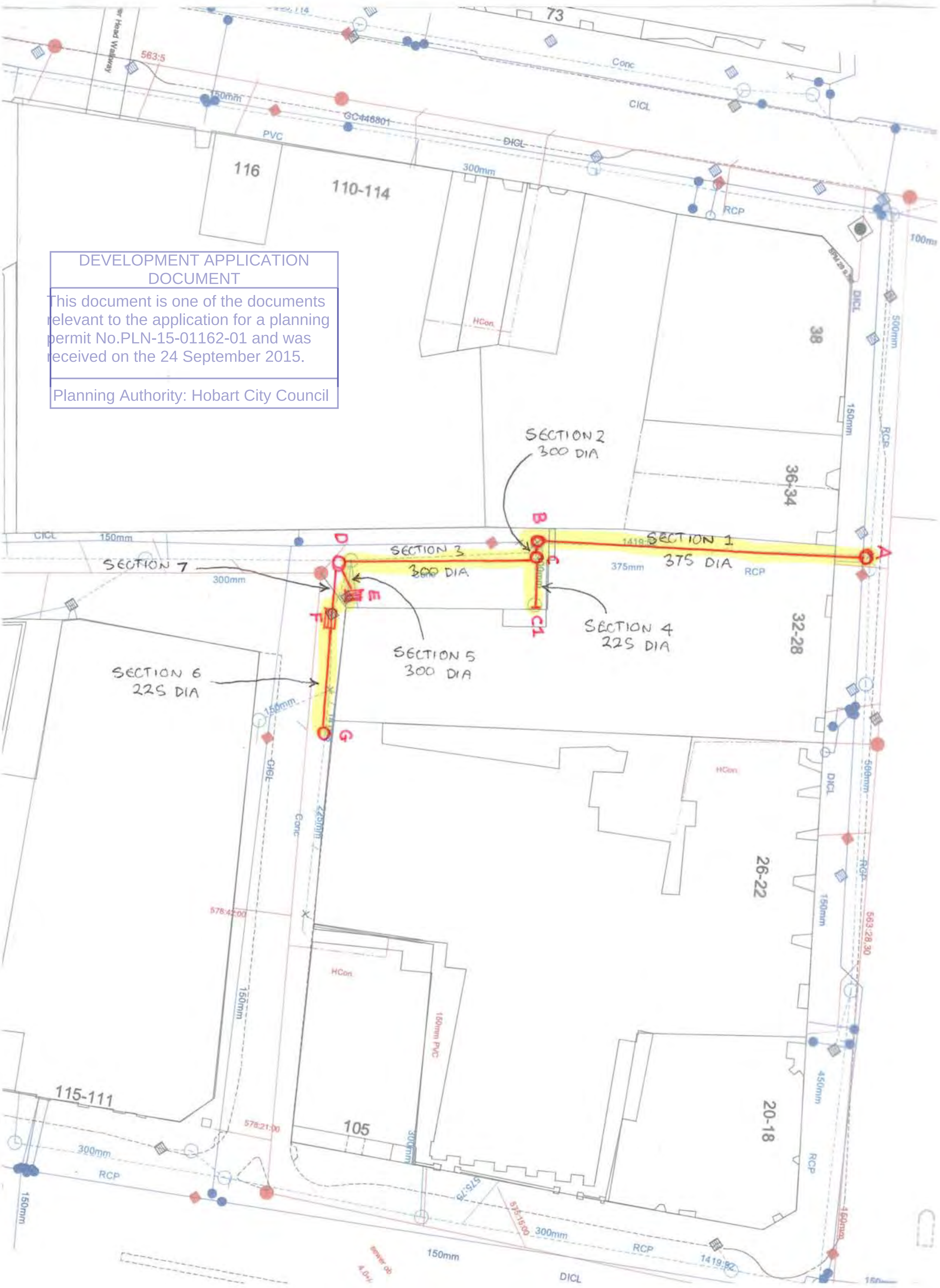
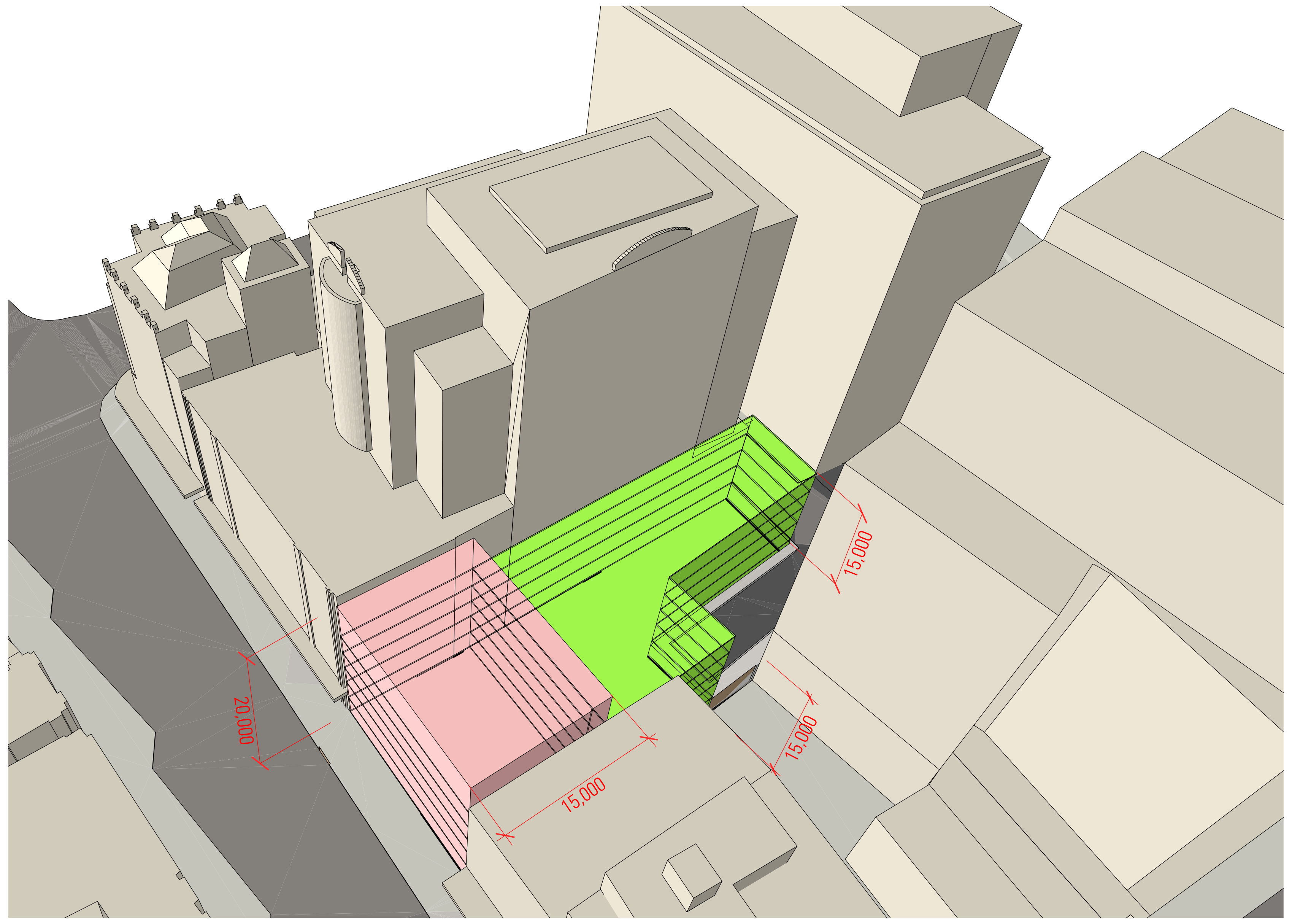


Photo: 7_6A, MPEG #: 260815_1, 00:05:08
5.1m, Finish node, maintenance hole, Nodename: D , gatic lid in front of car park

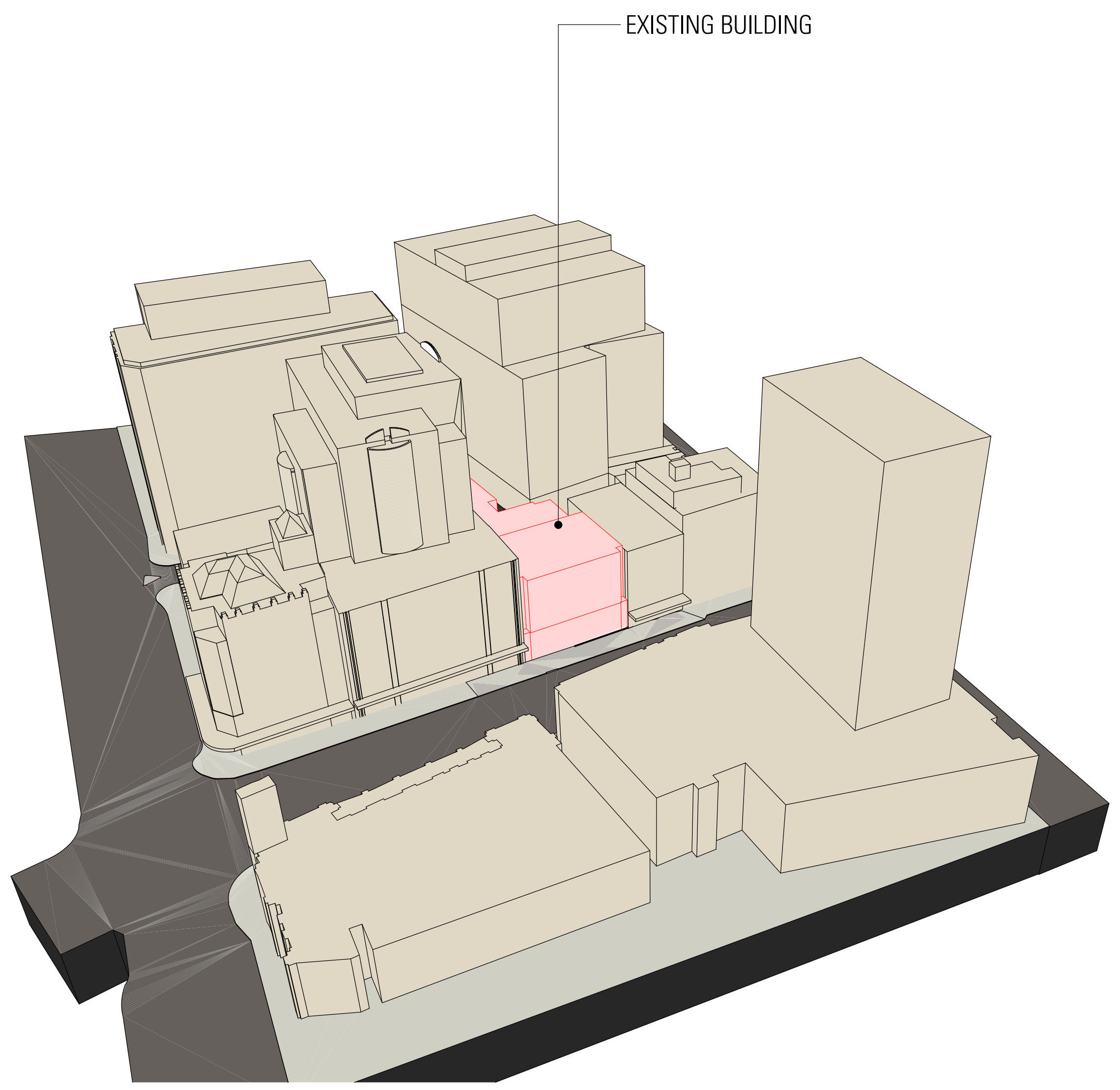
Photo: 7_6B, MPEG #: 260815_1, 00:05:08
5.1m, Finish node, maintenance hole, Nodename: D , gatic lid in front of car park


73
116
110-114
38
36-34
32-28
26-22
20-18
115-111
105
SECTION 2
300 DIA
SECTION 1
375 DIA
SECTION 3
300 DIA
SECTION 4
225 DIA
SECTION 5
300 DIA
SECTION 6
225 DIA
SECTION 7
A
B
C
C1
D
E
F
G
Conc
CICL
DICL
PVC
RCP
HCon
GC446801
563:5
150mm
300mm
375mm
100mm
500mm
225mm
450mm
150mm PVC
578:42:00
578:21:00
575:15:00
563:28:30
1419:52
Harrington Walkway

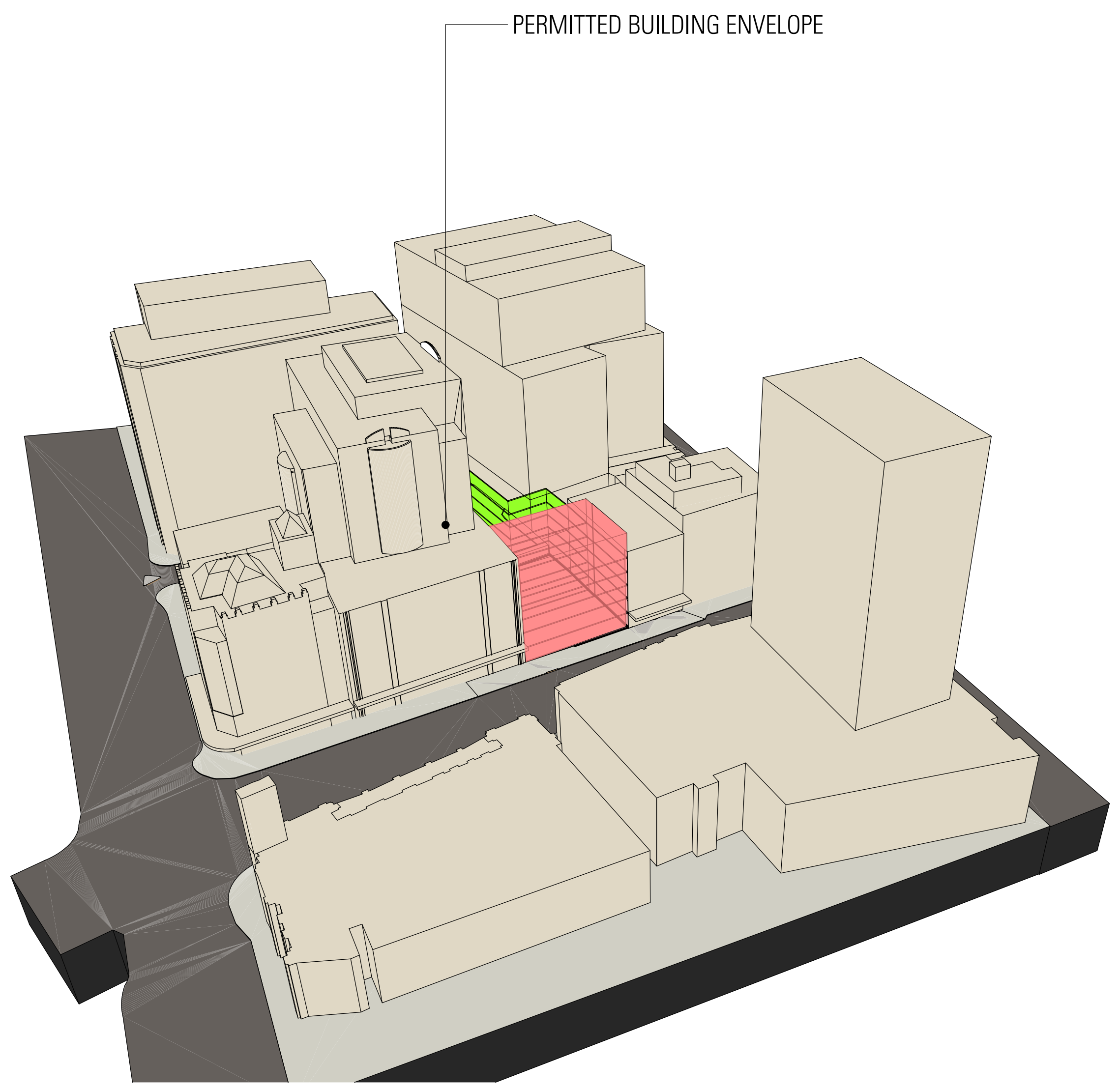
Attachment 5



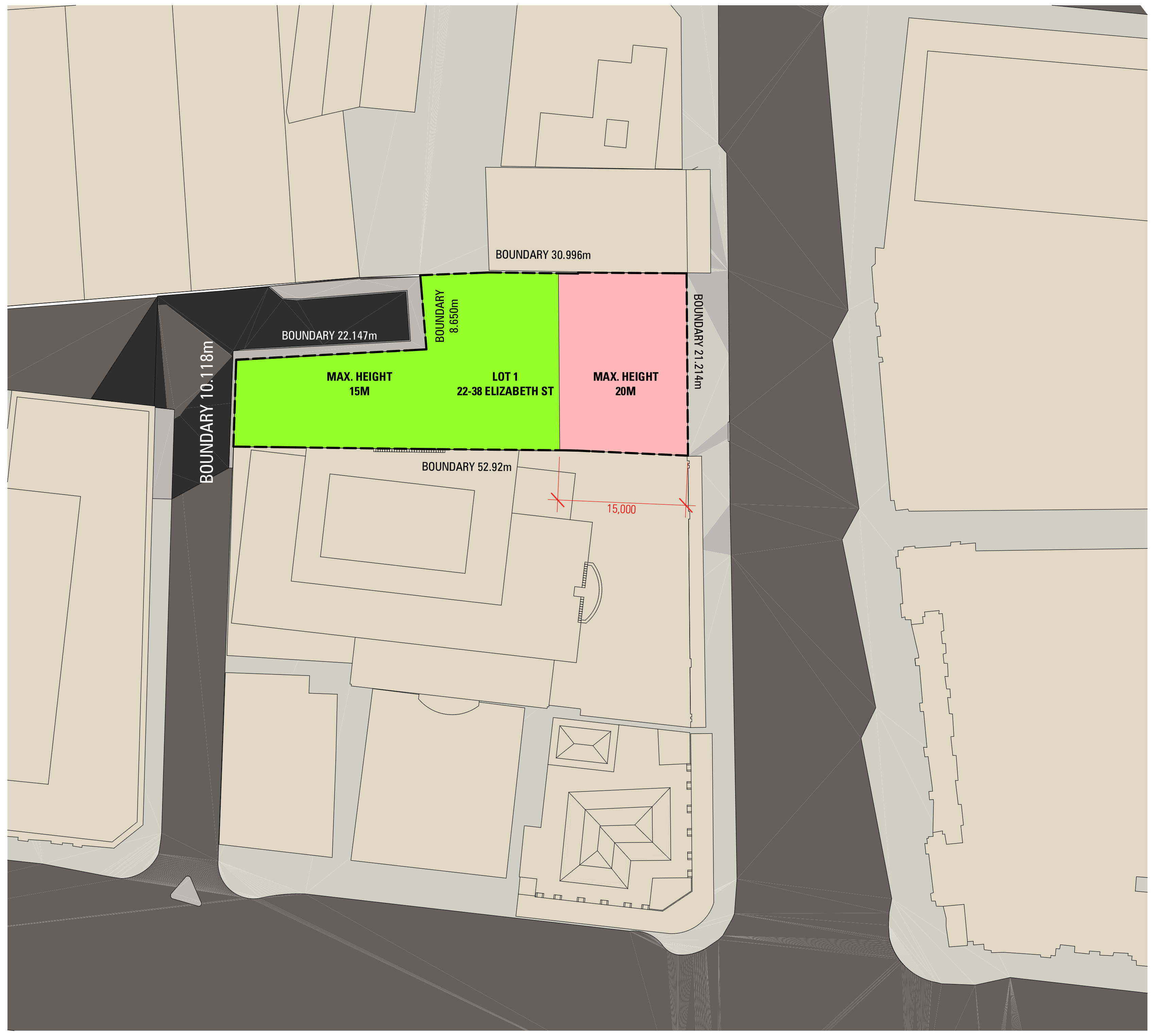
3D Views | Permitted Building Height Model
N.T.S



3D Views | Existing Condition Model
N.T.S



3D Views | Permitted Building Height Model
N.T.S



FLOOR PLAN | Permitted Building Height Model
N.T.S

🟥 **BUILDING PART A**
(MAXIMUM HEIGHT - 20M)

GROUND FLOOR GFA :	311.82 m^2
LEVEL 1 GFA :	311.82 m^2
LEVEL 2 GFA :	311.82 m^2
LEVEL 3 GFA :	311.82 m^2
LEVEL 4 GFA :	311.82 m^2
LEVEL 5 GFA :	311.82 m^2
TOTAL :	**1870 .92m^2**

🟩 **BUILDING PART B**
(MAXIMUM HEIGHT - 15M)

GROUND FLOOR GFA :	560.64 m^2
LEVEL 1 GFA :	560.64 m^2
LEVEL 2 GFA :	560.64 m^2
LEVEL 3 GFA :	560.64 m^2
LEVEL 4 GFA :	560.64 m^2
TOTAL :	**2830.2m^2**

TOTAL GFA FOR A PERMITTED HEIGHT BUILDING IS APPROX. 4700m^2

FILE: P:\1514 Elizabeth St Hotel\11.0 DRAWINGS\1514_Hotel model_DA_diagrams.pln

REVISIONS:
REV# DATE:
(Description)

DEVELOPMENT APPLICATION

PROJECT

PALACE HOTEL
28 Elizabeth Street
Hobart, TAS, 7000

JACOB ALLOM WADE PTY LTD
ABN 92 009 559 479
THE ORDNANCE STORE
21 CASTRAY ESPLANADE
BATTERY POINT TASMANIA
AUSTRALIA 7004

TELEPHONE 03 6223 4366
FAX 03 6223 5726
jaws@jawsarchitects.com
www.jawsarchitects.com

1514_DA21

SCALE			
DATE	SEPTEMBER 2015	PLOT DATE	15/10/2015
DRAWN	LW	ACCREDITED DESIGNER	NEAL MACKINTOSH
CHECKED	NM	ACCREDITATION NUMBER	CC1027V
CAD REF	1514_Hotel model_DA_diagrams.pln		

DRAWING
Permitted Building Envelope Diagrams

DRAWING NO 1514_DA21 REV

Attachment 6

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-01162-01 and was received on the 18 November 2015.

Planning Authority: Hobart City Council

ireneinc
smithstreetstudio
PLANNING & URBAN DESIGN

18 November 2015

Hobart City Council
GPO Box 503
HOBART TAS 7001

Email: rfi-information@hobartcity.com.au

Dear Mr Probert

FURTHER INFORMATION – 28-32 ELIZABETH STREET, HOBART

I am writing in response to your letter of the 17 November requiring further information in relation to the proposed development at 28-32 Elizabeth Street, Hobart (application no: PLN-15-01162-01).

Attached is a statement from Gandy and Roberts in relation to the proposed stormwater management system for the site.

TRAFFIC

Attached is a revised Traffic Impact Assessment which addresses concerns raised in discussions with Council's officers and replaces the report originally lodged with the application. The changes have resulted in a reduction in the number of car parking spaces to 39; as such the proposal now complies with the Acceptable Solution for E6.6.5 (as discussed on page 23 of the original planning report).

HEIGHT DISCRETION

The development is intended to operate as an international hotel with room capacity and facilities, which will cater for international tour operators. The development will therefore add significantly to the availability of this type of accommodation within Hobart.

Please find accompanying this letter a diagram illustrating the development potential that would be possible within the Permitted Building Envelope as per 22.4.1.A1. As can be seen the Permitted Envelope has a volume that is only slightly greater than what already exists on the site. The actual developable floor area would be further reduced for hotel rooms to have access to natural light, views and ventilation.

As can be seen in the diagrams the permitted envelope is substantially smaller than the height and volume of other existing buildings on the city block in which it is located. The development potential of the Amenity Building Envelope (as specified in 22.4.1.P1(b)) would provide marginally more developable floor area but given the shape of the allotment would not create a realistically developable volume and would result in a form which would not be consistent with the form of surrounding buildings.

A reduction in floor area to the extent required to comply with the envelopes would not be able to support the same development given the rooms required for this type of accommodation and required ancillary facilities or the additional features proposed including walk throughs, restaurants, function space and rooftop bar that as publically accessible spaces all contribute to the civic amenity of the Hobart.

The number of rooms that could be accommodated within the floor area of the permitted or Amenity Building Envelope would not be appropriate to provide the services necessary for an international hotel.

The SGS Economic Impact Assessment identifies that the development would generate significant economic activity during construction and in its ongoing operation. Economic activity would be generated both through direct employment and more broadly through the benefit to Hobart and the wider region, through the increase in tourism accommodation, and the marketing specifically aimed at the international market. A building form within the specified envelopes would not be feasible as it would not meet the needs of an international hotel operation, consequently the identified economic benefits would not occur.

Therefore it is considered that the proposal meets the applicable Performance Criteria relating to development beyond the Amenity Building Envelope including providing an overriding economic benefit, .

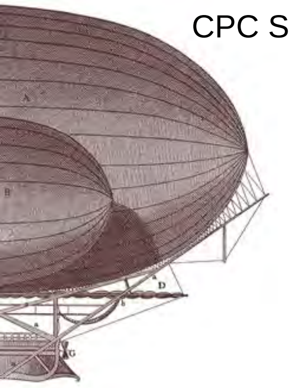
If you have any further queries in relation to any of the above please contact me on 6234 9281.

Yours sincerely

Jennifer Welch

Jen Welch
IRENEINC PLANNING

Attachment 7



GANDY ROBERTS
159 DAVEY ST
HOBART TASMANIA
AUSTRALIA 7000
CONSULTING ENGINEERS

TO Jen Welch
DATE 17
PROJECT 28 – 32 Elizabeth Street
PROJECT № 15.0197
SUBJECT Stormwater Treatment
MADE BY Adam Kohl

☐ FILE NOTE ☐ MEETING ☐ PHONE CALL ☒ MEMO

Based on State Stormwater Strategy 2010, Table E7.1 we need (in theory)

- 80% reduction in the average annual load of total suspended solids (TSS) based on typical urban stormwater TSS concentrations.
- 45% reduction in the average annual load of total phosphorus (TP) based on typical urban stormwater TP concentrations.
- 45% reduction in the average annual load of total nitrogen (TN) based on typical urban stormwater TN concentrations.

The selected Humeceptor provides

- 80% reduction in the average annual load of total suspended solids (TSS) based on typical urban stormwater TSS concentrations.
- 37% reduction in the average annual load of total phosphorus (TP) based on typical urban stormwater TP concentrations.
- 53% reduction in the average annual load of total nitrogen (TN) based on typical urban stormwater TN concentrations.

Given the carpark is undercover and runoff is 100% from an inner city roof, we consider this product to be fit for purpose.

6. COMMITTEE ACTING AS PLANNING AUTHORITY

6.2 APPLICATIONS UNDER THE CITY OF HOBART PLANNING SCHEME 1982

6.2.1 11 BEAUMONT ROAD, LENAH VALLEY - SUBDIVISION (46 LOTS) - PLN-15-00245-01 - FILE REF: 2541636 & P/11/336

106x’s

Attached are copies of reports and other additional information that support the content of the Officer’s report contained in the agenda, referred at this item.

Johnstone McGee & Gandy
incorporating **Dale P Luck & Associates**

Attachment 1

Engineers & Planners

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

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

www.jmg.net.au

JMG Ref: J143019PH
Client Ref: N/A

DEVELOPMENT APPLICATION DOCUMENT
This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 27 October 2015.
Planning Authority: Hobart City Council

13th June 2015

S & G Langiu
c/o Nick Griggs & Co
295 Elizabeth Street
North Hobart
TAS 7000

Dear Nick,

NO. 11 BEAUMONT ROAD, LENAH VALLEY – BUSHFIRE ASSESSMENT

I have undertaken a bushfire assessment in support of a proposed subdivision at 11 Beaumont Road, Lenah Valley (CT 29782/2, CT 29782/1 and CT 142445/101).

The proposal is for a 46 lot subdivision of land currently zoned ‘General Residential’ under the Hobart Interim Planning Scheme 2015. It is understood that the application was made under the City of Hobart Planning Scheme 1982 (‘CHPS’) and as such will be assessed under the provisions of the CHPS. The site is zoned ‘Residential 2’ (Precinct 22).

A copy of the subdivision plan is enclosed as Appendix A.

1. BUSHFIRE-PRONE VEGETATION

The site is currently vegetated with mature eucalypt vegetation, some patches of native grasses and extensive weed infestations.

Notwithstanding this, the vegetation is located on ‘General Residential’ zoned land (‘Residential 2’ under the CHPS). In accordance with the TFS’ *Bushfire Prone Areas Advisory Note No 01-2014*, the vegetation can be considered as ‘low threat’ vegetation for the purposes of E1.0 Bushfire-Prone Areas Code and AS 3959-2009. The landowner has an obligation to manage the potential for fire hazard resulting from their land.

Land within 100m of the subdivision includes existing urban residential development as well as some undeveloped, vegetated land. Upon review of the surrounding zoning, it is clear that all land within 100m of the site is currently also zoned ‘General Residential’. As such, it is considered appropriate to also assess surrounding land as comprising ‘low threat’ vegetation only.

It is noted that if vegetation on undeveloped residential land is not managed appropriately, the relevant landowners may be subject to abatement notices from Council or the Tasmania Fire Service.

2. CITY OF HOBART PLANNING SCHEME 1982

The *City of Hobart Planning Scheme 1982* (the ‘Planning Scheme’) is the applicable planning instrument for the proposed subdivision.

Clause P.22 states:

Site Suitability

Principals:
IT Johnston
CG Purdon
CC Holloway
GL Atherton

Associates:
RC Berry
R Bessell
MS Clark
NP Stolp
CC Marlow

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

Established 1960 "Your Vision is Our Mission" ISO 9001 Quality Certified

> ***P.22** Development shall be assessed as to whether any part of the site is subject to the risk of landslip, soil instability, soil erosion, excessive slope, ponding or flooding, bushfire hazard, soil contamination or environmental or safety hazard or constraints. Conditions on a permit may impose requirements regarding measures to be taken to ensure the risk of any hazard or constraint is reduced to an acceptable level.*

The Planning Scheme does not contain any quantitative development standards relating to bushfire protection.

Planning Directive No.5 ('PD5') is current best practice in Tasmania and accordingly provides a way of measuring consistency with clause P.22. The provisions of PD5 also form part of the Hobart Interim Planning Scheme 2015.

3. PLANNING DIRECTIVE NO.5 - BUSHFIRE-PRONE AREAS CODE

Clause E1.4(a) of Planning Directive No.5 ('PD5') allows for an Accredited Person to certify an exemption in situations where there is insufficient increase in risk to warrant specific bushfire protection measures.

As described in this report, vegetation on the site and within 100m of the site is 'low threat' vegetation for the purpose of this assessment. Having regard to the PD5 objectives for subdivision (Clause E1.6.1), there is considered to be insufficient risk to warrant the provision of hazard management areas, access or water supplies for bushfire fighting.

A certificate of PD5 Compliance is enclosed as Appendix B.

4. CONCLUSION

An assessment of the proposed subdivision against the requirements of PD5 has concluded that the proposed subdivision does not require any provision for bushfire protection. Future applications for habitable buildings will be assessed as BAL-LOW. As such, the proposal is considered to be acceptable with respect to clause P.22 of the CHPS.

Yours faithfully

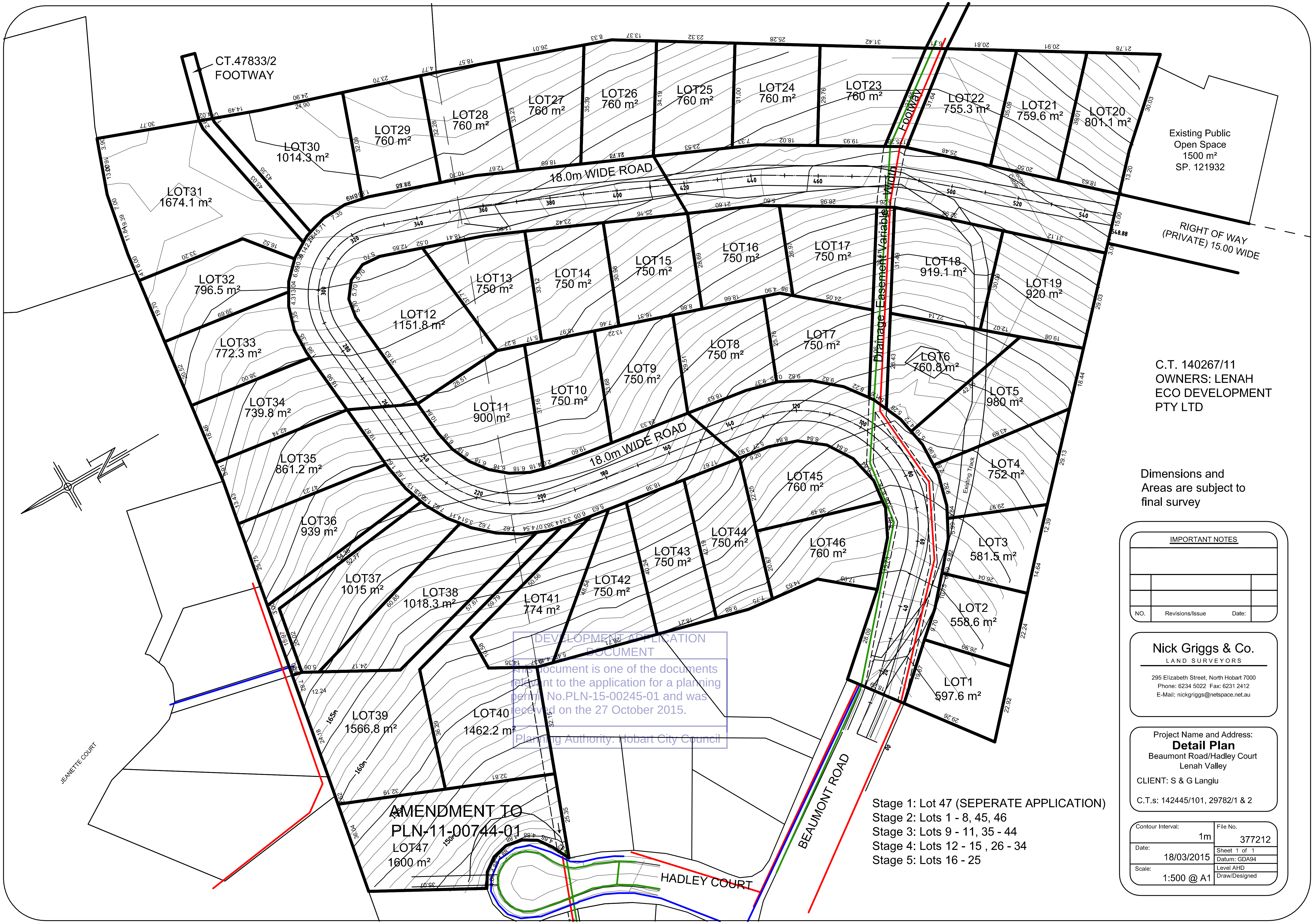
JOHNSTONE McGEE & GANDY PTY LTD

Tom O'Connor
TOWN PLANNER

Enclosed:
Appendix A – Plan of Subdivision
Appendix B – PD5 Certificate

APPENDIX A

PLAN OF SUBDIVISION



C.T. 140267/11
OWNERS: LENAH
ECO DEVELOPMENT
PTY LTD

Dimensions and
Areas are subject to
final survey

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 27 October 2015.

Planning Authority: Hobart City Council

Stage 1: Lot 47 (SEPERATE APPLICATION)
Stage 2: Lots 1 - 8, 45, 46
Stage 3: Lots 9 - 11, 35 - 44
Stage 4: Lots 12 - 15 , 26 - 34
Stage 5: Lots 16 - 25

IMPORTANT NOTES

NO.	Revisions/Issue	Date:

Nick Griggs & Co.
LAND SURVEYORS
295 Elizabeth Street, North Hobart 7000
Phone: 6234 5022 Fax: 6231 2412
E-Mail: nickgriggs@netspace.net.au

Project Name and Address:
Detail Plan
Beaumont Road/Hadley Court
Lenah Valley

CLIENT: S & G Langiu

C.T.s: 142445/101, 29782/1 & 2

Contour Interval: 1m
File No. 377212
Date: 18/03/2015
Sheet 1 of 1
Datum: GDA94
Level AHD
Scale: 1:500 @ A1
Draw/Designed

APPENDIX B

PD5 CERTIFICATE

Code E1 – Bushfire-prone Areas Code Clause 1.4a

Certificate of Insufficient Increase in Risk under s51(2)(d) (ii) *Land Use Planning and Approvals Act 1993*

Office Use

Date Received

Reference No

1. Land to which certificate applies[1]

Name of planning scheme or instrument: City of Hobart Planning Scheme 1982**(The Scheme)**

Use or Development Site	**Certificate of Title / PID**
Street Address 11 Beaumont Rd, Lenah Valley	CT 29782/2 CT 29782/1 CT 142445/101

2. Proposed Use or Development *(provide a description in the space below)*

Subdivision

3. Documents relied upon[2]

	Document or certificate description:
☐	***Description of Use or Development[3] (Proposal or Land Use Permit Application)*** ***Documents, Plans and/or Specifications*** *Title:* Detail plan, Beaumont Road/Hadley Court Lenah Valley *Author:* Nick Griggs & Co *Date:* 18/03/2015

---

[1] 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.

[2] List each document that is provided or relied upon to describe the use or development, or to assess and manage risk from bushfire, including its title, author, date, and version.

☐ ***Bushfire Report or Plan***[4]

Title: 'No.11 Beaumont Road, Lenah Valley - Bushfire Assessment'

Author: JMG Engineers & Planners

Date: 13/06/15

4. Bushfire Hazard Practitioner – Accredited Person

Name: Tom O'Connor

Phone No: 6231 2555

Address: 117 Harrington Street, Hobart, 7000

Fax No:

Email address: toconnor@jmg.net.au

Fire Service Act 1979 Accreditation No: BFP- 107

Scope: 1,2,3A,3B,3C

5. Certification

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

There is an insufficient increase in risk to warrant specific measures for bushfire hazard management and/or bushfire protection in accordance with the objective of Clause 1.4 (a) of the Code, as: *a) the risk arises from vegetation located on land zoned as inner residential, general residential or village; or*	☑
b) the development is on land that is shown on a bushfire prone areas map, endorsed by the Tasmania Fire Service, as not being a bushfire prone area.	☐

Signed

Date

13/6/15

---

[3] Identify the use or development to which the certificate applies by reference to the documents, plans, and specifications to be provided with the permit application to describe the form and location of the proposed use or development. For habitable buildings, a reference to a nominated plan indicating location within the site and the form of development is required.

[4] A Bushfire Report or other Plan or document demonstrating the relationship of the development to clause (a) or (b) of the exemption E1.4.

Attachment 2

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

TRAFFIC IMPACT ASSESSMENT

PROPOSED
RESIDENTIAL SUBDIVISION DEVELOPMENT

11 BEAUMONT ROAD
LENAH VALLEY

MAY 2015

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

TRAFFIC IMPACT ASSESSMENT

PROPOSED

RESIDENTIAL SUBDIVISION DEVELOPMENT

11 BEAUMONT ROAD

LENAH VALLEY

JUNE 2015

32 RIVERWAY ROAD, MONTROSE TASMANIA 7010
TEL & FAX: (03) 6273 9546 MOBILE: 0402 900 106
EMAIL: milglad@bigpond.net.au ABN: 51 345 664 433

CONTENTS

REFERENCES:

- Australian Standard AS 1742.2-2009 – Manual of uniform traffic control devices Part 2: Traffic control devices for general use
- AUSTROADS – Guide to Road Safety Part 6: Road Safety Audit (2009)
- Road and Maritime Services (Transport) - Guide to Traffic Generating Developments; Updated traffic surveys (August 2013)
- AUSTROADS – Guide to Road Design Part 3: Geometric Design (2009)
- AUSTROADS – Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2009)
- AUSTROADS – Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings (2009)
- Hobart Interim Planning Scheme 2015
- Engineering Design and Construction Manual for Subdivisions in Growth Areas (April 2011) – Growth Areas Authority (Victoria)

1. INTRODUCTION

The owners of a parcel of land at 11 Beaumont Road in Lenah Valley propose to subdivide the land to create 47 residential lots through a south-eastward extension of Beaumont Road.

A Traffic Impact Assessment (TIA) has been undertaken in support of the proposed subdivision development.

This TIA report considers the existing road and traffic characteristics along Beaumont Road in the area of the development site and along connecting streets including a section of Lenah Valley Road. An assessment is made of the traffic activity that the proposed subdivision development will generate and the effect that this traffic will have on Beaumont Road as well as the other connecting streets. Consideration is also given to the proposed layout of the subdivisional road.

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

2. SITE DESCRIPTION

The proposed subdivision site is located off the current south-eastern end of Beaumont Road. Beaumont Road junctions with Brushy Creek Road which in turn junctions with Lenah Valley Road some 350m to the southwest of the Girrabong Road junction.

The land use across this part of Lenah Valley is residential.

The location of the development site has been highlighted on the extract from the street atlas for this area, seen in Figure 2.1.

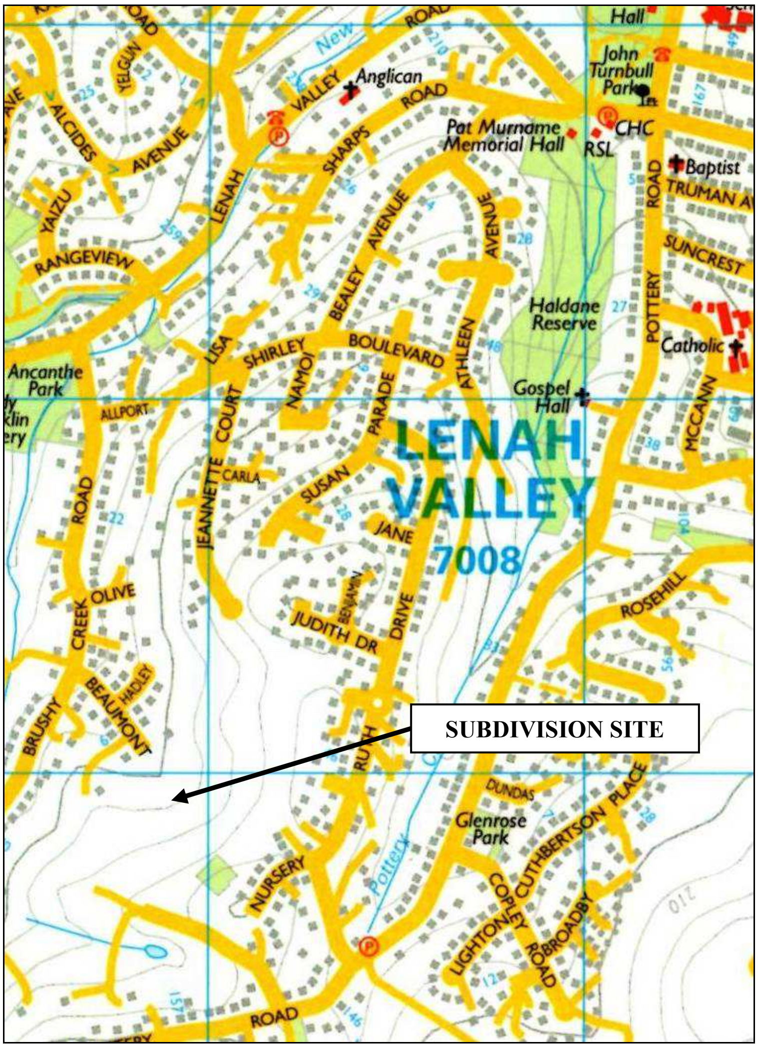


Figure 2.1: Extract of street atlas showing location of residential subdivision site

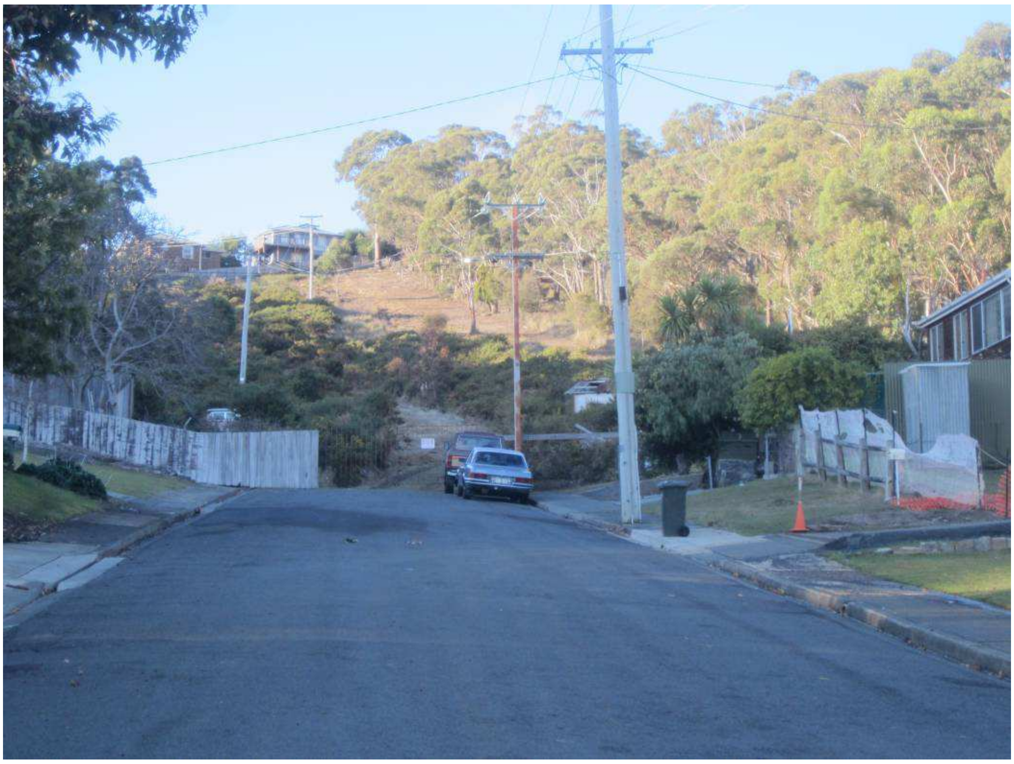
3. DEVELOPMENT PROPOSAL

The development proposal for the property at 11 Beaumont Road is the subdivision of the land to create 47 residential lots.

The residential lots will have areas ranging between 550m^2 and 1,700m^2. Four of the lots will be less than 600m^2, 28 lots will be between 750m^2 and 800m^2 and the remaining lots will have areas covering the range between 800m^2 and 1,700m^2.

All but one of the proposed lots will be accessed off the south-eastern extension of the existing section of Beaumont Road. One lot will be accessed off Hadley Court, a cul-de-sac street off Beaumont Road near its current end.

Views of the land to be subdivided are seen in Photographs 3.1 and 3.2.



Photograph 3.1: View to southeast along Beaumont Road towards land to be subdivided beyond the end of the road

Photograph 3.2: View along Hadley Court from Beaumont Road

The proposed subdivisional road will have reverse curved alignment on mostly an upgrade over a total subdivisional road length of around 550m.

There will be provision for two footways through or off the subdivisional road to areas to the south of the subdivision.

The one lot in Hadley Court will be developed as a separate application; the other 46 lots in the subdivision will be developed in four stages.

The drawing showing the proposed subdivision layout is included with this report as Attachment A.

4. EXISTING ROAD AND TRAFFIC ENVIRONMENT

4.1 Road Characteristics

It has been decided consideration should be given to several roads that will be affected by the proposed subdivision development. These include Beaumont Road, Brushy Creek Road and Lenah Valley Road to the Girrabong Road junction.

The existing section of Beaumont Road has a fairly straight alignment on an upgrade from Brushy Creek Road of around 13-14%. The road has a width between kerb faces of around 8.4m and there is a footpath along both sides of the road.

A view along the road is seen in Photograph 4.1.

Brushy Creek Road follows a varying vertical grade with three slight horizontal curves between Lenah Valley Road and the Beaumont Road junction, a distance of around 450m. It is constructed to a width between kerb faces of around 7.3m. There is a footpath along the eastern side of Brushy Creek Road for its full length and a varying width footpath along the western side with no footpath along part of the road.

Views along Brushy Creek Road are seen in Photographs 4.2 to 4.4.

The standard of construction of Lenah Valley Road between Brushy Creek Road and Girrabong Road varies with some sections having kerb and gutter along both sides of the road where the width between kerb faces is narrower at around 7.8m to 8.7m and other sections with kerb and gutter along one side of the road with widths of up to 10m. Just to the southwest of the Girrabong Road junction the width between kerb faces is around 9.5m.

Views along Lenah Valley Road are seen in Photographs 4.5 to 4.7.

A 50km/h speed limit applies to all these roads.

Photograph 4.1: View to northwest along Beaumont Road from near the south-eastern end of the road

Photograph 4.2: View to south along Brushy Creek Road with junction of Beaumont Road ahead on left

Photograph 4.3: View to south along Brushy Creek Road from just south of Allport Place

Photograph 4.4: View to south along Brushy Creek Road from Lenah Valley Road

Photograph 4.5: View to southwest along Lenah Valley Road from near Rangeview Crescent

Photograph 4.6: View to southwest along Lenah Valley Road from southwest of Girrabong Road

Photograph 4.7: View to northeast along Lenah Valley Road towards Girrabong Road

4.2 Traffic Activity

There is no useful traffic data available for the above road of interest. Therefore peak hour turning movement surveys were undertaken at the Lenah Valley Road/Brushy Creek Road and the Lenah Valley Road/Girrabong Road junctions.

The survey was undertaken on Thursday 25 June 2015 between 8:00am – 9:00am and 4:30pm - 5:30pm. The recorded turning traffic volumes during these surveys have been presented in Figure 4.1 and 4.2.

These peak hour traffic volumes indicated that the traffic volume on Lenah Valley Road between Girrabong Road and Brushy Creek Road is around 1,800 vehicle/day while on Brushy Creek Road at the Lenah Valley Road junction it is around 750 vehicle/day. Girrabong Road has a traffic volume of around 9,000 vehicles/day.

The current traffic volume on Beaumont Road at the Brushy Creek Road junction would be around 150 vehicles/hour.

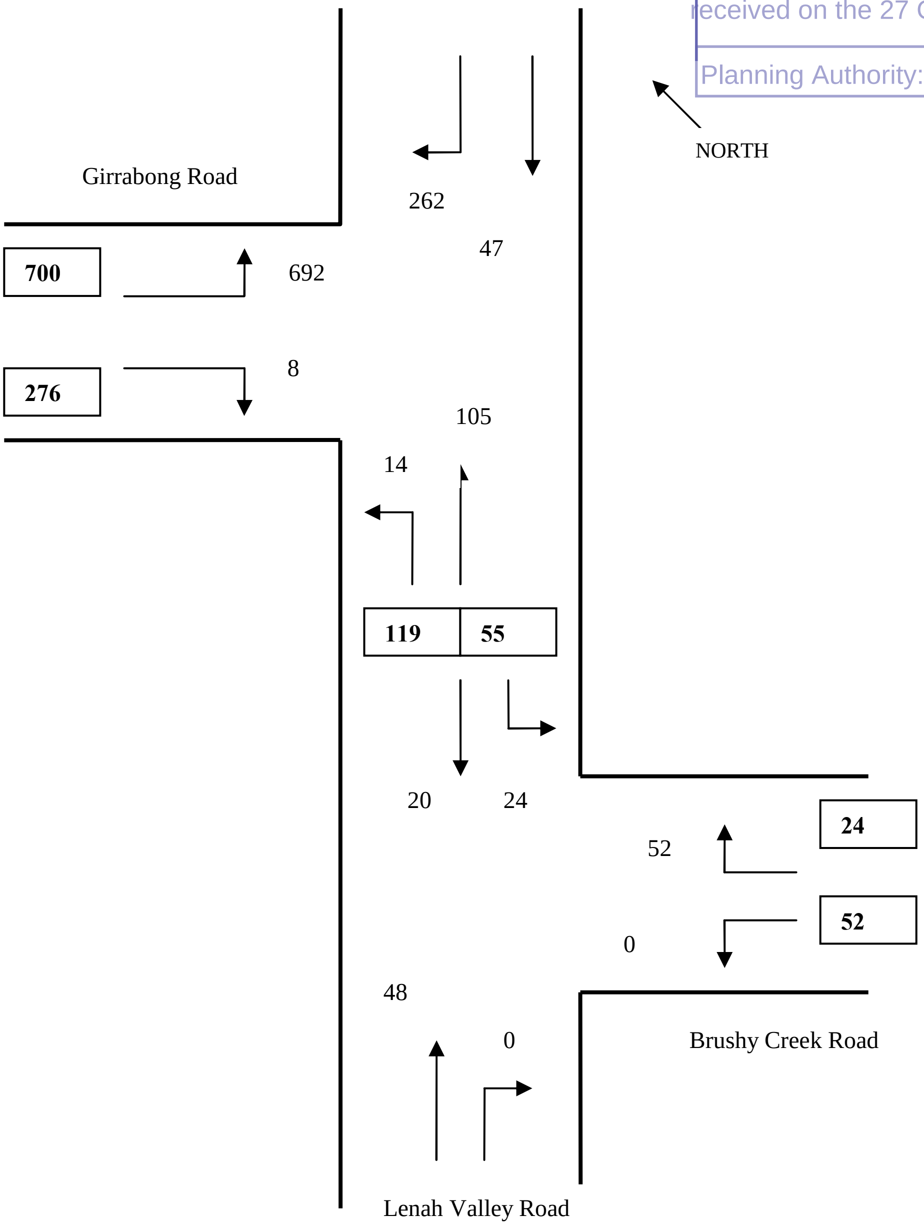


Figure 4.1: Turning traffic at Lenah Valley Road junctions with Girrabong Road and Brushy Creek Road - 8:00am to 9:00am

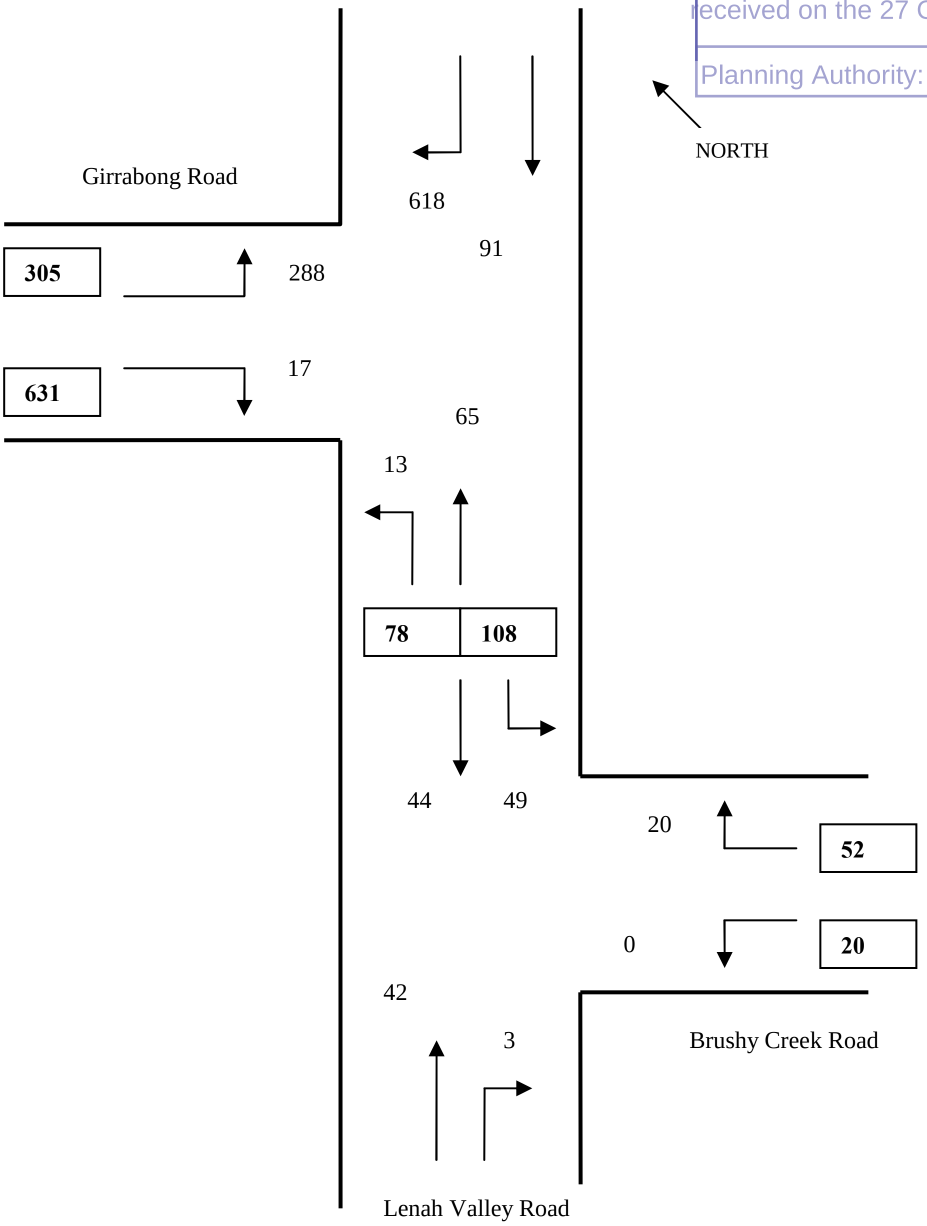


Figure 4.2: Turning traffic at Lenah Valley Road junctions with Girrabong Road and Brushy Creek Road - 4:30pm to 5:30pm

4.3 Crash Record

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

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

Information was requested from DSG about any reported crashes along Beaumont Road, Brushy Creek Road and Lenah Valley Road over the last five and a half years since January 2010.

There have been no reported crashes along Beaumont Road.

Advice has been received that the database has record of two crashes on Brushy Creek Road. The crashes have been loss of control type incidents which occurred within 100m of one another on or near the bend at the Allport Place junction. Both crashes occurred in 2013 and resulted in property damage only.

There has been one reported crash on Lenah Valley Road between Girrabong Road and Brushy Creek Road and one crash at the Girrabong Road junction. The midblock crash was a loss of control type incident in 2013 which occurred to the northeast of the Rangeview Road junction and required first aid attention. The 2014 crash at the Girrabong Road junction was a rear end collision which resulted in property damage only.

4.4 Road Safety Audit

As part of this assessment a road safety review of the above roads was undertaken.

A road safety audit is a formal examination of an existing project that impacts on road users, in which an independent qualified person examines the affected roads under existing traffic conditions. The audit is a necessary part of the development impact assessment because safety problems can occur on existing roads as a result of additional traffic being generated by new developments.

In this case, apart from the poor state of maintenance of some of the pavement markings on Lenah Valley Road, no issues were identified of sufficient importance that needed to be raised in this report.

5. TRAFFIC GENERATION BY THE DEVELOPMENT

As outlined in Section 3 of this report a residential subdivision development is proposed along the south-eastward extension of Beaumont Road which will create 47 residential lots.

<u>Traffic generation by residential subdivision</u>

In considering the traffic activity that the residential lots will generate when constructed, guidance is normally sought from the New South Wales Road Traffic Authority document – Guide to Traffic Generating Developments.

The updated ‘Technical Direction’ to the Guide dated August 2013 advises that the trip generation for residential dwellings in regional areas of New South Wales is 7.4 trips/dwelling/day.

This is consistent with findings by this consultant for dwellings in Tasmania. Surveys in the built up areas of Tasmania in recent times have found that typically this figure is 8.0 trips/dwelling/day with smaller residential units generating around 4 trips/unit/day and larger units generating around 6 trip/unit/day.

Based on advice from several developers and local surveys, up to 25% of the lots are likely to be developed with multiple residential units; 90 % with two units and 10% with three units. Based on the generation rate of 8 trips/dwelling/day and 5 trips/unit/day, this proportion of unit development will result in a traffic generation of 8.625 trips/lot/day.

Therefore the proposed 47 lot residential subdivision development, when fully occupied, can therefore be expected to generate some 406 vehicles/day and around 41 vehicles/hour during peak traffic periods based on the normal 10% of traffic activity occurring during the peak traffic periods.

Based on a 70:30 directional split in the morning peak hour and 65:35 direction split of traffic in afternoon peak hour, traffic movements at the Brushy Creek Road/Lenah Valley Road junction and the Lenah Valley Road/Girrabong Road junction in 10 years time will be as shown in Figures 5.1 and 5.2.

These traffic volumes are the surveyed volumes as seen in Figures 4.1 and 4.2 with the addition of the proposed subdivisional traffic and an increase of 1% p.a. to Girrabong Road traffic.

Comparing the turning traffic volumes for Girrabong Road in Figures 4.1 and 4.2 with traffic volumes from the same survey undertaken eight years ago, the traffic volumes are much the same, therefore a growth of 1% p.a. is considered reasonable.

No annual increase to the Lenah Valley Road or Bushy Creek Road traffic needs to be allowed as an increase in the traffic volume would occur only with other future subdivisional developments in the area southwest of the Girrabong Road junction.

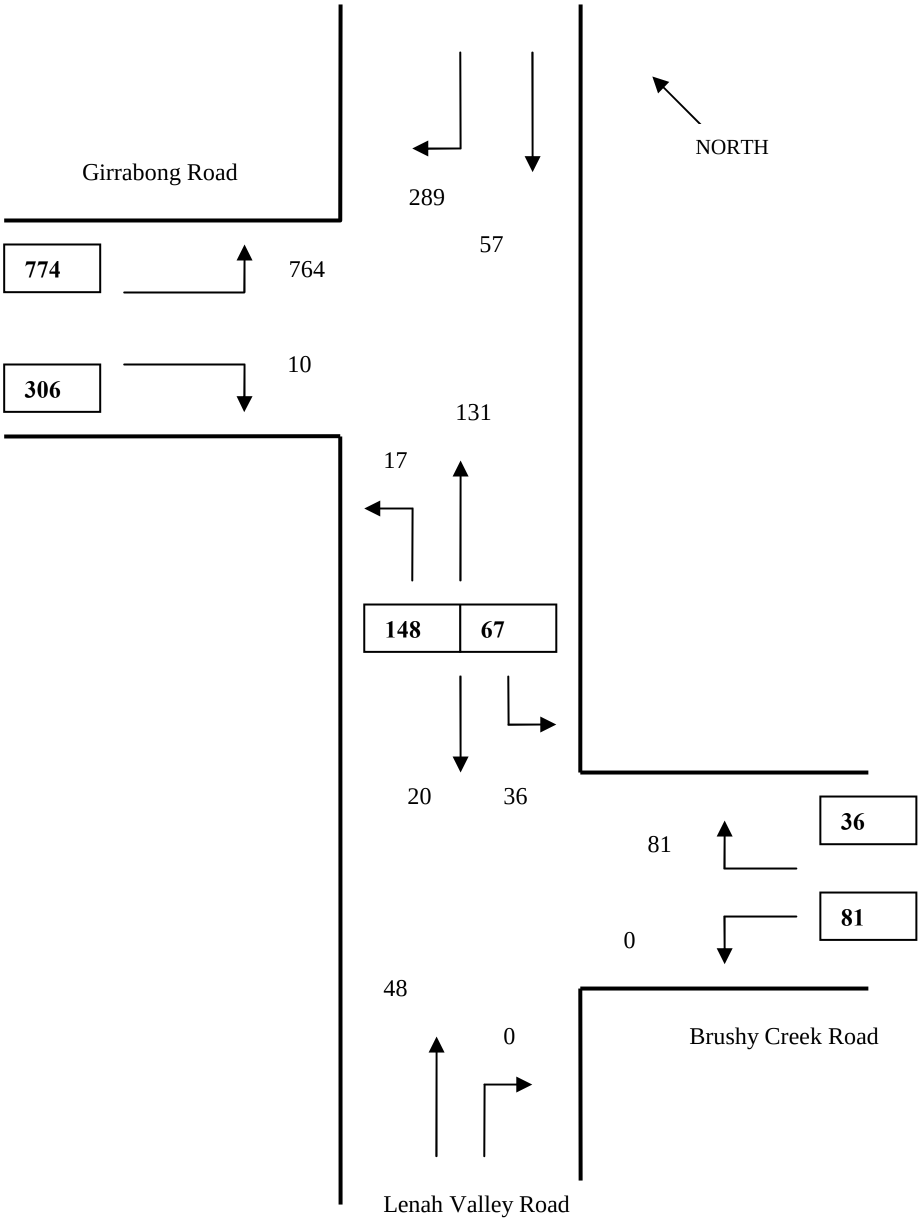


Figure 5.1: Turning traffic at Lenah Valley Road junctions with Girrabong Road and Brushy Creek Road - 8:00am to 9:00am in 2025

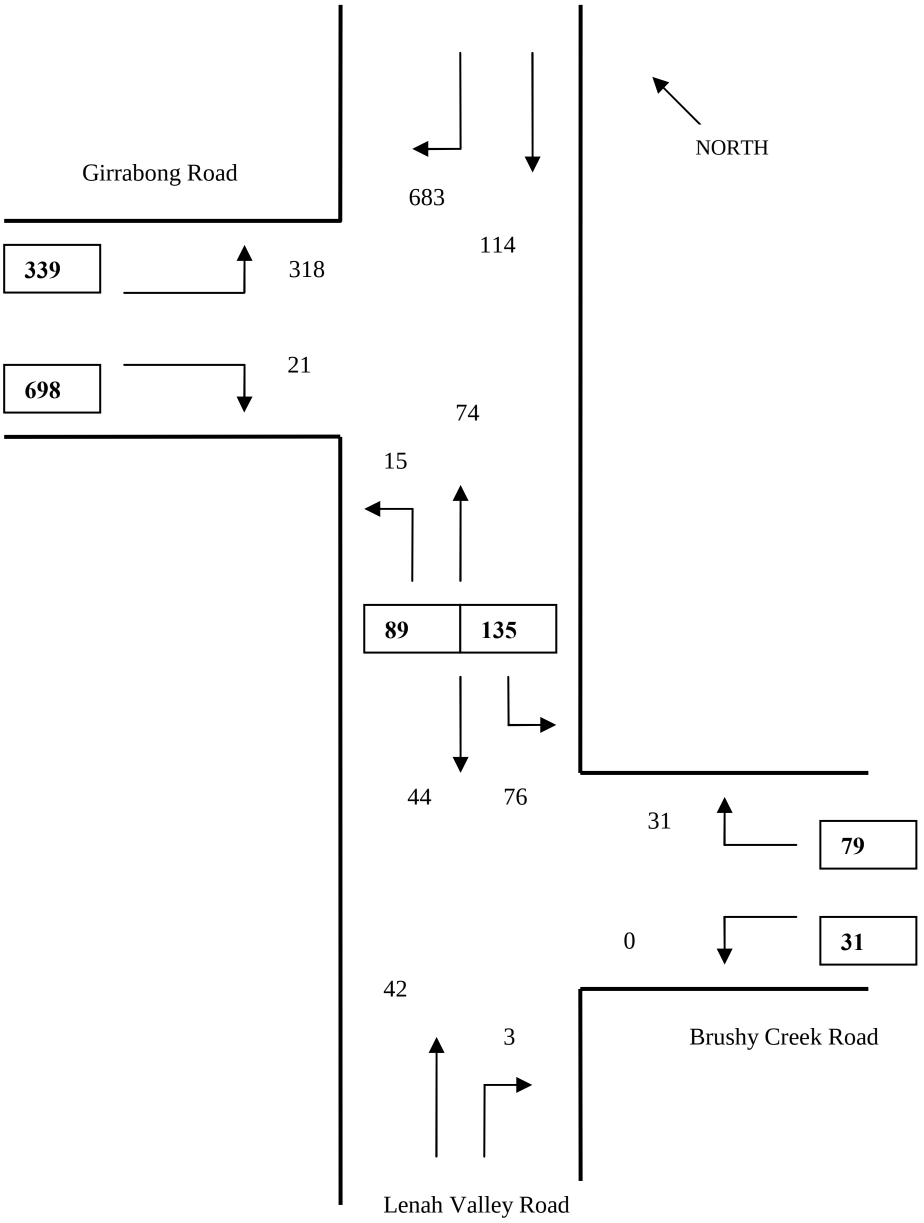


Figure 5.2: Turning traffic at Lenah Valley Road junctions with Girrabong Road and Brushy Creek Road - 4:30pm to 5:30pm in 2025

6. TRAFFIC ASSESSMENT AND IMPACT

This section of the report considers the impact that the traffic expected to be generated by the proposed subdivision development will have on Beaumont Road, Brushy Creek Road and Lenah Valley Road.

Consideration is also given to the available sight distances at affected intersections and the design of the subdivisional road layout.

6.1 Operational Impact of Increased Traffic Activity

The proposed subdivision development is expected to generate some 406 vehicle movements per day and 41 vehicles/hour during peak traffic periods along Beaumont Road, Brushy Creek Road and Lenah Valley Road.

In order to assess the impact of the traffic from the subdivision on the efficient operation of the road network, consideration has been given to the traffic operation at affected intersections. The ability of any road network to accommodate additional traffic volumes is fundamentally limited by the capacity of the intersections and junctions along the road network.

The two way traffic movement during peak traffic periods along Beaumont Road at the Brushy Creek Road junction in 2025 will be around 55 vehicles/hour and around half this volume along Brushy Creek Road to the south of Beaumont Road with the resultant conflicting traffic volume being well less than 100 vehicles/hour.

The expected traffic volumes at the Brushy Creek Road/Lenah Valley Road junction in 2025 are as shown in Figure 5.1 and 5.2. The maximum traffic conflict will be up to 150 vehicles/hour.

Intersections are normally capable of accommodating up to 1,500 vehicles/hour between conflicting traffic streams before operational issues arise. The traffic conflict at these two junctions will be no more than 10% of this traffic volume and therefore there will not be any operational traffic issues arising at these junctions.

Although traffic volumes at the Lenah Valley Road/Girrabong Road junction will be much higher, the conflict will be a little over half the above 1,500 vehicles/hour and therefore the operation will still be acceptable. A SIDRA analysis of the junction operation with the traffic volumes shown in Figures 5.1 and 5.2 has been undertaken to confirm the operational parameters.

The analysis has confirmed that during both peak periods the junction will operate at Level of Service A. The highest Degree of Saturation will be 0.57 and 0.44 for the AM and PM peak hours with queueing no longer than 12m.

The generated traffic by the proposed subdivision will also impact on the operation of the Lenah Valley Road/Creek Road/Pottery Road/Augusta Road intersection. The operation of this intersection was not analysed for this assessment as it was analysed for the TIA report which was prepared for the approved residential subdivision development off Creek Road. That report found that the intersection required capacity improvements to address the excessive delays and queueing that occurs currently during the morning peak hour and will occur in the near future during the afternoon peak hour.

The additional traffic from this proposed subdivision will add to the urgency for the capacity improvements at this intersection.

The increase in the traffic volume along Beaumont Road, Brushy Creek Road and Lenah Valley Road by 400 vehicles/day will also not create any traffic safety and operational issues along these streets away from the intersections. The traffic volume on Brushy Creek Road at Lenah Valley Road will increase to around 1,150 vehicle/day and well below desirable maximum limits for the local residential street function.

6.2 Available Sight Distances at Affected Intersections

The proposed subdivision development will not result in any new intersections being constructed. Therefore all the subdivisional traffic will pass through existing approved intersections.

Notwithstanding this, a check has been made of the available sight distances along Brushy Creek Road at Beaumont Road and along Lenah Valley Road at Brushy Creek Road.

Views along Brushy Creek Road for motorists entering from Beaumont Road are seen in Photographs 6.1 and 6.2 while views along Lenah Valley Road for motorists entering from Brushy Creek Road are seen in Photographs 6.3 and 6.4.

At both junctions the available sight distances along the through road are over 100m.

The required Austroads safe intersection sight distance for approach speeds of 50km/h is 93m. The 85th percentile approach speed on these roads would be less than 50km/h and therefore the available sight distances in all cases are more than required.

Photograph 6.1: View to south along Brushy Creek Road from Beaumont Road

Photograph 6.2: View to north along Brushy Creek Road from Beaumont Road

Photograph 6.3: View to southwest along Lenah Valley Road from Brushy Creek Road

Photograph 6.4: View to northeast along Lenah Valley Road from Brushy Creek Road

6.3 Internal Subdivisional Road Design

Consideration has been given to the proposed layout of the subdivisional road as shown on the drawing in Attachment A. Generally the proposed layout is supported as no concerns have been identified with the grade and alignment.

The 18m wide road reservation is in accordance with current standard requirements.

The new section of Beaumont Road will have a grade of around 17% along the initial 100m section, around 20% around half way into the subdivision for a distance of around 80m with the remaining sections of the road having a lesser grade and the last 100m having a slight downgrade.

While the speed limit along the subdivisional road will be 50km/h as for the existing section of Beaumont Road and other roads in this area, the horizontal and vertical road alignment will be such that vehicles speeds along the road will be significantly less than this, even less that 40km/h on some sections.

Being an extension of Beaumont Road, it would be reasonable in some respect to construct the subdivisional road to the same 8.4m width between kerb faces. Current IPWEA standards would require the road to be constructed even wider at 8.9m.

In weighing up the design width and character of the existing section of Beaumont Road against the 7.4m width of Brushy Creek Road and even sections of Augusta Road, it is clear that the 8.4 to 8.9m wide road is too wide for the desired local traffic environment.

In considering all factors including the local residential environment and required residential amenity, the alignment of the subdivisional road and a traffic volume of less than 500 vehicles/day (or around one vehicle per minute during peak hours at the start of the subdivisional road), a lesser road width of around 7.3m is recommended for the proposed subdivisional road, the same width as Brushy Creek Road.

This recommendation has regard for the IPWEA concern about available road width between parking cars on one or both sides of the road but also for the curved alignment.

There is no evidence to show the 7.3m width is a problem along Brushy Creek Road and from the consultant's knowledge and experience this is also the case for many other streets that have a similar width.

Some regard has also been given to the fact that the Victorian 'Engineering Design and Construction Manual' for subdivision development, which is applied over a large part of the Melbourne metropolitan area recommends a road width between kerb faces of 7.3m for local streets with traffic volumes of up to around 2,000 vehicles/day.

7. SUMMARY AND RECOMMENDATIONS

This Traffic Impact Assessment has been prepared to support the development application for the construction of a proposed 47 lot residential subdivision at 11 Beaumont Road.

The assessment has reviewed the existing road and traffic environment along affected roads from the area of the proposed subdivision development through to the Lenah Valley Road/Girrabong road junction. No issues of concern have been identified with respect to the traffic activity or crash record.

Beaumont Road has a road width between kerb faces of around 8.4m and there is a footpath along both sides of the road, Brushy Creek Road has a width between kerb faces of around 7.3m and the width of Lenah Valley Road between Brushy Creek Road and Girrabong Road varies with some sections having kerb and gutter along both sides of the road and the width between kerb faces is narrower at around 7.8m to 8.7m while other sections with kerb and gutter along one side of the road have widths of up to 10m.

Peak hour traffic volumes indicate that the traffic volume on Lenah Valley Road between Girrabong Road and Brushy Creek Road is around 1,800 vehicle/day, on Brushy Creek Road at Lenah Valley Road around 750 vehicle/day and on Beaumont Road at Brushy Creek Road around 150 vehicles/hour. Girrabong Road has a traffic volume of around 9,000 vehicles/day.

There have been no crashes along Beaumont Road, two reported crashes on Brushy Creek Road and two crashes along Lenah Valley Road between Girrabong Road and Brushy Creek Road over the last five and a half years.

The two crashes on Brushy Creek Road have been loss of control type incidents which occurred within 100m of one another on or near the bend at the Allport Place junction. The crashes occurred in 2013 and resulted in property damage only.

Along Lenah Valley Road there has been a midblock loss of control type crash in 2013 which occurred to the northeast of the Rangeview Road junction and required first aid attention while a 2014 crash at the Girrabong Road junction was a rear end collision which resulted in property damage only.

It has been estimated that the residential subdivision development when fully developed and occupied will generate some 406 vehicles/day and around 41 vehicles/hour during peak traffic periods.

With this additional traffic from the proposed subdivision, the resultant conflicting traffic volume at the Brushy Creek Road/Beaumont Road junction will be substantially less than 100 vehicles/hour in 2025. At the Brushy Creek Road/Lenah Valley Road junction it will be around 150 vehicles/hour in 2025.

Intersections are normally capable of accommodating up to 1,500 vehicles/hour between conflicting traffic streams before operational issues arise. The traffic conflict at these two junctions will be no more than 10% of this traffic volume and therefore there will not be any operational traffic issues arising at these junctions.

A SIDRA analysis of the Lenah Valley Road/Girrabong Road junction operation has confirmed that during both peak periods the junction will operate at Level of Service A. The highest Degree of Saturation will be 0.57 and 0.44 for the AM and PM peaks with queueing no longer than 12m.

The traffic generated by the proposed subdivision will also impact on the operation of the Lenah Valley Road/Creek Road/Pottery Road/Augusta Road intersection. Past investigations have found that the intersection requires capacity improvements to address the excessive delays and queueing which occur currently during the morning peak hour and which will occur in the future during the afternoon peak hour.

The additional traffic from this proposed subdivision will add to the urgency for the capacity improvement Lenah Valley Road/Creek Road/Pottery Road/Augusta Road intersection.

The increase in the traffic volume along Beaumont Road, Brushy Creek Road and Lenah Valley Road by 400 vehicles/day will not create any traffic safety and operational issues away from the intersections. The traffic volume on Brushy Creek Road at Lenah Valley Road will increase to 1,150 vehicle/day.

A check of the available sight distances along Brushy Creek Road at Beaumont Road and along Lenah Valley Road at Brushy Creek Road has found the available sight distances along the through road at both junctions are over 100m. The required Austroads safe intersection sight distance for approach speeds of 50km/h is 93m. The 85th percentile approach speed on these roads would be less than 50km/h and therefore the available sight distances in all cases are more than required.

The proposed layout of the subdivisional road is supported as no concerns with the grade and alignment have been identified. The 18m wide road reservation is in accordance with current standard requirements.

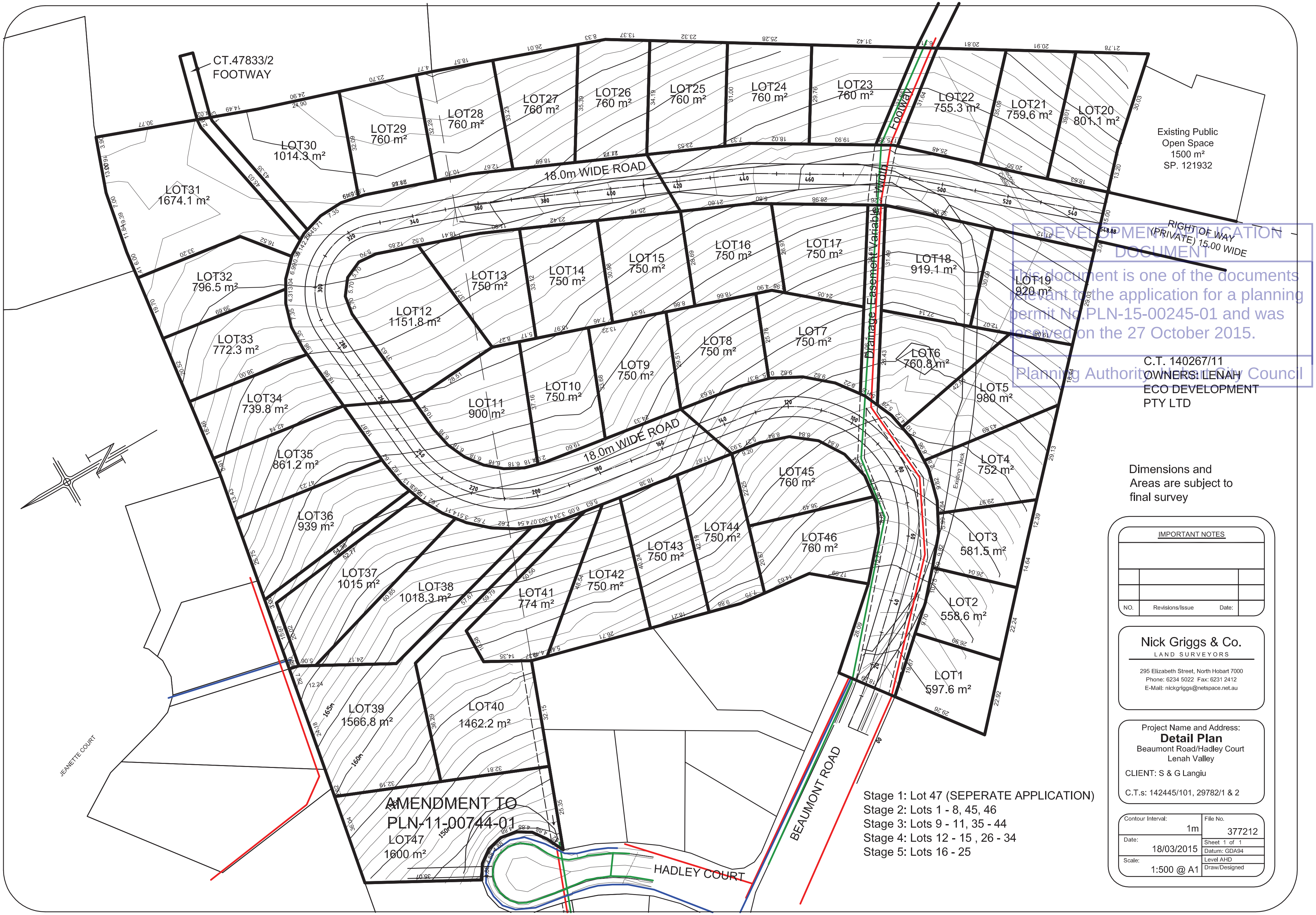
In considering the design width and character of the existing section of Beaumont Road which has a width of 8.4m and Brushy Creek Road which has a width of 7.3m width as well as all other relevant factors in achieving a desirable traffic environment outcome, it is clear that an 8.4 to 8.9m wide subdivisional road is too wide for this local environment.

There is no evidence to show the 7.3m width is a problem in Brushy Creek Road and it is the width that is applied in large parts of Melbourne for such residential streets. It is therefore recommended the subdivisional road be constructed to a width of around 7.3m.

It has been concluded that in accepting the above recommendations, traffic will operate safely and efficiently along the roads that have been addressed in this report.

ATTACHMENT A

Drawing of proposed subdivision layout



Dimensions and
Areas are subject to
final survey

Stage 1: Lot 47 (SEPERATE APPLICATION)
Stage 2: Lots 1 - 8, 45, 46
Stage 3: Lots 9 - 11, 35 - 44
Stage 4: Lots 12 - 15 , 26 - 34
Stage 5: Lots 16 - 25

IMPORTANT NOTES

NO.	Revisions/Issue	Date:

Nick Griggs & Co.
LAND SURVEYORS
295 Elizabeth Street, North Hobart 7000
Phone: 6234 5022 Fax: 6231 2412
E-Mail: nickgriggs@netspace.net.au

Project Name and Address:
Detail Plan
Beaumont Road/Hadley Court
Lenah Valley

CLIENT: S & G Langiu

C.T.s: 142445/101, 29782/1 & 2

Contour Interval: 1m
File No. 377212
Date: 18/03/2015
Sheet 1 of 1
Datum: GDA94
Level AHD
Scale: 1:500 @ A1
Draw/Designed

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 27 October 2015.

Planning Authority: Hobart City Council

Attachment 3

northbarker

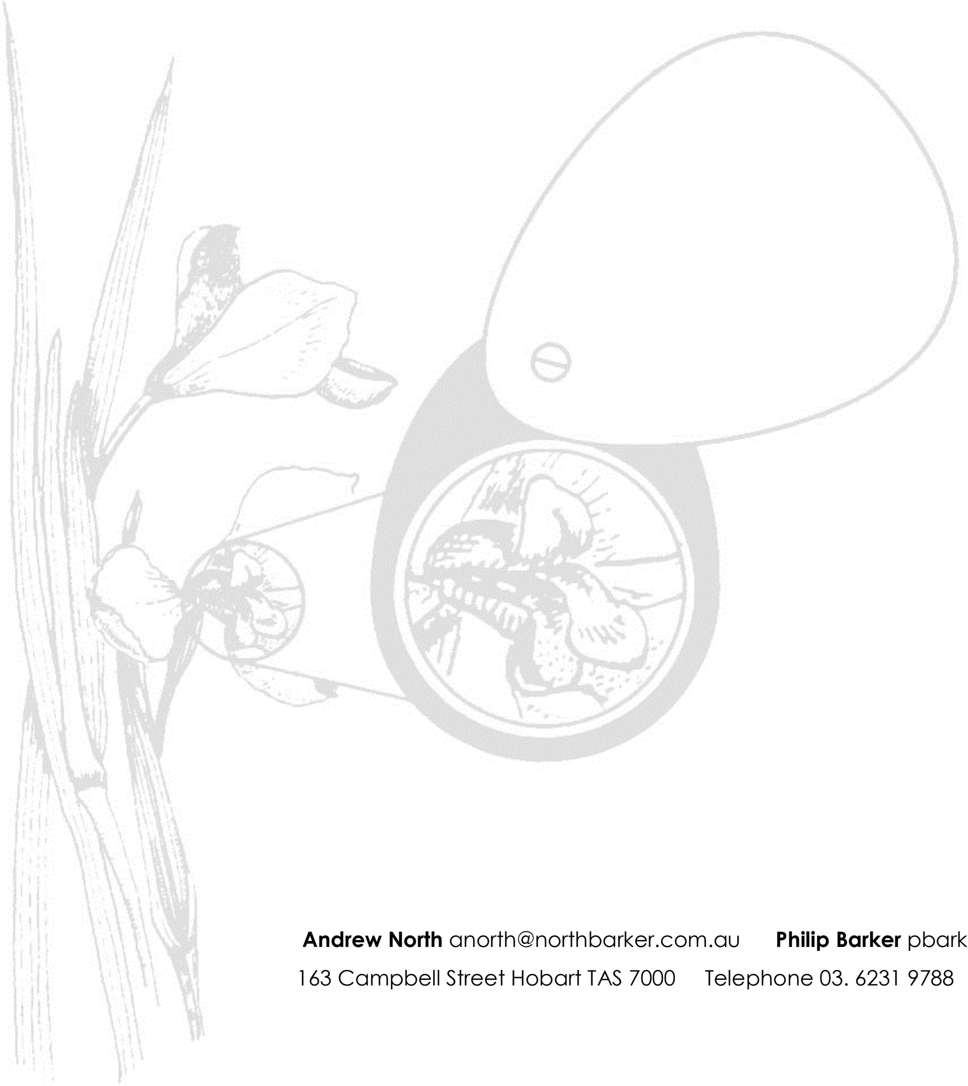
ECOSYSTEM SERVICES

11 Beaumont Road, Lenah Valley
Proposed Subdivision

VEGETATION SURVEY AND FAUNA HABITAT ASSESSMENT

30th June 2015

For JMG (JMG012)



Andrew North anorth@northbarker.com.au **Philip Barker** pbarker@northbarker.com.au
163 Campbell Street Hobart TAS 7000 Telephone 03. 6231 9788 Facsimile 03. 6231 9877

INTRODUCTION

Date of Survey: 23th June 2015.

Field Assessment: Dr Grant Daniels (NBES).

Report: Grant Daniels and Dave Sayers (NBES).

Mapping: Dave Sayers (NBES).

Method: Fieldwork based on the Timed Meander Search Procedure[1]. In addition to native plant species, non-native species have been recorded with emphasis on 'declared' weeds listed in the *Weed Management Act 1999*[2].

Native trees were recorded within the classes: small – 25-40 cm d.b.h; medium – 40-70 cm d.b.h; and large - > 70 cm d.b.h.

The conservation significance of species is determined at a State and National level by the Tasmanian *Threatened Species Protection Act 1995* and Commonwealth EPBCA (Appendix 1), the implications of which are considered in light of the relevant legislation (Appendix 2).

Background: The proponent is submitting an application to subdivide a parcel of land at 11 Beaumont Road, Lenah Valley (Figure 1). This report provides information in support of a development application to Hobart City Council.

Limitations: The survey was undertaken in winter. There may be some seasonal or discreet species that could have been overlooked. To compensate for this to some degree, field data are supplemented with observations from a Natural Values Atlas Report (#63690)[3].

SITE DESCRIPTION

The 5 ha property is bound by suburban development to the north, east and west, and lower density development to the immediate southwest.

The terrain consists of a moderate northwest facing slope extending from approximately 150-190 m a.s.l. The geology is comprised of dolerite and mudstone soils.

The property is zoned as General Residential under the Hobart Interim Planning Scheme 2015 and as such is not subject to the provisions within the Biodiversity Code E10.

BIOLOGICAL VALUES

This assessment has been undertaken in accordance with the "Guidelines for Natural Values Assessment"[4].

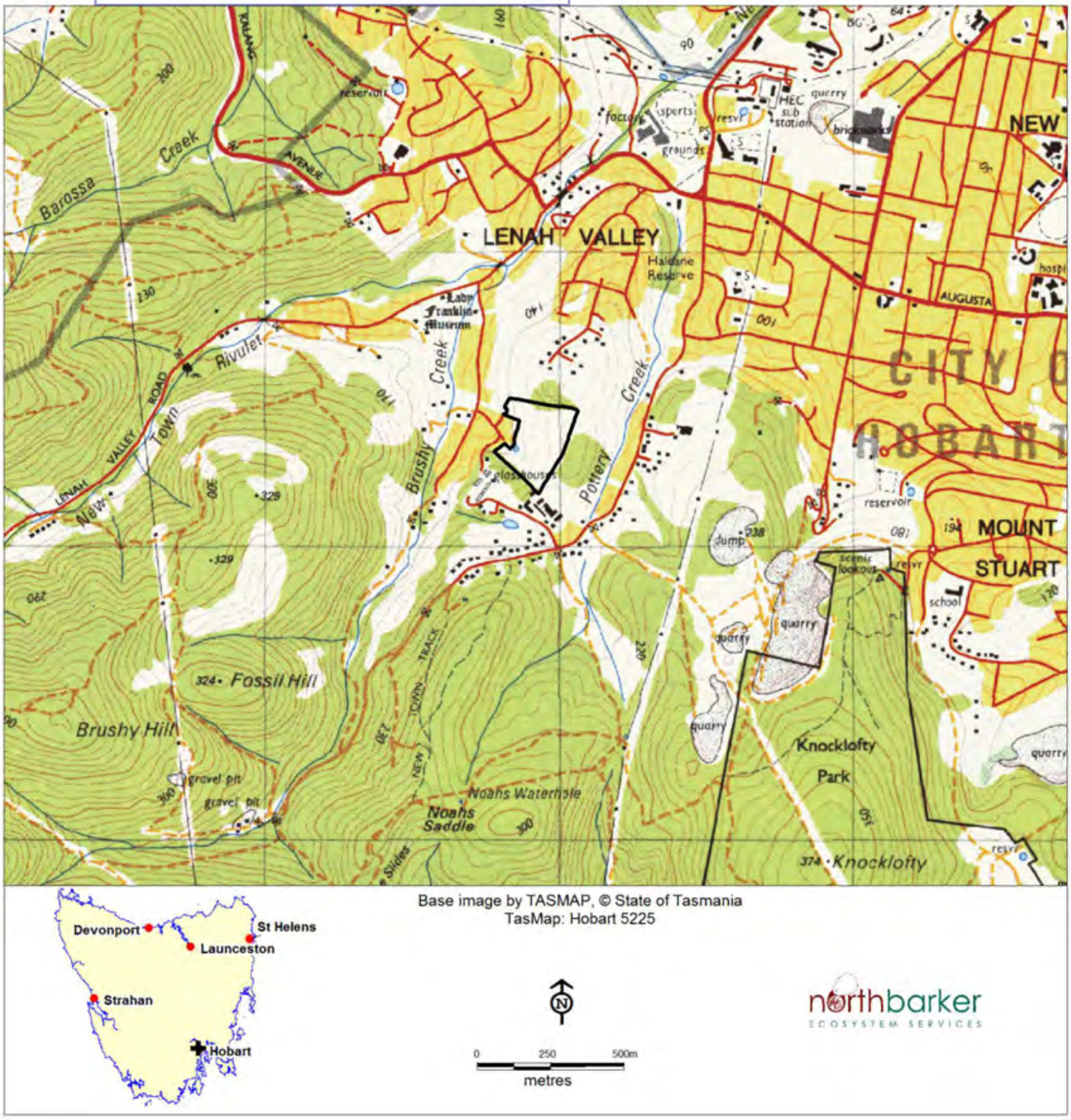
---

[1] Goff *et al.* 1982

[2] *Weed Management Act 1999*

[3] Natural Values Report (16/06/15), DPIPWE

[4] DPIPWE 2009



Base image by TASMAP, © State of Tasmania
TasMap: Hobart 5225

Figure 1 - Location of the property

BACKGROUND RESEARCH

The following sources were used for biological records from the region:

- Natural Values Atlas - all threatened plant and animal records within 5 km of the study area, plus potential suitability for other threatened fauna; and
- TASVEG 3.0 Digital Data - this layer has been field truthed.

VEGETATION

The study area is identified on the current state-wide vegetation mapping (TASVEG version 3.0) as comprising 'Urban areas' (FUR), which is a class within the Agricultural, urban and exotic vegetation group.

Our ground inspection established that the site is more accurately classified as 'Weed infestation' (FWU). This is due to a dense infestation of gorse (*Ulex europaeus*) and the current lack of housing required to constitute FUR (Plate 1).

The FWU on site includes patchy regrowth native trees (Plate 2) and the occasional remnant individual. The distribution of trees with a d.b.h. greater than 25 cm is illustrated in Figure 2.

FWU is a non-natural community and is thus not protected under the Tasmanian *Nature Conservation Act 2002* or the EPBCA.

Plate 1: The majority of the site is covered with a dense layer of gorse

Plate 2: Regrowth *Eucalyptus* trees are patchy across the site

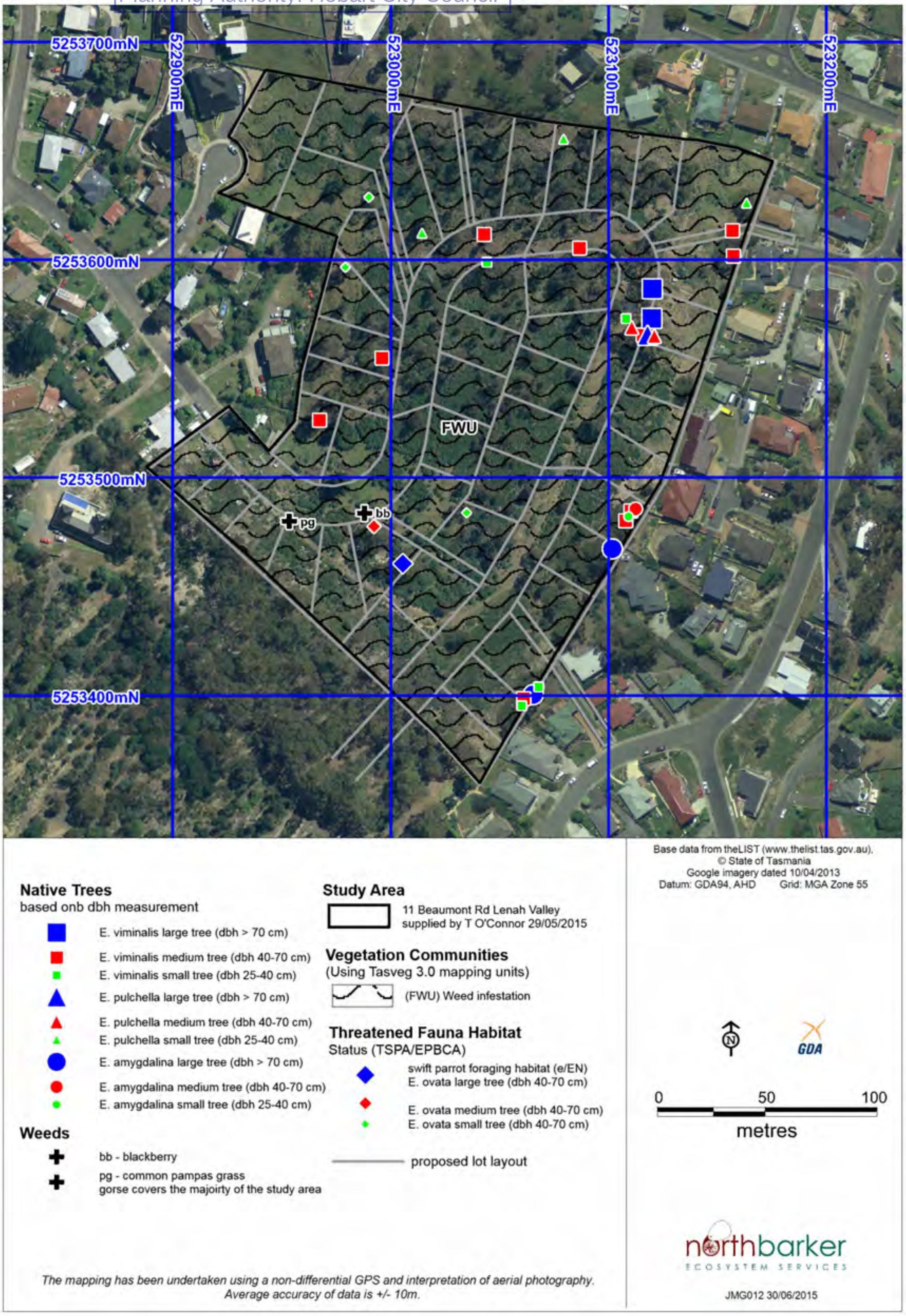


Figure 2: Native trees, selected weeds and TASVEG communities on site

PLANT SPECIES

A total of 59 species of vascular plant were recorded during the survey, including 20 introduced species, of which 6 are declared weeds. The survey species list is provided within Appendix 3.

No threatened species listed under the TSPA or the EPBCA were recorded during the survey.

Previous surveys within 5 km of the property have identified a variety of species of threatened flora variously listed under the TSPA and EPBCA. All threatened species recorded within 5 km are listed in Table 1 together with a description of their preferred habitat and an assessment of their likely occurrence on the property. None of these species are considered likely to have been overlooked on site. The site does not constitute good habitat for threatened flora.

Table 1: Flora species of conservation significance previously recorded within a 5km radius of the site[5]

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
Anogramma leptophylla annual fern	Vulnerable/ -	None	No suitable habitat present.
Asperula scoparia var.scoparia prickly woodruff	Rare/ -	Low	Occurs in grassy forest usually on moist sites. Limited suitable habitat on site.
Australina pusilla ssp. *muelleri* shade nettle	Rare/ -	None	A species with limited populations in dense wet forest. No suitable habitat present.
Austrostipa bigeniculata double jointed speargrass	Rare/ -	Very low	Closest known records are in grassy understorey at Queen's domain. Habitat very marginal.
Austrostipa blackii crested speargrass	Rare/ -	Very low	Closest known records are in grassy understorey at Queen's domain. Habitat very marginal.
Austrostipa nodosa knotty speargrass	Rare/ -	Low	Occurs in grassland or open forest on fertile soils in low rainfall areas. Species currently up for delisting and awaiting the Ministers approval.
Austrostipa scabra rough speargrass	Rare/ -	Low	Occurs in grassland or open forest on fertile soils in low rainfall areas. An abundant species that may warrant delisting.

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[5] Natural Values report 25/05/15, DPIPWE

[6] Lazarus *et al.* 2003; Jones *et al.* 1999

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
Bolboschoenus caldwellii sea clubsedge	Rare/ -	None	Occurs in marginal aquatic habitats. No suitable habitat present.
Brachyglottis brunonis Tasmanian daisy tree	Rare/ -	None	No suitable habitat. Unlikely to have been overlooked.
Brachyscome perpusilla and *radicata*	Rare/ -	Very low	Historical records only. Limited suitable habitat.
Caladenia caudata tailed spider orchid	Vulnerable/ VULNERABLE	Very low	Occurs in heathy open forest and heathland on easterly to north easterly sites close to the coast. Limited suitable habitat present.
Caladenia sylvicola forest fingers	Endangered/ CRITICLLY ENDANGERED	Very low	Known only from two sites in differing habitats – one in dry silver peppermint forest and the other in moist stringy bark forest. Both known records are on mudstone. The species is too rare for a detailed understanding of its habitat requirements. The species is only observable in the October – November flowering period.
Carex gunniana mountain sedge	Rare/ -	None	Occurs in soaks in wet forest and coastal sites. No suitable habitat present.
Carex longebrachiata drooping sedge	Rare/ -	None	Occurs in wet grassland. No suitable habitat present.
Carex tasmanica curly sedge	-/ VULNERABLE	Low	Occurs in moist grassland and disturbed habitats. Not likely to have been overlooked. Nominated for delisting.
Corunastylis nuda tiny midge orchid	Rare/ -	None	Occurs in open forest on dolerite. Numerous recent observations around Cascade area. Best observed during January/February flowering period. Habitat unsuitable.
Corunastylis nudiscapa bare midge orchid	Endangered/ -	None	Species not well known but peak flowering appears to be late February to early April. Numerous recent discoveries near C. nuda locations. Habitat unsuitable.
Cynoglossum australe Austral hounds tongue	Rare/ -	Low	Occurs mainly in coastal sandy habitats but occasionally on dry rocky dolerite slopes. Limited suitable habitat present. Species currently up for delisting and awaiting the Ministers approval
Deyeuxia densa heathland bent grass	Rare/ -	Very low	Occurs in heathland and creek sides and damp forest. No potential habitat present.

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
Dianella amoena matted flax lily	Rare/ ENDANGERED	None	Occurs in grasslands mainly on fertile soils in low rainfall areas. No suitable habitat present. All local records historic.
Diuris palustris swamp diuris	Endangered/ -	None	Occurs in swampy grasslands and heaths. No suitable habitat present.
Epacris virgata (Kettering*)*	Vulnerable/ -	Very low	Closest known records are west of Knocklofty Reserve. Occurs on dolerite but not recorded on site and unlikely to have been overlooked.
Erygium ovinum blue devil	Vulberable/ -	None	A species of fertile grasslands. No suitable habitat present.
Eucalyptus risdonii Risdon peppermint	Rare/ -	None	A highly distinctive species unlikely to have been overlooked.
Euphrasia scabra yellow eyebright	Endangered/ -	Very low	Occurs in open forest with moist rocky soils. Limited suitable habitat present.
Goodenia geniculata bent native-primrose	Endangered/ -	Very low	One historical record only. No suitable habitat.
Haloragis aspera rough raspwort	Vulnerable/ -	Very low	One historical record only. No suitable habitat.
Hyalosperma demissum moss sunray	Endangered/ -	Very low	One historical record only. No suitable habitat.
Hydrocotyle laxiflora stinking pennywort	Endangered/ -	None	Only known from she-oak forest on the Queen's Domain. No equivalent habitat present.
Hypoxis vaginata var. brevistigmata sheathing yellow star	Rare/ -	Very low	Occurs in moist grassland. No suitable habitat present.
Isoetopsis graminifolia grass cushion	Vulnerable/ -	None	Historical records only. No suitable habitat present.

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
Isolepis habra wispy clubsedge	Rare/ -	Very low	One old record only. No suitable habitat.
Juncus vaginatus clustered rush	Rare/ -	None	Occurs in streams and marshes. No suitable habitat present.
Lachnagrostis punicea subsp. filifolia narrowleaf blown grass	Rare/ -	None	Occurs in coastal habitats. No suitable habitat present.
Lepidium hyssopifolium soft peppercress	Endangered/ ENDANGERED	Very low	Occurs on fertile soils in dry habitats within the growth suppression zone of shade bearing trees. Limited suitable habitat present.
Lepidium pseudotasmanicum shade peppercress	Rare/ -	Low	Occurs in shady sites on fertile soils. Limited habitat (growth suppression zone of shade bearing trees) available. This species persists in disturbed sites but not these with large amounts of shrubby vegetation, such as the present site. Species currently nominated for delisting and awaiting the Ministers approval.
Olearia hookeri crimson tip daisybush	Rare/ -	None	A distinctive species unlikely to have been overlooked.
Pellaea calidirupium hotrock fern	Rare/ -	None	No suitable habitat present.
Pimelea curviflora var. *gracilis* slender curved riceflower	Rare/ -	None	One old record only. No suitable habitat present.
Pimelea flava ssp. *flava* yellow rice flower	Rare/ -	None	Occurs in various soils in dry sclerophyll forest. Unlikely to have been overlooked if present.
Prasophyllum apoxychilum tapered leek orchid	Endangered/ ENDANGERED	Very low	Occurs in grassy and scrubby open forest on sandy and clay loams, often amongst rocks. Detailed ecological requirements are not well known. Only observable in October-November, particularly following bushfires. Very limited potential to occur on site.
Prasophyllum perangustum Knocklofty leek orchid	Endangered/ CRITICALLY ENDANGERED	Very low	Known habitat is *E. pulchella* grassy forest on well drained dolerite clay loam at 300 m on a hill top. Ecological requirements little known but the only known site (crest of Knocklofty) is in a much more natural state

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
			than this site.
Pterostylis squamata Ruddy greenhood	Rare/ -	Very low	Occurs in heathy and grassy open forest on well drained sandy and loamy soils. Little suitable habitat but species more readily observed in December to March flowering season. Most previous records are historic.
Ranunculus pumilio var. pumilio ferny buttercup	Rare/ -	None	Occurs on damp grassland. Only 1 known record within 5 km. Very limited suitable habitat present and not observed.
Ranuculus sessiliflorus var. *sessiliflorus* rockplate buttercup	Rare/ -	None	No suitable habitat. Nominated for delisting.
Rytidosperma fulvum (formerly R. popinensis) blue wallabygrass	Rare/ -	None	Has undergone taxonomic change from the previously nationally endangered *R. popinensis.* Believed to be an introduced species form Victoria/South Australia.
Rytidosperma indutum tall wallabygrass	Rare/ -	Low	Dry grassy habitat. Species is known to favour disturbance, particularly fire. Habitat limited in suitability due to gorse infestation.
Scleranthus fasciculatus spreading knawel	Vulnerable/ -	Low	Very limited suitable habitat remains on site.
Senecio squarrosus leafy fireweed	Rare/ -	Low - moderate	Habitat is dry sclerophyll forest. This species is an annual or short-lived perennial herb and recruitment apparently occurs after fire. The site has not been burnt for some time therefore there is little chance of observing the species, if present, until after the next fire. Habitat limited in suitability due to gorse infestation.
Thelymitra bracteata leafy sun-orchid	Endangered/ -	Very low	No suitable habitat present. Not tolerant to the level of disturbance on site.
Thismia rodwayi fairy lanterns	Rare/ -	None	Occurs mainly in wet forest beneath broad leaved shrubs. No suitable habitat present.
Velleia paradoxa spur velleia	Vulnerable/ -	Very low	Occurs in stony grassland. No suitable habitat present.
Veronica notabilis forest speedwell	Extinct/ -	None	Considered to be extinct in Tasmania.
Vittadinia burbidgeae smooth new- holland daisy	Rare/ -	Low	This is a relatively new taxon that has been split from *V. muelleri* form which habitat requirements are currently indistinguishable. Typically associated with grassy sites on shallow soils.

Species	Status TSPA/EPBCA	Potential to occur	Observations and preferred habitat[6]
Vittadinia cuneata var. *cuneate* fuzzy new-holland daisy	Rare	Low	Old local records only. Limited likelihood of occurrence on site.
Vittadinia gracilis woolly new-holland daisy	Rare	Low	No suitable grassland habitat present.
Vittadinia muelleri narrow leaf new-holland daisy	Rare/ -	Low	Some habitat potential but unlikely to be present in meaningful numbers in relation to overall population size. Only one record within 500 m of property.
Westringia angustifolia narrowleaf westringia	Rare/ -	None	A distinctive species unlikely to have been overlooked.

INTRODUCED PLANTS

Six introduced plants listed as ‘declared’ weeds under the *Weed Management Act 1999* were recorded on the property. Gorse (*Ulex europaeus)* is heavily abundant, covering most of the site densely and being the primary reason for the classification of the site as FWU ‘weed infestation’. Boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*), English broom (*Cytisus scoparius*) and slender thistle (*Carduus pycnocephalus*) each occurred patchily throughout the gorse infestation. Pampas (*Cortaderia selloana*) and blackberry (*Rubus fruticosus*) were observed as isolated individuals only and as such have been mapped in Figure 2.

FAUNA CONSERVATION VALUES

No threatened fauna or threatened fauna nests/dens were observed on site. The site provides limited habitat values associated with threatened fauna, and no factors that could be considered critically limiting to any species potentially present. Of species known from within 5 km (Table 2), the eastern barred bandicoot (*Perameles gunnii*) and the Swift Parrot (*Lathamus discolor*) are the most likely to occur on site and are the only species with records from within 500 m of the site – only one record in each case.

Table 2: Fauna species of conservation significance previously recorded, or which may potentially occur, within 5 km of the property[7]

Species	Status TSPA/ EPBCA	Likelihood of occurrence	Observations and preferred habitat[8]
Birds			
Accipiter novaehollandiae grey goshawk	Endangered/ -	Very low	Inhabits large tracts of wet forest and requires old trees for nesting. No suitable nesting habitat present but may hunt over study area.
Alcedo azurea ssp. *diemenensis* azure kingfisher	Endangered/ ENDANGERED	None	No suitable riparian habitat present.
Aquila audax subsp. *fleayi* wedge-tailed eagle	Endangered/ ENDANGERED	Very low (foraging only)	Requires large sheltered trees for nesting and is highly sensitive to disturbance during the breeding season. No suitable nesting habitat present but may hunt over study area.
Haliaeetus leucogaster white-bellied sea-eagle	Vulnerable/ -	None	Occurs in coastal habitats and large inland waterways. No suitable habitat present.
Lathamus discolor swift parrot	Endangered/ ENDANGERED	**Moderate (foraging)** **None (nesting)**	Requires tree hollows for nesting and feeds on nectar of blue gum (*E. globulus*) and black gum (*E. ovata*) flowers. There are numerous records of swift parrot within 5km of the site. Black gums on site represent a potential but limited foraging resource in flowering years. No nesting habitat is present. If the black gums are retained on site there will be a risk of bird mortality through collision with houses.
Pardalotus quadragintus forty-spotted pardalote	Endangered/ ENDANGERED	None	Restricted to dry grassy forest and woodland along the east and southeast coast containing mature white gum (*E. viminalis*). Closest colony is in Taroona Hills over 10 km south east. Suitable white gums are found on site, but the site is not a suitable location and contains a suburban bird assemblage incompatible with the presence of this species.
Tyto novaehollandiae masked owl	Endangered/ VULNERABLE	Very low	Requires a mosaic of forest and open areas for foraging and large old-growth hollow-bearing trees for nesting. No suitable nesting habitat present but may hunt over study area.
Mammals			
Dasyurus maculatus subsp. *maculatus* spotted-tail quoll	Rare / VULNERABLE	Very low	Potential habitat within the surrounding landscape however not known as core habitat and only one known record within 5 km

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[7] Natural Values report 16/06/15, DPIPWE – species without terrestrial habitat requirements have been excluded

[8] Bryant & Jackson 1999

Species	**Status TSPA/ EPBCA**	**Likelihood of occurrence**	**Observations and preferred habitat[8]**
Perameles gunnii eastern-barred bandicoot	-/ VULNERABLE	**Moderate - high**	This species favours a mosaic of open grassy areas for foraging with thick vegetation cover for shelter and nesting. There are numerous records within 5 km and periurban locations are typically the stronghold of the species in south-eastern Tasmania. Saggs and shrubs in the study area may be used as cover and nesting habitat. Unlikely to suffer a significant reduction in habitat availability should the property be developed.
Sarcophilus harrisii Tasmanian devil	Endangered/ ENDANGERED	Very low	Known within 5 km, however no breeding habitat on site and limited potential for foraging.
Reptiles and amphibians			
Pseudemoia pagenstecheri tussock skink	Vulnerable/ -	None	Occurs in *Poa* tussock grassland and *Themeda* grassland without trees. No suitable habitat present.
Litoria raniformis green and golden frog	Vulnerable/ VULNERABLE	None	Occurs in well vegetated wetlands. No suitable habitat present.
Invertebrates			
Antipodia chaostola leucophaea chaostola skipper	Endangered / ENDANGERED	Low	Host plant *Gahnia radula* (thatch saw sedge) is present within the study area, but the species and its characteristic leaf shelters were not observed and there are very few known occurrences within 5 km.
Discocharopa vigens ammonite snail	Endangered/ CRITICALLY ENDANGERED	Very low	This snail has been recorded from the following seven locations in the Hobart metropolitan area: Mount Wellington, Mount Nelson, The Domain, Hillgrove, Grasstree Hill, South Hobart and Austins Ferry. Species thought to be extinct from Mt Nelson. Habitat of the species includes dry and wet eucalypt forests on dolerite in the Hobart metropolitan area, below 400 m in altitude. To date, the species has only been found under dolerite rocks. Suitable habitat present but given lack of knowledge and quality of habitat, highly unlikely to be present
Lissotes menalcas Mount Mangana stag beetle	Vulnerable/ -	None	No suitable wet forest habitat with decaying logs.

Species	Status TSPA/ EPBCA	Likelihood of occurrence	Observations and preferred habitat[8]
Roblinella agnewi silky snail	Rare/ -	Very low	Occurs in dolerite scree. No suitable habitat observed.

Swift parrot (*Lathamus discolor*)

This small fast flying parrot occurs in eucalypt forests in south-eastern Australia and Tasmania. Swift parrots breed in Tasmania and migrate to mainland Australia in autumn where they are semi-nomadic, foraging on flowering eucalypts in Victoria and New South Wales. In Tasmania the breeding range is largely restricted to the south-east coast within the range of Tasmanian blue gum (*Eucalyptus globulus*) forest, which is its main nectar food source. They also forage on the nectar of black gum (*Eucalyptus ovata*) flowers. The swift parrot has been found to be in decline throughout its range in eastern and northern Tasmania. Recent evidence indicates the young are predated on by the introduced sugar glider[9]. Residential subdivisions in bushland present a significant threatening process to the conservation of the species through direct habitat loss by tree removal and from bird collision with house windows and other built structures.

Black gums occur on site. Swift parrots are likely to pass through the site and may use the black gums for foraging during flowering years. The black gums present on site are not considered to represent a significant foraging resource in the context of the number of viable foraging trees present with region. In addition they are not suitable for swift parrot nesting. If the black gums are retained on site, there is likely to be an increased risk of bird strike mortality of swift parrots without adequate care in house design.

Eastern barred bandicoot (*Perameles gunnii*)

There are numerous records for the eastern barred bandicoot within a 5 km radius of the study area. Eastern barred bandicoots inhabit grassland and grassy woodland and they have also adapted to pasture, semi-urban parks and gardens. They prefer to forage in open grassy areas, but for shelter and nesting they require a dense ground cover of native tussock grasses, sedges and shrubs. They forage after dusk and sleep during the day in grass-lined nests where the cover is thick. The present sites location and habitat is suitable for breeding and foraging for this species.

The species is listed as Vulnerable nationally under the EPBCA. However Tasmanian legislation does not reflect that view and the species is not listed on the TSPA. Although subject to predation from domestic pets (cats and dogs), it persists in many periurban situations. The major threat to this species in Tasmania comes from the red fox (*Vulpes vulpes*). Therefore, it is considered that the proposed development in itself does not represent a threat to the survival of this species.

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[9] Stojanovic et al (2014)

ASSESSMENT OF IMPACT AND MITIGATION

NATIVE VEGETATION

In order to build dwellings and associated infrastructure, some native trees/shrubs would need to be felled. Losses to native ground layer vegetation will be minor due to the extensive occurrence of gorse.

The loss of native vegetation could be minimised by applying a condition to the development approval that restricts removal of native vegetation over and above that which is reasonably required for the construction of a dwelling, bushfire protection and services. Given the extensive occurrences of gorse on site, such a condition however may interfere with or increase the costs of weed removal.

THREATENED FLORA

No threatened plant species were recorded on site. Although the survey was conducted in winter, it is considered that the probability of threatened species being present on site is negligible.

THREATENED FAUNA

The property supports habitat that is suitable for the eastern barred bandicoot. This is more a reflection of the adaptability of this species to modified periurban environments, rather than a reflection of habitat quality *per se*. Eastern barred bandicoots may forage and shelter within the site, although it is not considered that the conservation status of the eastern barred bandicoot would be adversely affected by development of the property, especially as the species main threat is from predation by the red fox.

As only a small number of non-hollow-bearing black gum trees will potentially be impacted, there is minimal predicted impact to swift parrot habitat availability. However, swift parrots are known to occur in the vicinity and the construction of new dwellings within an area containing swift parrots potentially brings an increased risk of swift parrot mortality brought about by collision with new windows and other structures. Collision with fences, windows and vehicles is recognised as one key cause of mortality in parrots. The level of risk would be determined by the architectural details of the proposed houses. Large windows, reflective glass and chain link fences are particularly hazardous and should be avoided. House design should be in accordance with recognised best practice. To minimise this risk standard practice for infrastructure development as outlined in the Tasmanian Bird Collision Code[10] should be applied. Paradoxically, it may also be prudent to remove the black gums from the site should they be close to any potential housing sites. This will remove the possibility of bird collision following visits to these trees for foraging.

FIRE MANAGEMENT

Incumbent with the construction of residential development in bushland is a need to ensure that the risk of fire damage meets requirements set out by the Tasmania Fire Service. Guidelines developed by the Fire Service include the establishment of a *Building Protection Zone* (BPZ) and a *Fuel Modified Buffer Zone* (FMBZ). Fuel levels in both zones require active management. This can impact upon the integrity of the

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[10] Threatened Species Network, 2008.

vegetation and upon biodiversity values and potential for natural recruitment in the long term. There is a challenge in reconciling bushfire hazard minimisation with the protection and maintenance of biodiversity values in bushland areas.

WEEDS

Earthworks associated with construction on site present a risk of spreading weeds, both on site and offsite.

Appropriate management of important weeds during construction and following completion of the development would minimise the risk of these species spreading into surrounding areas. Weed management should include preliminary weed control prior to construction, supplemented by follow up measures post construction to target any regenerating plants.

LEGISLATIVE IMPLICATIONS

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA)

The EPBCA is structured for self-assessment; the proponent must indicate whether or not the project is considered a 'controlled action' which if confirmed would require approval from the Commonwealth Minister.

The probability of any nationally listed flora species occurring on the property is considered low.

The eastern barred bandicoot could potentially occur on the property. However, the vegetation survey and fauna habitat assessment has indicated that the proposal is unlikely to cause a measurable decline to the eastern barred bandicoot.

The swift parrot may forage in the immediate surrounds from time to time. The clearance of *E. ovata* on site is not likely to result in a significant impact to the swift parrot.

Tasmanian *Threatened Species Protection Act 1995* (TSPA)

Any impact on threatened plant species listed under the TSPA will require a 'permit to take' from the Policy and Conservation Assessments Branch (PCAB) at the Department of Primary Industries, Parks, Wildlife and the Environment (DPIPWE).

No threatened species was recorded on site. Although the survey occurred in winter, the chance of threatened species occurring on site is considered negligible.

Tasmanian *Weed Management Act 1999* (WMA)

Hobart City is a Zone B municipality for gorse, English broom, slender thistle, boneseed and blackberry (*Rubus fruticosus*). According to the provisions of the *Weed Management Act 1999*, Zone B municipalities are those which host widespread infestations where control and prevention of spread is the principle aim.

Under the relevant statutory weed management plan, the study area is recognised as a 'Zone A' area for pampas grass. Zone A municipalities are those which host only small and manageable infestations of the declared weed that are deemed eradicable;

as such, eradication of the species from the municipality is the primary objective, with individual land managers being responsible for plants on their land.

Earthmoving and construction works required as part of the proposed subdivision present a risk of exacerbating the existing infestations and spreading soil borne seed and vegetative material.

Properties containing declared weeds are potentially subject to the directives of the Regional Weed Management Officer.

Given the dense infestations of weeds on site, a Weed Management Plan may be useful to aid in the adherence to WMA specifications.

Hobart Interim Planning Scheme 2015

The property is zoned as General Residential under the Hobart Interim Planning Scheme 2015 and as such is not subject to the provisions within the Biodiversity Code E10. The property is also not under the Biodiversity Protection overlay.

The *Land Use Planning and Approvals Act 1993* (LUPAA)

LUPAA states that 'in determining an application for a permit, a planning authority must (amongst other things) seek out the objectives set out in Schedule 1[11].

Schedule 1 includes 'The objectives of the Resource Management and Planning System of Tasmania' which are (amongst other things):

> 'To promote sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity'.

Sustainable development includes 'avoiding, remedying or mitigating any adverse effects of activities on the environment'[12].

Across the municipality and State the rate of residential development is resulting in numerous small and in themselves relatively insignificant land clearance outcomes. Collectively, they can create a loss of carrying capacity and biodiversity values. Considering the zoning of the present property is general residential and the vegetation is in poor condition due to dense occurrences of weeds, clearance is not considered to represent a significant impact to local and regional natural values.

CONCLUSION AND RECOMMENDATIONS

The property supports no vegetation of conservation significance and is mostly in poor condition due to a dense infestation of gorse.

The site contains some habitat for the threatened swift parrot and the eastern barred bandicoot. The latter species is capable of persisting in periurban developments and may even benefit from increased habitat heterogeneity as a result of development. The swift parrot has only a small amount of foraging habitat on site and it is suggested that the retention of foraging trees within the proposed suburban development would be potentially detrimental overall, due to increased risk of bird

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[11] Section 51(2)(b) – Part 4 Enforcement of Planning Control – Division 2 Development Control (*LUPPA 1993*)

[12] page 56 – *LUPPA 1993*

collision with the new dwellings. Risk of collision can be further minimised by ensuring controls are put in place to ensure design of the proposed residences and fences conform to contemporary bird strike minimisation guidelines to reduce swift parrot mortality.

The development of the site would allow for the heavy weed infestations to be managed. A number of declared weeds, especially gorse, is present in heavy infestations. Given the level of infestations, targeted weed control is recommended at all stages of works. This would be may be aided by the preparation of a Weed Management Plan.

REFERENCES

Bryant, S. & Jackson, J. (1999). *Tasmania's Threatened Fauna Handbook: what, where and how to protect*. Threatened Species Unit, Parks & Wildlife Service, Hobart.

Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999. No. 91, 1999.*

DPIPWE (2009). *Guidelines for Natural Values Assessments*. Reporting On the Impact of Proposed Developments on Natural Values and Providing Recommendations for Mitigating Those Impacts. Department of Primary Industries, Parks, Water and Environment July 2009.

DPIPWE (2015). Natural Values Report 63390 (16/06/2015), Natural Values Atlas, Threatened Species Section, Department of Primary Industries and Water, Hobart.

Department of Primary Industries, Parks, Water and Environment. *TASVEG 3.0*, Released November 2013. Tasmanian Vegetation Monitoring and Mapping Program, Resource Management and Conservation Division.

Goff, F.G, Dawson, G.A. and Rochow, J.J. (1982). Site examination for threatened and endangered plant species. *Environmental Management 6 (4) pp 307-316*.

Knight, R.I. (2012). Analysis of comprehensiveness of existing conservation reserves and proposed additions to the Tasmanian forest reserves system. Report to the Independent Verification Group for the Tasmanian Forests Intergovernmental Agreement, February 2012. Natural Resource Planning, Hobart.

Lowland Grassland Review Expert Group (2008). A Review of the Conservation Status of Lowland *Themeda* and *Poa* Grassland Native Vegetation Communities. An unpublished report to the Lowland Grassland Review Steering Committee, Resource Management and Conservation, Department of Primary Industries & Water, Hobart.

Jones, D., Wapstra, H., Tonelli, P. and Harris, S. (1999). *The Orchids of Tasmania.* Melbourne University Press.

Kirkpatrick, J.B., Barker, P., Brown, M.J., Harris, S., and Mackie, R. (1995). *The Reservation Status of Tasmanian Vascular Plant Communities*. Wildlife Scientific Report 95/4. Parks and Wildlife Service, Hobart.

Lazarus, E., Lawrence, N. & Potts, W. (2003) *Threatened Flora of Tasmania CD.* Department of Primary Industries, Water & Environment, Hobart.

Peters, D. & Thackway, R. (1998) *A New Biogeographic Regionalisation for Tasmania*. Tasmanian Parks and Wildlife Service, Hobart.

Pfennigwerth, S. (2008). *Minimising the swift parrot collision threat.* Guidelines and recommendations for parrot-safe building design. World Wildlife Fund – Australia.

Stojanovic, D, Webb, M, Alderman, R et al 2014, *'Discovery of a novel predator reveals extreme but highly variable mortality for an endangered migratory bird'*, Diversity and Distributions, vol. 20, no. 10, pp. 1200-1207.

Tasmanian Fire Service (2005). *Guidelines for development in bushfire prone areas of Tasmania. Living with fire in Tasmania.*

Tasmanian State Government (1993). *Land Use Planning and Approvals Act 1993.* No.70 of 1993. Government Printer, Hobart, Tasmania

Tasmanian State Government (1995). *Threatened Species Protection Act 1995.* No.83 of 1995. Government Printer, Hobart, Tasmania

Tasmanian State Government (1999). *Weed Management Act 1999.* No.105 of 1999. Government Printer, Hobart, Tasmania.

Tasmanian State Government (2002). *Nature Conservation Act 2002.* No.63 of 2002. Government Printer, Hobart, Tasmania.

Tasmanian State Government (2006). *Nature Conservation Amendment (Threatened Native Vegetation Communities) Act 2006.* Government Printer, Hobart, Tasmania.

APPENDIX 1 – SPECIES CONSERVATION VALUES

SPECIES OF NATIONAL SIGNIFICANCE

Listed in Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The *EPBC* Act has six categories of threat status for species:

1. **Extinct -** If at a particular time there is no reasonable doubt that the last member of the species has died.
2. **Extinct in the wild -** If it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or If it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
3. **Critically endangered** - If at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
4. **Endangered** - If it is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
5. **Vulnerable** - If at a particular time it is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
6. **Conservation dependent -** If, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

SPECIES OF STATE SIGNIFICANCE

Listed in Tasmanian *Threatened Species Protection Act 1995* (TSP Act)

Threatened flora and fauna species in Tasmania are listed in Schedules 3 (extinct or endangered), 4 (vulnerable) or 5 (rare). These three categories are defined in Section 15 of the Act.

1. **Extinct** - If no occurrence of the taxon in the wild can be confirmed during the past 50 years.
2. **Endangered -** If it is in danger of extinction because long-term survival is unlikely while the factors causing it to be endangered continue operating.
3. **Vulnerable** - If it is likely to become an endangered taxon while the factors causing it to be vulnerable continue operating.
4. **Rare** - If it has a small population in Tasmania that is not endangered or vulnerable but is at risk.”

Species that have been nominated and approved by the Scientific Advisory Committee for listing in the Act.

SPECIES OF REGIONAL OR GENERAL SIGNIFICANCE

The following definitions are from three publications: Flora Advisory Committee 1994, Vertebrate Advisory Committee 1994, Invertebrate Advisory Committee 1994.

Flora only - Species listed as rare but not necessarily ‘at risk’ (**r3**).

Fauna only – Species requiring monitoring (**m**).

Both – Species of unknown risk status (**k**) in Tasmania, or thought to be uncommon within region, or a species having a declining range or populations within the area.

Species considered being outside its normal range or of an unusual form as determined and justified in the body of the report.

Species identified in regional studies as being of conservation significance that are not listed in current legislation.

Species that have been recognised, but have not been formally described in a published journal, that are thought to be significant as determined and justified in the body of the report.

Plant species that are not known to be reserved. To be so it must be known to exist in at least one secure Reserve. Secure reserves include reserves and parks requiring the approval of both Houses of Parliament for their revocation. They include: National Parks, Aboriginal Sites, Historic Sites, Nature Reserves, State Reserves, Game Reserves, Forest Reserves, Wellington Park, and insecure reserves in the World Heritage Area which is protected by international agreement under the World Heritage Convention.

APPENDIX 2 – LEGISLATIVE IMPLICATIONS OF THREATENED SPECIES

Tasmanian *Threatened Species Protection Act 1995*

Threatened flora and fauna species in Tasmania are listed in Schedules 3 (endangered) and 4 (vulnerable) of the Threatened Species Protection Act, 1995. Rare species that are considered to be ‘at risk’ are listed in Schedule 5 of the Act. These three categories are defined in Section 15 of the Act.

1. “An extant taxon of native flora or fauna may be listed as **endangered** if it is in danger of extinction because long-term survival is unlikely while the factors causing it to be endangered continue operating.
2. A taxon of native flora or fauna may be listed as **vulnerable** if it is likely to become an endangered taxon while the factors causing it to be vulnerable continue operating.
3. A taxon of native flora or fauna may be listed as **rare** if it has a small population in Tasmania that is not endangered or vulnerable but is at risk.”
4. The Act provides mechanisms for protecting these species from threatening processes the implementation of ‘recovery plans’, ‘threat abatement plans’, ‘land management plans’, public authority agreements’, and ‘interim protection orders’.

Section 51 (a) of the TSPA states that: “A person must not knowingly, without a permit - take, trade in, keep or process any listed flora or fauna”. The Act defines ‘take’ as including: “kill, injure, catch, damage, destroy and collect. A land manager is therefore required to obtain a permit from the Development and Conservation Assessment Branch (DCAB) of the Tasmanian Department of Primary Industries and Water (DPIW) to carry out management that may adversely affect any of the species listed in the Act.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act establishes a process for assessing actions that are likely to have impacts of *national environmental significance.* Such impacts include World Heritage Areas, RAMSAR Wetland sites of international importance, migratory species protected under international agreements, nuclear actions, the Commonwealth marine environment and **nationally threatened species and communities.**

Threatened species are defined in several categories:

1. Extinct

- If at a particular time there is no reasonable doubt that the last member of the species has died.

2. Extinct in the wild

- If it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
- If it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

3. Critically endangered

- If at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

4. Endangered

- If it is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

5. Vulnerable

- If at a particular time it is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

6. Conservation dependent

- If, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

An action that is likely to affect species that are listed in any of the above categories may require ministerial approval unless the Commonwealth Environment Minister has granted an exemption. The Act establishes a **referral process** to Environment Australia to determine whether an action requires a formal **approval** and thus would be required to proceed through the **assessment and approval process**.

A referral must provide sufficient information to allow the Minister to make a decision. The Minister is then required to make a decision within 20 business days of the referral. The Minister may decide an approval is not necessary if the action is taken in a specified manner. The action may not require approval but may require a **permit** if undertaken on Commonwealth land. If an approval is required then an **environmental assessment** must be carried out. In such instances the environmental assessment approach will be determined by the Minister and may vary from preliminary documentation to a full public inquiry depending on the scale and complexity of the impact.

APPENDIX 3: VASCULAR PLANT SPECIES

Species list - project: JMG012

Status codes:

ORIGIN	NATIONAL SCHEDULE	STATE SCHEDULE
i - introduced	EPBC Act 1999	TSP Act 1995
d - declared weed WM Act	CR - critically endangered	e - endangered
en - endemic to Tasmania	EN - endangered	v - vulnerable
t - within Australia, occurs only in Tas.	VU - vulnerable	r - rare

Sites:

1	FWU - gorse infestation with emergent gums in places - E522938, N5253470 23/06/2015	Grant Daniels

Site	Name	Common name	Status
	DICOTYLEDONAE		
	ASTERACEAE		
1	*Arctotheca calendula*	capeweed	i
1	*Bedfordia salicina*	tasmanian blanketleaf	en
1	***Carduus pycnocephalus***	**slender thistle**	**d**
1	*Cassinia aculeata subsp. aculeata*	dollybush	
1	***Chrysanthemoides monilifera ssp. monilifera***	**boneseed**	**d**
1	*Cirsium vulgare*	spear thistle	i
1	*Euchiton sp.*	cudweed	
1	*Hypochaeris radicata*	rough catsear	i
1	*Pseudognaphalium luteoalbum*	jersey cudweed	
1	*Senecio sp.*	groundsel	
1	*Sonchus asper subsp. asper*	green prickly sowthistle	i
	CARYOPHYLLACEAE		
1	*Stellaria media*	garden chickweed	i
	EPACRIDACEAE		
1	*Astroloma humifusum*	native cranberry	
	FABACEAE		
1	***Cytisus scoparius***	**english broom**	**d**
1	***Ulex europaeus***	**gorse**	**d**
	FUMARIACEAE		
1	*Fumaria sp.*	fumitory	i
	GENTIANACEAE		
1	*Centaurium erythraea*	common centaury	i
	GOODENIACEAE		
1	*Goodenia lanata*	trailing native-primrose	

	HALORAGACEAE		
1	*Gonocarpus tetragynus*	common raspwort	
	LAURACEAE		
1	*Cassytha pubescens*	downy dodderlaurel	
	MYRTACEAE		
1	*Eucalyptus amygdalina*	black peppermint	en
1	*Eucalyptus globulus subsp. globulus*	tasmanian blue gum	
1	*Eucalyptus obliqua*	stringybark	
1	*Eucalyptus ovata var. ovata*	black gum	
1	*Eucalyptus pulchella*	white peppermint	en
1	*Eucalyptus viminalis subsp. viminalis*	white gum	
	OXALIDACEAE		
1	*Oxalis sp.*	woodsorrel	
	POLYGONACEAE		
1	*Acetosella vulgaris*	sheep sorrel	i
	PRIMULACEAE		
1	*Lysimachia arvensis*	scarlet pimpernel	i
	ROSACEAE		
1	*Acaena novae-zelandiae*	common buzzy	
1	*Cotoneaster pannosus*	velvet cotoneaster	i
1	*Crataegus monogyna*	hawthorn	i
1	*Prunus spinosa*	blackthorn	i
1	*Rosa rubiginosa*	sweet briar	i
1	***Rubus fruticosus***	**blackberry**	**d**
1	*Rubus parvifolius*	native raspberry	
	RUBIACEAE		
1	*Galium aparine*	cleavers	i
	SANTALACEAE		
1	*Exocarpos cupressiformis*	common native-cherry	
	SCROPHULARIACEAE		
1	*Verbascum thapsus*	great mullein	i
	SOLANACEAE		
1	*Solanum laciniatum*	kangaroo apple	
	GYMNOSPERMAE		
	PINACEAE		
1	*Pinus radiata*	radiata pine	i
	MONOCOTYLEDONAE		
	CYPERACEAE		
1	*Gahnia radula*	thatch sawsedge	
1	*Schoenus sp.*	bogsedge	

JUNCACEAE

1	*Juncus procerus*	tall rush	
1	*Juncus sarophorus*	broom rush	

POACEAE

1	*Agrostis capillaris*	brown top bent grass	i
1	*Austrodanthonia carphoides var. angustior*	short wallabygrass	
1	*Austrostipa rudis subsp. australis*	southern speargrass	
1	*Austrostipa sp.*	speargrass	
1	***Cortaderia selloana***	**silver pampasgrass**	**d**
1	*Dactylis glomerata*	cocksfoot	i
1	*Ehrharta erecta*	panic veldtgrass	i
1	*Ehrharta stipoides*	weeping grass	
1	*Holcus lanatus*	yorkshire fog	i
1	*Poa labillardierei*	silver tussockgrass	
1	*Poa rodwayi*	velvet tussockgrass	
1	*Rytidosperma sp.*	wallabygrass	

XANTHORRHOEACEAE

1	*Lomandra longifolia*	sagg

PTERIDOPHYTA

DENNSTAEDTIACEAE

1	*Pteridium esculentum subsp. esculentum*	bracken

Attachment 4

SITE INFRASTRUCTURE AND SERVICES REPORT

11 Beaumont Road, Lenah Valley Subdivision

OCTOBER 2015

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

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TABLE OF CONTENTS

1. Introduction

This report has been prepared in support of a planning application for subdivision of 47 residential lots at 11 Beaumont Road, Lenah Valley and addresses proposed infrastructure for the subdivision including the roadway, sewer pipework system, water pipework system and stormwater drainage network.

Analysis of the stormwater system includes capacities of the existing system, proposed stormwater infrastructure, stormwater detention storage required to restrict post-development flows to pre-development flows for a 1:20 Average Recurrence Interval (ARI) storm, water discharge quality and overland flow paths for the proposed subdivision.

2. The Site

The site is located to the east of Hadley Court and Beaumont Road, and west of Ruth Drive. The subdivision site of 4.94ha is currently a mixture of open paddock and light bushland and slopes steeply at around 25% from east to west. There is existing residential development on the eastern, northern and western boundaries of the site. To the south the land is undeveloped bushland.

3. Stormwater System

3.1 Existing System

Stormwater runoff generated from 1.76ha of the northern portion of the site is directed to an overland flow path which drains to the north west of the site and into the head of the Hadley Court cul-de-sac where it enters into the piped stormwater system via roadside pits. This drainage then flows through properties on the low side of the cul-de-sac to Brushy Creek Road and Ultimatley Brushy Creek. The remainder of the site slopes towards the existing system at the end of Beaumont Road. Existing pipeworks conveys this water down Beaumont Road, under Brushy Creek Road and into Brushy Creek. From here Brushy Creek flows north into New Town Rivulet.

There is an existing DN300 stormwater main that runs through the site, from the south east boundary below Nursery Court to Beaumont Road. Currently, this pipe collects water from approximately 9 lots directly upstream (to the east) of the site.

The site is located towards the upper western slopes of a ridge running north south parallel with Ruth Drive as such there is limited overland flows into the site from the crest of the hill.

3.2 Design Standards

The stormwater infrastructure will be designed in accordance with HCC design standards for stormwater with piped stormwater drainage to be provided for a 1 in 20 year ARI storm. For events greater than the 1 in 20 year ARI, overland flow paths are to be provided clear of habitable buildings.

3.3 Proposed Stormwater System

It is proposed to connect stormwater generated from the subdivision site into the existing system running through the site, provided it has the capacity to handle the increase in flows from the developed site for a 1:20 year storm event. A layout plan showing the proposed site stormwater system is shown in Appendix A, drawing J143019PH-C02.

Catchment areas for the lots within the subdivision, and the 9 Lots upstream of the subdivision were entered into the pits in the pipe layout in AutoCAD Civil 3D Advanced Road Design (ARD) to calculate predicted 1:20 year flows in the system.

Details of the pipe profiles, including the existing pipe profiles with the hydraulic grade line levels are shown in Appendix A, drawings J143019PH-C09 - C13. Drawing C13 includes the hydraulic grade line report table which shows the predicted flows for the future development, and the capacity of the existing DN300 which is well in excess of the estimated flows.

Directly downstream of the subdivision site the existing DN300 runs down approximately 140m to the end of Beaumont Road where it increases to DN450 pipe for another 100m until it discharges into Bushy Creek. The existing pipe network was modelled using Advanced Road Design (ARD) software. The existing stormwater pipe network is shown in drawing C02C, Appendix C. It was calculated that for the 20 year ARI storm, 740L/s of flow would be discharging from the existing pipework into the creek. This includes an estimated 452L/s of flow generated from the proposed subdivision (not taking into account the proposed storage on site). The total catchment area (including the 5ha of proposed development) was calculated at approximately 7.5ha. All of the downstream existing pipework modeled with ARD (aside from a 40m length of DN300 pipe directly downstream of the subdivision) had the capacity to take on flows generated from the subdivision (post-development), as well as existing flows, assuming that there was no detention storage on site. It was estimated that the 40m length of existing pipe had a capacity of 590L/s however predicted flows were estimated at 632L/s. The 632L/s however does not take into account the proposed storage within the site to restrict flows to pre-development flows. Thus it can be assumed that the actual flows for a 1:20 year storm will be much less than 632L/s, therefor the capacity of the existing pipe work will be sufficient.

4. Stormwater Detention

4.1 Assumptions

Stormwater infrastructure and detention storage for the site has been sized to accommodate a 1:20 year storm, based on the standard requirements of the Hobart City Council for subdivision developments.

Detention storage for the site has been sized to restrict post development flows to pre-development flows for a 1:20 year ARI storm.

Stormwater management will include the implementation of WSUD (Water Sensitive Urban Design) principles which have been modelled using the MUSIC (Model for Urban Stormwater Improvement Conceptualisation) software program.

Information to support calculations was obtained from Australian Rainfall and Runoff, A Guide to Flood Estimation - 1998 (AR&R) and the Bureau of Meteorology (BOM) website.

4.2 Flow and Detention Calculations

Calculations were completed as outlined below in order to estimate the amount of storage required within the subdivision so that post-development flow is limited to pre-development flow in a 1 in 20 year ARI event for the critical time of concentration of the subdivision site, noting that the subdivision location is at the highest point of the catchment. A flow calculation was also conducted to estimate predicted flows from the subdivision at the critical time of concentration for Brushy Creek/New Town Rivulet system, so as to determine the effects of post-development flows on the Rivulet.

Using the Rational Method, as recommended by AR&R, the time of concentration of the subdivision site pre-development was calculated at 6.28 minutes.

The 1 in 20 year Average Recurrence Interval (ARI) intensity for various duration storms for the Lenah Valley area was obtained from Intensity-Frequency-Duration (IFD) tables from the BOM website.

The runoff coefficient for the site for a 20 year ARI pre-development flow was determined from AR&R by obtaining a 10 year ARI runoff coefficient from Figure 1.13 using the estimated fraction impervious of the site of 0.1 and intensity for a 10 year ARI, 60 minute duration storm of 21.95mm/hr. This was the multiplied by the frequency factor (F_y) to obtain a run-off coefficient for the 20 year event of 0.16.

The pre-development flow for the subdivision site (approximately 5 ha) was calculated by the Rational Method at 0.206m^3/s. Details of these calculations are attached in Appendix B.

For estimated post development flow and storage calculations, the subdivision was split into 2 separate catchments, the ‘Road’ catchment and the ‘Residential’ catchment. As the name suggests, the Road catchment includes all areas of road reservation within the subdivision site and was allocated a run-off coefficient of 0.61, using AR&R figure 1.13 as above with a fraction impervious estimated at 0.64. The calculated value takes into account not only the impervious road and footpath area, but a 6.6m cross sectional width of grassed area within the 18m wide road reservation. The total area of the road catchment was calculated at 0.96 ha.

The Residential catchment includes all residential lots allocated within the subdivision. The run-off coefficient was estimated using AR&R, figure 1.13 and equaled 0.43 for a 1:20 year storm, with a fraction impervious of 0.4. The total area was calculated at 4 ha for the Residential catchment. Details of these calculations are shown in Appendix B.

The post-development flow for the entire subdivision site, including flows generated from the ‘Residential’ and ‘Road’ catchment during a 1:20yr ARI event was calculated at 0.664m^3/s.

Boyds Formula was used to calculate the required retention storage to restrict future flows up to a 20 year ARI event to the pre-development flow. For a 20 year ARI event, the volume of storage required for the site was calculated at 170m^3. Details of these calculations are shown in Appendix B.

The critical time of concentration of Brushy Creek was estimated at 69 minutes. Post-development flows using the above explained methods in a 1:20 year storm during the critical time of concentration of the creek was calculated at 0.152m^3/s, as opposed to the pre-development flow of 0.051m^3/s. The flow which will occur downstream of the site at the Brushy Creek, Newtown Rivulet junction is estimated at 22m^3/sec during a 1:20yr ARI storm(Newtown Rivulet Flood Study - Extension to include Maypole Creek and Brushy Creek, Hydro Electric Corporation, Tasmania August 1999). The additional peak flow generated by the proposed subdivision of 0.101m^3/s represents a 0.45% increase in rivulet flows at this point, without acknowledging the effects of any proposed storage on site.

4.3 Proposed Storage

In order to restrict post-development flow to pre-development flow rates for the 1:20 year ARI critical storm it will be necessary to construct stormwater storages with a total of 170m^3 of storage capacity, 115m^3 of this stored within the residential lots and 54m^3 in the road reservation. Due to the steep nature of the site, the restrictions associated with the area available for large detention ponds and risks associated with failure of a large detention pond on downstream residents, it is proposed that on average each lot should include storage of 2600L (or similarly, 2.9 Litres of storage for every m^2 of lot). Discharge from the tanks to be controlled by an orifice with a discharge rate equivalent to 0.004 l/m^2.

For run-off generated by the roadway, it is proposed that 2 or 3 storage tanks with a combined storage of 54m^3 be installed on the proposed stormwater system under the roadway. Outflow from the tanks will be via an orifice sized for the pre-development 1:20 year flow with a combined outflow of 0.040m^3/s. The potential locations for the tanks are shown on drawing J132019PH-C02. The exact location and size will be detailed during the detailed design phase.

5. Subdivision Overland Flow Paths

Proposed overland flows paths within the subdivision are indicated on drawing J143019PH-C02B, Appendix C.

The subdivision site is located at the top of the catchment and most piped stormwater is directed into other catchments, with the exception of the 9 lots to the south eastern boundary in which water is directed to the existing DN300 pipe through the subdivision site.

The site generally has very few existing defined water courses apart from a shallow drainage line running east to west at the northern boundary of the proposed subdivision. Post-development, these flows will be intercepted by driveways and housing and directed to the piped drainage system and proposed roadway. This roadway will act as the main overland flow path cut-off for the subdivision. Calculations have been completed to ensure that the proposed kerb and gutter of the roadway holds the capacity to accommodate 1:100 year (+30% for climate change) flows, assuming that the proposed pipe system is at capacity during a 1:20 year storm.

In summary, the capacity of the roadway at different grade changes was calculated. There exists a sag in the proposed roadway (see road profile drawing C03, Appendix A) on the eastern boundary of lots 17 and 18. It is proposed that during a 1:100 year event, flows will be conveyed down the walkway between lots 17 and 18, and between 6 and 7 by means of an open drain to the lower road.

Table 1 below represents a summary of these results. These calculations are shown in Appendix D, and the drainage paths are labelled on the Overland Flow Path plan in Appendix C.

Table 1 - Road Drainage Paths

^{3}	0.08	0.067	0.116	0.210	0.065	0.092	0.138
	8.8%	9.3%	9.3%	17.4%	3.35%	16.9%	16.9%
^{3}	0.771	0.79	0.79	1.084	0.476	1.068	1.068
	78	67	86	95	84	73	83

6. Music Analysis of the Existing and Proposed Stormwater System

6.1 Music Stormwater Analysis of Existing Site

A MUSIC (Model for Urban Stormwater Improvement Conceptualisation) model was constructed for the existing site using input parameters defined in the 'Draft NSW MUSIC Modelling Guidelines: August 2010' and 6min interval rainfall data for Hobart for the period 1990 to 2010.

Due to the majority of the existing subdivision area being grassed and bushed land, the 'Forest' land use type was used to model the existing catchment of 5 ha.

This modelling indicated that the existing catchment was likely producing run-off at the site boundary rivulet containing the following:

Table 2 - Stormwater Run-Off Characteristics of Existing Catchment

Flow (ML/yr)	4.44
Suspended Solids (kg/yr)	192
Total Phosphorus (kg/yr)	0.391
Total Nitrogen (kg/yr)	4.51
Gross Pollutants (kg/yr)	214

6.2 Music Stormwater Analysis of Traditionally Developed Site

To enable a comparison to be made between the stormwater run-off characteristics of the existing site and the run-off from the proposed subdivision if no WSUD (Water Sensitive Urban Design) stormwater treatment measures were employed a MUSIC model was developed which contained only the area of new residential development, again stormwater concentration parameters were used from the 'Draft NSW MUSIC Modelling Guidelines; August 2010'. The 'Urban' land use type was used to model the catchment. This modelling indicated that the site, developed in a traditional sense without any WSUD components was likely to produce run-off containing the following:

Table 3 - Stormwater Run-Off Characteristics of 'Traditionally' Developed Site

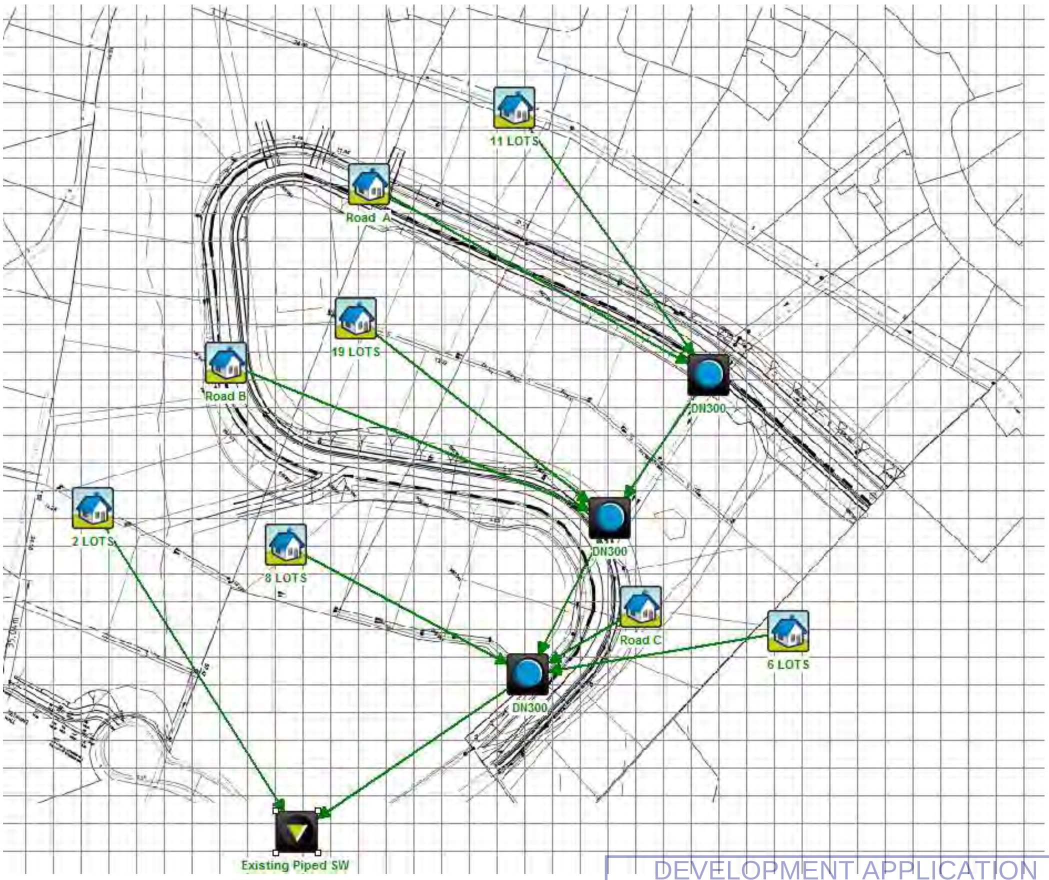
Flow (ML/yr)	12.6
Suspended Solids (kg/yr)	2730
Total Phosphorus (kg/yr)	4.43
Total Nitrogen (kg/yr)	28.1
Gross Pollutants (kg/yr)	567

A comparison of the models for the pre-developed site and traditionally developed site indicate the following changes in run-off characteristics.

Table 4 - Stormwater Run-Off Comparison of Existing and ‘Traditionally’ Developed Site

Flow (ML/yr)	4.44	12.6	284% Increase
Suspended Solids (kg/yr)	192	2730	1421% Increase
Total Phosphorus (kg/yr)	0.391	4.43	1133% Increase
Total Nitrogen (kg/yr)	4.51	28.1	623% Increase
Gross Pollutants (kg/yr)	214	567	265% Increase

Figure 1 – MUSIC Model of Existing ‘Traditional’ Subdivision Site



6.3 State Water Quality Objectives

The Tasmanian Stormwater Management Code in the planning scheme states (among other things) that if a subdivision is more than 5 lots, the stormwater system for the new development must be of size and design sufficient to achieve the stormwater quality and quantity targets in accordance with the State Stormwater Strategy 2010, as detailed below unless it is not feasible to do so;

Acceptable Stormwater quality and quantity targets:

- 80 per cent reduction in the annual average load of total suspended solids

- 45 per cent reduction in the annual average load of total phosphorus

- 45 per cent reduction in the annual average load of total nitrogen

Based on this, the subdivision development should be targeting the following residual loads leaving the site following the completion of the subdivision:

Table 5 - Target WSUD Residual Loads

Suspended Solids (kg/yr)	546
Total Phosphorus (kg/yr)	2.44
Total Nitrogen (kg/yr)	15.46

6.4 Post Development WSUD Features and Music Modelling

Post development modelling has been undertaken for the proposed subdivision to determine the most appropriate WSUD features to be incorporated into the subdivision design so as to best minimise the impact on downstream stormwater quality.

Due to the steepness of the site, in particularly the subdivision road, systems such as swale drains cannot be utilised on the site. Also, there are no suitable flat areas where open space can be allocated so that sedimentation and detention ponds can be utilised.

The main features of the modelling include:

- Provision of an average 2600L tank on each residential lot. Total storage 115kL.
- Provision of 3 detention tanks installed within the subdivision road way. Total storage 54kL.
- Provision of a gross pollutant trap (Humeceptor or similar) within the subdivision access road, closest to the downstream subdivision boundary onto Beaumont Road. This would need to be installed on the existing stormwater line currently running through the site and into which stormwater flows from the subdivision are connecting.

Figure 2 provides a schematic of the MUSIC model showing the relationship of the treatment measures.

Fig 2 - MUSIC Model of Developed Subdivision

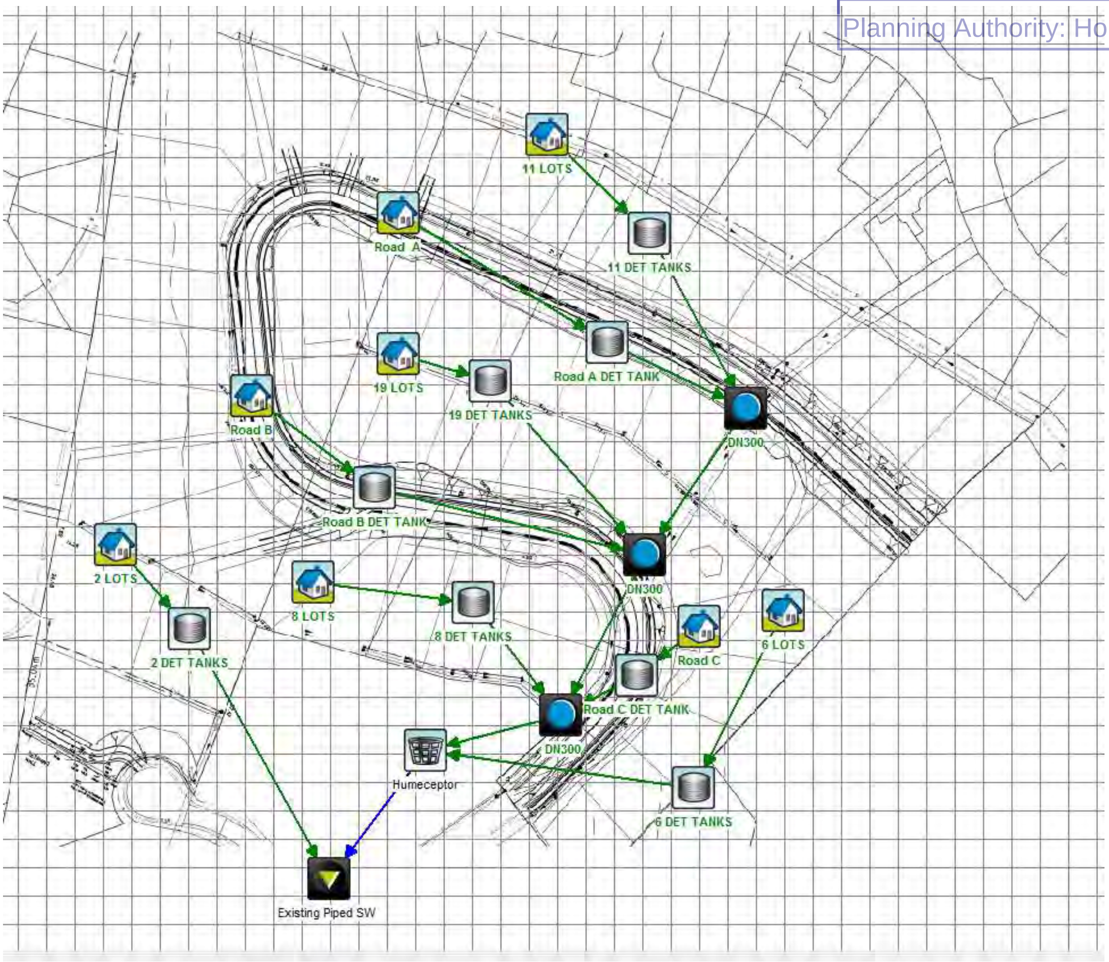


Table 6 provides details of the treatment train effectiveness of the detention tanks and gross pollutant trap.

Table 6 - Treatment Train Effectiveness

Flow (ML/yr)	12.6	12.5	0.1%
Suspended Solids (kg/yr)	2710	572	78.9%
Total Phosphorus (kg/yr)	4.44	2.85	35.8%
Total Nitrogen (kg/yr)	28	23.2	17%
Total Gross Pollutants (kg/yr)	567	0	100%

7. Roadways

7.1 Design Standards

The site is bounded by Hadley Court to the west and Ruth Drive to the east. The existing road network is described further in the report titled *'Traffic Impact Assessment - Proposed*

Residential Subdivision Development, 11 Beaumont Road, Lenah Valley' prepared by Milan Prodanovic Traffic Engineering & Road Safety (May 2015).

Subdivision road infrastructure will be designed and constructed in accordance with the Local Government Association of Tasmania document - Tasmanian Subdivision Guidelines October 2013 and the Institute of Public Works Engineering Australia, Tasmanian Division Standard Drawings incorporating amendments as defined for the Hobart City Council areas.

The proposed road infrastructure comprises of a residential access road which is an extension to Beaumont Road.

The road system will be contained within an 18.0m road reserve and the roadway width will be in accordance with IPWEA standard drawing TSD-R06-v1 which requires 8.9m carriageway widths.

Footpaths will be provided to the roadway in accordance with IPWEA Standard drawing TSD-R11-v1 which requires a footpath on one side of all local streets other than collectors.

8. WATER SUPPLY

8.1 *Existing System*

Water supply to the surrounding reticulation network is from 2 Reservoirs; the Barossa Reservoir with a Reservoir Elevation of 178m AHD and top water level height (TWL) of 181m and the Lenah Valley reservoir with a TWL height of 270m AHD. Design Standards

The water infrastructure will be designed in accordance with TasWater's current design standards for water supply.

8.2 *Proposed Water Network*

Reticulation will be supplied to approx. 46 lots of the subdivision by a new connection to the existing DN100 DICL main on Nursery Court, Lenah Valley reservoir, as the Barossa reservoir has insufficient pressure available to supply any of the lost within the subdivision. Access to the subdivision for the new supply will be down the walkway between Lot 23 and Lot 22 of the new subdivision adjacent to existing stormwater and sewer mains. Refer Appendix E for location of the supply point.

It is also required that a Pressure Reducing Valve be installed on the new main to reduce pressures in the system to below 800kPa, as required in TasWater's design standards. See Appendix A, drawing C01 attached for the layout of the proposed water network.

A model of the proposed water network has been developed using EPANET to determine minimum and maximum pressures within the network for the following scenarios:

- Peak Day
- Peak Day + Fire

An extended period analysis was undertaken using TasWater's diurnal demand patterns, as recommended by TasWater. TasWater provided boundary conditions in the form of a minimum total head available to the subdivision at 2 possible supply points for both Peak Day and Fire Flow superimposed on peak flow day and are as follows, consecutively:

- Barossa Reservoir (1) - 177m and 154m AHD
- Lenah Valley Reservoir (2) – 265 and 263 AHD

The minimum pressure obtained at the boundary for Peak Day and Peak Day + Fire for each supply point are given in Table 1.

Table 1 - Water Network Pressures for Peak Day and Peak Day + Fire (with pressure reducing valve to reduce pressure to less than 80m)

Peak Day Min. (m)			
38.03	35.58	Lot 29	79.59 (Lot 2)

Residential Peak Day demand is based on 0.017836 L/s / ET. Peak Day + Fire is calculated by superimposing 10 L/s (or 561 ET) on the most disadvantaged node for each supply network. A schematic layout of the modelling results, identifying the most disadvantaged node on each supply network, the network pressures and proposed water main pipe sizes are included as Appendix E of this report.

Water connections are to be supplied to each lot in accordance with TasWater's Guidelines and Standard Drawings.

Fire coverage is be provided to the lots by hydrants in the road reservation in accordance with TasWater and Tas Fire requirements which requires hydrants at a maximum spacing of 90m or within 120m of the rear boundary of a property.

9. Sewerage System

9.1 Existing System

The site is currently undeveloped so no sewer is servicing the site. There exists however a DN150 sewer main that runs through the site, continuing down into Beaumont Road which services about 9 residential lots upstream of the site.

9.2 Design Standards

The sewerage infrastructure will be designed in accordance with Taswater's design standards for sewerage.

9.3 Proposed Sewerage Network

Drawing J143019PH-C01 attached in Appendix A shows the proposed sewerage system. The development consists of 2 catchments. The first catchment (44 lots) is serviced by a gravity drainage network which connects into the existing DN150 sewer main which runs through the site, and into Beaumont Road. The second catchment (2 lots) is serviced by an existing DN150 sewer in Hadley Court and is an extension of the proposed sewer main servicing Lot 47 in the 1 lot subdivision (separate) application (PLN-15-00223-01).

For profiles of these networks please refer to drawings J143019PH-C13 and C14 in Appendix A of this report.

Using the Melbourne Retail Agencies Edition of the Water Services Associations Sewerage Code of Australia (WSA) in conjunction with TasWater's default values, sewer flow estimates for the development are given in Table 2.

Table 2 - Flows from Proposed Development using WSAA Sewerage Code Appendix B

ADWF (L/s)	0.29
PDWF (L/s)	1.93
Design Flow (L/s)	2.61

Refer to Appendix F of this report for the complete flow estimation calculations and TasWater default values used.

Where sewer mains are located in private property, easements will be provided over in accordance with TasWater requirements.

10. Recommendations

The following stormwater treatment measures are recommended for incorporation into the engineering design for the subdivision in attempt to comply with Council's stormwater management objectives conditions.

Residential Lot Detention Tanks X 46 (**Note: Details to be confirmed during detailed design**)

- Average Storage Volume = 2.6kL
- Average Peak Discharge rate per lot = 3.6L/s

Road Detention Tanks X 3 (**Note: Details to be confirmed during detailed design**)

- Storage Volume = 24kL, 15kL, 15kL
- Peak Discharge rate = 18 L/s - 10L/s

Road detention tanks have been proposed to be situated so that they incorporate into the proposed road design of the subdivision, at low points and changes of grade of the roadway i.e. the larger, 24kL tank collecting the largest area of land and located in the dip in the road way to the south east of the site. The others are located to the north west of the site and to the south west of the site. Drawing J143019PH-C02B in Appendix C shows the proposed layout of these tanks.

HumeCeptor or Similar Approved Gross Pollutant Traps

Install a gross pollutant trap on the major piped stormwater outfall. Note that the gross pollutant trap modelled in the MUSIC analysis was a 'HumeCeptor' with removal efficiencies of TSS-80% ; TN-30% and TP-30%. The HumeCeptor system Technical manual describes their recommended MUSIC inputs as 'conservative' and that Humes Water Solutions can optimise these values to suit specific sites. Taking this into account, further modelling could be undertaken which may achieve values of TN and TP removal closer to Council's desired water quality objectives. It should be noted however that the provision of roadside treatment swales which would aid in achieving the Council's water quality objectives would be problematic on this site.

Roadways

Subdivision road infrastructure will be designed and constructed in accordance with the Local Government Association of Tasmania document - Tasmanian Subdivision Guidelines October 2013 and the Institute of Public Works Engineering Australia, Tasmanian Division Standard Drawings incorporating amendments as defined for the Hobart City Council areas

Water

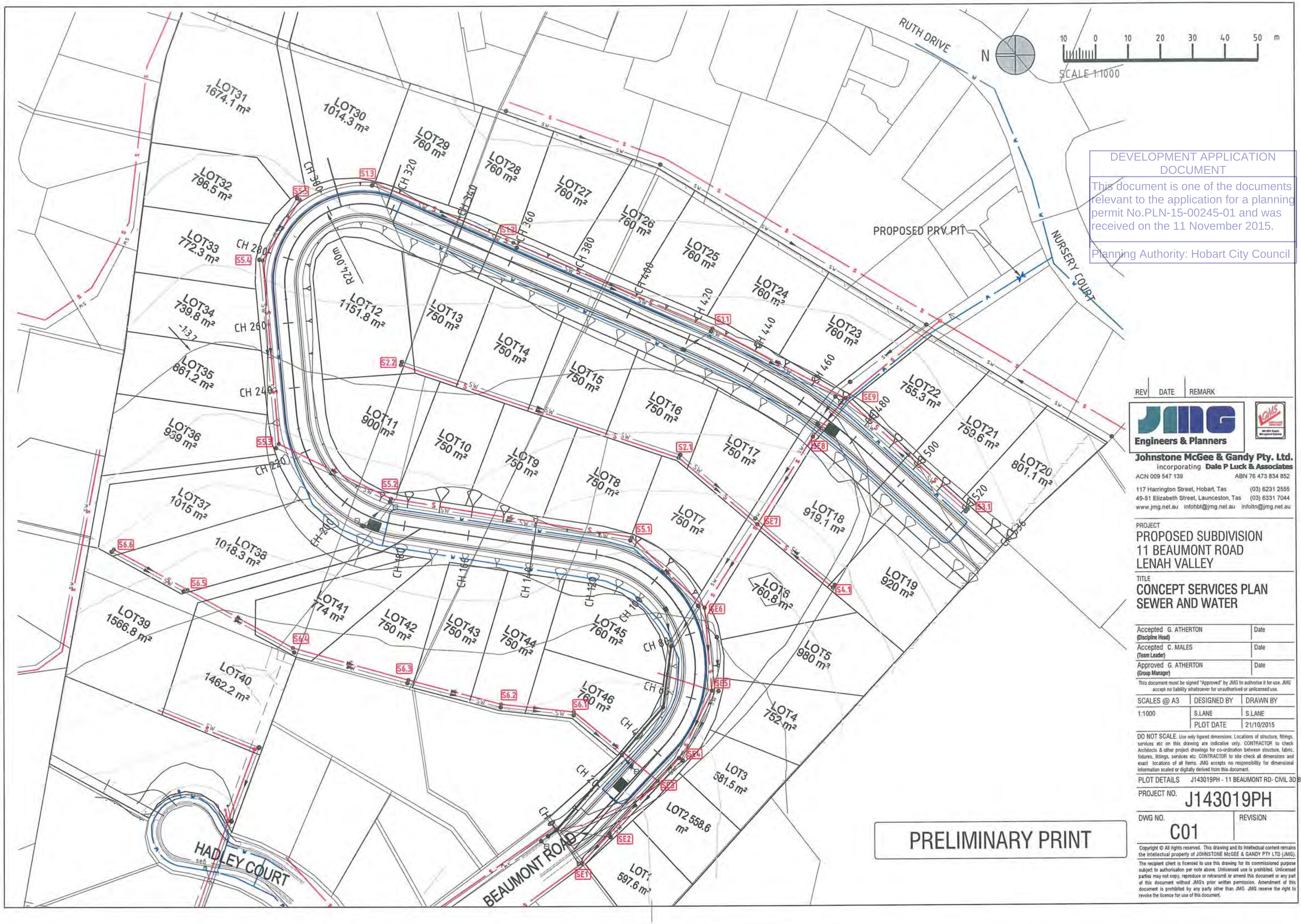
New subdivision to be serviced from the Lenah Valley reservoir using a new connection to the existing Main located in Nursery Court. A PRV valve will be required to reduce pressures within the subdivision to TasWater limits.

Sewer

The existing DN150 main running through the site can be utilized for the majority of new connections with 2 lots to utilize an extension to the main of Hadley Court

APPENDIX A

Concept Design Drawings
J143019PH-C01-C15



DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

REV	DATE	REMARK

Engineers & Planners

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PROJECT
PROPOSED SUBDIVISION 11 BEAUMONT ROAD LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN SEWER AND WATER

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C01

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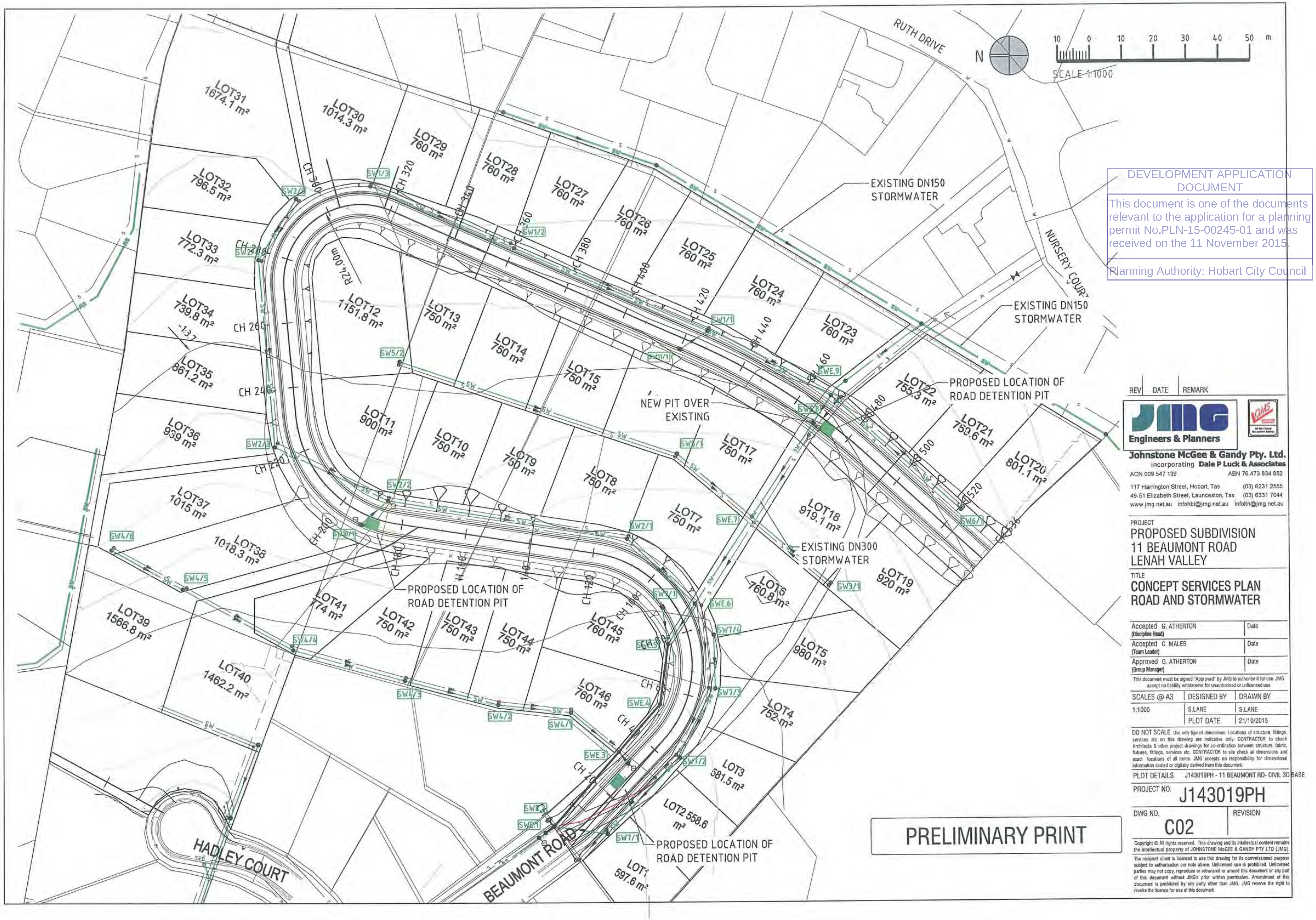

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD AND STORMWATER

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PROJECT NO. J143019PH

DWG NO. C02

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DEVELOPMENT APPLICATION DOCUMENT

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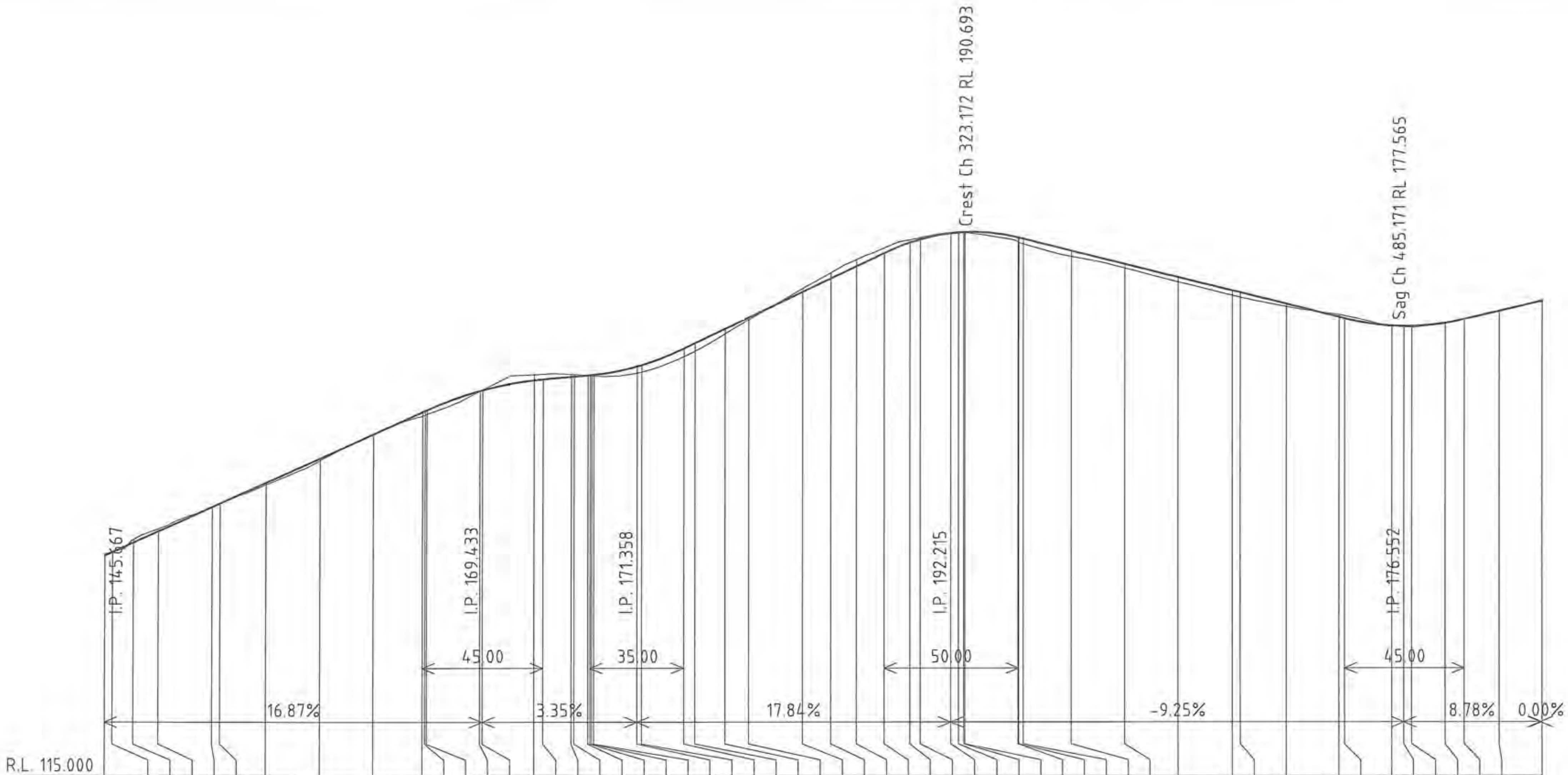

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EXISTING SURFACE	145.929	146.171	147.886	149.405	152.428	152.929	155.528	158.884	162.578		165.227	165.319	168.540	
CHAINAGE	0.00	2.89	10.65	20.00	40.00	42.93	60.00	80.00	100.00	118.37	119.33	120.00	140.00	140.87

CUT/FILL	-0.784		-0.335	-0.282	+0.024		+0.127	+0.175		+0.972		+1.119	+0.695	+0.303
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CUT/FILL	-0.480	-0.771	-0.925		-0.388	-0.229		-0.111	-0.002	+0.027	+0.607		+0.709	+0.795
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CUT/FILL	+0.561	+0.651	+0.679	+0.677	+0.404	-0.320		+0.101		+0.168	+0.009		-0.044	-0.227
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Profile ALN- ROAD C.L. From 0.000 To 535.918
Scales: (H) 1:2000 (V) 1:750

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD PROFILE

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C03
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DEVELOPMENT APPLICATION DOCUMENT

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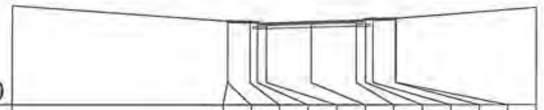

R.L. 146.900

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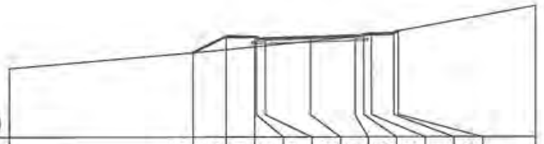
Ch 40.000



R.L. 152.500

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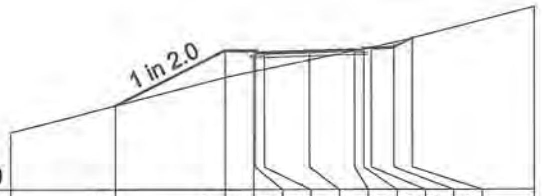
Ch 80.000



R.L. 156.700

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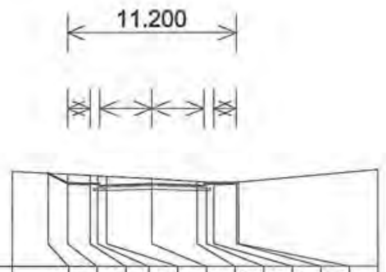
Ch 120.000



R.L. 143.600

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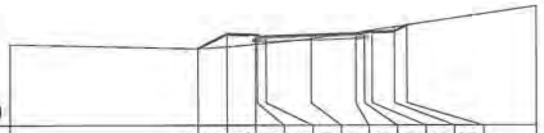
Ch 20.000



R.L. 149.800

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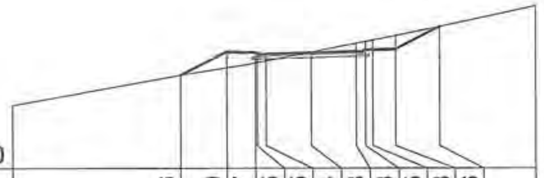
Ch 60.000



R.L. 154.900

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Ch 100.000

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Engineers & Planners

Johnstone McGee & Gandy Pty. Ltd.
incorporating **Dale P Luck & Associates**
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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD CROSS SECTIONS
SHEET 1 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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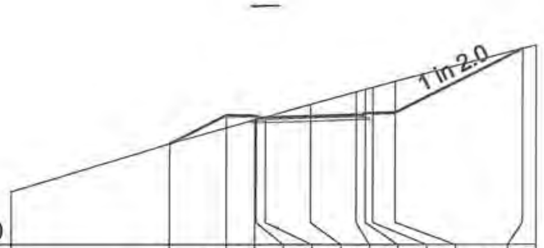
PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C04

REVISION



R.L. 161.500

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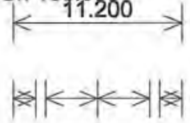
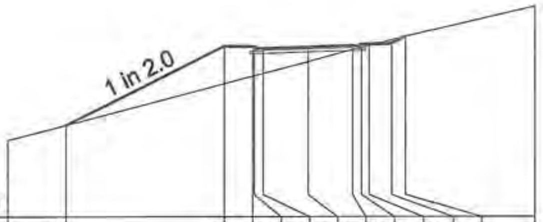
OFFSET	-20.00	-9.42	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	14.09	15.00

Ch 160.000

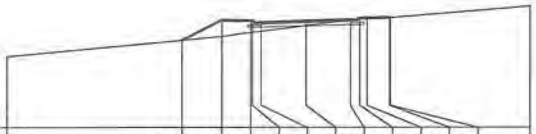




R.L. 160.900

DESIGN SURFACE		166.98	172.24	172.21	172.19	172.09	172.18	172.27	172.37	172.39	172.42	172.88	
EXISTING SURFACE	165.98	166.98	169.74	170.13	170.26	170.42	171.20	171.99	172.15	172.28	172.66	172.88	174.86
OFFSET	-20.00	-16.12	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	6.53	15.00

Ch 200.000



R.L. 171.700

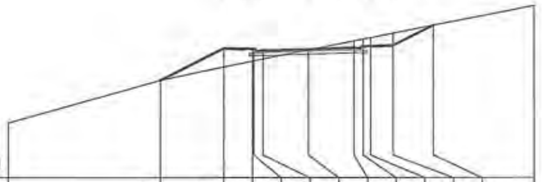
DESIGN SURFACE		177.50	178.86	178.83	178.80	178.70	178.79	178.88	178.98	179.01	179.04	179.02	
EXISTING SURFACE	176.42	177.50	177.76	177.96	178.03	178.11	178.49	178.86	178.90	178.93	179.02	179.02	179.77
OFFSET	-20.00	-8.32	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	5.63	15.00

Ch 240.000

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

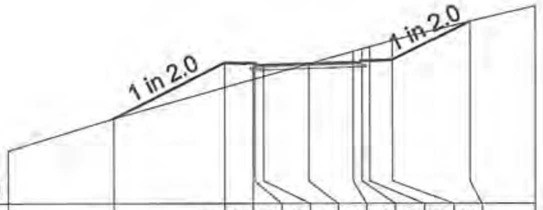
Planning Authority: Hobart City Council



R.L. 160.100

DESIGN SURFACE		166.52	168.65	168.62	168.59	168.49	168.58	168.67	168.77	168.80	168.83	170.16	
EXISTING SURFACE	163.70	166.52	167.41	167.72	167.82	167.95	168.54	169.13	169.25	169.34	169.64	170.16	171.46
OFFSET	-20.00	-9.85	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	8.26	15.00

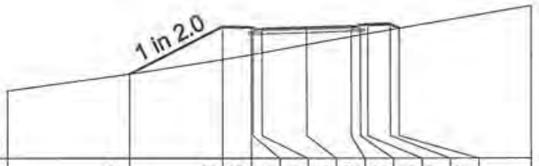
Ch 140.000



R.L. 161.500

DESIGN SURFACE		167.11	170.81	170.78	170.75	170.65	170.74	170.83	170.93	170.96	170.99	173.53	
EXISTING SURFACE	164.98	167.11	169.18	169.59	169.73	169.90	170.72	171.54	171.71	171.85	172.26	173.53	174.55
OFFSET	-20.00	-13.00	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	10.69	15.00

Ch 180.000



R.L. 166.600

DESIGN SURFACE		172.16	175.29	175.26	175.24	175.14	175.23	175.32	175.42	175.44	175.47	175.17	
EXISTING SURFACE	171.06	172.16	173.12	173.36	173.45	173.56	174.11	174.63	174.74	174.82	175.07	175.17	176.66
OFFSET	-20.00	-11.87	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	6.19	15.00

Ch 220.000

REV	DATE	REMARK

JMG Engineers & Planners

Johnstone McGee & Gandy Pty. Ltd.
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ACN 009 547 139 ABN 76 473 834 852
117 Harrington Street, Hobart, Tas (03) 6231 2555
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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD CROSS SECTIONS
SHEET 2 OF 5

Accepted G. ATHERTON (Discipline Head) Date
Accepted C. MALES (Team Leader) Date
Approved G. ATHERTON (Group Manager) Date

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SCALES @ A3	DESIGNED BY	DRAWN BY
1:1000	S.LANE	S.LANE
	PLOT DATE	21/10/2015

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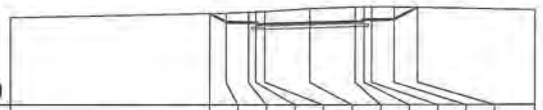
PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C05 REVISION

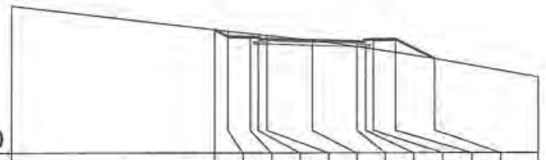
PRELIMINARY PRINT



R.L. 180.500

DESIGN SURFACE		186.54	185.99	185.96	185.94	185.84	185.93	186.02	186.12	186.14	186.17	186.95	
EXISTING SURFACE	186.27	186.54	186.57	186.62	186.65	186.68	186.85	186.96	186.96	186.97	186.98	186.95	186.78
OFFSET	-20.00	-6.68	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	7.16	15.00

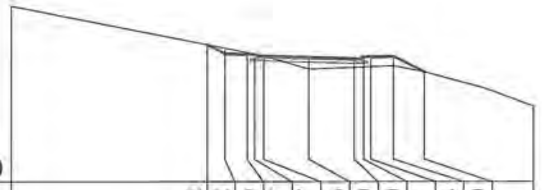
Ch 280.000



R.L. 183.200

DESIGN SURFACE		191.36	190.91	190.88	190.86	190.76	190.67	190.58	190.68	190.70	190.73	189.45	
EXISTING SURFACE	192.95	191.36	191.26	191.10	191.05	190.99	190.67	190.25	190.16	190.08	189.85	189.45	188.20
OFFSET	-20.00	-6.50	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	8.17	15.00

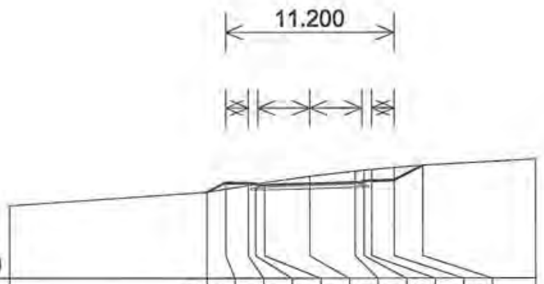
Ch 320.000



R.L. 179.800

DESIGN SURFACE		188.92	188.32	188.29	188.27	188.17	188.08	187.99	188.09	188.11	188.14	187.10	
EXISTING SURFACE	191.47	188.92	188.68	188.39	188.29	188.17	187.28	187.39	187.41	187.43	187.50	187.10	184.82
OFFSET	-20.00	-6.79	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	7.68	15.00

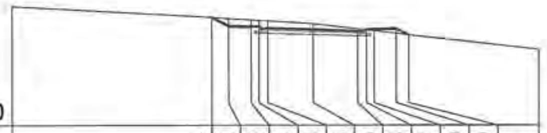
Ch 360.000



R.L. 176.100

DESIGN SURFACE		181.79	182.43	182.40	182.37	182.27	182.36	182.45	182.55	182.58	182.61	183.56	
EXISTING SURFACE	180.89	181.79	182.00	182.24	182.32	182.42	182.84	183.20	183.25	183.29	183.41	183.56	183.97
OFFSET	-20.00	-6.87	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	7.52	15.00

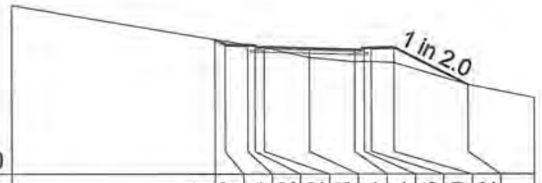
Ch 260.000



R.L. 182.900

DESIGN SURFACE		190.04	189.48	189.45	189.43	189.33	189.24	189.15	189.25	189.27	189.30	188.89	
EXISTING SURFACE	190.79	190.04	189.97	189.88	189.85	189.81	189.63	189.28	189.21	189.16	188.99	188.89	187.91
OFFSET	-20.00	-6.72	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	6.42	15.00

Ch 300.000



R.L. 181.600

DESIGN SURFACE		190.51	190.17	190.14	190.12	190.02	189.93	189.84	189.94	189.96	189.99	187.52	
EXISTING SURFACE	192.78	190.51	190.40	190.16	190.08	189.99	189.32	189.03	189.05	189.06	188.98	187.52	186.65
OFFSET	-20.00	-6.27	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	10.54	15.00

Ch 340.000

PRELIMINARY PRINT

REV | DATE | REMARK

Engineers & Planners

Johnstone McGee & Gandy Pty. Ltd.
incorporating **Dale P Luck & Associates**
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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD CROSS SECTIONS
SHEET 3 OF 5

Accepted G. ATHERTON (Discipline Head) Date
Accepted C. MALES (Team Leader) Date
Approved G. ATHERTON (Group Manager) Date

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SCALES @ A3: 1:1000
DESIGNED BY: S.LANE
DRAWN BY: S.LANE
PLOT DATE: 21/10/2015

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

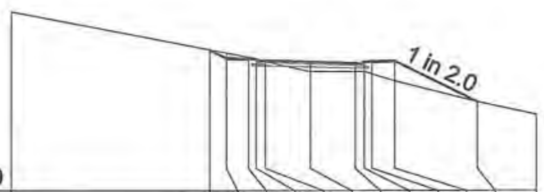
PROJECT NO. J143019PH

DWG NO. C06
REVISION

DEVELOPMENT APPLICATION DOCUMENT

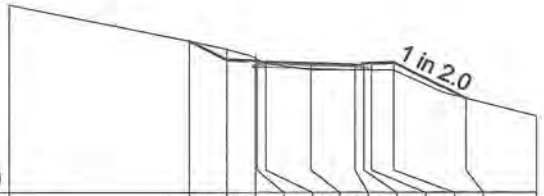
This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council



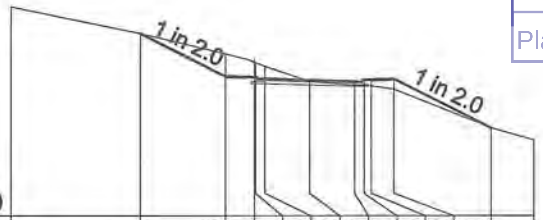
OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	187.72	
-6.72	185.18	185.18
-5.60	184.98	184.62
-4.10	184.71	184.59
-3.60	184.62	184.57
-3.00	184.40	184.47
0.00	183.72	184.38
3.00	183.74	184.29
3.60	183.74	184.39
4.10	183.59	184.41
5.60	183.11	184.44
11.06	181.71	181.71
15.00	180.87	

Ch 400.000



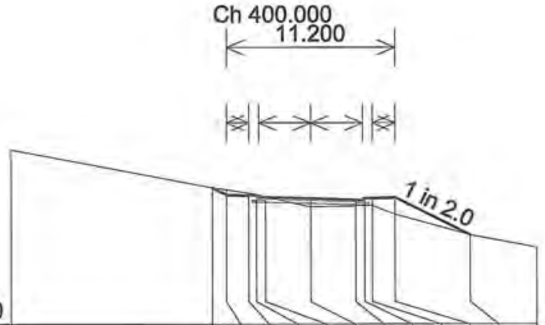
OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	184.57	
-8.09	182.17	182.17
-5.60	181.62	180.92
-4.10	181.22	180.89
-3.60	180.97	180.87
-3.00	180.66	180.77
0.00	180.27	180.68
3.00	180.25	180.59
3.60	180.25	180.69
4.10	180.24	180.71
5.60	180.24	180.74
10.35	178.37	178.37
15.00	177.18	

Ch 440.000



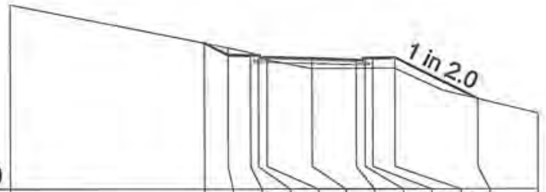
OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	182.49	
-11.29	180.71	180.71
-5.60	179.37	177.86
-4.10	178.98	177.83
-3.60	178.78	177.81
-3.00	178.53	177.71
0.00	177.52	177.62
3.00	177.28	177.53
3.60	177.25	177.63
4.10	177.23	177.65
5.60	177.01	177.68
12.12	174.43	174.43
15.00	173.62	

Ch 480.000



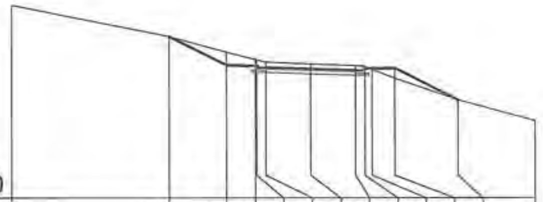
OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	189.46	
-6.54	186.94	186.94
-5.60	186.80	186.47
-4.10	186.58	186.44
-3.60	186.50	186.42
-3.00	186.33	186.32
0.00	185.67	186.23
3.00	185.73	186.14
3.60	185.74	186.24
4.10	185.75	186.26
5.60	185.18	186.29
10.59	183.80	183.80
15.00	182.98	

Ch 380.000



OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	186.08	
-7.17	183.55	183.55
-5.60	183.22	182.77
-4.10	182.91	182.74
-3.60	182.73	182.72
-3.00	182.43	182.62
0.00	181.85	182.53
3.00	181.86	182.44
3.60	181.87	182.54
4.10	181.87	182.56
5.60	181.88	182.59
11.04	179.87	179.87
15.00	178.92	

Ch 420.000



OFFSET	EXISTING SURFACE	DESIGN SURFACE
-20.00	183.03	
-9.40	180.97	180.97
-5.60	179.93	179.07
-4.10	179.55	179.04
-3.60	179.42	179.02
-3.00	179.26	178.92
0.00	179.15	178.83
3.00	179.04	178.74
3.60	178.99	178.84
4.10	178.79	178.86
5.60	178.21	178.89
9.83	176.78	176.78
15.00	175.39	

Ch 460.000

PRELIMINARY PRINT

REV	DATE	REMARK

Engineers & Planners

Johnstone McGee & Gandy Pty. Ltd.
incorporating **Dale P Luck & Associates**
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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD CROSS SECTIONS
SHEET 4 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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1:1000	S.LANE	S.LANE
	PLOT DATE	21/10/2015

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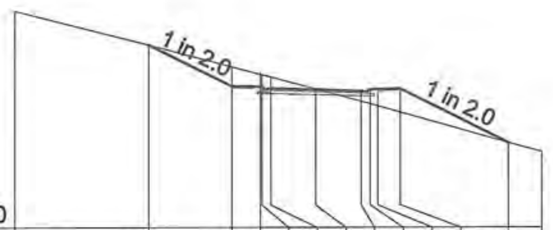
PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

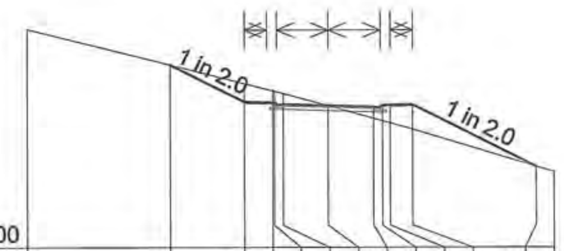
DWG NO. C07 REVISION



R.L. 170.500

DESIGN SURFACE		182.66	179.91	179.88	179.85	179.75	179.66	179.57	179.67	179.70	179.73	176.14	
EXISTING SURFACE	184.92	182.66	181.20	180.80	180.67	180.51	179.71	178.89	178.73	178.59	178.16	176.14	175.55
OFFSET	-20.00	-11.11	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	12.78	15.00

Ch 520.000



R.L. 168.600

DESIGN SURFACE		180.72	178.25	178.22	178.20	178.10	178.01	177.92	178.02	178.04	178.07	173.96	
EXISTING SURFACE	183.09	180.72	179.47	179.09	178.96	178.81	178.00	177.16	176.99	176.86	176.44	173.96	173.63
OFFSET	-20.00	-10.53	-5.60	-4.10	-3.60	-3.00	0.00	3.00	3.60	4.10	5.60	13.83	15.00

Ch 500.000

DEVELOPMENT APPLICATION
DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

REV	DATE	REMARK

Engineers & Planners

Johnstone McGee & Gandy Pty. Ltd.
incorporating **Dale P Luck & Associates**
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49-51 Elizabeth Street, Launceston, Tas (03) 6331 7044
www.jmg.net.au infohbt@jmg.net.au infoltn@jmg.net.au

PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
ROAD CROSS SECTIONS
SHEET 5 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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1:1000	S.LANE	S.LANE
	PLOT DATE	21/10/2015

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C08

REVISION

PRELIMINARY PRINT

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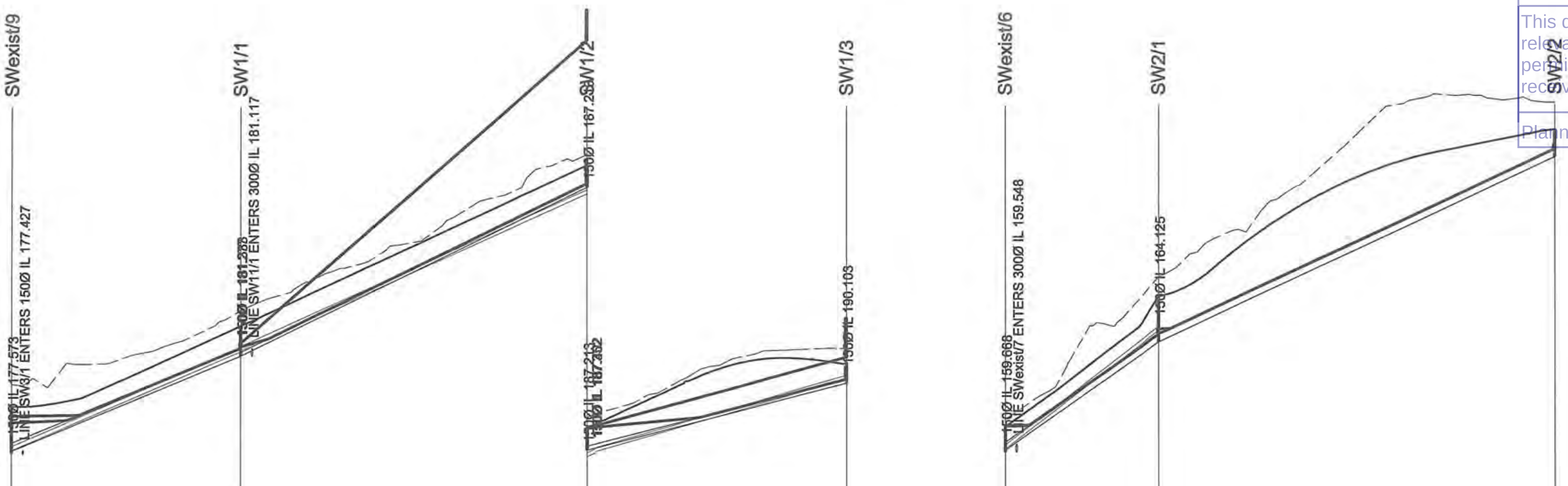
DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council



PIPE DETAILS		300Ø StormPRO		150Ø StormPRO		150Ø StormPRO	
SLOPE/GRADE		1:12.2		1:10.3		1:19.5	
DATUM RL 169.6					RL 179.5		
PIPE VELOCITY (m/s)		1.042m/s		3.344m/s		1.827m/s	
PIPE HGL CAPACITY (l/s)		448.708l/s		76.485l/s		54.481l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=74 l/s		Q=58 l/s		Q=31 l/s	
DEPTH TO INVERT	1.679		1.133		0.835		0.786
INVERT LEVEL	177.549		181.117		187.457		189.955
FINISHED SURFACE	179.228		182.250		188.292		190.741
EXISTING SURFACE	180.062		182.833		188.692		191.255
CHAINAGE	164.274	43.398	207.671	65.485	273.156	48.826	321.982

	300Ø StormPRO		300Ø StormPRO	
	1:7.1		1:10.8	
RL 151.7				
	1.026m/s		0.991m/s	
	592.558l/s		477.336l/s	
	Q=73 l/s		Q=70 l/s	
0.906		1.727		1.026
159.622		163.682		170.643
160.528		165.409		171.669
160.818		166.132		172.692
87.217	28.995	116.212	75.237	191.449

PRELIMINARY PRINT

REV	DATE	REMARK

Engineers & Planners

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incorporating **Dale P Luck & Associates**
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www.jmg.net.au infohbt@jmg.net.au infoltn@jmg.net.au

PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER PROFILES
SHEET 1 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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(V): 1:200	PLOT DATE	21/10/2015

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C09

REVISION

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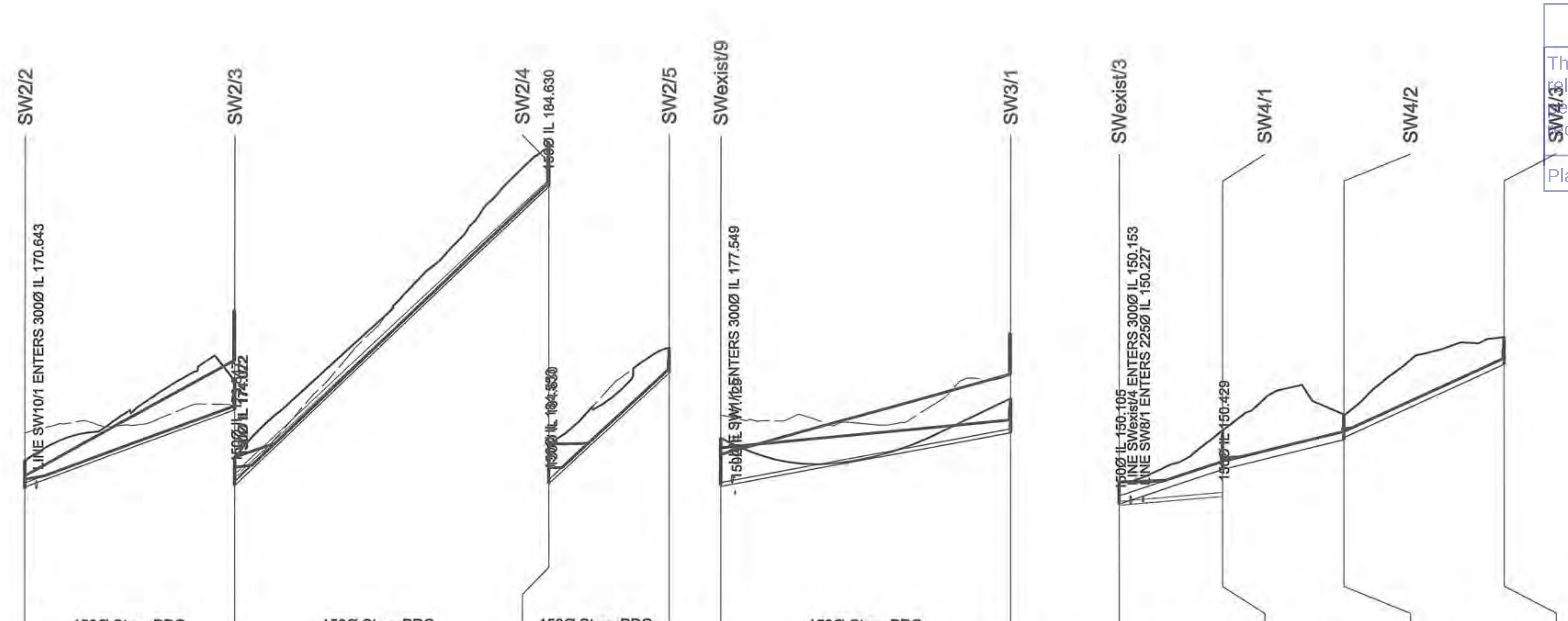

PIPE DETAILS SLOPE/GRADE		150Ø StormPRO 1:13.7		150Ø StormPRO 1:5.3		150Ø StormPRO 1:5.4	
DATUM RL 162.8			RL 165.6		RL 176.6		
PIPE VELOCITY (m/s)		2.569m/s		2.021m/s		0.450m/s	
PIPE HGL CAPACITY (l/s)		65.773l/s		109.088l/s		107.248l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=44 l/s		Q=35 l/s		Q=8 l/s	
DEPTH TO INVERT	0.964		1.048		1.460		0.936
INVERT LEVEL	170.705		173.545		184.592		188.680
FINISHED SURFACE	171.669		174.593		186.052		189.616
EXISTING SURFACE	172.692		173.695		186.052		189.616
CHAINAGE	191.449	38.982	230.431	58.181	288.612	22.239	310.851

PIPE DETAILS SLOPE/GRADE		150Ø StormPRO 1:27.3	
DATUM	RL 169.5		
PIPE VELOCITY (m/s)		1.841m/s	
PIPE HGL CAPACITY (l/s)		45.548l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=32 l/s	
DEPTH TO INVERT	1.801		1.270
INVERT LEVEL	177.427		179.394
FINISHED SURFACE	179.228		180.664
EXISTING SURFACE	180.062		181.532
CHAINAGE	164.274	53.719	217.993

PIPE DETAILS SLOPE/GRADE		300Ø StormPRO 1:15.1		300Ø StormPRO 1:20.6		225Ø StormPRO 1:11.0	
DATUM	RL 142.2						
PIPE VELOCITY (m/s)		0.892m/s		0.802m/s		1.241m/s	
PIPE HGL CAPACITY (l/s)		400.528l/s		339.949l/s		225.131l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=63 l/s		Q=57 l/s		Q=50 l/s	
DEPTH TO INVERT	0.815		1.457		0.941 0.867		1.007
INVERT LEVEL	150.153		151.427		152.523 152.597		155.309
FINISHED SURFACE	150.968		152.884		153.464		156.316
EXISTING SURFACE	150.968		152.884		153.464		156.316
CHAINAGE	33.807	19.241	53.048	22.603	75.651	29.826	105.477

DEVELOPMENT APPLICATION
DOCUMENT
This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.
Planning Authority: Hobart City Council

PRELIMINARY PRINT

REV	DATE	REMARK

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER PROFILES
SHEET 2 OF 5

Accepted G. ATHERTON (Discipline Head) Date
Accepted C. MALES (Team Leader) Date
Approved G. ATHERTON (Group Manager) Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C10
REVISION

DEVELOPMENT APPLICATION DOCUMENT

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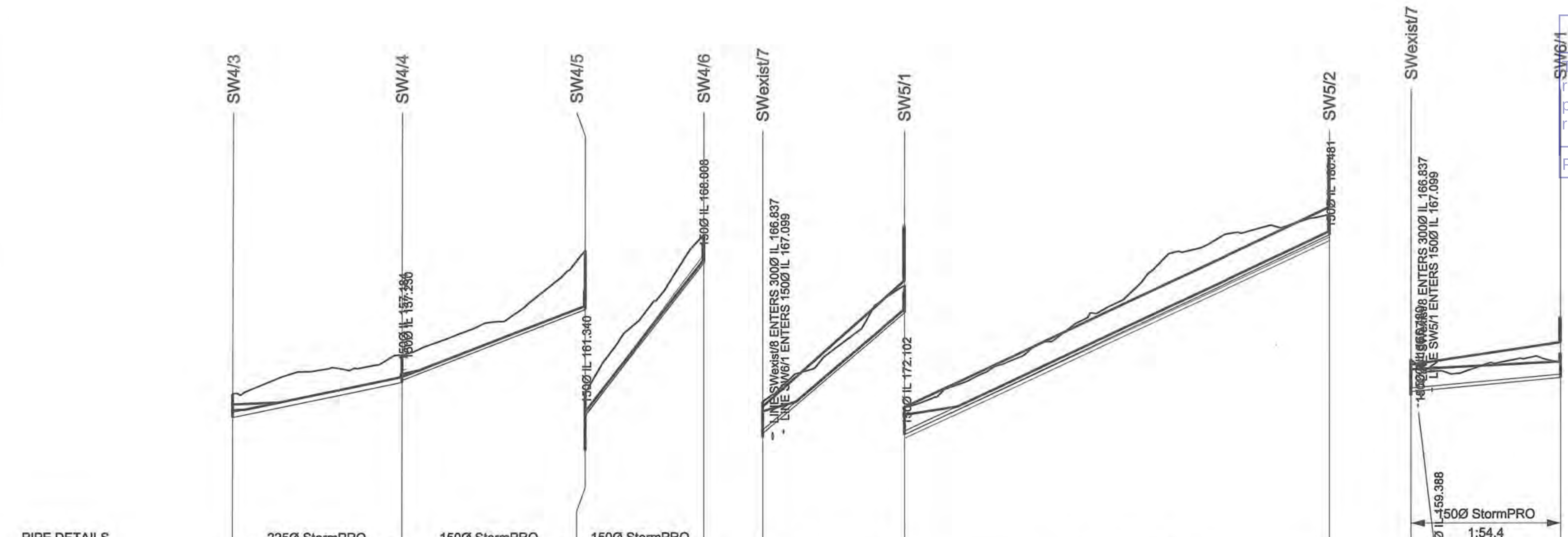
Planning Authority: Hobart City Council



DATUM RL 147.4

RL 153.4

PIPE DETAILS SLOPE/GRADE		225Ø StormPRO 1:24.0		150Ø StormPRO 1:13.0		150Ø StormPRO 1:3.9	
PIPE VELOCITY (m/s)		0.865m/s		1.557m/s		0.885m/s	
PIPE HGL CAPACITY (l/s)		148.973l/s		67.565l/s		127.479l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=35 l/s		Q=27 l/s		Q=15 l/s	
DEPTH TO INVERT	1.007		1.157 1.079		2.509 1.009		1.217
INVERT LEVEL	155.309		156.813 156.891		159.892 161.392		167.861
FINISHED SURFACE	156.316		157.970		162.401		169.078
EXISTING SURFACE	156.316		157.970		162.401		169.078
CHAINAGE	105.477	36.128	141.606	39.161	180.766	25.304	206.070

RL 159.1

RL 164.3

	150Ø StormPRO 1:5.9		150Ø StormPRO 1:10.7	
	3.351m/s		2.445m/s	
	102.790l/s		75.108l/s	
	Q=58 l/s		Q=42 l/s	
1.348		1.164		0.868
167.099		172.238		180.738
168.447		173.402		181.606
168.447		173.402		181.606
119.430	30.310	149.740	90.857	240.597

RL 159.1

	150Ø StormPRO 1:54.4	
	1.323m/s	
	31.425l/s	
	Q=23 l/s	
1.348		0.638
167.099		167.686
168.447		168.324
168.447		168.324
119.430	31.919	151.349

PRELIMINARY PRINT

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER PROFILES
SHEET 3 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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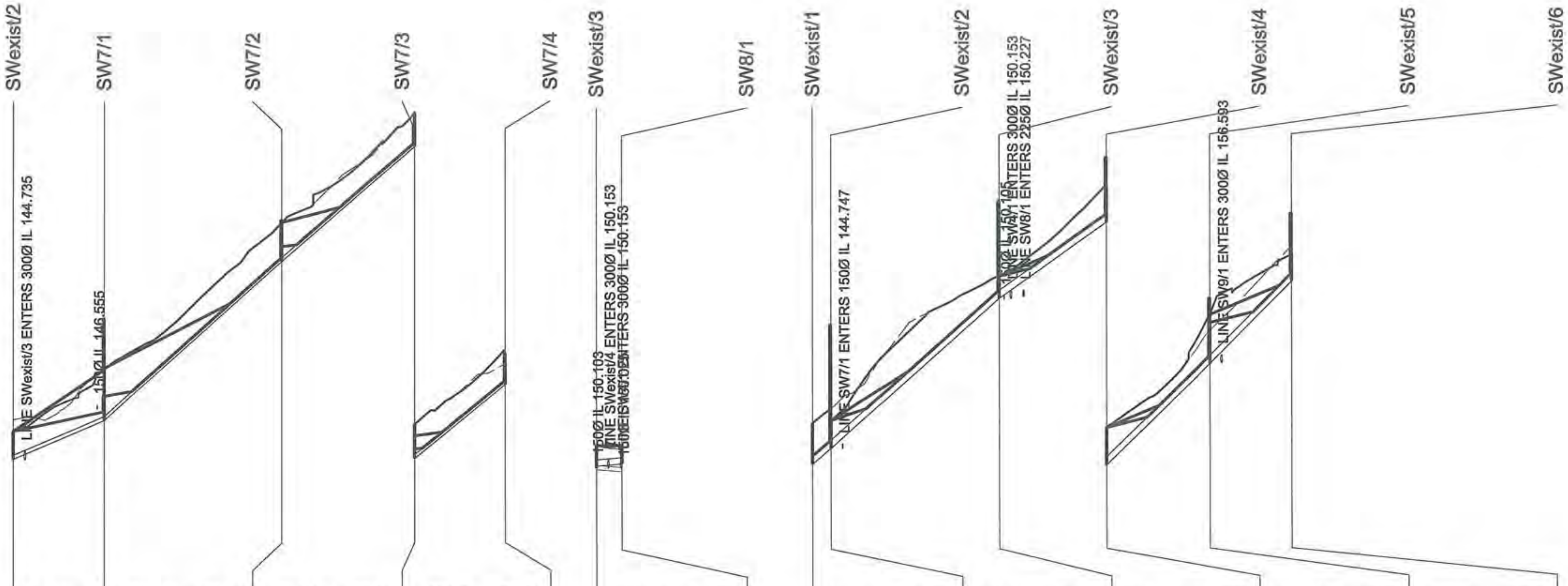
PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C11

REVISION



PIPE DETAILS SLOPE/GRADE		150Ø StormPRO 1:11.9		150Ø StormPRO 1:5.6		150Ø StormPRO 1:5.8		150Ø StormPRO 1:6.2	
DATUM RL 136.8								RL 148.1	
PIPE VELOCITY (m/s)		2.882m/s		2.518m/s		1.759m/s		1.251m/s	
PIPE HGL CAPACITY (l/s)		70.862l/s		105.269l/s		103.707l/s		99.874l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=50 l/s		Q=43 l/s		Q=30 l/s		Q=22 l/s	
DEPTH TO INVERT	1.009		1.895		1.425		1.248		0.757
INVERT LEVEL	144.747		146.141		151.889		156.046		158.712
FINISHED SURFACE	145.756		148.036		153.314		157.294		159.469
EXISTING SURFACE	146.180		148.036		153.314		157.294		159.469
CHAINAGE	3.371	16.629	20.001	32.399	52.400	24.108	76.507	16.609	93.116

	225Ø StormPRO 1:58.5	
RL 142.3		
	0.000m/s	
	92.574l/s	
	Q=0 l/s	
0.741		0.563
150.227		150.305
150.968		150.868
150.968		150.857
33.807	4.565	38.372

	300Ø StormPRO 1:6.0		300Ø StormPRO 1:5.6		300Ø StormPRO 1:7.1		300Ø StormPRO 1:5.2		300Ø StormPRO 1:5.0	
RL 136.2				RL 145						
	6.193m/s		5.634m/s		4.813m/s		4.826m/s		4.837m/s	
	648.803l/s		671.315l/s		594.760l/s		700.548l/s		712.368l/s	
	Q=438 l/s		Q=398 l/s		Q=340 l/s		Q=341 l/s		Q=342 l/s	
1.488		1.021		0.815		1.358		1.779		0.980
144.173		144.735		150.153		152.911		156.568		159.548
145.661		145.756		150.968		154.269		158.347		160.528
145.661		146.180		150.968		154.269		157.774		160.818
0.000	3.371	3.371	30.436	33.807	19.557	53.364	18.923	72.287	14.930	87.217

DEVELOPMENT APPLICATION DOCUMENT

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Planning Authority: Hobart City Council

REV	DATE	REMARK

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER PROFILES
SHEET 4 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C12

REVISION

PRELIMINARY PRINT

DEVELOPMENT APPLICATION DOCUMENT

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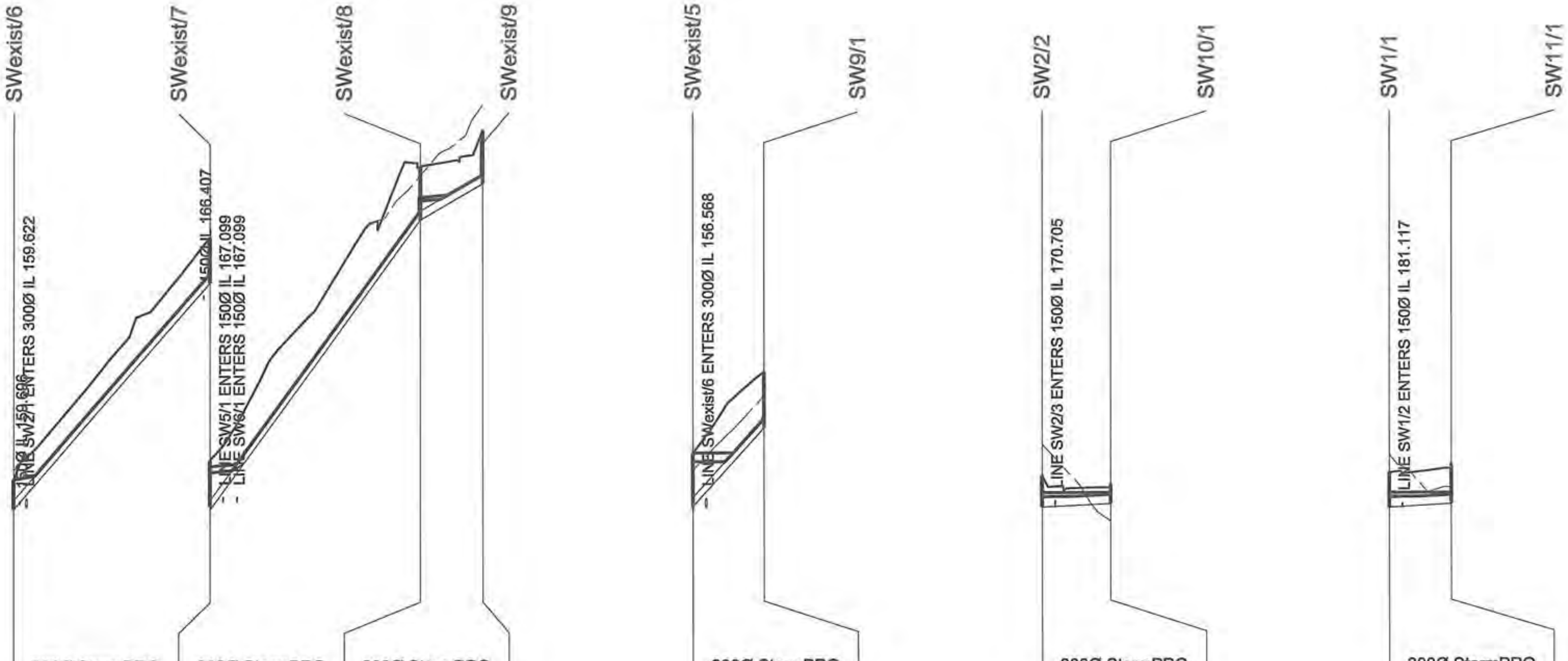
Planning Authority: Hobart City Council



	SWexist/6		SWexist/7		SWexist/8		SWexist/9
PIPE DETAILS SLOPE/GRADE		300Ø StormPRO 1:4.4		300Ø StormPRO 1:3.7		300Ø StormPRO 1:8.6	
DATUM RL 151.6				RL 158.9			
PIPE VELOCITY (m/s)		3.960m/s		2.934m/s		2.939m/s	
PIPE HGL CAPACITY (l/s)		766.124l/s		837.866l/s		536.558l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=280 l/s		Q=207 l/s		Q=208 l/s	
DEPTH TO INVERT	0.980		1.500 1.610		1.762		1.753
INVERT LEVEL	159.548		166.947 166.837		176.292		177.475
FINISHED SURFACE	160.528		168.447		178.054		179.228
EXISTING SURFACE	160.818		168.447		177.750		180.062
CHAINAGE	87.217	32.213	119.430	34.622	154.052	10.221	164.274

	SWexist/5		SW9/1
PIPE DETAILS SLOPE/GRADE		300Ø StormPRO 1:4.5	
DATUM RL 151.6		RL 148.6	
PIPE VELOCITY (m/s)		0.000m/s	
PIPE HGL CAPACITY (l/s)		752.690l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=0 l/s	
DEPTH TO INVERT	1.754		1.828
INVERT LEVEL	156.593		159.163
FINISHED SURFACE	158.347		160.991
EXISTING SURFACE	157.774		160.206
CHAINAGE	72.287	11.578	83.865

	SW2/2		SW10/1
PIPE DETAILS SLOPE/GRADE		300Ø StormPRO 1:100.0	
DATUM RL 151.6		RL 162.7	
PIPE VELOCITY (m/s)		0.000m/s	
PIPE HGL CAPACITY (l/s)		146.618l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=0 l/s	
DEPTH TO INVERT	1.026		0.651
INVERT LEVEL	170.643		170.756
FINISHED SURFACE	171.669		171.407
EXISTING SURFACE	172.692		170.190
CHAINAGE	191.449	11.269	202.718

	SW1/1		SW11/1
PIPE DETAILS SLOPE/GRADE		300Ø StormPRO 1:87.7	
DATUM RL 151.6		RL 173.2	
PIPE VELOCITY (m/s)		0.000m/s	
PIPE HGL CAPACITY (l/s)		157.325l/s	
PIPE DESIGN FLOW 1:20yr ARI (l/s)		Q=0 l/s	
DEPTH TO INVERT	1.133		1.302
INVERT LEVEL	181.117		181.234
FINISHED SURFACE	182.250		182.536
EXISTING SURFACE	182.833		181.768
CHAINAGE	207.671	10.262	217.933

PRELIMINARY PRINT

REV	DATE	REMARK

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER PROFILES
SHEET 5 OF 5

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C12 REVISION

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

HGL Report - SW BEAUMONT Return Period: 20yrs Location: Hobart

Pipe Connecting Pits (Downstream Upstream)	Effective Catchment Area	Time on Concentration (Tc)	Rainfall Intensity	Pipe Class	Pipe Diameter	Pipe Length	Mannings n	Pipe Slope	Pipe Velocity	Pipe Velocity Head	HGL at Downstream Pit	Pipe Friction Slope	Pipe Friction Loss	Pit Loss Coefficient	Pipe Head Loss	Adopted Upstream Water Level	HGL at Upstream Pit	Pit Surcharge Level (Pit Inlet/Outlet Level)	Downstream Pipe Invert	Upstream Pipe Invert	Pipe Design Flow	Pipe HGL Capacity	Pipe Manning Capacity	Pipe Calcs Pit Loss
	(ha)	(Min.)	(mm/hr)		(mm)	(m)		(%)	(m/s)	(m)	(m)	(%)	(m)	Ku	(m)	(m)	(m)	(m)	(m)	(m)	(l/s)	(l/s)	(l/s)	(m)
SWexist/1 SWexist/2	1.49	8.6	101.0	StormPRO	300	3.371	0.012	18.670	6.19	1.957	144.473	0.08	0.264	1.000	1.957	146.992	145.035	145.756	144.173	144.735	437.7	648.8	427.7	2.0
SWexist/2 SWexist/3	1.30	8.5	101.0	StormPRO	300	30.436	0.012	17.802	5.63	1.619	145.756	0.07	1.993	1.000	1.619	152.072	150.453	150.968	144.735	150.153	398.2	671.3	442.0	1.6
SWexist/2 SW7/1	0.19	5.7	101.0	StormPRO	150	16.629	0.012	8.383	2.88	0.424	145.756	0.04	0.713	1.307	0.554	147.023	146.469	148.036	144.747	146.141	49.6	70.9	46.1	0.6
SWexist/3 SWexist/4	1.04	8.4	101.0	StormPRO	300	19.557	0.012	14.102	4.81	1.182	150.968	0.05	0.949	1.000	1.182	154.393	153.211	154.269	150.153	152.911	340.2	594.8	393.4	1.2
SWexist/3 SW4/1	0.27	7.5	101.0	StormPRO	300	19.241	0.012	6.621	0.89	0.041	150.968	0.00	0.041	1.000	0.041	151.768	151.727	152.884	150.153	151.427	63.0	400.5	269.6	0.0
SWexist/3 SW8/1	0.00	5.0	101.0	StormPRO	225	4.565	0.012	1.709	0.00	0.000	150.968	0.00	0.000	18.000	0.000	150.968	150.968	150.868	150.227	150.305	0.0	92.6	0.0	0.0
SW7/1 SW7/2	0.16	5.4	101.0	StormPRO	150	32.399	0.012	17.741	2.52	0.323	147.023	0.03	1.080	1.263	0.408	152.445	152.037	153.314	146.141	151.889	43.3	105.3	67.0	0.4
SWexist/4 SWexist/5	1.04	8.3	101.0	StormPRO	300	18.923	0.012	19.326	4.83	1.189	154.269	0.05	0.923	1.000	1.189	158.057	156.868	158.347	152.911	156.568	341.2	700.5	460.5	1.2
SW4/1 SW4/2	0.23	7.0	101.0	StormPRO	300	22.603	0.012	4.849	0.80	0.033	151.768	0.00	0.039	1.000	0.033	152.856	152.823	153.464	151.427	152.523	56.7	339.9	230.7	0.0
SW7/2 SW7/3	0.11	5.2	101.0	StormPRO	150	24.108	0.012	17.243	1.76	0.156	152.445	0.02	0.414	1.313	0.207	156.401	156.194	157.294	151.889	156.046	30.3	103.7	66.1	0.2
SWexist/5 SWexist/6	1.04	8.3	101.0	StormPRO	300	14.930	0.012	19.959	4.84	1.194	158.057	0.05	0.732	1.042	1.244	161.092	159.848	160.528	156.568	159.548	341.9	712.4	468.0	1.2
SWexist/5 SW9/1	0.00	5.0	101.0	StormPRO	300	11.578	0.012	22.197	0.00	0.000	158.057	0.00	0.000	18.000	0.000	159.463	159.463	160.991	156.593	159.163	0.0	752.7	0.0	0.0
SW4/2 SW4/3	0.20	6.6	101.0	StormPRO	225	29.826	0.012	9.093	1.24	0.079	152.856	0.01	0.162	1.227	0.096	155.631	155.535	156.316	152.597	155.309	49.8	225.1	148.4	0.1
SW7/3 SW7/4	0.08	5.0	101.0	StormPRO	150	16.609	0.012	16.052	1.25	0.080	156.401	0.01	0.152	3.836	0.306	159.166	158.860	159.469	156.046	158.712	21.5	99.9	63.8	0.3
SWexist/6 SWexist/7	0.69	6.7	101.0	StormPRO	300	32.213	0.012	22.969	3.96	0.800	160.528	0.03	1.081	1.000	0.800	168.047	167.247	168.447	159.548	166.947	279.9	766.1	502.1	0.8
SWexist/6 SW2/1	0.31	7.8	101.0	StormPRO	300	28.995	0.012	14.002	1.03	0.054	160.528	0.00	0.079	1.000	0.054	164.036	163.982	165.409	159.622	163.682	72.5	592.6	392.0	0.1
SW4/3 SW4/4	0.13	5.9	101.0	StormPRO	225	36.128	0.012	4.163	0.87	0.038	155.631	0.00	0.101	1.000	0.038	157.077	157.039	157.970	155.309	156.813	34.7	149.0	100.4	0.0
SWexist/7 SWexist/8	0.39	6.5	101.0	StormPRO	300	34.622	0.012	27.310	2.93	0.439	168.047	0.02	0.661	1.000	0.439	177.031	176.592	178.054	166.837	176.292	207.4	837.9	547.5	0.4
SWexist/7 SW5/1	0.22	5.6	101.0	StormPRO	150	30.310	0.012	16.955	3.35	0.573	168.047	0.06	1.724	1.211	0.694	173.080	172.386	173.402	167.099	172.238	57.7	102.8	65.5	0.7
SWexist/7 SW6/1	0.08	5.0	101.0	StormPRO	150	31.919	0.012	1.839	1.32	0.089	168.047	0.01	0.324	3.630	0.324	168.696	168.371	168.324	167.099	167.686	22.8	31.4	21.6	0.3
SW2/1 SW2/2	0.28	6.6	101.0	StormPRO	300	75.237	0.012	9.253	0.99	0.050	164.036	0.00	0.192	1.000	0.050	170.993	170.943	171.669	163.682	170.643	70.0	477.3	318.7	0.1
SW4/4 SW4/5	0.10	5.5	101.0	StormPRO	150	39.161	0.012	7.663	1.56	0.124	157.077	0.01	0.536	1.554	0.192	160.232	160.040	162.401	156.891	159.892	26.8	67.5	44.1	0.2
SWexist/8 SWexist/9	0.39	6.5	101.0	StormPRO	300	10.221	0.012	11.574	2.94	0.441	177.031	0.02	0.196	2.473	1.090	178.865	177.775	179.228	176.292	177.475	207.7	536.6	356.4	1.1
SW5/1 SW5/2	0.15	5.0	101.0	StormPRO	150	90.657	0.012	9.355	2.45	0.305	173.080	0.03	2.868	2.129	0.650	181.536	180.886	181.606	172.238	180.738	42.1	75.1	48.7	0.6
SW2/2 SW2/3	0.17	6.3	101.0	StormPRO	150	38.982	0.012	7.285	2.57	0.337	170.993	0.03	1.349	1.575	0.530	174.223	173.693	174.593	170.705	173.545	44.2	65.8	43.0	0.5
SW2/2 SW10/1	0.00	5.0	101.0	StormPRO	300	11.269	0.012	1.000	0.00	0.000	170.993	0.00	0.000	18.000	0.000	171.056	171.056	171.407	170.643	170.756	0.0	146.6	0.0	0.0
SW4/5 SW4/6	0.05	5.0	101.0	StormPRO	150	25.304	0.012	25.566	0.88	0.040	161.540	0.00	0.123	5.288	0.211	168.220	168.009	169.078	161.392	167.861	15.2	127.5	80.5	0.2
SWexist/9 SW3/1	0.11	5.0	101.0	StormPRO	150	53.719	0.012	3.662	1.84	0.173	178.865	0.02	1.002	2.675	0.463	180.329	179.867	180.664	177.427	179.394	31.7	45.5	30.5	0.5
SWexist/9 SW1/1	0.28	5.8	101.0	StormPRO	300	43.398	0.012	8.222	1.04	0.055	178.865	0.00	0.122	1.000	0.055	181.472	181.417	182.250	177.549	181.117	73.6	448.7	300.4	0.1
SW2/3 SW2/4	0.13	5.8	101.0	StormPRO	150	58.181	0.012	18.987	2.02	0.208	174.223	0.02	1.290	2.120	0.442	185.182	184.740	186.052	173.545	184.592	34.8	109.1	69.4	0.4
SW1/1 SW1/2	0.21	5.4	101.0	StormPRO	150	65.485	0.012	9.682	3.34	0.571	181.472	0.06	3.709	1.603	0.915	188.520	187.605	188.292	181.117	187.457	57.5	76.5	49.5	0.9
SW1/1 SW11/1	0.00	5.0	101.0	StormPRO	300	10.262	0.012	1.140	0.00	0.000	181.472	0.00	0.000	18.000	0.000	181.534	181.534	182.536	181.117	181.234	0.0	157.3	0.0	0.0
SW2/4 SW2/5	0.03	5.0	101.0	StormPRO	150	22.239	0.012	18.382	0.45	0.010	185.182	0.00	0.032	9.354	0.097	188.925	188.828	189.618	184.592	188.680	7.7	107.2	68.2	0.1
SW1/2 SW1/3	0.11	5.0	101.0	StormPRO	150	48.826	0.012	5.116	1.83	0.170	188.292	0.02	0.898	2.693	0.459	190.562	190.103	190.741	187.457	189.955	31.4	54.5	36.0	0.5

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Engineers & Planners

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
STORMWATER HGL REPORT

Accepted G. ATHERTON (Discipline Head) Date
Accepted C. MALES (Team Leader) Date
Approved G. ATHERTON (Group Manager) Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

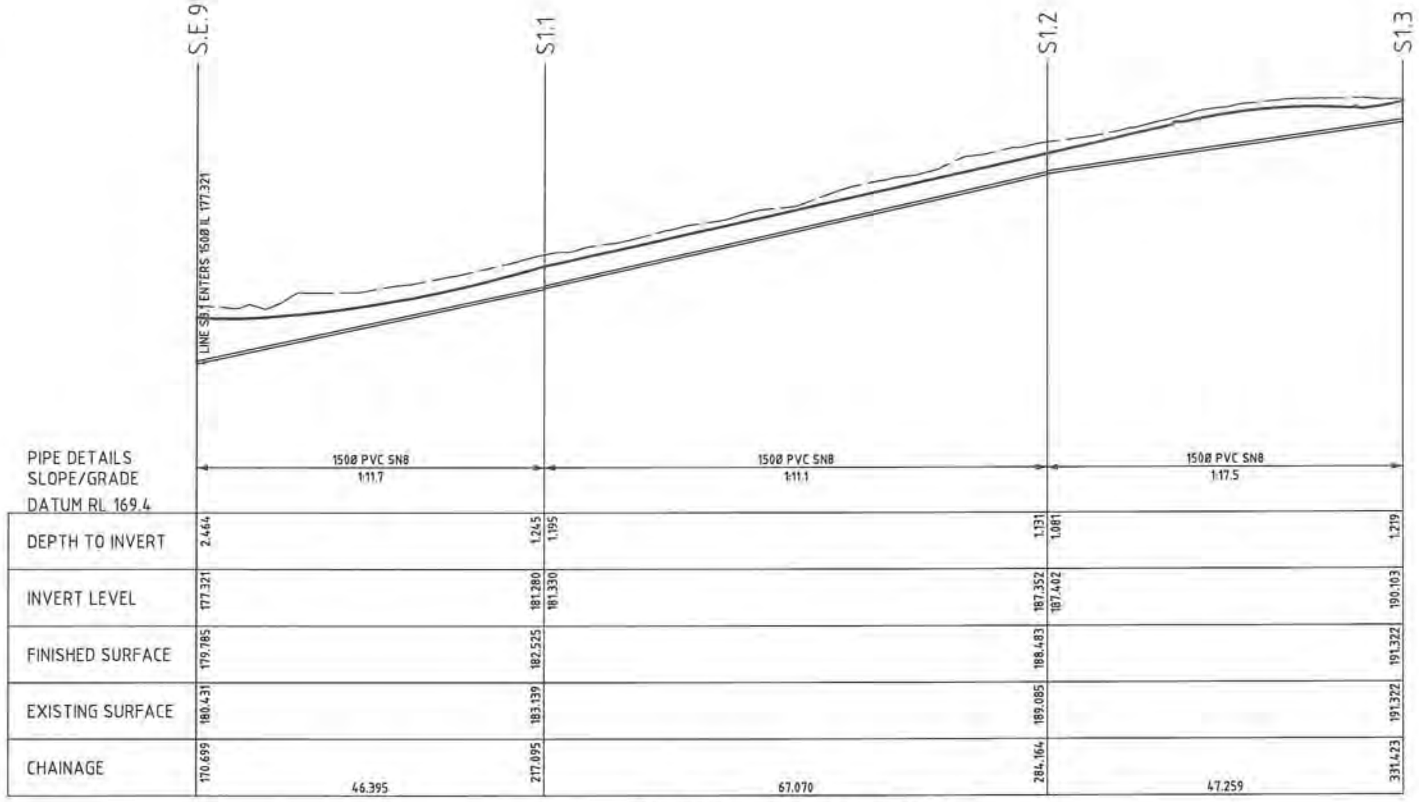
PROJECT NO. J143019PH

DWG NO. C13 REVISION

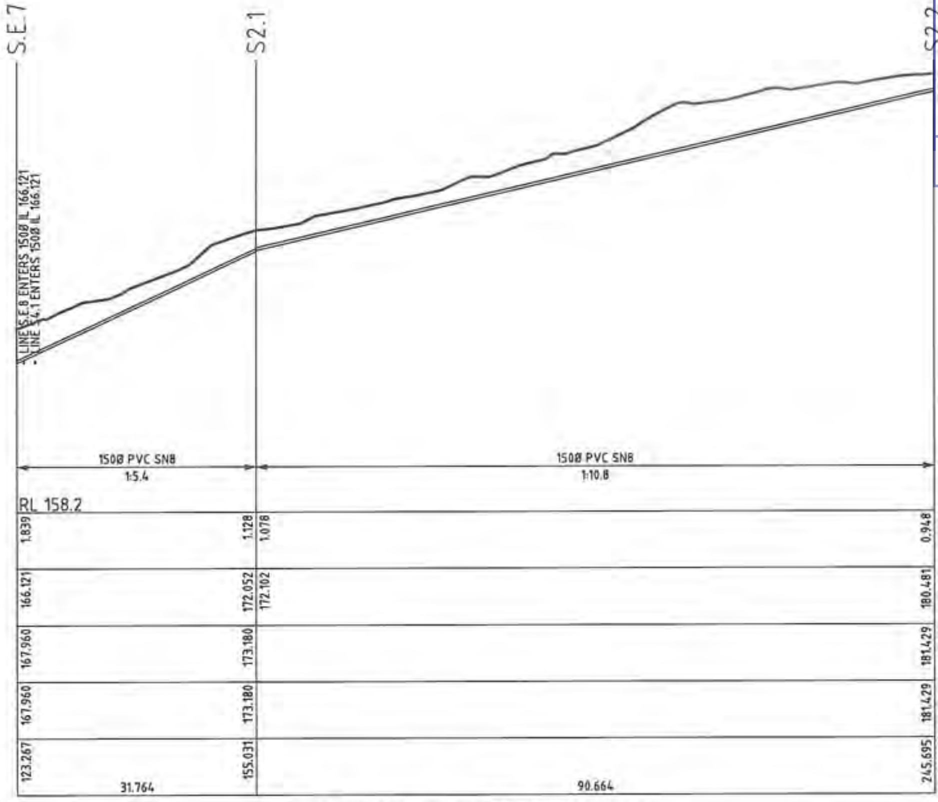
DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council



SEWER LONGITUNDINAL SECTION FOR LINE 1
SCALES: HORIZONTAL 1:500 VERTICAL 1:200



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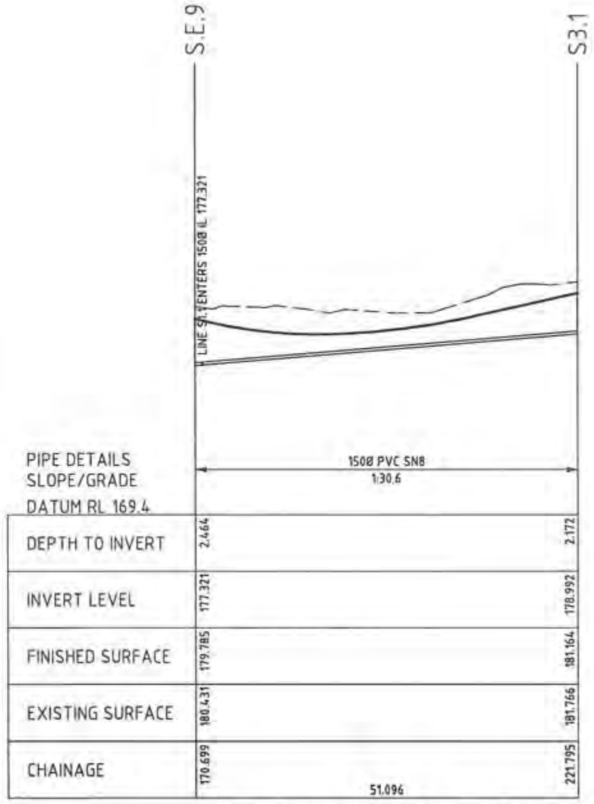

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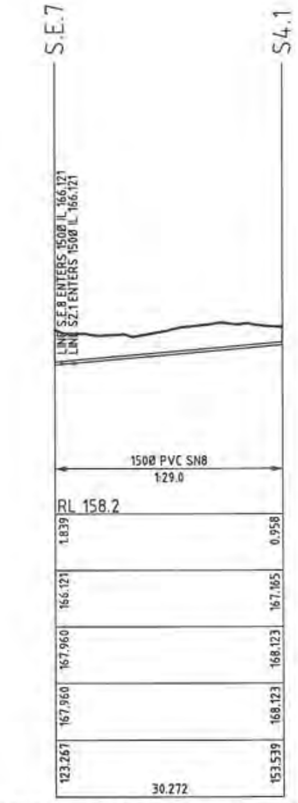
SCALES: HORIZONTAL 1:500 VERTICAL 1:200



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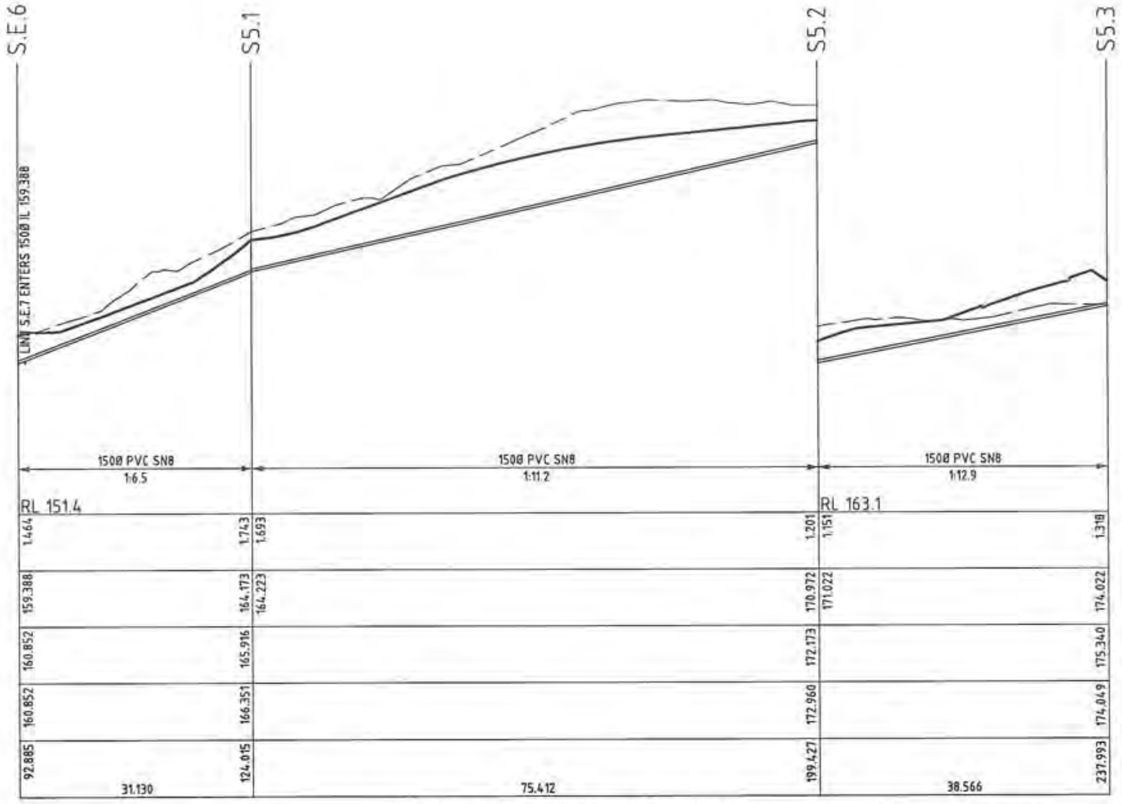
SCALES: HORIZONTAL 1:500 VERTICAL 1:200



SEWER LONGITUNDINAL SECTION FOR LINE 5
SCALES: HORIZONTAL 1:500 VERTICAL 1:200

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
SEWER PROFILES
SHEET 1 OF 2

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C14
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DEVELOPMENT APPLICATION DOCUMENT

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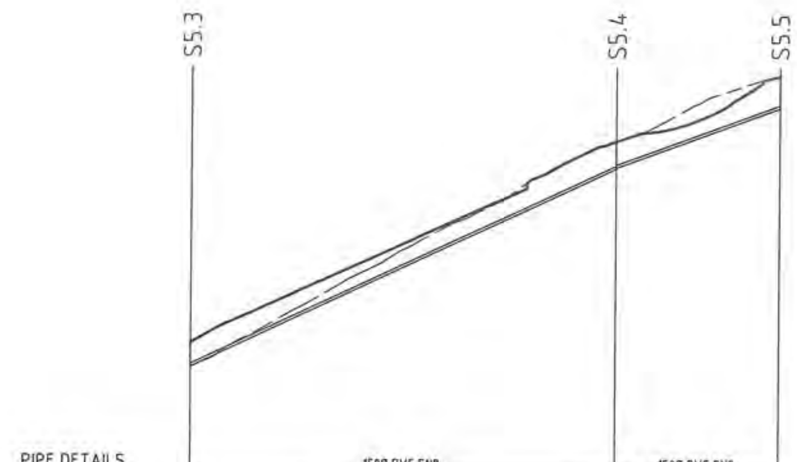
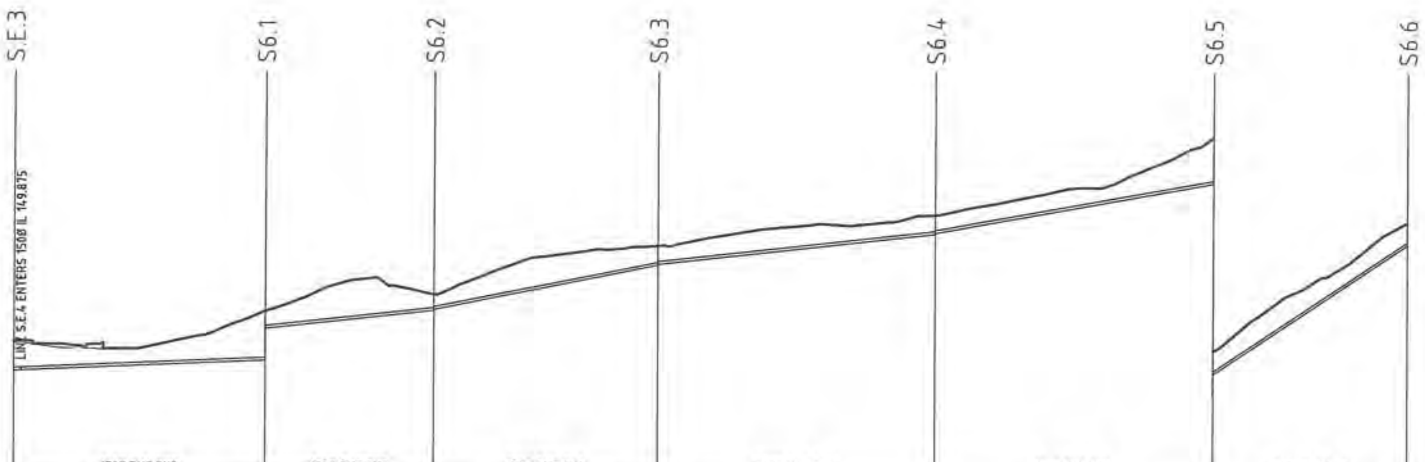


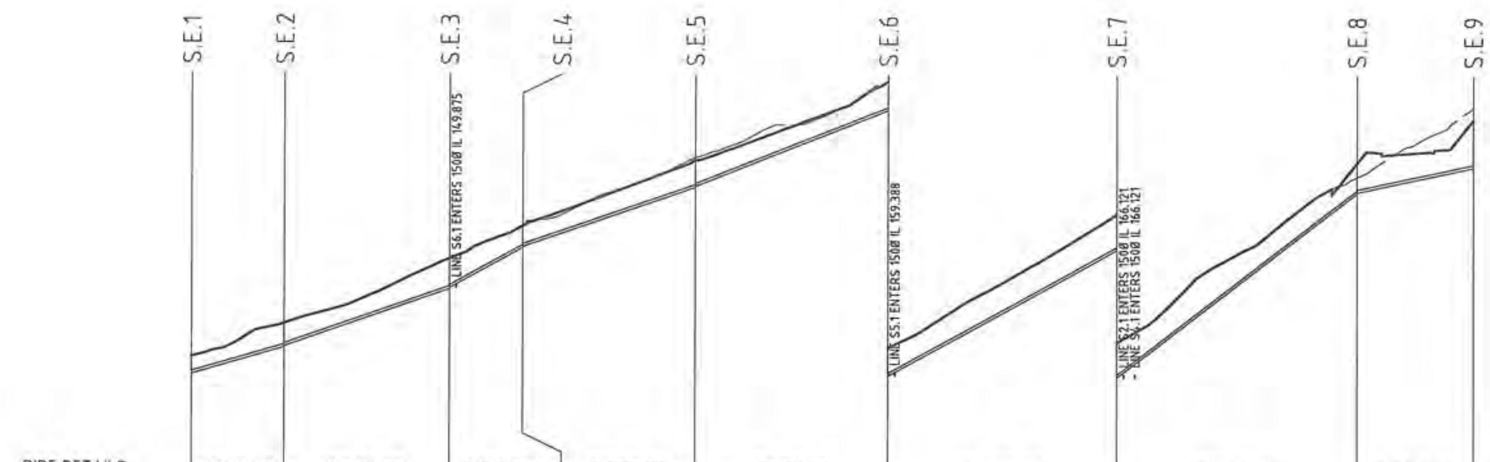
PIPE DETAILS		150Ø PVC SN8		150Ø PVC SN8	
SLOPE/GRADE		1:5.4		1:6.9	
DATUM RL 166.1					
DEPTH TO INVERT	1.268		1.455 1.405		1.696
INVERT LEVEL	174.072		184.630 184.680		187.865
FINISHED SURFACE	175.340		186.085		189.561
EXISTING SURFACE	174.049		186.085		189.561
CHAINAGE	237.993	56.690	294.683	21.907	316.590

SEWER LONGITUNDINAL SECTION FOR LINE 5
SCALES: HORIZONTAL 1:500 VERTICAL 1:200



PIPE DETAILS		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8	
SLOPE/GRADE		1:59.5		1:22.8		1:12.5		1:22.6		1:14.0		1:3.8	
DATUM	RL 141.9										RL 153.2		
DEPTH TO INVERT	1.559		2.623 0.927		0.853 0.803		1.020 0.970		1.000 0.950		2.415 1.245		1.185
INVERT LEVEL	149.875		150.439 152.135		153.119 153.169		155.549 155.599		157.230 157.280		159.949 161.119		168.008
FINISHED SURFACE	151.434		153.062		153.972		156.569		158.230		162.364		169.193
EXISTING SURFACE	151.434		153.062		153.972		156.569		158.230		162.364		169.193
CHAINAGE	34.497	33.530	68.027	22.478	90.505	29.697	120.202	36.920	157.122	37.324	194.446	25.874	220.320

SEWER LONGITUNDINAL SECTION FOR LINE 6
SCALES: HORIZONTAL 1:500 VERTICAL 1:200



PIPE DETAILS		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8		150Ø PVC SN8	
SLOPE/GRADE		1:8.7		1:7.2		1:4.5		1:7.3		1:6.3		1:4.5		1:3.3		1:11.8	
DATUM RL 137.3											RL 151.4		RL 158.2				
DEPTH TO INVERT	0.929		1.264 1.214		1.609 1.559		1.148 1.098		1.448 1.398		1.514 1.464		1.889 1.839		1.602 1.552		2.514
INVERT LEVEL	145.272		146.709 146.759		149.825 149.875		152.026 152.076		155.233 155.283		159.338 159.388		166.071 166.121		175.903 175.953		177.271
FINISHED SURFACE	146.201		147.973		151.434		153.174		156.681		160.852		167.960		177.505		179.785
EXISTING SURFACE	146.201		147.973		151.434		153.174		156.825		160.852		167.960		176.763		180.431
CHAINAGE	0.000	12.511	12.511	21.985	34.497	9.648	44.144	23.070	67.215	25.670	92.885	30.382	123.267	31.906	155.173	15.526	170.699

SEWER LONGITUNDINAL SECTION FOR LINE .E
SCALES: HORIZONTAL 1:500 VERTICAL 1:200

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
CONCEPT SERVICES PLAN
SEWER PROFILES
SHEET 2 OF 2

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C15
REVISION

APPENDIX B

Estimated Flows and Boyds Formula Storage Calculations

11 Beaumont Road - Lenah Valley
J143019PH
Estimated Catchment Flow

Time of Concentration - RATIONAL

A= 0.02 Km^2
S_a= 264 m/km
L= 0.22 km
t_c= **6.28 mins**
I_{eff}= 95.07

$$Tc = \frac{58*L}{A^{0.1}Se^{0.2}}$$

INTENSITY/ FREQUENCY/ DURATION (IFD) Data - BOM Website - LOCATION: Hadley Court, Lenah Valley

	Coefficients								
ARI in years	A	B	C	D	E	F	G	loge(I)	I (mm/hr)
1	2.440670252	-5.13E-01	-4.53E-03	1.10E-02	-3.20E-03	-7.91E-04	1.81E-04	3.436150702	31.07
2	2.701974392	-5.20E-01	6.27E-03	9.52E-03	-3.96E-03	-5.43E-04	1.61E-04	3.749133363	42.48
5	2.95421052	-5.42E-01	3.21E-02	8.55E-03	-5.97E-03	-2.89E-04	1.73E-04	4.127956302	62.05
10	3.088603973	-5.54E-01	4.67E-02	7.36E-03	-7.02E-03	-6.87E-05	1.63E-04	4.335367701	76.35
20	3.24660635	-5.65E-01	5.99E-02	7.19E-03	-8.16E-03	2.83E-05	1.80E-04	4.554598909	95.07
50	3.432682514	-5.77E-01	7.43E-02	6.27E-03	-9.22E-03	2.16E-04	1.76E-04	4.812835534	123.08
100	3.560993433	-5.86E-01	8.50E-02	5.79E-03	-1.01E-02	3.35E-04	1.81E-04	4.991927958	147.22
								e=	2.72
								tc (mins)=	6.28
								tc (hrs) =	0.10

Frequency Conversion Factors - AR&R

ARI (years)	1	2	5	10	20	50	100
Conversion Factor, F_y	0.8	0.85	0.95	1	1.05	1.15	1.2

Pre-Development Flow Calculation - 1:20 Year ARI

	km^2	Fraction Impervious	$I_{10/1}$ (mm/hr)	*C_{10}	C_{20}	I_{20} (mm/hr)	Q_{20} (m^3/s)
LOTS	0.0398	0.100	21.950	**0.15**	0.16	95.07	**0.166**
ROAD RES	0.0096	0.100	21.950	**0.15**	0.16	95.07	**0.040**
						TOTAL:	**0.206**

**From Figure 1.13 Book 8 ARR - 10 YEAR, 1 HOUR DURATION*

POST-Development Flow Calculation - 1:20 Year ARI (ASSUME 5 MINUTE TIME OF CONCENTRATION)

	km^2	Fraction Impervious	$I_{10/1}$ (mm/hr)	*C_{10}	C_{20}	I_{20} (mm/hr)	Q_{20} (m^3/s)	Q1(m^3/s)	Q5(m^3/s)
LOTS	0.0398	0.400	21.950	**0.405**	0.43	103.40	**0.487**	0.122	0.290
ROAD RES	0.0096	0.640	21.950	**0.61**	0.64	103.40	**0.177**	0.044	0.105
	0.0494					TOTAL:	**0.664**	0.166	0.395

**From Figure 1.13 Book 8 ARR - 10 YEAR, 1 HOUR DURATION*

Pre-Development Flow Calculation - 1:100 Year ARI

	km^2	Fraction Impervious	C_{100}	I_{100} (mm/hr)	Q_{100} (m^3/s)
LOTS	0.0398	0.100	0.18	147.22	**0.293**
ROAD RES	0.0096	0.100	0.18	147.22	**0.071**
				TOTAL:	**0.364**

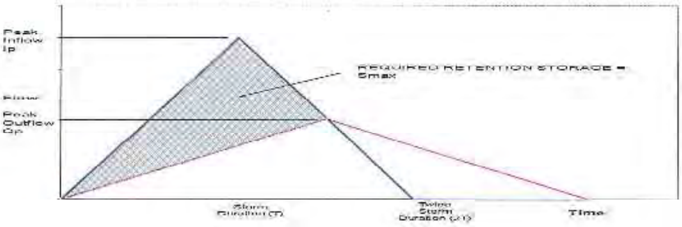
POST-Development Flow Calculation - 1:100 Year ARI (ASSUME 5 MINUTE TIME OF CONCENTRATION)

	km^2	Fraction Impervious	C_{100}	I_{100} (mm/hr)	I_{100} + 30% CC (mm/hr)	Q_{100} + 30% CC (m^3/s)
LOTS	0.0398	0.400	0.49	160.57	208.74	**0.864**
ROAD RES	0.0096	0.640	0.73	160.57	208.74	**0.314**
					TOTAL:	**1.178**

11 Beaumont Road - Lenah Valley
/143019PH

BOYDS FORMULA

1:20 year



$$S_{max} = V_1 (1 - Q_p/I_p)$$

S_{max} = Maximum Volume of temporary Storage (m^3)

V_1 = Volume of inflow flood (m^3)

I_p = Peak discharge of inflow hydrograph (m^3/s)

Q_p = Peak discharge of outflow hydrograph (m^3/s)

🟨	To be input by user
🟧	Calculated by spreadsheet

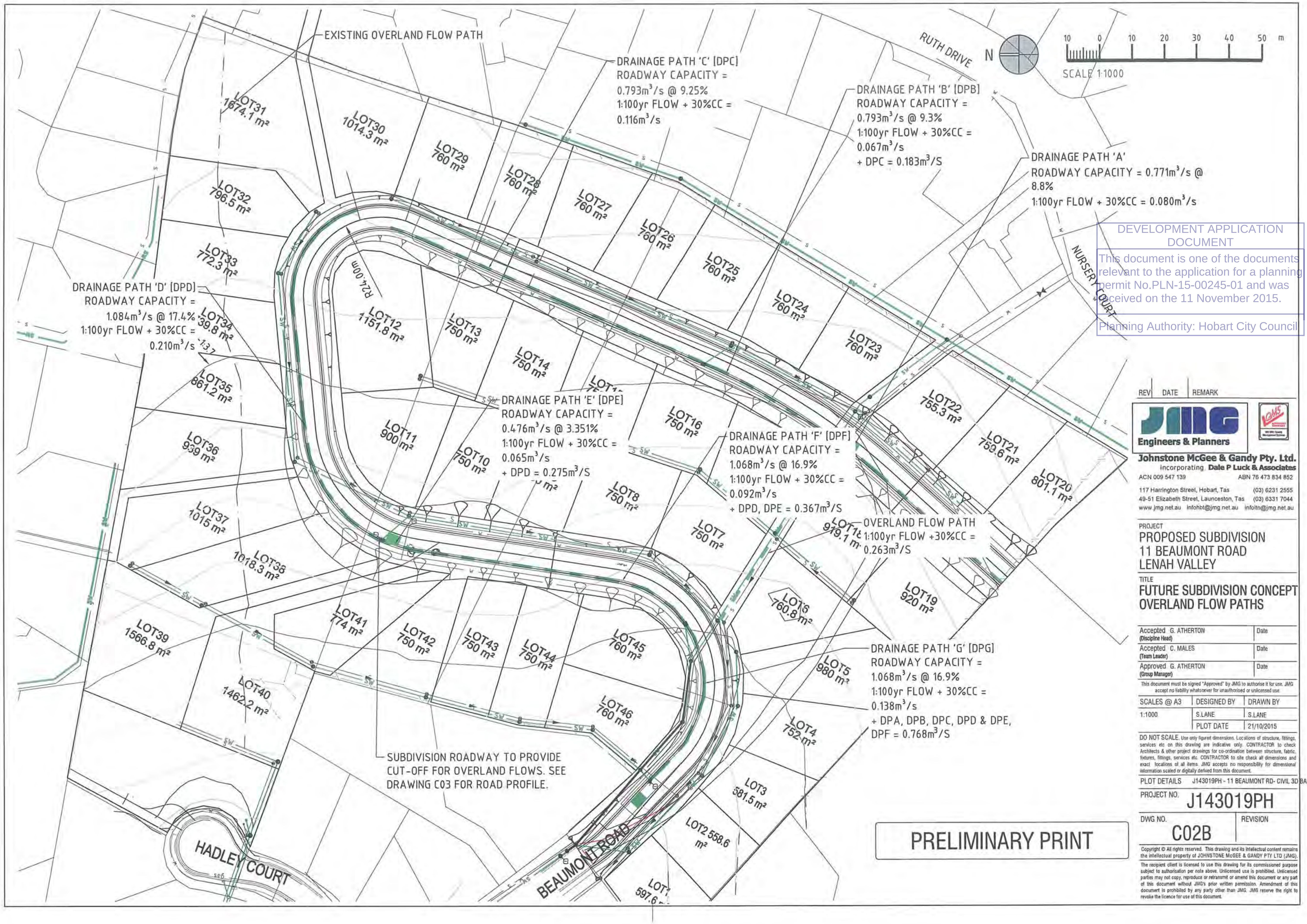
	LOTS		ROAD RES		
Catchment Area (A) =	0.0398	km²	0.0096	km²	
Runoff Coefficient (20 Year) =	0.43		0.84		46 lots 2.505195
20 Year Effective Catchment Area = ∑CA =	0.02		0.01		2600 L tanks per lot
Restricted outflow requirement =	0.166		0.040		

Storage requirement is highest value of S_{max} calculated in the table below
Critical storm duration is the storm duration when S_{max} occurs
Continue table until a clear Smax is calculated

		1:20 YEAR - LOTS				1:20 YEAR - ROAD RES				1:20 YEAR -TOTAL			
Storm Duration (min)	Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)
5	103	0.485	0.166	145	95.76	0.176	0.040	53	40.88	0.661	0.206	198	136.64
6	96.8	0.456	0.166	164	104.40	0.166	0.040	60	45.23	0.621	0.206	224	149.64
8	85.28	0.402	0.166	193	113.17	0.145	0.040	70	50.85	0.547	0.206	263	164.01
10	**76**	**0.358**	**0.166**	**215**	**115.24**	**0.130**	**0.040**	**78**	**54.03**	**0.488**	**0.206**	**293**	**169.27**
12	68.66	0.323	0.166	233	113.40	0.117	0.040	85	55.79	0.441	0.206	317	169.20
15	60.15	0.283	0.166	255	105.69	0.103	0.040	93	56.64	0.386	0.206	348	162.33
20	50.3	0.237	0.166	284	85.26	0.086	0.040	103	55.29	0.323	0.206	388	140.55
30	39	0.184	0.166	331	32.12	0.067	0.040	120	48.12	0.250	0.206	451	80.24
60	25.7	0.121	0.166	436	-161.22	0.044	0.040	158	14.31	0.165	0.206	594	-146.91
120	17.9	0.084	0.166	607	-586.87	0.031	0.040	221	-67.49	0.115	0.206	827	-654.37
180	14.8	0.070	0.166	753	-1037.96	0.025	0.040	274	-158.53	0.095	0.206	1026	-1196.49
360	10.9	0.051	0.166	1109	-2472.58	0.019	0.040	403	-461.23	0.070	0.206	1512	-2933.81
720	7.82	0.037	0.166	1591	-5571.68	0.013	0.040	578	-1150.16	0.050	0.206	2169	-6721.83
1440	5.2	0.024	0.166	2116	-12209.25	0.009	0.040	769	-2687.70	0.033	0.206	2884	-14896.96
2880	3.22	0.015	0.166	2620	-26029.56	0.006	0.040	952	-5960.92	0.021	0.206	3572	-31990.48
4320	2.45	0.012	0.166	2990	-39984.12	0.004	0.040	1087	-9282.94	0.016	0.206	4077	-49267.06

APPENDIX C

Stormwater Overland Flow Path Plan J143019PH-C02B & Stormwater Downstream Pipe Network Plan J143019PH-C02C



REV DATE REMARK

Engineers & Planners

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
FUTURE SUBDIVISION CONCEPT
OVERLAND FLOW PATHS

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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SCALES @ A3	DESIGNED BY	DRAWN BY
1:1000	S.LANE	S.LANE
	PLOT DATE	21/10/2015

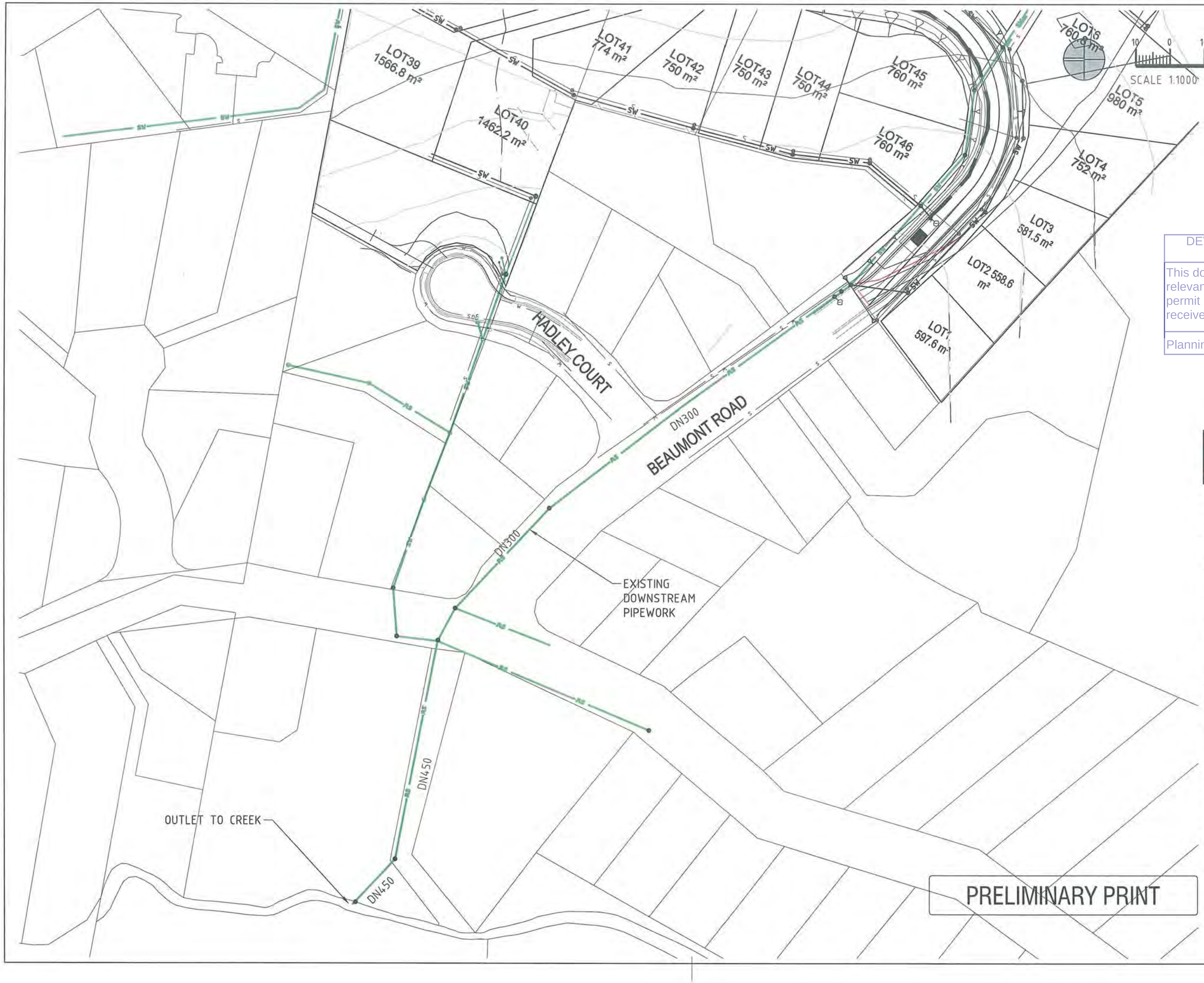
DO NOT SCALE. Use only figured dimensions. Locations of structure, fittings, services etc on this drawing are indicative only. CONTRACTOR to check Architects & other project drawings for co-ordination between structure, fabric, fixtures, fittings, services etc. CONTRACTOR to site check all dimensions and exact locations of all items. JMG accepts no responsibility for dimensional information scaled or digitally derived from this document.

PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C02B

REVISION



DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

REV	DATE	REMARK

Engineers & Planners

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PROJECT
PROPOSED SUBDIVISION
11 BEAUMONT ROAD
LENAH VALLEY

TITLE
DOWNSTREAM STORMWATER
NETWORK

Accepted G. ATHERTON (Discipline Head)	Date
Accepted C. MALES (Team Leader)	Date
Approved G. ATHERTON (Group Manager)	Date

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	PLOT DATE	27/10/2015

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PLOT DETAILS J143019PH - 11 BEAUMONT RD- CIVIL 3D BASE

PROJECT NO. J143019PH

DWG NO. C02C REVISION

APPENDIX D

Roadway Overland Flow Path Calculations

J143019PH - 11 BEAUMONT ROAD

n = 0.03 grassed
n=0.016 Asphalt/concrete

Flow from Road Res into Pit (m^3/s)

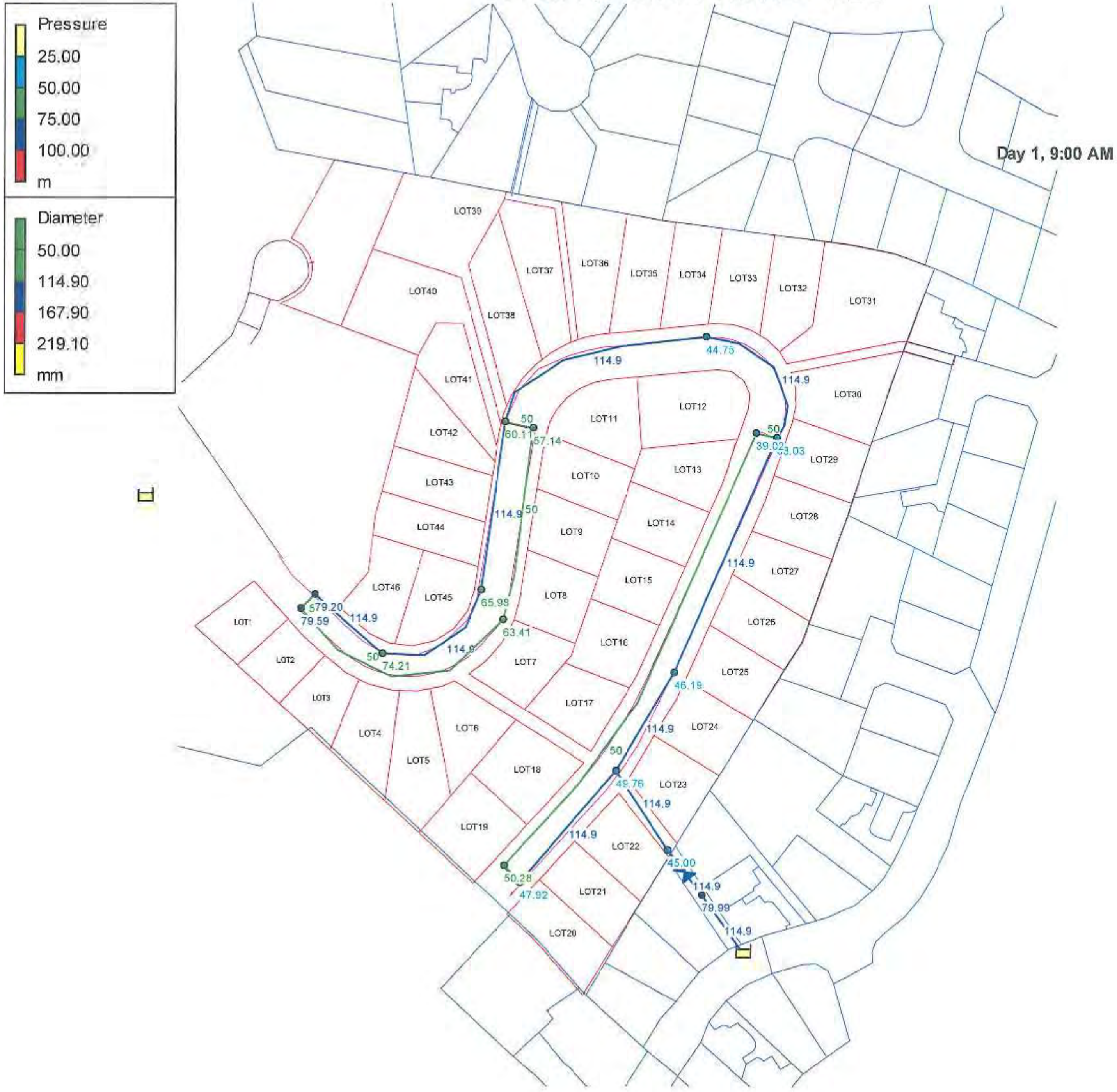
	1:20 ARI	1:100 ARI	**100+30%**	
Intensity =	103	161	209.3	mm/hr
$C_{ROAD\ RES}$ =	0.64	0.73		
C_{LOTS} =	0.43	0.49		

DRAINAGE PATH	FLOW PATH (m)	SLOPE %	LOT AREA (km^2)	LOT FLOW 20 YR ARI (m^3/S)	LOT FLOW 100 YR+30% CC (m^3/S)	LOT OVERLAND FLOW PATH FLOW (m^3/S)	ROAD RESERVATION FLOW 100 YR+30% (m^3/S)	OVERLAND FLOW PATH FLOW TOTAL 100 YR + 30% (m^3/S)	CAPACITY (m^3/s)	DEPTH OF FLOW IN GUTTER (mm)
A	67	8.78	0.002316	0.029	0.066	0.038	0.043	0.080	0.771	77
B	47	9.25	0.00228	0.028	0.065	0.037	0.030	0.067	0.79	67
C	105	9.25	0.00304	0.037	0.087	0.049	0.067	0.116	0.79	86
D	108	17.38	0.0087	0.107	0.248	0.141	0.069	0.210	1.084	95
E	60	3.351	0.00165	0.020	0.047	0.027	0.038	0.065	0.476	84
F	49	16.9	0.00375	0.046	0.107	0.061	0.031	0.092	1.068	73
G	54	16.9	0.006413	0.079	0.183	0.104	0.034	0.138	1.068	83
			0.028149	0.347	0.803	0.456	0.312	0.768		

APPENDIX E

EPANET Water Schematic Layout

11 BEAUMONT ROAD - RES



DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

11 BEAUMONT ROAD - RES + FIRE

MOST DISADVANTAGED NODE
35.58m Pressure

PRV PIT

APPENDIX F

Residential Sewer Design Flow Estimation Calculations

DEVELOPMENT APPLICATION DOCUMENT

This document is one of the documents relevant to the application for a planning permit No.PLN-15-00245-01 and was received on the 11 November 2015.

Planning Authority: Hobart City Council

11 Beaumont Road Subdivision
J143019PH

RESIDENTIAL SEWER DESIGN FLOW ESTIMATION

🟩 Inputs

No. of single dwelling lots	46	
No. of units in multiple dwelling lots		
ET/single occupancy	1	
Sum of ET	46	
kL/ET/Annum	200	
L/ET/day	547.9452	*L*
ADWF	0.29	*L/s*

	AREA 1	**AREA 2**
PDWF (*L/s*)	1.93	
GWI	0.04	
IIF	0.64	
d	6.63	
A	1.64	
ADWF (*L/s*)	0.29	
P_{wet}*	1.00	
A(EFF)	0.71	
$P_{impervious}$ *	0.20	
I	38.15	
$I_{(1,2)}$ *	20.00	
F.S.	1.47	
F.C. *	1.30	
C *	1.60	

** TasWater default values*

DESIGN FLOW = PDWF + GWI + IIF

	AREA 1	**AREA 2**	
DESIGN FLOW	**2.61**		***L/s***

Notes / Abbreviations:

ADWF - Average Dry Weather Flow
ET - Equivalent Tenement
PDWF - Peak Dry Weather Flow
GWI - Ground Water Infiltration (non-rainfall dependant)
IIF - Peak (rainfall dependant) Inflow Infiltration
d - Dry Weather Peaking Factor
A - Gross Area (Hectares)
P_{wet} - Portion of planned pipe network estimated to have ground water table levels in excess of pipe inverts
A(EFF) - Function of expected portion of catchment to be covered with impervious structures
$P_{impervious}$ - Expected portion of catchment to be covered with impervious structures
I - Function of rainfall intensity at the developments geographic location
$I_{(1,2)}$ - 1 Hour duration rainfall intensity for an ARI of 2 years
F.S. - Factor Size
F.C. - Factor containment
C - Leakage Severity Coefficient

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