

UPS
URBAN PLANNING SERVICES PTY LTD

UPPER COOMERA

202 BAILEYS MOUNTAIN ROAD

DEVELOPMENT APPLICATION - MCU - Impact Assessable // July 2018

SECTION 3: SPECIALIST REPORTS

ATTACHMENT 8

Traffic Impact Assessment, prepared by Bitzios Consulting



URBAN PLANNING SERVICES PTY LTD

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA RESIDENTIAL CARE FACILITY

TRAFFIC IMPACT ASSESSMENT

FOR

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1. INTRODUCTION

1.1 BACKGROUND

Bitzios Consulting has been engaged by Sandson Pty Ltd to prepare a traffic impact assessment for a proposed residential care facility to be located at 202 Baileys Mountain Road, Upper Coomera. The subject site location is shown in Figure 1.1.



Source: Google Earth

Figure 1.1: Subject Site Location

1.2 SCOPE

The scope of this assessment is detailed below:

- assessment of public transport, pedestrian and cycling networks and connectivity surrounding the development site;
- summary of the development's traffic generation and any impacts on the surrounding road network;
- assessment of the car and bicycle parking provision against Council's Transport Code (2016) as well as consideration to site specific operations of the applicant's existing aged care facilities;
- assessment of the development's on-site parking geometric layout, including swept path checks using AutoTURN software for general traffic and service vehicle manoeuvring, against Council's Transport Code (2016) and the relevant sections of Australian Standards (AS2890);
- assessment of the site's access location and form; and
- assessment of the site's service vehicle provisions against Council's Transport Code (2016).

2. EXISTING CONDITIONS

2.1 EXISTING SITE

The site currently includes a detached dwelling with vehicular access on Baileys Mountain Road.

2.2 EXISTING ROAD NETWORK

Details of the immediate road network surrounding the subject site are outlined in Table 2.1.

Table 2.1: Road Network

Road Name	Jurisdiction	Hierarchy	Speed Limit	No. of Lanes	Median Divided	Comments
Baileys Mountain Road	Council	Distributor	60km/h	2 (two-way)	No	Provides access to the proposed development and connects to Old Coach Road to the east.
Reserve Road	Council	Distributor	70km/h	4 (two-way)	Yes	Distributes residential traffic to the Pacific Motorway and intersects with Old Coach Road to the north.
Old Coach Road	Council	Collector	60km/h	2 (two-way)	No	Runs parallel to the Pacific Motorway and intersects with Reserve Road to the south.

2.3 ALTERNATE TRANSPORT

2.3.1 Public Transport

The subject site is located nearby to public transport services. Two (2) local bus stops are located within a 500m radius of the subject site, as illustrated in Figure 2.1. These bus stops are serviced by Route 727 (Coomera to Helensvale via Reserve Road) every 60 minutes during peak hours.



Source: Google Earth

Figure 2.1: Public Transport Services

2.3.2 Active Transport

Walking

The areas surrounding the site are pedestrian friendly with good quality pathways on most streets. The pathways provide access to residential, educational (i.e. Upper Coomera State College) and public transport facilities. Figure 2.2 illustrates the pathways surrounding the subject site.

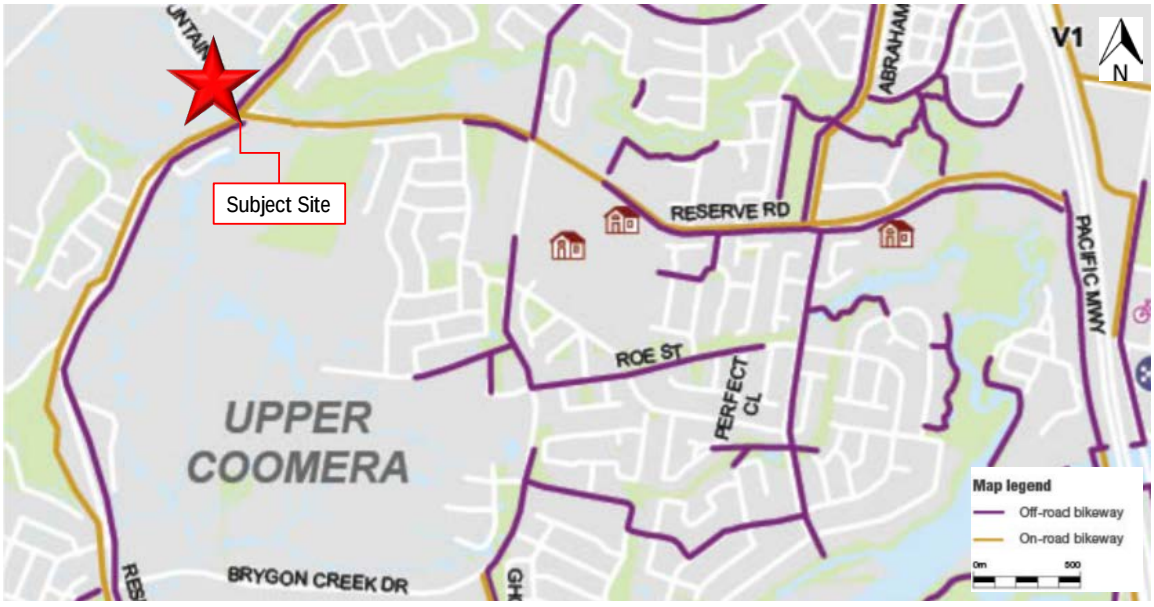


Source: Google Earth

Figure 2.2: Pedestrian Facilities Surrounding the Subject Site

Cycling

The subject site is located within a highly connected cycle network with good on-road and off-road bikeways, cycle friendly roads and shared paths. The cycle network provides connection to Pimpama, Southport, Broadbeach, Burleigh and Gold Coast's western suburbs. Figure 2.3 shows the cycling network surrounding the subject site.



Source: CoGC Cycle Guide

Figure 2.3: Cycle Facilities Surrounding the Subject Site

3. PROPOSED DEVELOPMENT

3.1 DEVELOPMENT DETAILS

The proposed development is for a residential care facility catering for both high care living and independent living. The high care and independent living components will be located across Levels 1 and 2 of the building. The breakdown for the proposed staged development is detailed in Table 3.1.

Table 3.1: Proposed Staged Development Details

Land Use	Units	Beds
Stage 1		
High Care Residential (High Care Living)	80	80
Stage 2		
High Care Residential (High Care Living)	50	64
Low Care Residential (Independent Living)	8	14
Total	138	158

The site will be accessed by a single all-movements vehicle crossover on Baileys Mountain Road, with 95 car parking spaces and one (1) drop-off emergency vehicle bay provided on ground floor.

A copy of the development layout plans prepared by BDA Architecture is attached at Appendix A.

4. TRAFFIC ASSESSMENT

4.1 DEVELOPMENT TRAFFIC GENERATION

Traffic generation rates for the proposed high care residential component was sourced from Roads and Maritime Services' (RMS) *Guide to Traffic Generating Developments (2002).* The 'housing for aged and people with disabilities' rates of 0.1 to 0.2 trips per dwelling in the PM peak hour has been adopted for the high care residential component. For a conservative assessment, the higher of the rates (i.e. 0.2 trips per dwelling) has been adopted. The RMS Guide does not prescribe an AM peak hour trip generation rate for this land use.

The low care residential component of the development is similar to the 'housing for seniors' land use defined in the RMS *Guide to Traffic Generating Developments – Technical Direction (2013)*. As such, a trip generation rate of 0.4 trips per dwelling in the PM peak hour was adopted for this component of the development. The RMS Technical Direction does not prescribe an AM peak hour trip generation rate for this land use and specifically states that the *"morning site peak hour does not generally coincide with the network peak hour"*.

Table 4.1 details the number of trips resulting from the proposed development during the PM peak hour.

Table 4.1: Development Traffic Generation

Land Use	Quantity	PM Peak Rate	PM Peak Hour Trips (vph)
High Care Residential (High Care Living)[1]	130 units	0.2 trips per unit	26
Low Care Residential (Independent Living)[2]	8 units	0.4 trips per unit	3.2
		Total Trips	30

Note 1: 'Housing for aged and people with disabilities' trip rate from the RMS Guide (2002)
Note 2: 'Housing for seniors' trip rate from the RMS Technical Direction (2013)

The proposed development is estimated to generate in the order of 30 trips (two-way) in the PM peak hour. The expected IN / OUT trip splits are outlined in Table 4.2.

Table 4.2: Development Traffic Splits

Land Use	% Splits		PM Peak Hour Trips (vph)	
	PM In %	PM Out %	PM IN Trips	PM OUT Trips
High Care Residential (High Care Living)	60%	40%	15.6	10.4
Low Care Residential (Independent Living)	60%	40%	1.3	1.9
		Total Trips	17	13

The proposed development is estimated to generate in the order of 17 "IN" trips and 13 "OUT" trips in the PM peak hour. Under uniform flow, this equates to:

- approximately 1 vehicle every 3.5 minutes entering the development in the PM peak hour; and
- approximately 1 vehicle every 5 minutes exiting the development in the PM peak hour.

This increase in traffic is minor and is not expected to result in any adverse capacity impacts to the surrounding road network. Therefore, detailed traffic analyses are not warranted, and no mitigation measures are required to be imposed.

5. PARKING ASSESSMENT

5.1 CAR PARKING REQUIREMENT AND PROVISION

The car parking requirement for the proposed residential care facility land use is not stipulated within Council's Transport Code (2016). The level of care for the proposed land use has components representative of a high care residential facility, as well as a low care residential facility. Council have previously acknowledged similarities between retirement facilities and residential care facilities. In lieu of a specific car parking rate for residential care facilities, the car parking rate for a high care retirement facility and low care retirement facility are used as a guide for this assessment.

The provision of residential car parking for the proposed high care residential facility is not required because residents are typically unable to drive due to poor health. Further to this, the applicant's existing aged care facility sites are understood to have no parking demand for high care residents. While not a requirement, the development will provide a mini-bus (van) shuttle to transfer high care residents within the facility.

The visitor car parking rate for high care retirement facilities is 1 space per 2 units, which provides a high quantity of parking for this scale of development, particularly when compared to standard residential units which exhibit a visitor car parking rate of 2 spaces plus 1 space per 10 units. Due to the low quantity of visitors being present at the applicant's existing aged care facilities at any one time, a parking rate of 1 space per 4 units is suitable to meet the needs of the development.

Staff numbers have been supplied by the applicant with a rate of 1 space per staff member applied to the site. The residential and visitor car parking requirement for a low care retirement land use in Council's Transport Code (2016) has been adopted for the low care residential component of the development.

Table 5.1 details the car parking requirement and provision for the proposed development.

Table 5.1: Car Parking Requirement and Provision

Land Use	Type	Quantity	Parking Rate	Parking Requirement	Parking Provision
High Care Residential	Resident	130 units	Not applicable	0	0
	Visitor		1 space per 4 units	33	42
Low Care Residential	Resident	8 units	1 space per unit	8	8
	Visitor		1 space per 4 units	2	2
High Care / Low Care	Staff	40 staff	1 space per staff	40	40
Total Residential Car Parking Spaces				8	8
Total Visitor Car Parking Spaces				35	44
Total Staff Car Parking Spaces				40	40

As shown, eight (8) resident, 44 visitor and 40 staff car parking spaces are provided on-site which is suitable to meet the demands of the proposed development and is consistent with the intent of Performance Outcome 1 (PO1) in Council's Transport Code (2016).

It is noted that the construction of the development site will be undertaken in two (2) stages; however, all car parking will be provided in the first stage of development.

5.2 BICYCLE PARKING REQUIREMENT AND PROVISION

Council's Transport Code (2016) has been used to source bicycle parking rates for the proposed development. In the absence of bicycle parking rates for the residential care facilities, the bicycle parking rate for a retirement facility has been referenced as a guide only. Due to the health and limited physical mobility of residents within the high care section of the facility, no resident bicycle parking spaces are required for the high care component.

Based on previous residential care development approvals (e.g. PN52626/01/DA1 / MCU201800587), a bicycle parking rate of 1 space per 2 units for residents and 1 space per 10 units for visitors is appropriate to meet Performance Outcomes PO10 and PO12 of Council's Transport Code (2016). Due to the locality of the proposed site and the likelihood of staff being within a reasonable cycling distance to work, a staff bicycle parking rate of 1 space per 5 staff members has been adopted.

Table 5.2 details the bicycle parking requirement and provision for the proposed development.

Table 5.2: Bicycle Parking Requirement and Provision

Land Use	Type	Quantity	Rate	Requirement	Provision
High Care Residential	Visitor	130 units	1 space per 10 units	13	16
Low Care Retirement	Resident	8 units	1 space per 2 units	4	8
	Visitor		1 space per 10 units	1	4
Low Care / High Care Staff	Staff	40 staff	1 space per 5 staff	8	8
Total Security Level B Bicycle Parking Spaces				12	16
Total Security Level C Bicycle Parking Spaces				14	20

As shown, the development provides eight (8) resident, 20 visitor and eight (8) staff bicycle parking spaces, which is suitable to meet the demand of the site. Visitor (Security Level C) and resident / staff (Security Level B) bicycle parking spaces are provided on the ground floor in accordance with AS2890.3 design requirements for the respective security class.

5.3 Parking Geometric Layout Assessment

The on-site parking geometric layout has been assessed against Council's Transport Code (2016) and the relevant sections of Australian Standards AS2890.1, AS2890.2, AS2890.3 and AS2890.6, with key features outlined in Table 5.3.

Table 5.3: On-Site Parking Geometric Layout Assessment

Design Element	Required	Proposed	Compliant
Employee and resident car parking (User Class 1A)	2.4m x 5.4m	Min. 2.4m x 5.4m	Yes
Single tandem car parking spaces (residential)	2.4m x 10.4m	2.4m x 10.8m	Yes
Residential visitor parking (User Class 2)	2.5m x 5.4m	2.5m x 5.4m	Yes
People with Disability car parking (User Class 4)	2.4m x 5.4m with adjacent shared area of same dimensions	2.5m x 5.4m with adjacent shared area of same dimensions	Yes
Car parking aisle width	5.8m plus an additional 0.3m for single sided parking aisles	6m	Yes
Ambulance bay (6.4m SRV)	3.5m x 6.4m	3.6m x 6.5m	Yes
Loading bay (8.8m MRV)	3.5m x 8.8m	3.5m x 8.8m	Yes
Height Clearance (Car Park)	2.2m	2.5m	Yes
Height Clearance (PWD Bays)	2.5m	2.5m	Yes
Height Clearance (SRV)	3.5m	3.5m	Yes
Height Clearance (MRV)	4.5m	No overhead obstructions shown	Yes
Operating Height Clearance (RCV)	6.5m	No overhead obstructions shown	Yes
Clearance to vertical obstructions	0.3m	0.3m	Yes

Design Element	Required	Proposed	Compliant
Column intrusions	As per Figure 5.1 in AS2890.1	As per Figure 5.1 in AS2890.1	Yes
Grades (entry)	Max. 1:20 for the first 6m into the site from the property boundary	Max. 1:20 for the first 6m into the site from the property boundary	Yes
Grades (car parking modules)	Max. 1:20 (parallel to the angle of the bay) 1:16 (any other direction)	No grade shown	Yes
Internal roadways	3m (one-way) and 5.5m (two-way) plus 0.3m clearances on both sides	Greater than 3m (one-way) plus clearances and greater than 5.5m (two-way) plus clearances	Yes
Horizontal bicycle parking	0.5m x 1.8m x 1.5m wide aisle	0.5m x 1.8m x >2.7m wide aisle	Yes

Based on the findings presented above, the on-site parking layout generally complies with the relevant requirements of Australian Standards (AS2890) and achieves relevant performance outcomes within Council's Transport Code (2016).

A swept path assessment attached at Appendix B illustrates all critical turning manoeuvres undertaken throughout the site.

6. ACCESS ASSESSMENT

6.1 VEHICULAR ACCESS

The proposed development provides a vehicular crossover (two-way) on Baileys Mountain Road. Details of the proposed access is summarised in Table 6.1.

Table 6.1: Vehicular Access Details

Design Element	Details
Access Facility Category	Type 1 as per AS2890.1 (i.e. User Class 1A, 25-100 car parking spaces and local road frontage).
Crossover Form	The driveway is provided generally in accordance with IPWEAQ Standard Drawing RS-051 – Type B (6-9m at the property boundary, with splays at 1.5m wide by 1.8m long) as per Council's Driveway Code.
Pedestrian Sight Line Triangle	Pedestrian sight line triangles are provided on the ingress and egress sides of driveway at 3m along the property boundary and 3m into the site, which exceeds the requirement of Figure 3.4 in AS2890.2. The area within the triangle is clear of all obstructions to visibility.

As shown, the proposed access generally complies with the relevant requirements of AS2890 and IPWEAQ Standard Drawing RS-051.

6.2 SIGHT DISTANCE

A sight distance of more than 100m is available to the east and west of the site's Baileys Mountain Road vehicle access as shown in Figure 6.1. This exceeds the minimum requirement of 83m specified in AS2890.1 for a 60km/h frontage road speed.



Figure 6.1: Sight Distance Photos – Baileys Mountain Road

6.3 INTERNAL VEHICLE QUEUING

Australian Standards AS2890.1 requires sufficient on-site queuing to ensure that vehicles do not extend beyond the property boundary. The development plans attached at Appendix A show an internal queuing provision of approximately 25m (4 vehicle lengths) between the property boundary and first control point (i.e. PWD bay in undercover car park). This provision is more than suitable to accommodate the peak ingress flow rate of 17 vehicles (refer Table 4.2) or 1 vehicle every 3.5 minutes under uniform flow.

6.4 PEDESTRIAN CONNECTIVITY

The development layout plans attached at Appendix A show suitable pedestrian links to/from all car parking areas to the main building access points.

7. SERVICING ASSESSMENT

7.1 SERVICING

Council's Transport Code (2016) requires a 12.5m Heavy Rigid Vehicle (HRV) to service a retirement facility land use. It is understood that this requirement is historically based on more substantial facilities similar to hospitals in order to cater for larger scale deliveries and operations. Furthermore, the applicant's existing aged care facilities are serviced by a maximum size 8.8m Medium Rigid Vehicle (MRV). On this basis, servicing by an 8.8m MRV is proposed for the subject site.

A swept path assessment has been undertaken to demonstrate an 8.8m MRV can enter the site in a forward gear, manoeuvre on-site while maintaining 0.3m outer body clearances at all times and exit the site in a forward gear. The swept path assessment is attached at Appendix B.

7.2 REFUSE COLLECTION

Council's 10.2m front-end Refuse Collection Vehicle (RCV) will undertake collection on-site within the loading/manoeuvring zone. A swept path assessment has been undertaken to demonstrate that the RCV can enter the site in a forward gear, manoeuvre on-site while maintaining 0.3m outer body clearances at all times and exit the site in a forward gear. The swept path assessment is attached at Appendix B.

8. SUMMARY AND CONCLUSIONS

The key findings of the traffic impact assessment for the proposed residential care facility to be located at 202 Baileys Mountain Road, Upper Coomera are as follows:

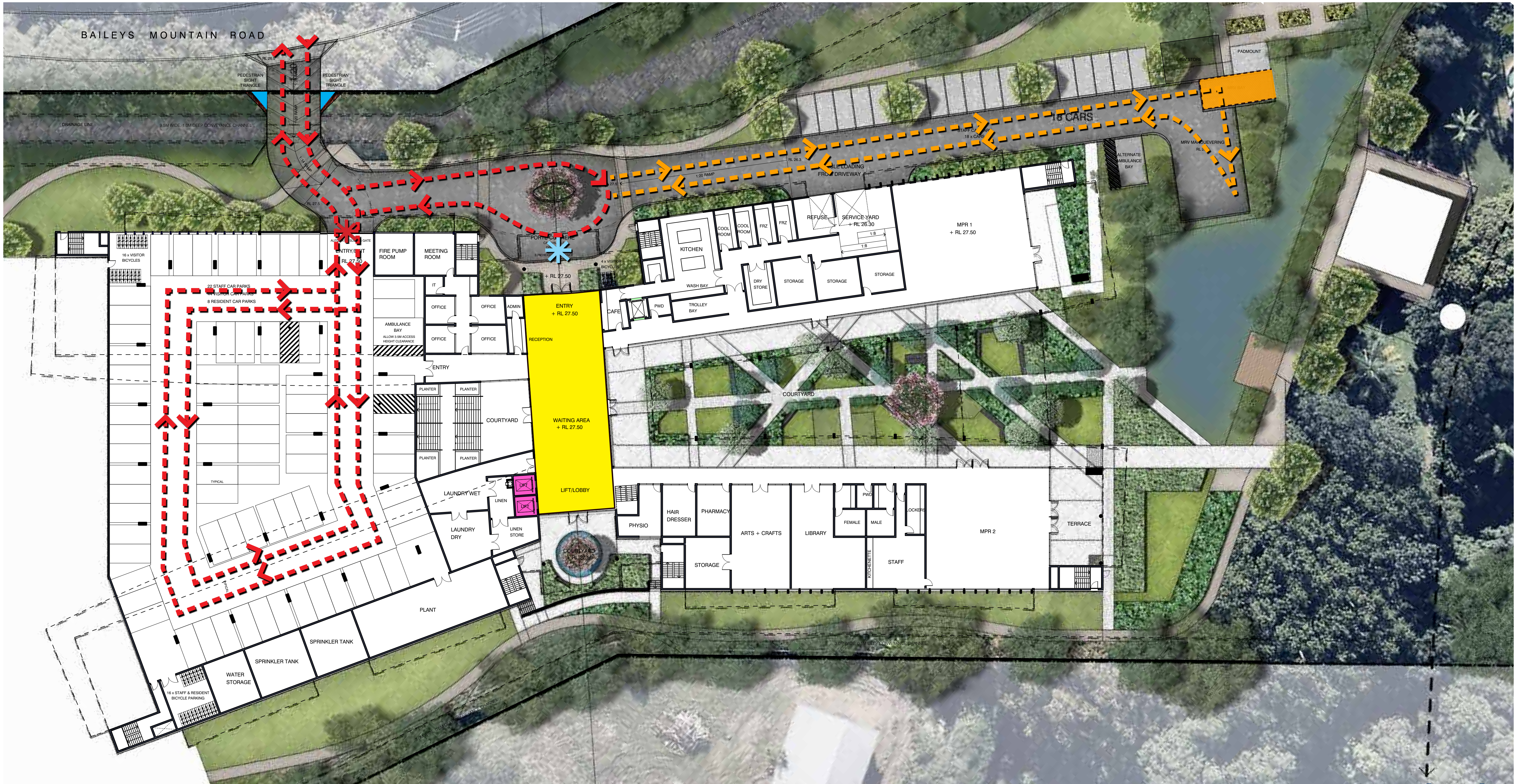
- the proposed development is for a residential care facility comprising 130 high care units and 8 low care units;
- the proposed development is located nearby to bus stops, pedestrian pathways and cycle facilities;
- the proposed development is estimated to generate in the order of 30 trips in the PM peak hour, which is not expected to result in any adverse capacity impacts to the surrounding road network. Therefore, no mitigation measures are required to be imposed;
- the proposed development provides eight (8) resident, 44 visitor and 40 staff car parking spaces, which is suitable to meet the needs of the development and is consistent with the intent of Performance Outcome 1 in Council's Transport Code (2016);
- the proposed development provides eight (8) resident, eight (8) staff and 20 visitor bicycle parking spaces, which is suitable to meet the demand of the subject site;
- the on-site parking geometric layout generally complies with relevant requirements of AS2890 and Council's Transport Code (2016);
- the proposed development is accessed by an all-movement crossover on Baileys Mountain Road. The access generally complies with relevant requirements of IPWEAQ Standard Drawing RS-051 (Type B) and AS2890 in terms of access location, form, pedestrian sight line triangles and sight distances; and
- servicing by an 8.8m MRV and 10.2m RCV will occur via the loading bay on-site. A swept path assessment was undertaken to demonstrate these service vehicles can enter the site in a forward gear, manoeuvre on-site while maintaining 0.3m outer body clearances at all times and exit the site in a forward gear.

Based on the above assessment, it is concluded that there are no significant traffic or transport impacts associated with the proposed development to preclude its approval and relevant conditioning on transport planning grounds.

APPENDIX A

DEVELOPMENT LAYOUT PLANS

PEDESTRIAN ENTRY
RECEPTION / FOYER
LIFTS
HRV BAY
CAR PARK ACCESS CONTROL POINT
PEDESTRIAN PATHWAY
VEHICULAR CIRCULATION
DROP OFF/PORTE COCHERE
STAFF/SERVICE VEHICULAR CIRCULATION
SIGHT TRIANGLE



DEVELOPMENT SUMMARY
STAGE 1 + 2

Site Area : 30873 m²
Site Cover : 6162 m² : 20%

RESIDENTIAL CARE	COMPONENTS	TYPE A 1 Bed	TYPE B 1 Bed	TYPE C 1 Bed	TYPE D 1 Bed	TYPE E 2 Bed	TYPE F 2 Bed	TYPE G 1 Bed	TYPE H 2 Bed	TYPE I 2 Bed	No of Res. Care Dwellings	No. of Beds	GOGC GFA (sq.m)	Balcony / Verandah (sq.m)	Total Area (sq.m)	Carparks Provided	Bicycles Provided
Level 2	Residential Care Apartments	32	16	9	3			2	5	1	68	74	2405	305	2710		
	Dining / Sitting / Lounge												395		395		
	Core, Corridor & Services												1295	1460	2755		
Level 1	Residential Care Apartments	47		6	3	12	2				70	84	2255	305	2560		
	Dining / Sitting / Lounge												510		510		
	Core, Corridor & Services												1330	1420	2750		
Ground Floor	Recreation Facilities																
	Pharmacy												31		31		
	Physio												30		30		
	Hair Dresser												31		31		
	Arts + Crafts												108		108		
	Library												107		107		
	Function / Multipurpose												539		539		
	Café												19		19		
	Core, Corridor & Services												1065		1065		
	Car Parking & Bicycle Store														2127	92	36
	BOH & Loading Areas														422		
Total (Low Care)								**2**	**5**	**1**	**8**	**14**				**50**	**23**
Total (High Care)		**64**	**16**	**15**	**5**	**12**	**2**				**114**	**144**				**44**	**13**
Total (Dementia Wing)		**15**			**1**						**16**						
TOTAL STAGE 1 + 2		**79**	**16**	**15**	**6**	**12**	**2**	**2**	**5**	**1**	**138**	**158**	**10120**	**3490**	**16159**	**94**	**36**

HIGH CARE APARTMENTS

TYPE A - SUITE	79 Units	1 Bed, 1 Bath	29 m² Enclosed 8 m² Balcony (Min) OR Access to Verandah
TYPE B - SUITE	16 Units	1 Bed, 1 Bath	29 m² Enclosed 8m² Balcony (Min) OR Access to Verandah
TYPE C - SUITE	15 Units	1 Bed, 1 Bath	28 m² Enclosed Access to Verandah
TYPE D - SUITE	6 Units	1 Bed, 1 Bath	39 m² Enclosed 12 m² Balcony
TYPE E - STUDIO	12 Units	2 Bed, 1 Bath	39 m² Enclosed 12 m² Balcony (Min) OR Access to Verandah
TYPE F - STUDIO	2 Units	2 Bed, 1 Bath	42 m² Enclosed Access to Verandah
TOTAL	**130 UNITS**	**144 BEDS**	

* Enclosed areas measured to the centre line of party walls, external walls & glazing.
Balconies measured to the centre line of party walls, glazing, and balustrades. Voids excluded.
Areas are approximate and will be subject to change

LOW CARE APARTMENTS

TYPE G - 1 BED APARTMENT	2 Units	1 Bed, 1 Bath 1 Car Space	53 m² Enclosed 16 m² Balcony (Min) OR Access to Verandah
TYPE H - 2 BED APARTMENT	5 Units	2 Bed, 2 Bath 1 Car Space	80 m² Enclosed 12 m² Balcony (Min) OR Access to Verandah
TYPE I - 2 BED APARTMENT	1 Units	2 Bed, 2 Bath 1 Car Space	80 m² Enclosed 12 m² Balcony (Min) OR Access to Verandah
TOTAL	**8 UNITS**	**14 BEDS**	

* Enclosed areas measured to the centre line of party walls, external walls & glazing.
Balconies measured to the centre line of party walls, glazing, and balustrades. Voids excluded.
Areas are approximate and will be subject to change

PROPOSED CAR PARKING

HIGH CARE	REQUIRED	PROVIDED
130 UNITS NO REQUIREMENT	0 Car Parks	0 Car Parks
VISITORS (1 CAR PER 3 UNITS)	42 Car Parks	42 Car Parks
LOW CARE		
8 UNITS (1 CAR PER 1 UNIT)	8 Car Parks	8 Car Parks
VISITORS (1 CAR PER 4 UNITS)	2 Car Parks	2 Car Parks
STAFF (1 CAR PER STAFF)	40 Car Parks	40 Car Parks
TOTAL	**76 Car Parks**	**94 Car Parks**

PROPOSED BIKE PARKING

HIGH CARE	REQUIRED
130 UNITS NO REQUIREMENT	0 Bike Parks
VISITORS (1 BIKE PER 10 UNITS)	13 Bike Parks
LOW CARE	
8 UNITS (1 BIKE PER 2 BEDS)	14 Car Parks
VISITORS (1 BIKE PER 10 UNITS)	1 Bike Park
STAFF (1 BIKE PER 5 STAFF MEMBERS)	8 Bike Parks
TOTAL	**36 Bike Parks**

DEVELOPMENT SUMMARY
STAGE 1

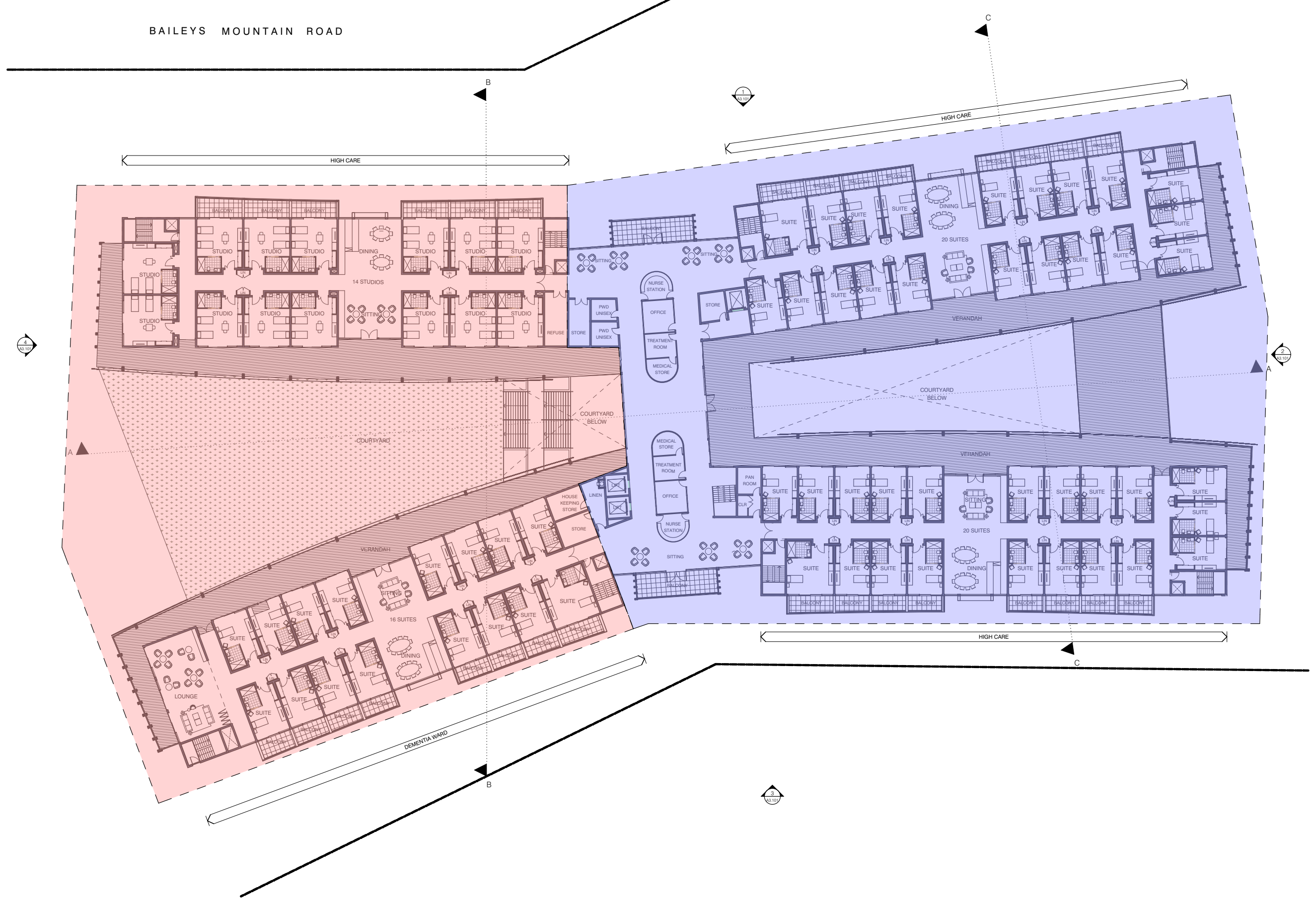
RESIDENTIAL CARE	COMPONENTS	TYPE A 1 Bed	TYPE B 1 Bed	TYPE C 1 Bed	TYPE D 1 Bed	TYPE E 2 Bed	TYPE F 2 Bed	TYPE G 1 Bed	TYPE H 2 Bed	TYPE I 2 Bed	No of Res. Care Dwellings	No. of Beds	GOGC GFA (sq.m)	Balcony / Verandah (sq.m)	Total Area (sq.m)	Carparks Provided	Bicycles Provided
Level 2	Residential Care Apartments	32		6	2						40	40	1205	155	1360		
	Dining / Sitting / Lounge												205		205		
	Core, Corridor & Services												990	860	1850		
Level 1	Residential Care Apartments	32		6	2						40	40	1205	155	1360		
	Dining / Sitting / Lounge												205		205		
	Core, Corridor & Services												990	860	1850		
Ground Floor	Recreation Facilities																
	Pharmacy												31		31		
	Physio												30		30		
	Hair Dresser												31		31		
	Arts + Crafts												108		108		
	Library												107		107		
	Function / Multipurpose												539		539		
	Café												19		19		
	Core, Corridor & Services												1065		1065		
	Car Parking & Bicycle Store														2127	92	36
	BOH & Loading Areas														422		
Total (Low Care)																**50**	**23**
Total (High Care)		**64**		**12**	**4**						**80**	**80**				**44**	**13**
Total (Dementia Wing)																	
TOTAL STAGE 1		**64**		**12**	**4**						**80**	**80**	**6730**	**2030**	**10887**	**94**	**36**

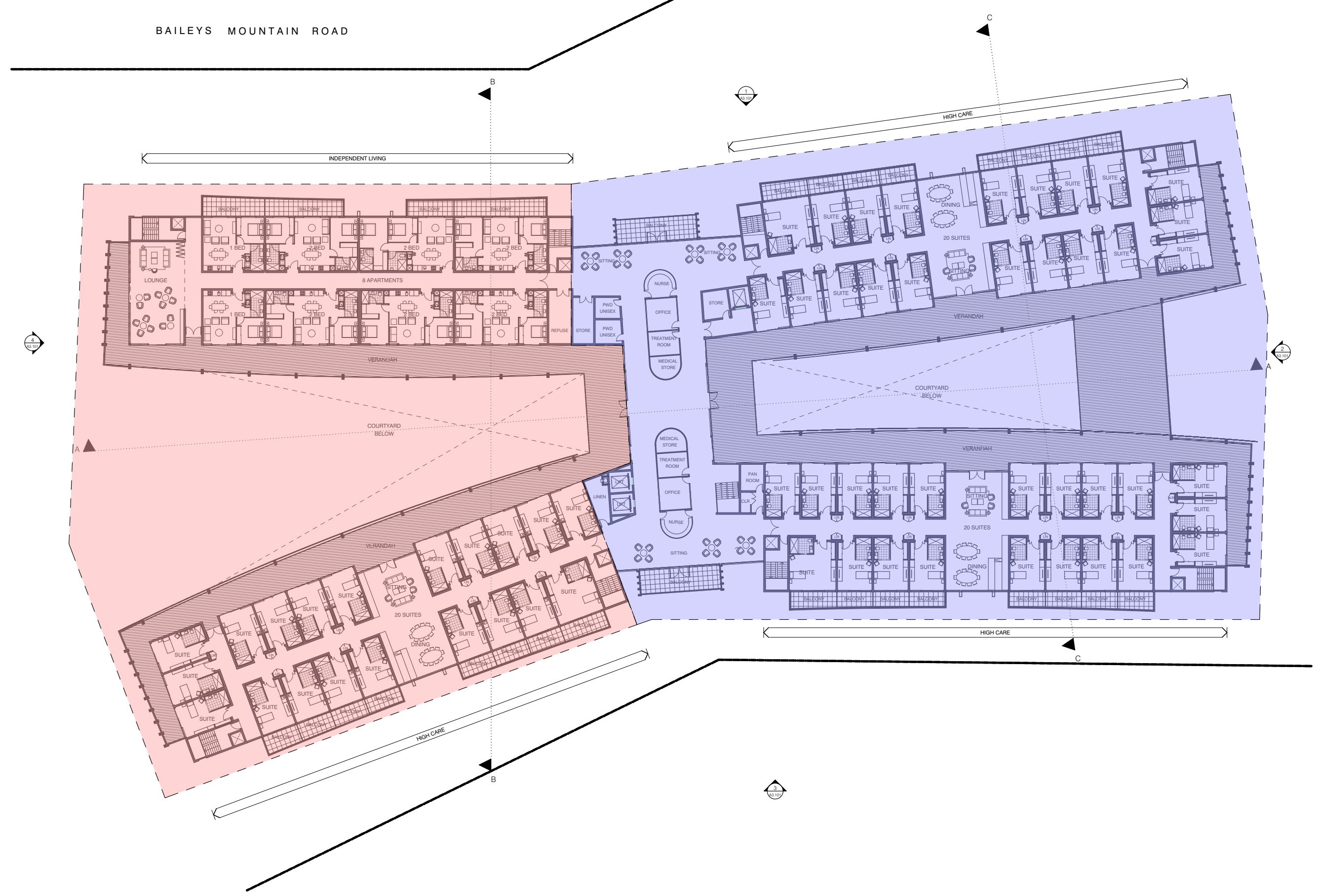
DEVELOPMENT SUMMARY
STAGE 2

RESIDENTIAL CARE	COMPONENTS	TYPE A 1 Bed	TYPE B 1 Bed	TYPE C 1 Bed	TYPE D 1 Bed	TYPE E 2 Bed	TYPE F 2 Bed	TYPE G 1 Bed	TYPE H 2 Bed	TYPE I 2 Bed	No of Res. Care Dwellings	No. of Beds	GOGC GFA (sq.m)	Balcony / Verandah (sq.m)	Total Area (sq.m)	Carparks Provided	Bicycles Provided
Level 2	Residential Care Apartments		16	3	1			2	5	1	28	34	1200	150	1350		
	Dining / Sitting / Lounge												190		190		
	Core, Corridor & Services												305	600	905		
Level 1	Residential Care Apartments	15			1	12	2				30	44	1050	150	1200		
	Dining / Sitting / Lounge												305		305		
	Core, Corridor & Services												340	560	900		
Total (Low Care)								**2**	**5**	**1**	**8**	**14**					
Total (High Care)			**16**	**3**	**1**	**12**	**2**				**34**	**64**					
Total (Dementia Wing)		**15**			**1**						**16**						
TOTAL STAGE 2		**15**	**16**	**3**	**2**	**12**	**2**	**2**	**5**	**1**	**58**	**78**	**3390**	**1460**	**4850**		

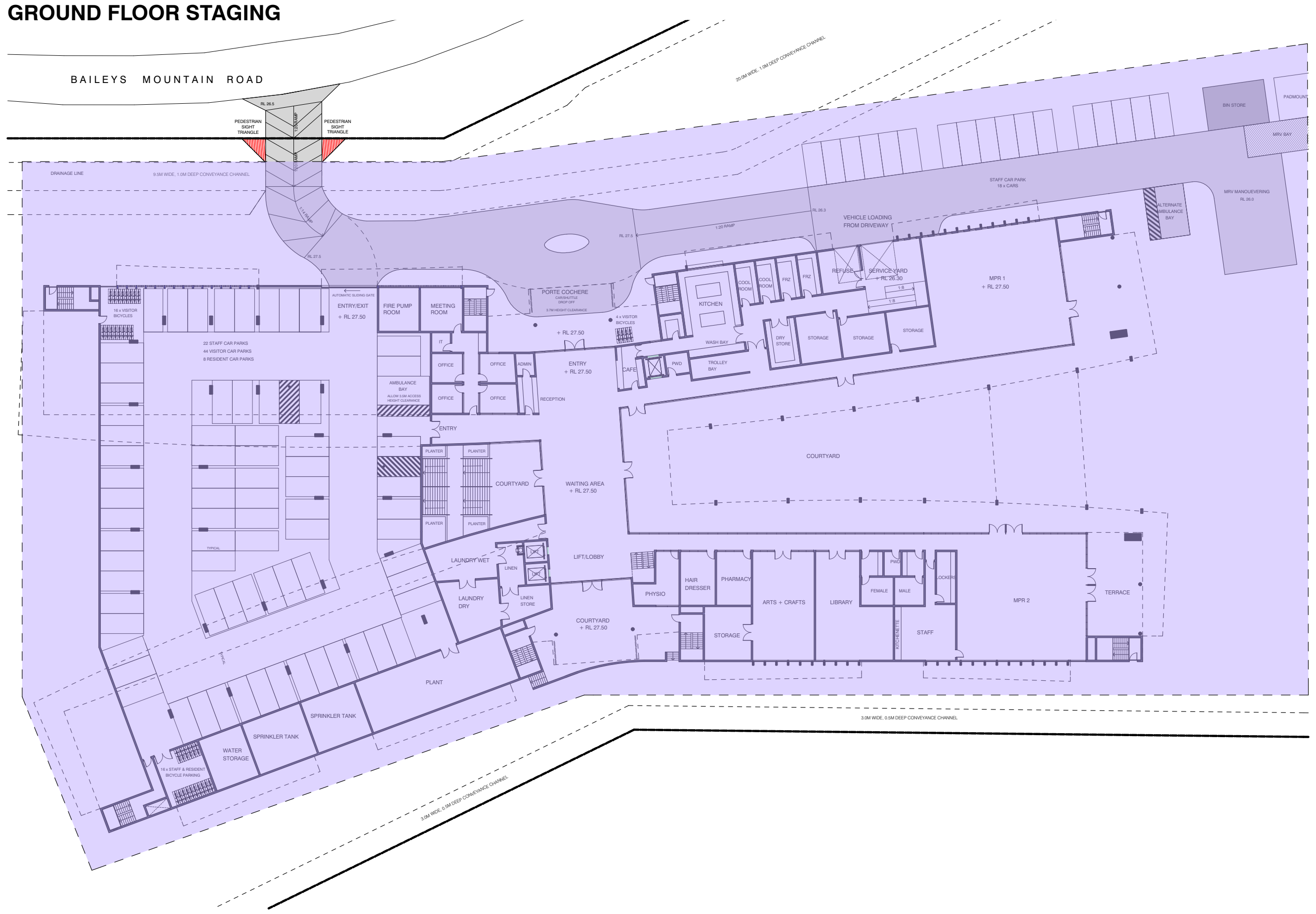
5.3 STAGING PLAN

FIRST FLOOR STAGING





GROUND FLOOR STAGING



STAGE 1

STAGE 2

6.3 CARPARKING & REFUSE COLLECTION

- RESIDENTS CAR PARK
- VISITORS CAR PARK
- STAFF PARKS
- REFUSE STORAGE AREAS
- REFUSE HARDSTAND & STORAGE AREA
- PATH OF MANAGERS TRANSFER OF BINS TO PICKUP

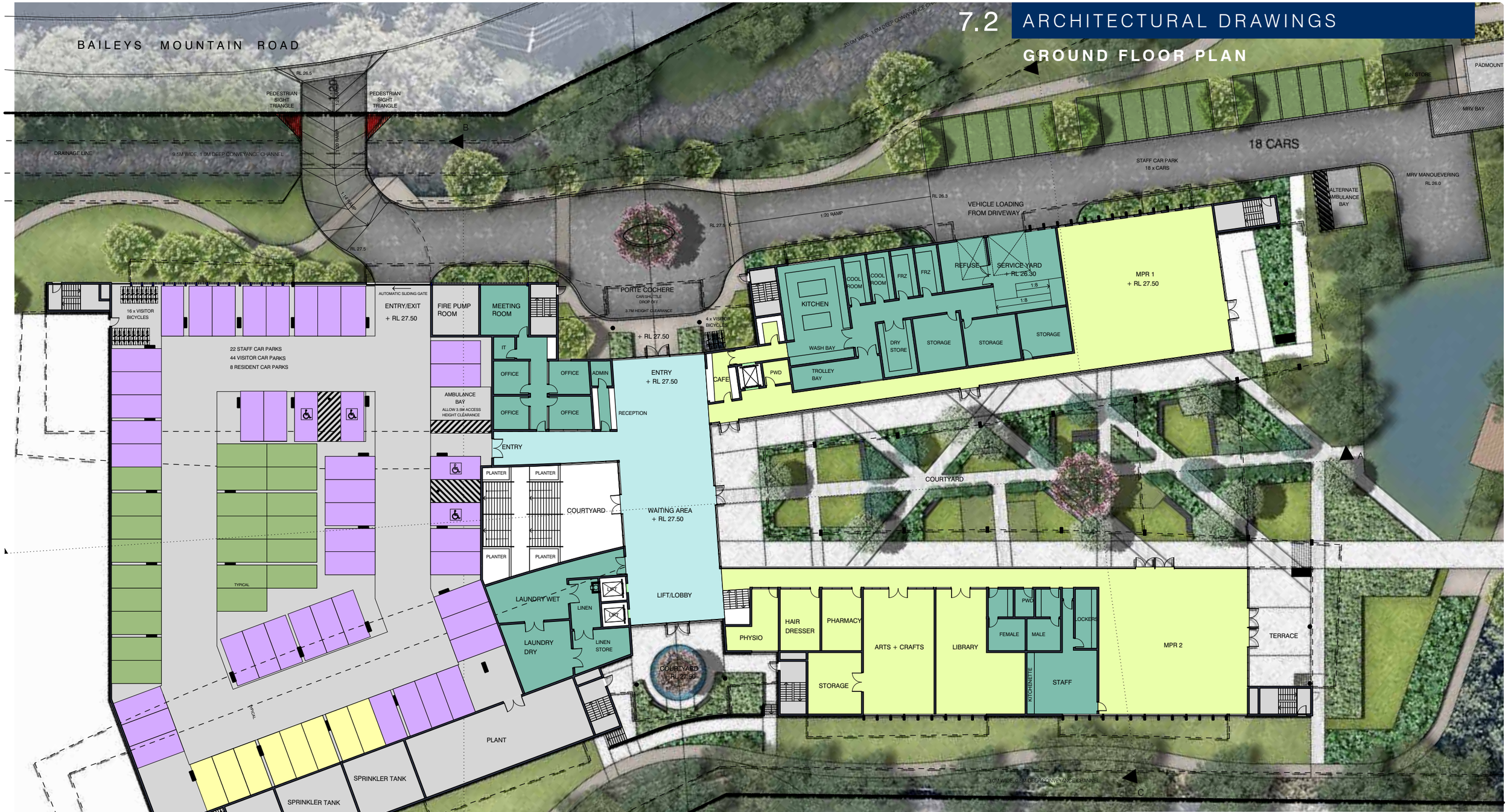
NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY.



NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY.

7.2 ARCHITECTURAL DRAWINGS

GROUND FLOOR PLAN



PROPOSED CAR PARKING

HIGH CARE	REQUIRED	PROVIDED
130 UNITS NO REQUIREMENT	0 Car Parks	0 Car Parks
VISITORS (1 CAR PER 4 UNITS)	33 Car Parks	42 Car Parks
LOW CARE		
8 UNITS (1 CAR PER 1 UNIT)	8 Car Parks	8 Car Parks
VISITORS (1 CAR PER 4 UNITS)	2 Car Parks	2 Car Parks
STAFF (1 CAR PER STAFF)	40 Car Parks	40 Car Parks
TOTAL	**76 Car Parks**	**94 Car Parks**

PROPOSED BIKE PARKING

HIGH CARE	REQUIRED
130 UNITS NO REQUIREMENT	0 Bike Parks
VISITORS (1 BIKE PER 10 UNITS)	13 Bike Parks
LOW CARE	
8 UNITS (1 BIKE PER 2 BEDS)	14 Car Parks
VISITORS (1 BIKE PER 10 UNITS)	1 Bike Park
STAFF (1 BIKE PER 5 STAFF MEMBERS)	8 Bike Parks
TOTAL	**36 Bike Parks**

NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY.



ELEVATION 1
NORTH EAST ELEVATION - 1:400 (A3)



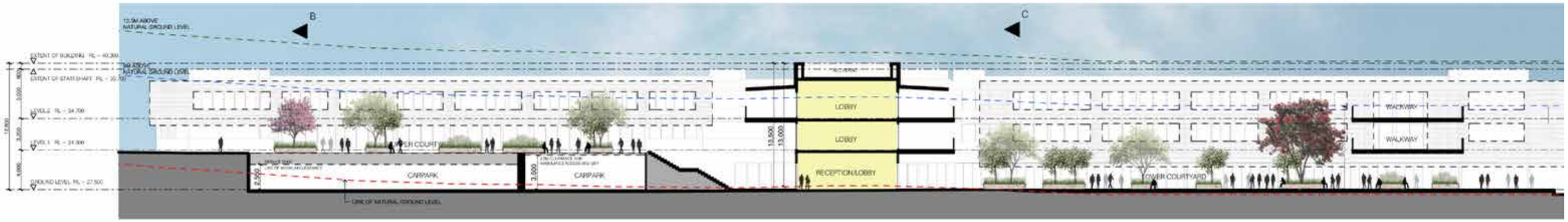
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SOUTH EAST ELEVATION - 1:400 (A3)



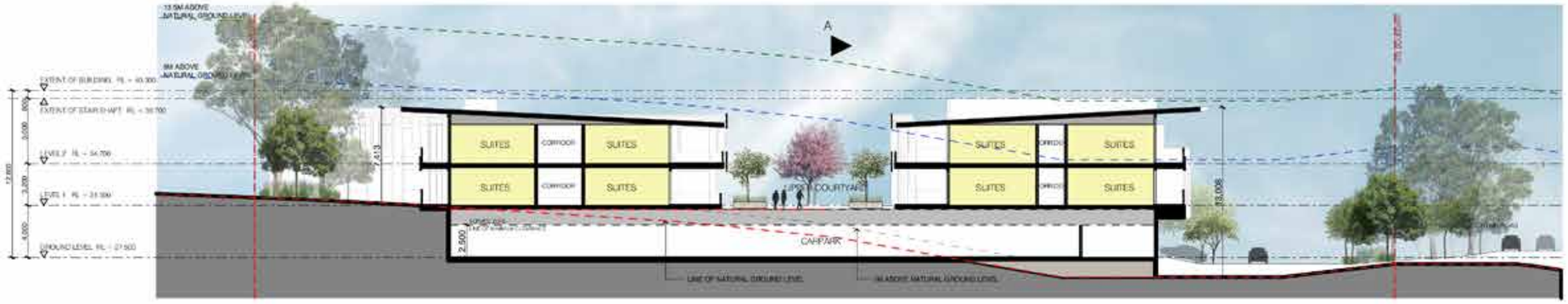
ELEVATION 3
SOUTH WEST ELEVATION - 1:400 (A3)



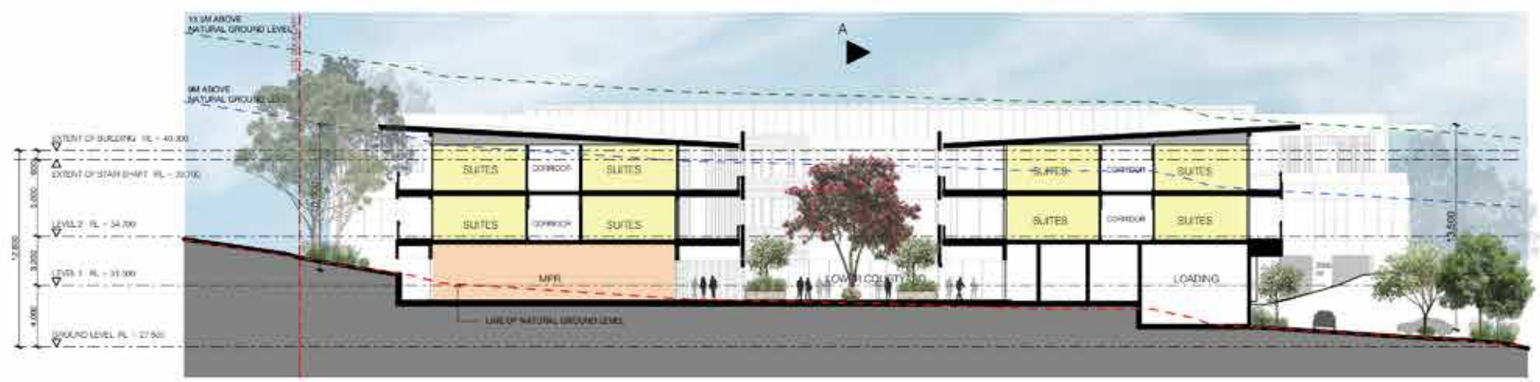
ELEVATION 4
NORTH WEST ELEVATION - 1:400 (A3)



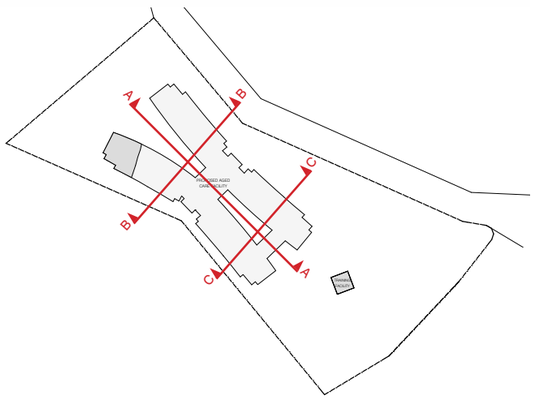
SECTION A
1:400 (A3)



SECTION B
1:400 (A3)



SECTION C
1:400 (A3)



APPENDIX B

SWEPT PATH ASSESSMENT

BAILEYS MOUNTAIN ROAD

EXISTING PUBLIC ROAD CULVERT

9.5M WIDE, 1.0M DEEP CONVEYANCE CHANNEL

PEDESTRIAN SIGHT TRIANGLE

PEDESTRIAN SIGHT TRIANGLE

ENTRY/EXIT
+ RL 27.50

FIRE PUMP ROOM

MEETING ROOM

AMBULANCE BAY

IT

OFFICE

OFFICE

OFFICE

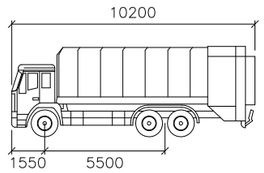
ENTRY

PORTE C

20.0M WIDE

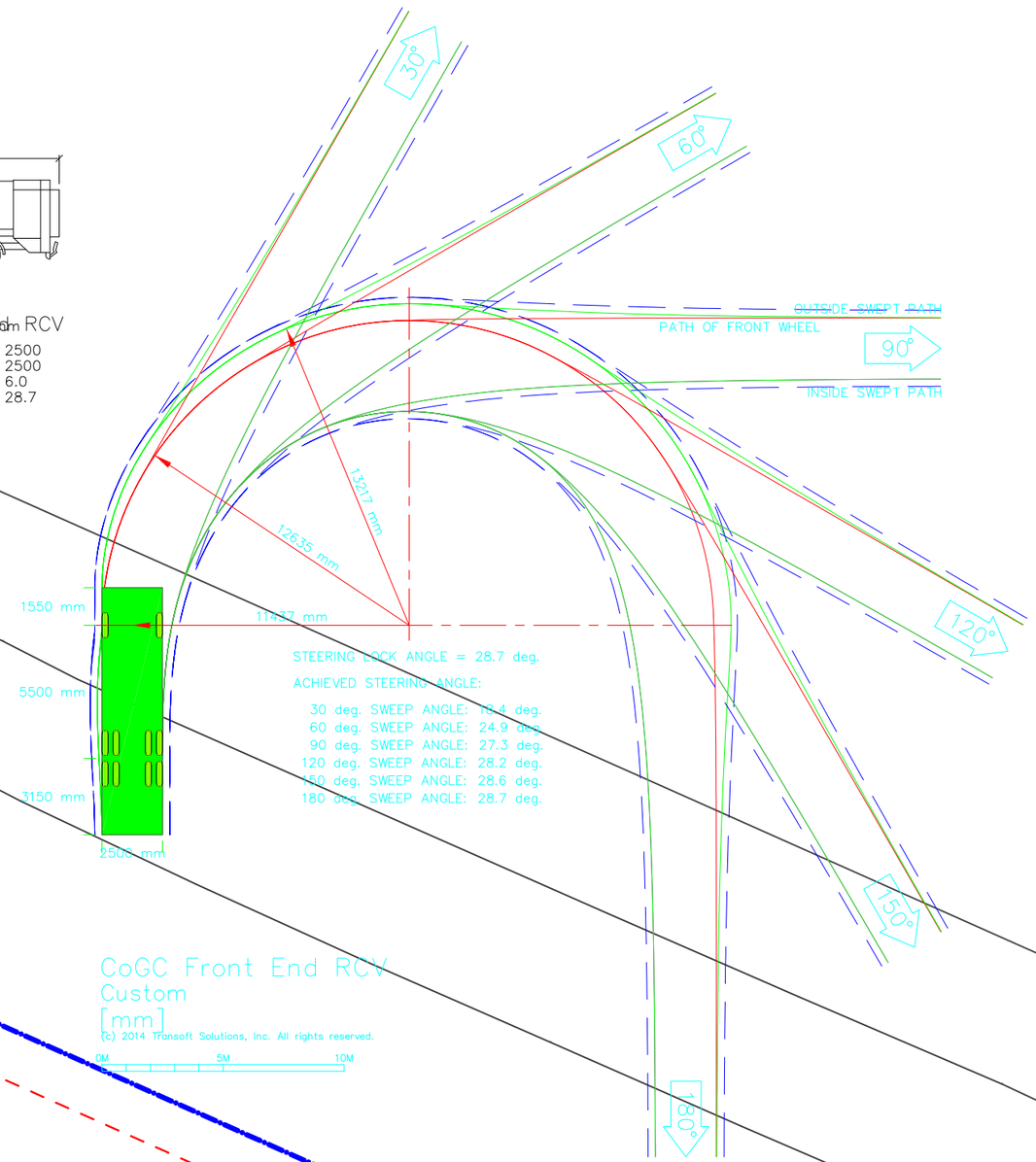
CoGC Front End RCV
Custom

CoGC Front End RCV
Custom



CoGC Front End RCV
[mm]

Width	: 2500
Track	: 2500
Lock to Lock Time	: 6.0
Steering Angle	: 28.7



STEERING LOCK ANGLE = 28.7 deg.

ACHIEVED STEERING ANGLE:

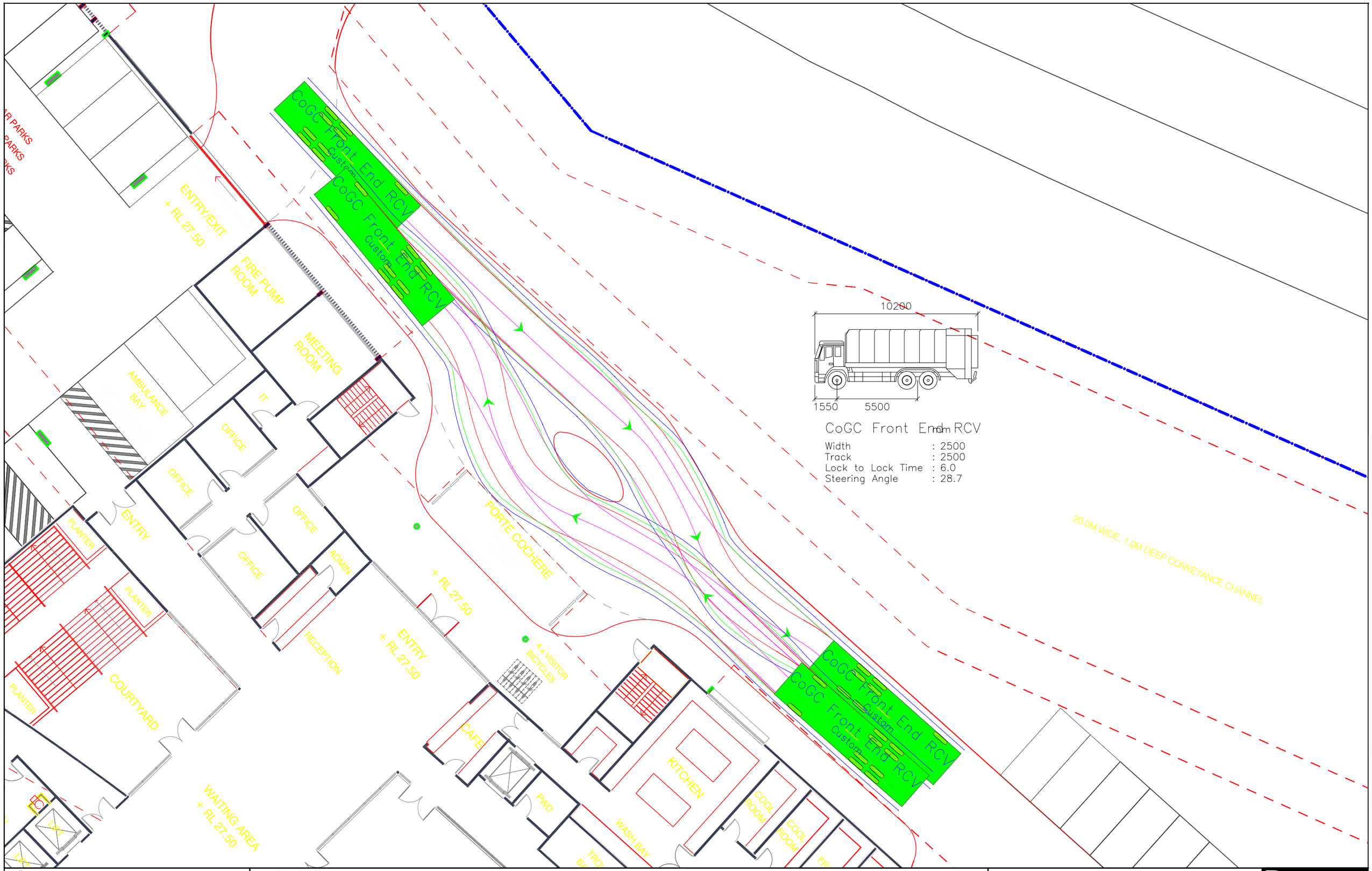
30 deg. SWEEP ANGLE: 16.4 deg.
60 deg. SWEEP ANGLE: 24.9 deg.
90 deg. SWEEP ANGLE: 27.3 deg.
120 deg. SWEEP ANGLE: 28.2 deg.
150 deg. SWEEP ANGLE: 28.6 deg.
180 deg. SWEEP ANGLE: 28.7 deg.

CoGC Front End RCV
Custom
[mm]

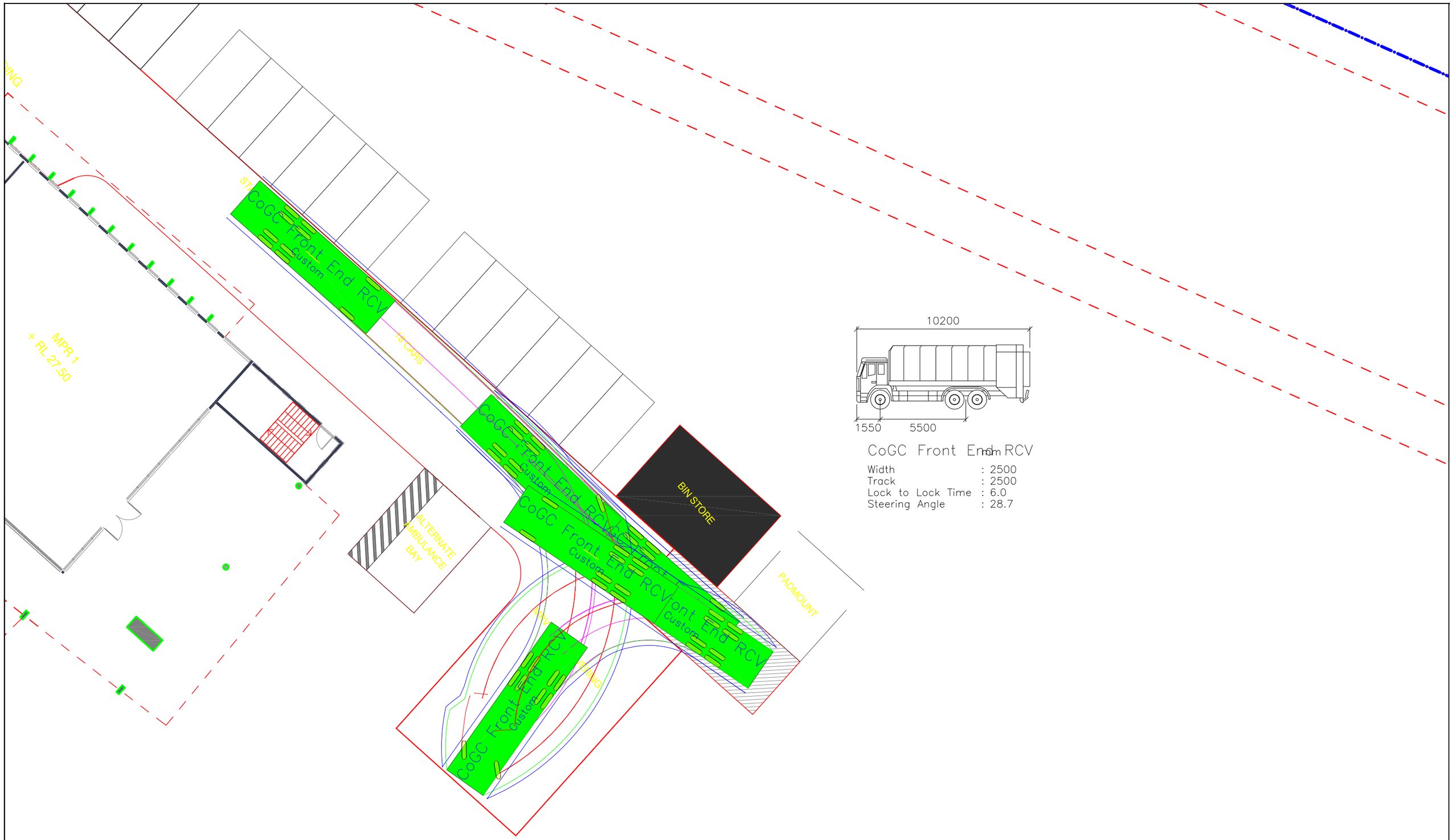
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0M 5M 10M

Date: 30/07/18	Drawing Name: Swept Path Assessment	Scale @ A3 0 2 4 6 8 10 12 1:250	BITZIOS consulting
Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 1 / Version A



Date: 30/07/18	Drawing Name: Swept Path Assessment	Scale @ A3 0 2 4 6 8 10 1:200	BITZIOS consulting
Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 2 / Version A



CoGC Front End RCV

Width	: 2500
Track	: 2500
Lock to Lock Time	: 6.0
Steering Angle	: 28.7

Date: 30/07/18	Drawing Name: Swept Path Assessment	Scale @ A3 0 2 4 6 8 10 1:200	BITZIOS consulting	
Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 3	Version A

AIN ROAD

EXISTING PUBLIC ROAD CULVERT

9.5M WIDE, 1.0M DEEP CONVEYANCE CHANNEL

PEDESTRIAN SIGHT TRIANGLE

PEDESTRIAN SIGHT TRIANGLE

B99 AS2890.1

B99 AS2890.1

1:20 RAMP

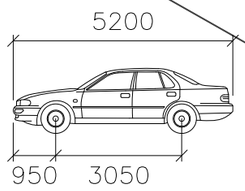
22 STAFF CAR PARKS
44 VISITOR CAR PARKS
8 RESIDENT CAR PARKS

B99 AS2890.1

B99 AS2890.1

1:7

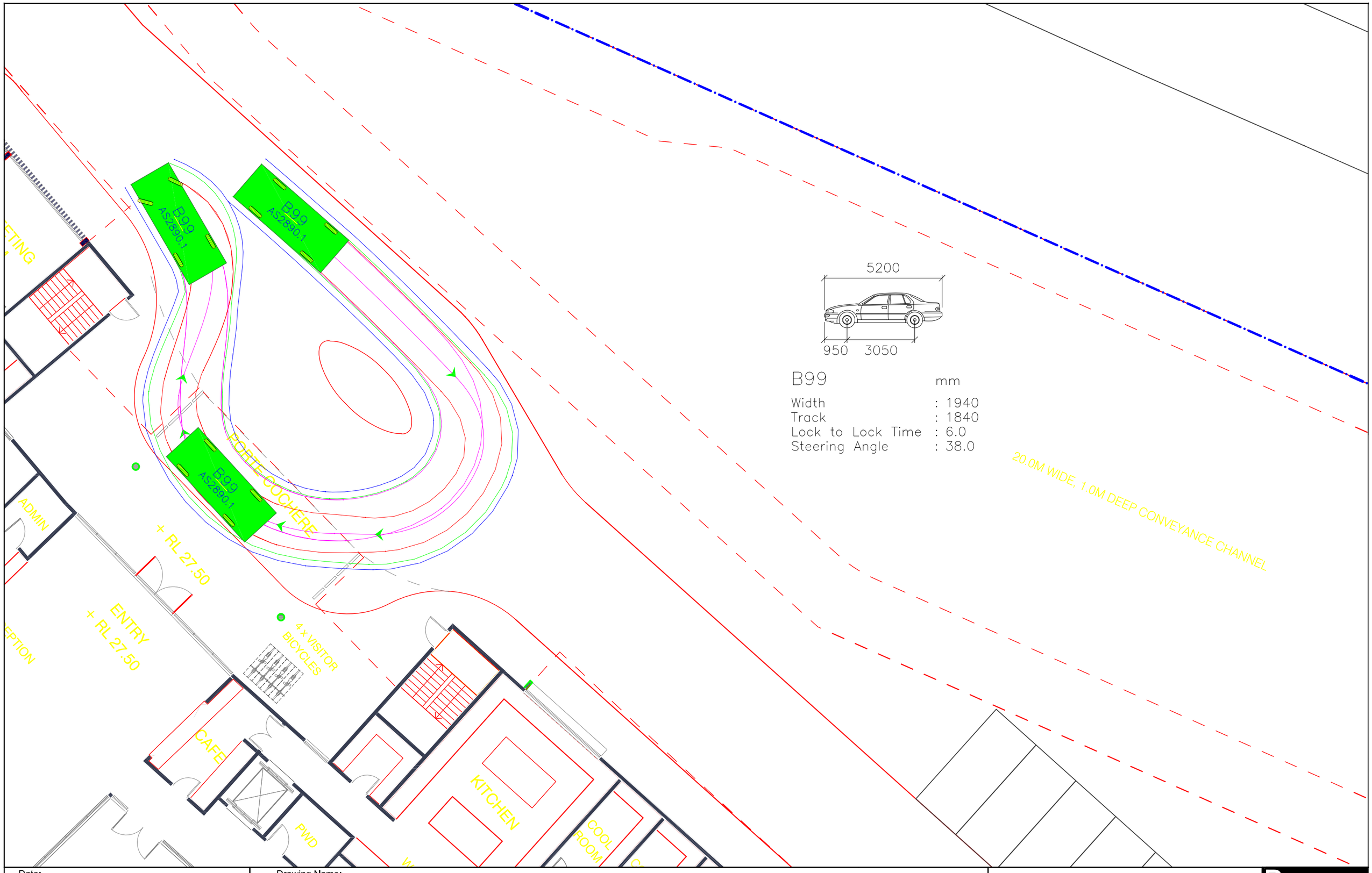
FIRE PUM
ROOM



B99 mm

Width	: 1940
Track	: 1840
Lock to Lock Time	: 6.0
Steering Angle	: 38.0

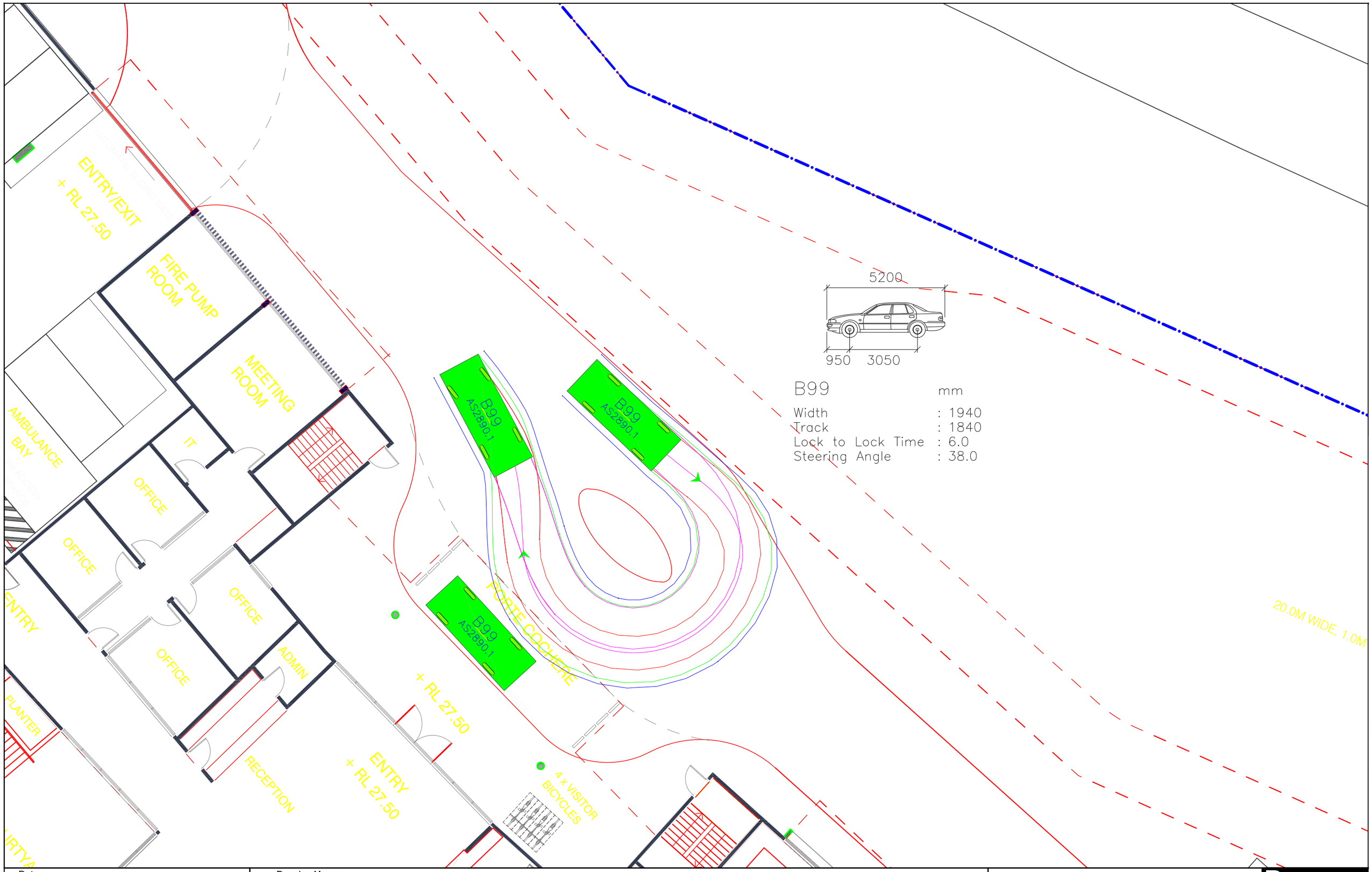
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Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 4 / Version A



B99 mm

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Steering Angle	: 38.0

Date: 30/07/18	Drawing Name: Swept Path Assessment	Scale @ A3 0 1 2 3 4 5 6 7 1:150	BITZIOS consulting
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Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 6 / Version A

22 STAFF CAR PARKS
44 VISITOR CAR PARKS
8 RESIDENT CAR PARKS

SRV STANDARDS (AU)

PEDESTRIAN SIGHT TRIANGLE

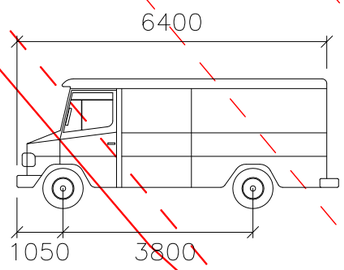
FIRE PUMP ROOM

MEETING ROOM

IT

OFFICE

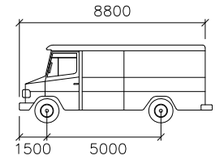
OFFICE



SRV mm

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Track	: 2300
Lock to Lock Time	: 6.0
Steering Angle	: 38.0

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Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 7 / Version A



MRV mm

Width	: 2500
Track	: 2500
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

20.0M WIDE, 1.0M DEEP CONVEYANCE CHANNEL

PORTE COCHERE

4 x VISITOR BICYCLES

MRV AS2890.1

CAFE

KITCHEN

PWD

WASH BAY

TROLLEY BAY

COOL ROOM

COOL ROOM

FRZ

FRZ

DRY STORE

REFUSE

STORAGE

STORAGE

STORAGE

SERVICE YARD
+ RL 26.30

1:8

1:8

VEHICLE LOADING FROM DRIVEWAY
+ RL 25.90

B99 AS2890.1

STAFF CAR PARK
10 CARS

MRV AS2890.1

COURTYARD

MPR 1
+ RL 27.50

BIN STOR

Date: 30/07/18	Drawing Name: Swept Path Assessment	Scale @ A3 0 2 4 6 8 10 12 1:250	BITZIOS consulting
Project No: P3686	Project Name: 202 Baileys Mountain Road, Upper Coomera		Sheet 8 / Version A

ATTACHMENT 9

Engineering Services Report, prepared by Arcadis



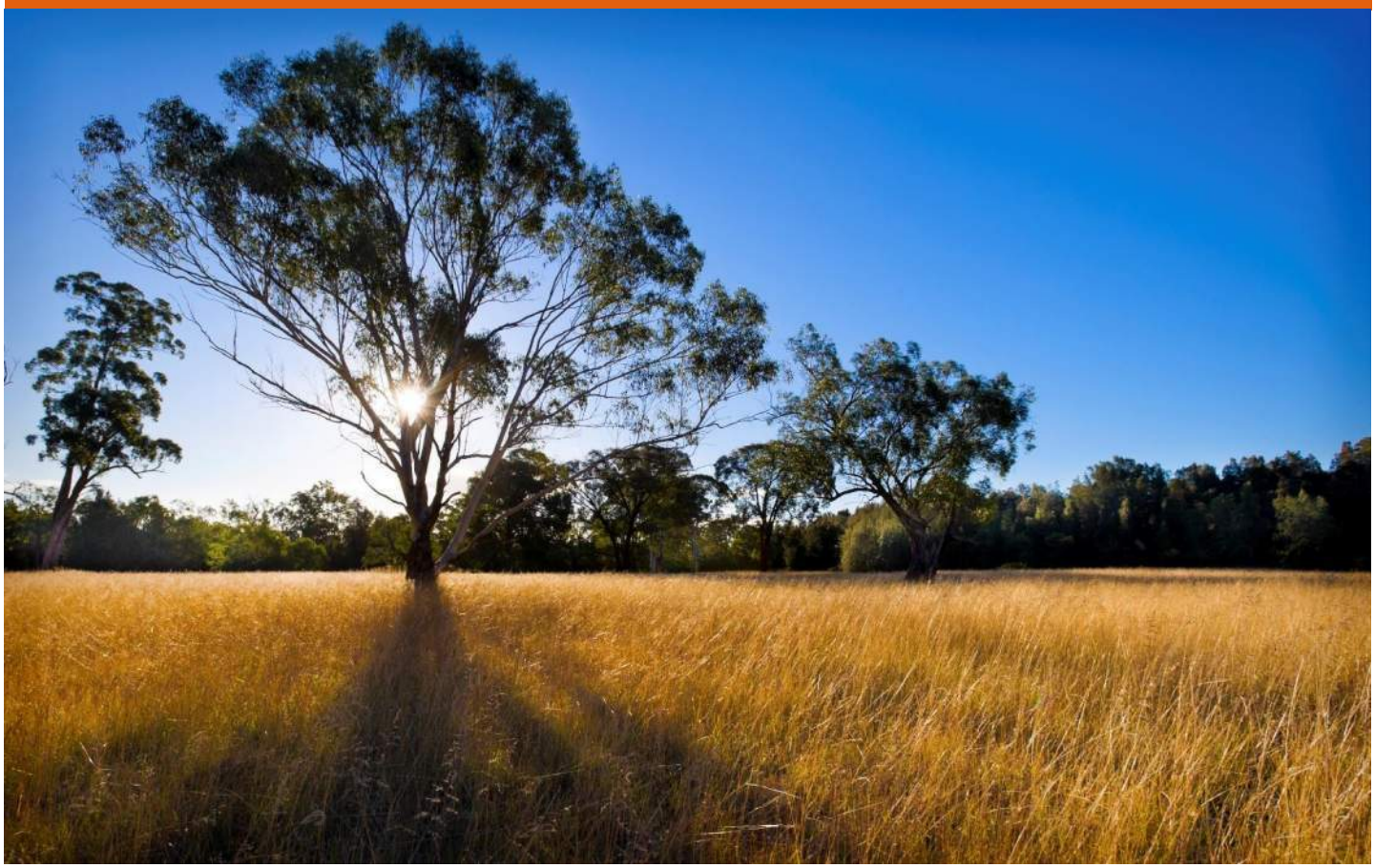
URBAN PLANNING SERVICES PTY LTD

ARCADIS Design & Consultancy for natural and built assets

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ENGINEERING SERVICES REPORT

26 JULY 2018



Incorporating Hyder

SANDSON PTY LTD
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ENGINEERING SERVICES REPORT

Author	Oliver Purton	
Checker	Ashley Shepherd	
Approver	James Stockwell RPEQ 20152	
Report No	F0001-10021414-AAR	
Date	26/07/2018	
Revision	02	

This report has been prepared for Sandson Pty Ltd in accordance with the terms and conditions of appointment for 202 Baileys Mountain Road dated June 2018. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/07/2018	Draft Issue	OP	JS
02	26/07/2018	Issued for Approval	OP	JS

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APPENDIX B

ENGINEERING DRAWINGS

APPENDIX C

ASSET INFRASTRUCTURE MAPS

APPENDIX D

DIAL BEFORE YOU DIG SEARCH RESULTS

APPENDIX E

2015 CITY PLAN PRIORITY INFRASTRUCTURE PLAN FOR WATER & SEWER

APPENDIX F

2015 CITY PLAN OVERLAY MAPS

1 EXECUTIVE SUMMARY

Sandson Pty Ltd has commissioned Arcadis to provide supporting documentation for a development application over the following allotment in Upper Coomera, QLD.

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

This application is to be lodged with City of Gold Coast (CoGC). The proposed development constitutes a development comprising of an aged care facility.

This report deals with the engineering services component of the development and the engineering planning issues associated with the development application.

This report demonstrates that the proposed development can connect to local potable water, sewerage reticulation, stormwater drainage, transport, electrical and telecommunications infrastructure.

Stormwater drainage collected on site shall be directed towards the proposed private on-site detention basin and discharged into the downstream drainage network. All stormwater will be discharged directly via overland flow to existing conveyance channels traversing through the site to the point of discharge. Site Based Stormwater Management Plan 'F0002-10022603-AAR-SBSMP' prepared by Arcadis should be referred to for further details.

It is envisaged that the proposed development will make its sewerage connection via the existing manhole located within Reserve Road which forms part of a DN300 diameter gravity sewerage main, that gravitates north-east along Reserve Road. The connection to the existing manhole will be made via a private connection line that will extend north up into the site to service the development. The existing septic tank on the site which currently services the existing dwelling will be removed. The existing dwelling to be converted into a training facilitiy will then be connected to the private gravity system and discharged to Council's network.

It is proposed to connect into the DN225 potable water main located in the northern side of reserve road. The fire and potable water meters will be located on site and above ground if larger than or including 50mm in size. There is sufficient room to accommodate this. The existing property on the site will be serviced via this new connection into the water network.

Calculations based on Equivalent Persons (EP's) illustrate that there is an increase in loading from the Council planned demand for potable water and wastewater services for the site. Therefore, Arcadis has undertaken further detailed network capacity assessments for both water and sewer. Refer to Arcadis' Water Network Capacity Assessment 'F0004-10022603-AAR WNCA' & Arcadis' Sewer Network Capacity Assessment 'F0003-10021414-AAR SNCA'. Both reports concluded that the proposed development does not cause any additional network non-compliances.

Electrical and telecommunication services shall be provided to the development through connection points to the existing service adjacent to the site in Reserve Road.

Vehicle access will be provided to the site via a new vehicular cross-over accessible from Baileys Mountain Road.

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2 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The subject site is located at 202 Baileys Mountain Road, Upper Coomera, South-East Queensland, Australia on the following allotment:

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

The total area of the site is 30,870m².

2.2 LAND USAGE

In its current state the subject site described as 202 Baileys Mountain Road is occupied by a single residential dwelling and sheds.

A site locality plan is located below in Figure 2-1.



Figure 2-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

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2.3 EXISTING TOPOGRAPHY

The site topography consists of moderately grading slopes (averaging <4%) with the site generally grading south-east towards both Baileys Mountain Road and Reserve Road. An existing topographic survey can be found in Appendix A.

The highest point of the site is at approximately RL39.0m AHD at the far north-west corner of the site on the northern boundary. The lowest point is approximately RL21.0m AHD located in the south-eastern corner of the site.

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3 PROPOSED DEVELOPMENT

It is proposed to deliver an aged care facility with the following features;

- Aged Care Suites;
- Retirement Apartments
- Residents Amenities (Café, Kitchens, Library, Treatment Rooms, etc);
- Staff Facilities; and
- Carparking.

The existing dwelling on the site will be repurposed as a staff training facility.

A master plan of the proposed development has been provided in Figure 3-1 below.

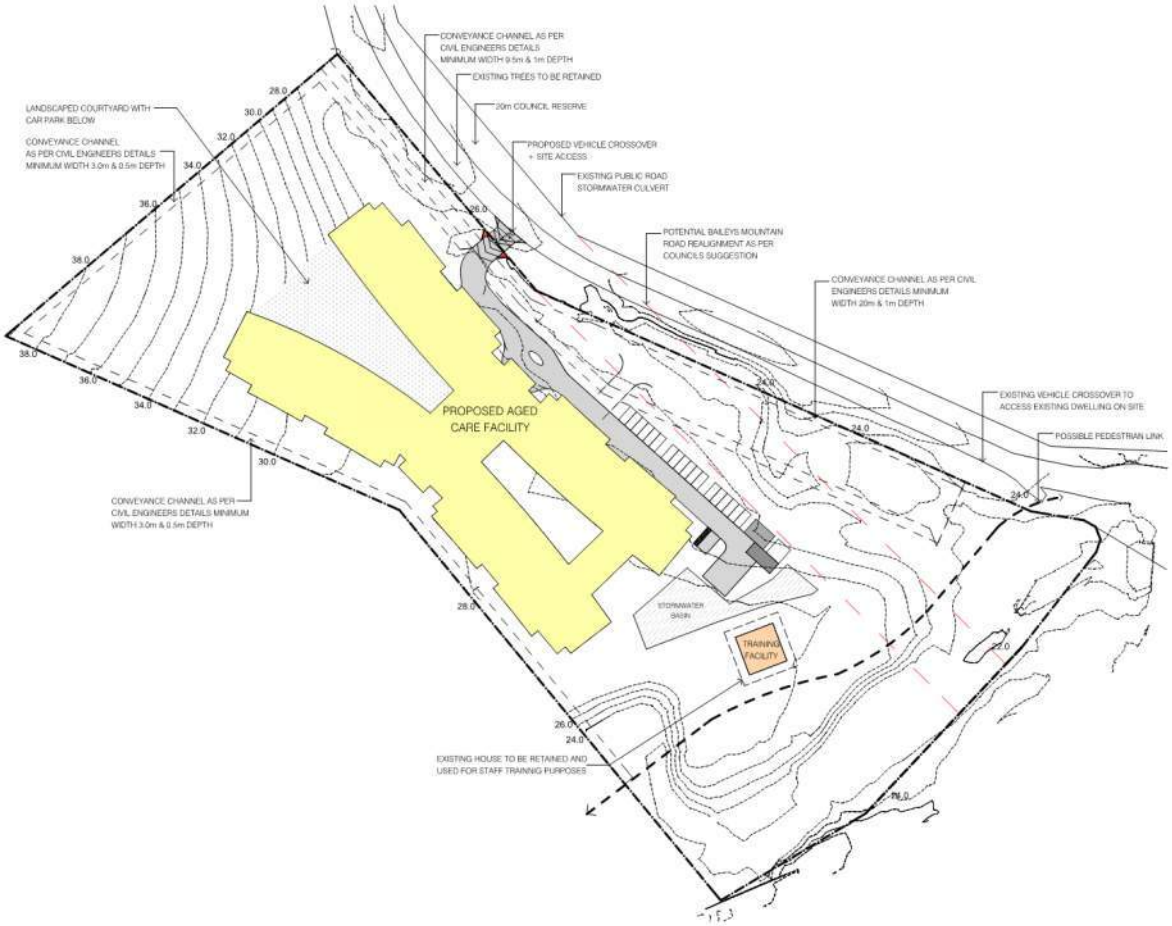


Figure 3-1 Development Master Plan (Courtesyof BDA)

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4 INFRASTRUCTURE SERVICES

4.1 STORMWATER DRAINAGE

A Site Based Stormwater Management Plan (SBSMP) 'F0002-10022603-AAR' which addresses the issues of stormwater quantity and quality for the development has been prepared separately. The SBSMP should be referred to for a more in-depth analysis of prevailing stormwater issues, however a summary of key engineering requirements are provided herein.

4.1.1 EXISTING STORMWATER DRAINAGE

The following existing stormwater mains have been identified adjacent to the development site of the CoGC's asset infrastructure maps and survey (refer Appendix A and Appendix C for further details):

Council Stormwater Infrastructure

From the west to the east on Baileys Mountain Road;

- 2 x DN375 Stormwater mains crossing Baileys Mountain Road, located adjacent to the north-eastern site boundary;
- 2 x 750x1500 Stormwater box culverts crossing Baileys Mountain Road, located adjacent to the south-eastern corner of the site;

From the north to the south on Old Coach Road;

- 5 x 2700x1800 Stormwater box culverts crossing Old Coach Road, located to the east of the site;

From the South to the north on Reserve Road;

- 1 x DN900 stormwater main within the northern verge of Reserve Road;
- 1 x Stormwater manhole located adjacent to the site, within Reserve Road; and
- 10 x Stormwater drainage pits connected to DN375 stormwater mains within Reserve Road.

Site Stormwater Infrastructure

- 2 x DN1300 Reinforced Concrete Pipe (RCP) located beneath the existing driveway of the site;
- 1 x DN1200 RCP located beneath an alternative access driveway to the site off Reserve Road;
- 1 x DN675 Mild Steel (MS) pipe located in the north-eastern corner of the site;
- Natural drainage channel along the northern boundary of the site conveying flows from the north and the east of the site; and
- Natural drainage channel along the eastern boundary of the site that conveys flows from the east and the south that enter the site.

The existing stormwater discharge from the site is identified as discharging into the existing conveyance channels surrounding the site via overland flow before discharging through the box culverts to the east of the site beneath Old Coach Road. Please refer to Appendix A & Appendix B.

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4.1.2 PROPOSED STORMWATER DRAINAGE INFRASTRUCTURE

The site will manage stormwater quantity and quality objectives through the use of private infrastructure prior to discharging to CoGC infrastructure.

Stormwater drainage collected on site shall be directed towards the proposed private on-site detention basin and discharged into both the existing overland flow path. All stormwater will be discharged directly via overland flow to existing conveyance channels traversing through the site to the point of discharge. A new stormwater culvert crossing will be required at the proposed driveway location.

For a more detailed explanation, in-depth analysis and proposed drainage regime refer to the SBSMP 'F0002-10022603-AAR'.

4.1.3 FLOODING & CONVEYANCE

2015 City Plan Flood Overlay Map – 5 (refer to Appendix F) indicates that the site is not subject to regional flooding.

Overland flow is conveyed through the site via the existing conveyance channels. It is noted that some augmentation will be required to the northern channel to facilitate flow as well as the development. The development does not propose to alter or change the eastern channel. Please refer to SBSMP 'F0002-10022603-AAR' prepared by Arcadis for further information regarding the conveyance of external flows across the site.

4.2 WATER SUPPLY

4.2.1 EXISTING WATER SUPPLY INFRASTRUCTURE

The following existing water mains and fittings have been identified adjacent to the development site on the CoGC's asset infrastructure maps (refer Appendix C for further details):

- 1 x DN200 water main located along the northern verge of Reserve Road adjacent to the site; and
- 1 x DN300 water main located along the northern verge of Old Coach Road adjacent to the site.

4.2.2 PROPOSED WATER SUPPLY INFRASTRUCTURE

It is proposed to connect into the DN300 potable water main that is aligned along the north-western verge of Old Coach Road, south of the proposed development. The existing property on the site will also be serviced via this new connection into the water network.

There is opportunity to connect into the DN200 potable water main that is located along the northern verge of Reserve Road adjacent to the site. This could potentially provide an equitable solution.

The fire and potable water meters will be located on site and above ground if larger than or including 50mm in size.

The proposed connection location is detailed on the engineering drawings included in Appendix B.

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4.2.3 PROJECTED DEVELOPMENT LOADINGS

The development has been assessed under two loading cases to better determine the anticipated impact it will have on the surrounding network. These cases are the:

- **CoGC Planned Demand** – A demand assigned to the site via the City of Gold Coast 2015 City Plan which is derived from Council's network and the property's net area;
- **Proposed Demand** – The calculated demand for the property based on proposed architect plans and conversion rates from the SEQ Water Supply and Sewerage Design and Construction Code (SEQ WS & S D&C Code).

In the existing case, the development site is identified as being part of the 'Rural' Zone as per the South East Queensland Water and Sewerage Design and Construct Code (SEQ WS&S D&C) – Table A1. In accordance with the SEQ WS&S D&C Code, the 'Rural' domain carries a 0ET/ha rating.

Table 4-1 shows the planned demand for the site based off CoGC City Plan.

below shows the calculated Equivalent Tenements (ET) for the proposed development site.

Table 4-1 CoGC Planned Demand

Category	Area (Ha)	Conversion Rate	Planned Demand (ET)*	Planned Demand (EP)
Rural	3.0870	0 ET/Ha	0	0
		TOTAL	**0**	**0**

*2.73EP/ET – SEQ WS&S D&C Code CoGC EP/ET Conversion

Table 4-2 Proposed Development Loadings

Category	No. Units	Conversion Rate	Proposed ET Loading	Proposed EP Loading
Nursing Home	**144 beds**	0.26ET/bed	37.44	102.2
1 Bedroom apartment/studio	**2**	0.47ET/dwelling	0.94	2.57
2 Bedroom apartment/studio	**6**	0.63ET/dwelling	3.78	10.3
Medical Treatment room	**4**	0.3ET/room	1.2	3.28
Retail/office/cafe	**910m^2**	0.6ET/100m^2	5.46	14.91
		Total:	**48.82**	**134**

*2.73EP/ET – SEQ WS&S D&C Code CoGC EP/ET Conversion

As shown above, the proposed development loading for the site presents an increase in loading when compared to the current planned demand under Council's City Plan. Therefore, Arcadis has undertaken a water (WNCA) network assessment. See Arcadis' WNCA report 'F0004-10022603-AAR' for further details. It was found that the development did not have a significant impact on the network.

4.2.4 INTERNAL WATER NETWORK

The developer shall, as part of the development works, construct an internal water reticulation service for the proposed development in accordance with the relevant building code requirements.

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A water network design will be undertaken by a qualified hydraulic engineer for the proposed development to determine adequate levels of services for all internal firefighting flows and services demands.

4.2.5 FIRE SYSTEM WATER SUPPLY

In accordance with the SEQ WS&S D&C Code, the site is permitted to draw the following fire flows: 7.5L/s for 2 hours as the site is classed as Rural.

As outlined above, the external water connection for the site will be designed as part of future application to GCW with the internal water network design being undertaken by a qualified hydraulic engineer.

4.2.6 CoGC WATER SUPPLY PRIORITY INFRASTRUCTURE PLAN

Plan for Trunk Water Supply Infrastructure - Map 20 (refer to Appendix E) indicates that there is a planned potable water main upgrade in both the 2021 & Ultimate horizon along Baileys Mountain Road and Reserve Road respectively, adjacent to the site.

This is not envisaged to impact the proposed works which can make connection to the exiting main on Reserve Road.

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4.3 SEWERAGE

4.3.1 EXISTING SEWERAGE SUPPLY INFRASTRUCTURE

The following sewerage infrastructure has been identified adjacent to the proposed development site within the CoGC's asset infrastructure mapping:

Council Infrastructure:

- 4 x Sewer manholes located within Reserve Road, fronting the sites south-eastern boundary;
- 1 x DN300 gravity sewer main, which gravitates south-west, located in the north-western verge of Reserve Road to the south of the proposed development; and
- 1 x DN300 gravity sewer main, which gravitates north-east, located in the north-western verge of Old Coach Road to the south of the proposed development.

Private Infrastructure:

- 1 x septic tank servicing the existing dwelling.

4.3.2 PROPOSED SEWERAGE SUPPLY INFRASTRUCTURE

It is envisaged that the proposed development will make its sewerage connection via the existing manhole located within Reserve Road which is serviced by a DN300 diameter gravity sewerage main, that gravitates north-east along Reserve Road. The connection to the existing manhole will be made via a private connection line that will extend north up into the site to service the development. The existing septic tank on the site which currently services the existing property will be decommissioned and removed. The existing property will then be serviced via the proposed private sewer line.

The proposed connection locations are detailed on the engineering drawings included in Appendix B.

4.3.3 PROJECTED DEVELOPMENT LOADINGS

Due to the nature of the specific development the wastewater demand was calculated in the same manner as the water supply. As previously outlined in this report, the proposed development presents an increase in ET loading when compared to the current planned demand under Council's City Plan.

See Arcadis's Sewer Network Capacity Assessment (SNCA) 'F0003-10022603-AAR' for further details. It was found that the development did not cause any issues with the existing gravity sewer network. The local pump station (SPS PA1) has existing emergency storage non-compliances. The addition of the proposed development increases this non-compliance but is not the cause. Council will need to consider their future upgrade plans for the sewer network to incorporate additional emergency storage to cater for the growth of the local network.

4.3.4 CoGC SEWERAGE PRIORITY INFRASTRUCTURE PLAN

Plan for Trunk Sewerage Infrastructure Sewage Collection and Treatment - Map 20 (refer to Appendix E) indicates that there are no planned future upgrades within the vicinity of the site.

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4.4 ELECTRICAL, GAS AND TELECOMMUNICATIONS SERVICES

The following services have been identified in the road reserves in the vicinity of the site. These have been identified through Site Survey and DBYD searches are included in Appendix A & Appendix D respectively.

Dial Before You Dig (DBYD) search results confirm that Energex has an underground electrical cable running along the middle of Reserve Road and the southern verge of Old Coach Road, adjacent to the site.

Overhead electrical reticulation has been identified in the immediate vicinity of the site running along the south-western verge of Baileys Mountain Road and the south-eastern verge of Old Coach Road, as shown on the site survey.

Telecommunication services have been identified in the immediate vicinity of the site within the eastern verge of Baileys Mountain Road from the site survey.

DBYD search has identified gas mains adjacent to the site, running within the northern verge of Baileys Mountain Road and the southern verge of Reserve Road.

Connection of the proposed development to the abovementioned services will be undertaken by a specialist consultant and will form part of future Operational Works applications to Council and the respective asset owners.

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5 ROADS AND ACCESS

Vehicle access is currently provided to the site via two gravel vehicular crossovers from both Baileys Mountain Road and Old Coach Road. It is noted that these two access paths are not proposed to be used by the development. It is noted these two driveways are subject to overland flow conveyance during large rainfall events.

It is proposed build a new vehicular crossover entry that meets council's current vehicle access requirements on Baileys Mountain Road.

All new and reinstated footpaths and verge works must be designed in compliance with Council standards and be approved for Operational Works prior to construction.

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6 EARTHWORKS

6.1 EXCAVATION

The proposed development involves the undertaking of moderate bulk earthworks cut operations for the construction of the building slab, columns and underground services and parking facilities. Detailed bulk earthwork modelling will be undertaken as part of the operational works application. The details of these earthworks operations will be subject to detailed design; however, preliminary earthworks drawings have been provided to indicate indicatively how the development will tie into the natural topography and conveyance channels around the site.

Refer to Appendix B for the preliminary earthworks drawings.

6.2 ACID SULFATE SOIL ASSESSMENT

Acid sulfate soils are soils that contain iron pyrites which are formed under specific geological conditions typical to low lying areas. These conditions require the presence of iron, sulphur and organic matter and generally occur in alluvial soils. The pyrites oxidise when exposed to air and, when combined with water, form sulphuric acid. The resulting sulphuric acid leaches out of the soil and may lower the pH of receiving waters, increase the levels of dissolved metals in the receiving waters (particularly iron and aluminium) and strip the natural neutralising capacity from the receiving waters. These consequences can have a serious impact on constructed environments and environmental ecosystems.

CoGC 2015 City Plan Acid Sulfate Soils Overlay Map 05 suggests that the subject site is not affected by acid sulfate soils. A geotechnical engineer will be required to confirm via any relevant testing if required.

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7 COGC OVERLAY MAPS

As outlined throughout this report, it is evident that the site is subject to multiple property constraints as identified by CoGC's overlay mapping system (refer to Appendix F). Clarification and acknowledgement of these constraints are presented below to demonstrate mitigation of any potential impacts on the design and surrounding area.

7.1 ACID SULFATE SOILS

Please refer Section 6.2.

7.2 LANDSLIDE HAZARD

CoGC 2015 Landslide Hazard Overlay Map 05 indicates that small portions of the site along the south-western boundary are within a landslide hazard area. As part of a future OPW application, a geotechnical engineer would be required to provide necessary stability reporting.

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8 CONCLUSION

This report has provided an assessment of the proposed residential development's impact on existing local infrastructure. The report was prepared to assist with the proposed Development Application for the development site located at 202 Baileys Mountain Road, Upper Coomera.

This report demonstrates that the proposed development can connect to local potable water, sewerage reticulation, stormwater drainage, transport, electrical and telecommunications infrastructure.

Stormwater drainage collected on site shall be directed towards the proposed private on-site detention basin and discharged into the downstream drainage network. All stormwater will be discharged directly via overland flow to existing conveyance channels traversing through the site to the point of discharge. Site Based Stormwater Management Plan 'F0002-10022603-AAR-SBSMP' prepared by Arcadis should be referred to for further details.

It is envisaged that the proposed development will make its sewerage connection via the existing manhole located within Reserve Road which is serviced by a DN300 diameter gravity sewerage main, that gravitates north-east along Reserve Road. The connection to the existing manhole will be made via a private connection line that will extend north up into the site to service the development. The existing septic tank on the site which currently services the existing property will be removed. The existing property will then be serviced via the proposed private sewer line.

It is proposed to connect into the DN225 potable water main located in the northern side of reserve road. The fire and potable water meters will be located on site and above ground if larger than or including 50mm in size. There is sufficient room to accommodate this. The existing property on the site will be serviced via this new connection into the water network.

Calculations based on Equivalent Persons (EP's) illustrate that there is an increase in loading from the Council planned demand for potable water and wastewater services for the site. Therefore, Arcadis has undertaken further detailed network capacity assessments for both water and sewer. Refer to Arcadis' Water Network Capacity Assessment 'F0004-10022603-AAR WNCA' & Arcadis' Sewer Network Capacity Assessment 'F0003-10021414-AAR SNCA'. Both reports concluded that the proposed development does not cause any additional network non-compliances.

Electrical and telecommunication services shall be provided to the development through connection points to the existing service adjacent to the site in Reserve Road.

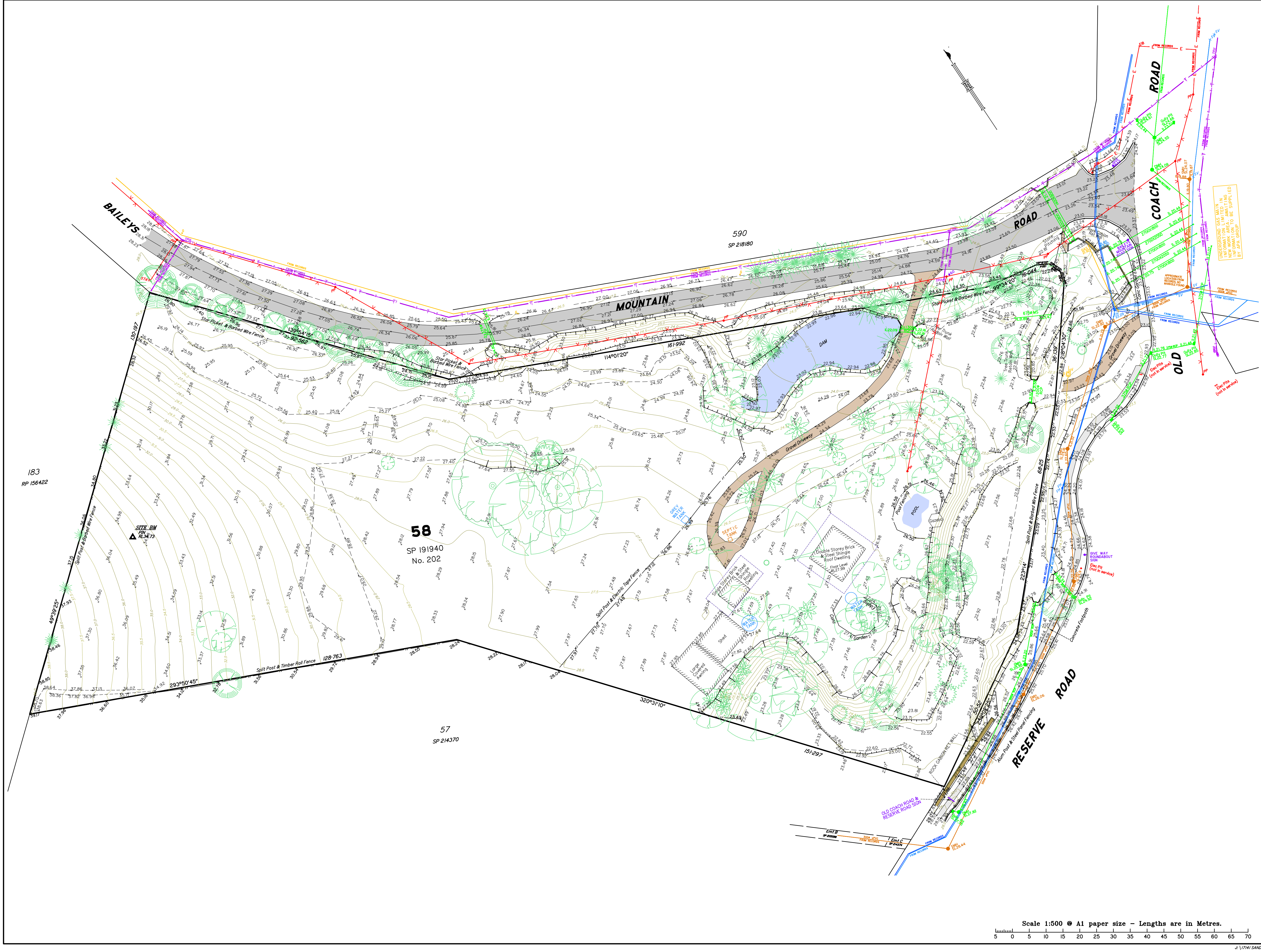
Vehicle access will be provided to the site via a new vehicular cross-over accessible from Baileys Mountain Road.

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APPENDIX A

SITE SURVEY

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Scale 1:500 @ A1 paper size – Lengths are in Metres.

5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

⚠ General Notes

This Plan has been prepared for the Client under specific instructions as per the Job Number & date of this plan. It is suitable for the purpose of Engineering Design only and is not to be used by another person or corporation or for another purpose, and is subject to the following limitations.

1) The boundaries shown hereon have been determined from plan dimensions only and not by field survey. No search has been undertaken for Easements or other encumbrances on Title.

2) Services have been located from visible indicators & relevant Authority records. Prior to any demolition, excavation or construction, relevant Authorities should be contacted for the possible location of further services and detailed location of all services.

3) Legend
1. Sewer
2. Water
 Potable Water
3. Stormwater
4. Overhead Commun
5. Underground Commun
 NBN Commun
6. Overhead Fibre Optic
7. Underground Fibre Optic
8. Overhead Electricity
9. Underground Electricity
10. Gas
11. Top of Bank
12. Toe of Bank

4) These notes form an integral part of this plan and no part of this plan may be reproduced in whole or in part without these notes.

AMENDMENTS

DESCRIPTION	DATE

SCHLENCKER SURVEYING (QLD)
Gold Coast ♦ Brisbane
Consultants in Surveying, Mapping & Development
A.B.N. 36 909 833 411
PO Box 41,
Helensvale QLD 4212
Suite 206,
Helensvale Professional Centre
3 Sir John Overall Dr,
Helensvale QLD 4212
Ph (07) 5573 6744
Fax (07) 5573 6755
Mob 0413 945 959
EMAIL mail@...net.au

DETAIL & LEVEL SURVEY

Lot 58 on SP191940

GOLD COAST CITY COUNCIL
202 BAILEYS MOUNTAIN ROAD,
UPPER COOMERA

Level Datum : AHD Derived
Level Origin - PSM 158725 RL 33.689
Contours at 0.5m intervals

SURVEYED		DATE	
SPR & TB		6/12/2017	
DRAWN	DATE	CHECKED	DATE
KDC	19.12.2017	KWB	20.12.2017
SCALE		DWG. NO.	
1:500		17141-01	

TREE DETAILS


9773


2887


2909


2915


2830


9717


9692


9612


2824


2835


2870


2840


9633


2878


2859


2856


2848

BAILEYS MOUNTAIN ROAD

COACH ROAD

OLD RESERVE ROAD

183
RP 156422

58
SP 191940
No. 202

57
SP 214370

SITE BM
PIN
RL34.73

590
SP 218180

9773
2887
2909
2915
2830
9717
9692
9612
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GIVE WAY ROUNDABOUT SIGN

Scale 1:500 @ A1 paper size – Lengths are in Metres.

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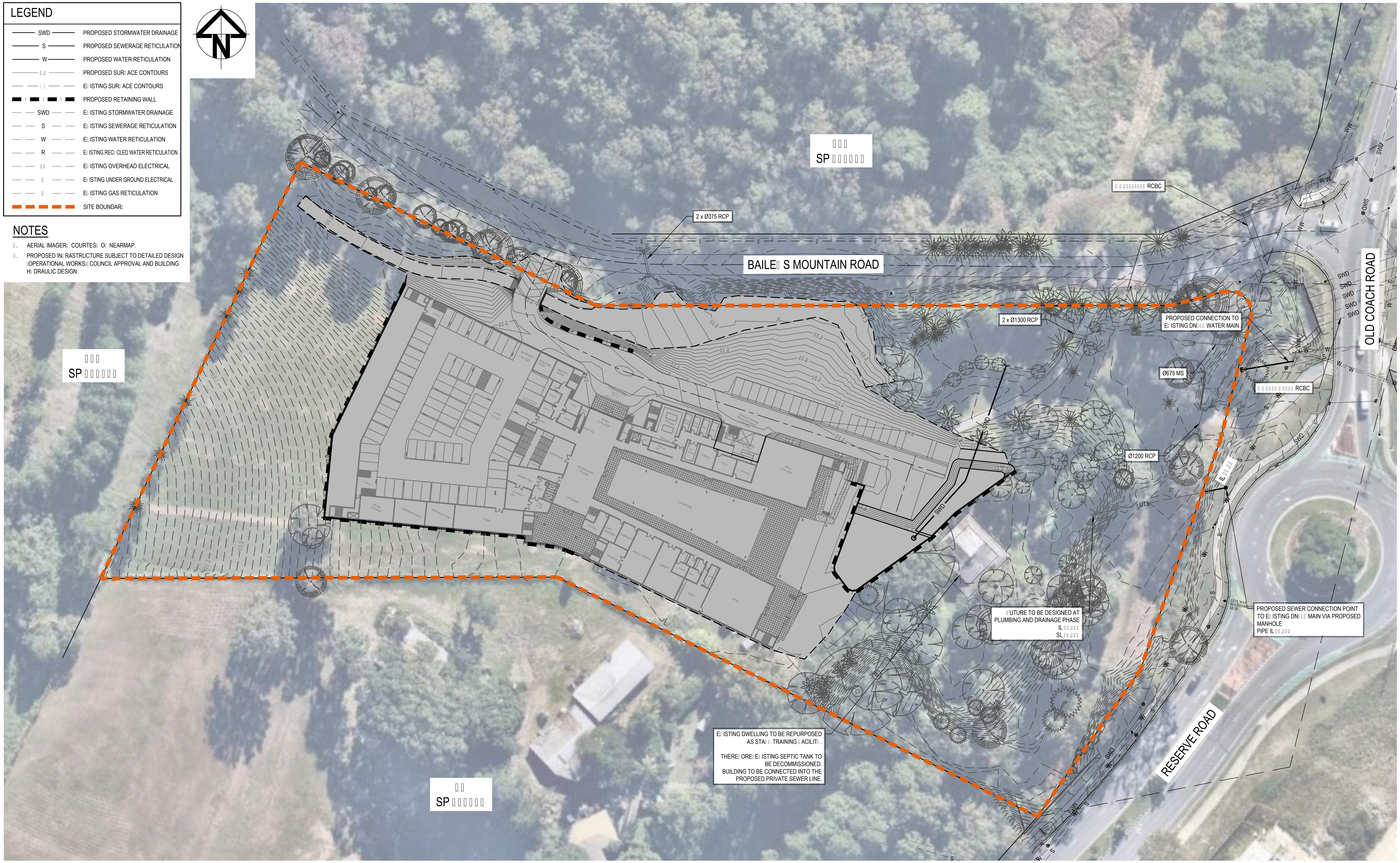
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SPR & TB		6/12/2017	
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KDC	19.12.2017	SPR	.....
SCALE 1:500		DWG. NO. 17141-01	

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APPENDIX B

ENGINEERING DRAWINGS

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	ORIGINAL ISSUE	N	OP		
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SCHLENCKER SURV ING

BDA ARCHITECTURE

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PRELIMINAR
NOT TO BE USED OR CONSTRUCTION

R.P.E. N

Dr N. AHE
D d O. PURTON
Pr M r J. STOCKWELL

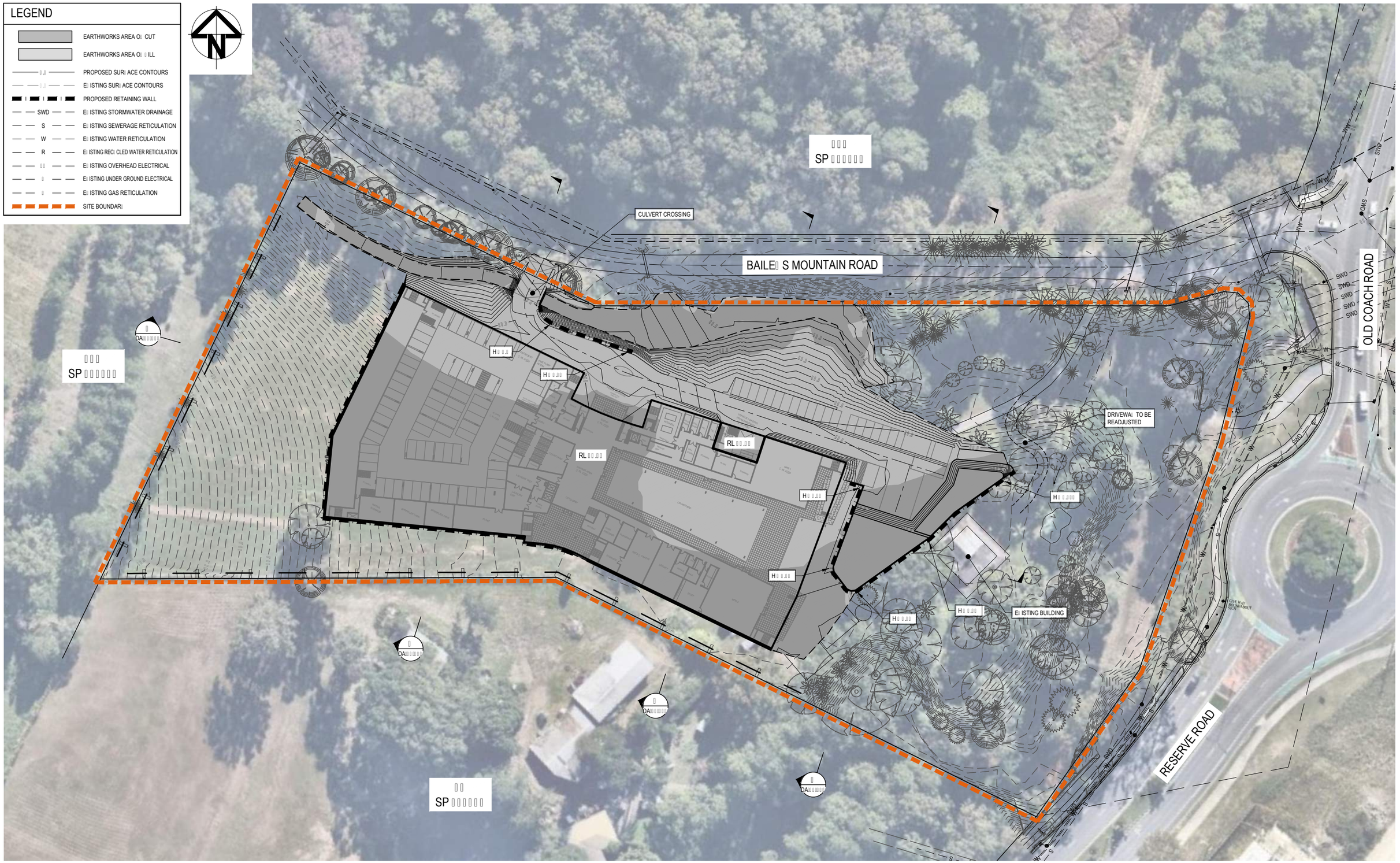
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H D AHD

BAILE S MOUNTAIN ROAD
UPPER COOMERA

ENGINEERING SERVICES PLAN

ARCADIS
Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289
Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N. DA — Pr N. —



	ORIGINAL ISSUE	N	AS			
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S

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BDA ARCHITECTURE

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SANDSON PT LTD

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Dr
N. AHE
D d
A. SHEPHERD
Pr M r
J. STOCKWELL

C r d r r d

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BAILE S MOUNTAIN ROAD
UPPER COOMERA

T

PRELIMINAR EARTHWORKS PLAN

ARCADIS

Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289

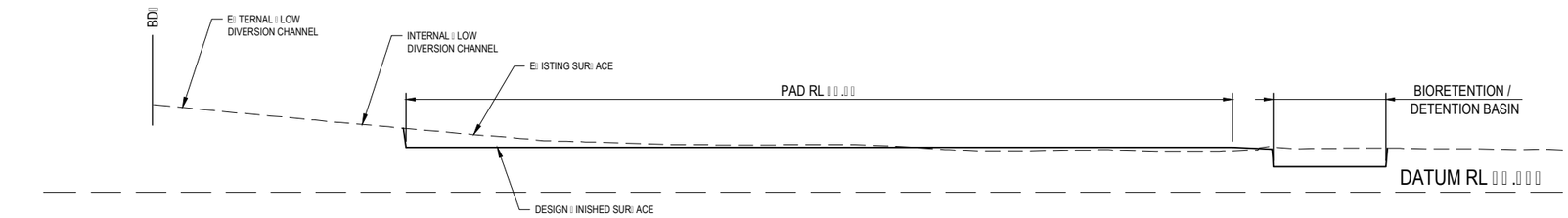
Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N. Pr N. I

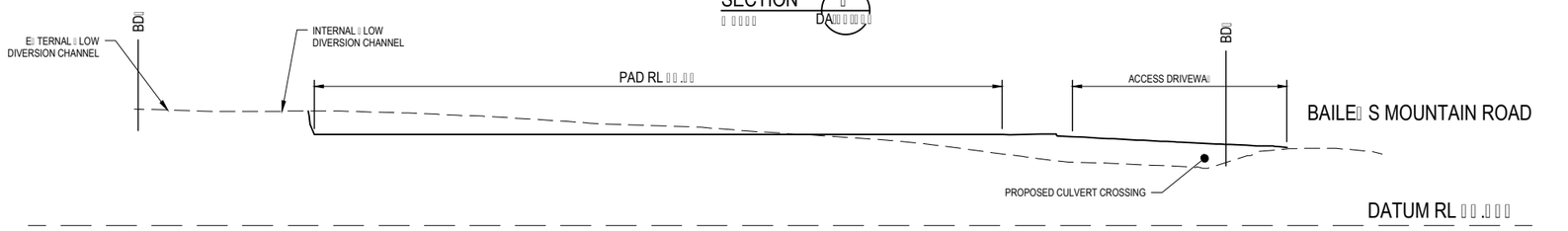
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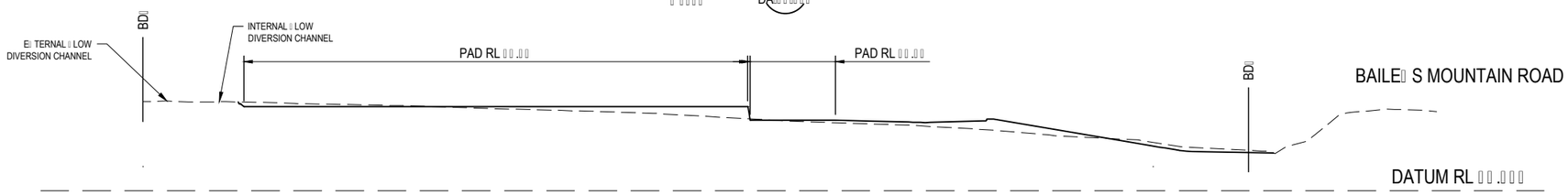
PM



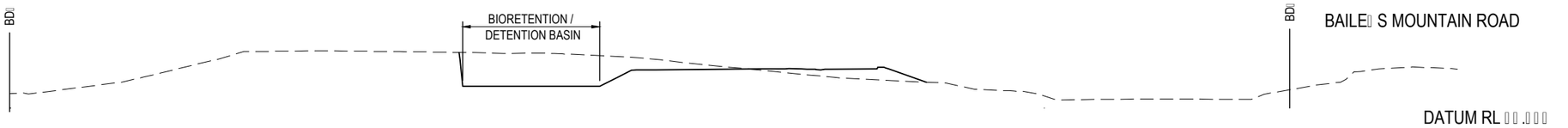
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BAILE S MOUNTAIN ROAD
UPPER COOMERA

T

PRELIMINAR EARTHWORKS
CROSS SECTIONS

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Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289

Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N . Pr N . I

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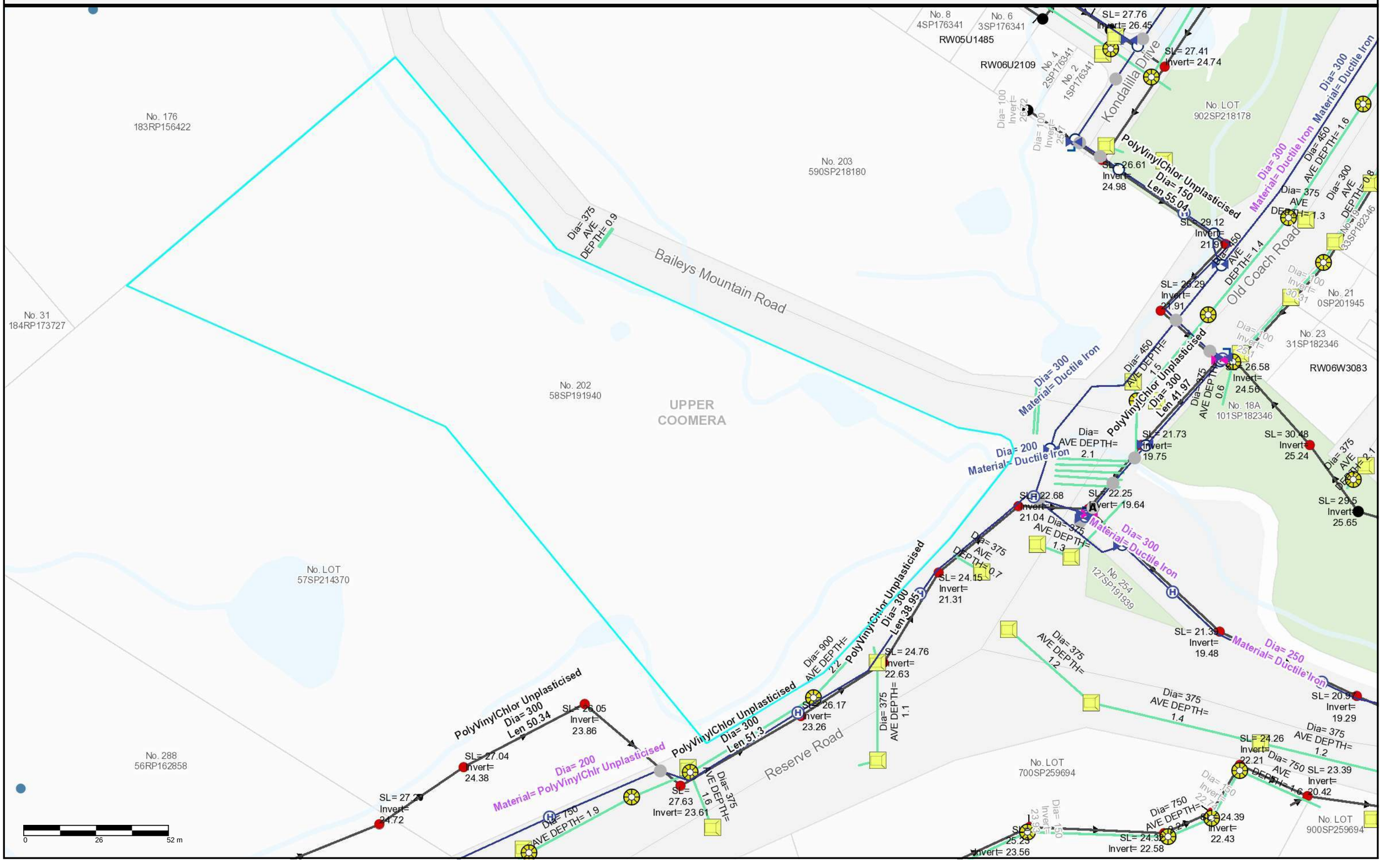
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APPENDIX C

ASSET INFRASTRUCTURE MAPS

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L58 SP191940 REF 202 Baileys Mountain Rd



CITY OF GOLDCOAST

Projection
MGA94, Zone 56
GDA

N

Disclaimer: Gold Coast City Council, Queensland 2014 or The State of Queensland 2014. No Warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Legend

Water Valve
- Other
- Altitude Valve
- Air Release
- Pressure Relief Valve
- Service Valve
- Stop Valve
- Major Supply
- Bypass
- Actuated Valve
- Dialysis
- Non-return/Reflux Valve
- Pressure Reducing
- Scour
- DMA Boundary
- Reservoir Zone

Water Hydrant

Water Fitting
- Other
- Cross Link
- End
- Gibault
- Sampling Point
- T - Joint.
- Taper
- Swabbing Chamber

Water Maintenance Hole

Water Pipe Potable

Raw Water Fitting
- Not Categorized
- Raw Endcap Fitting
- Raw Junction Fitting
- Raw Reducer Fitting

Raw Water Valve

Raw Water Main

Drainage Pit
- Other
- Inlet Gully
- Manhole
- Pit
- Roof water Inspection Chamber
- Roof water Outlet to Swale

Drainage Pipe

Sewer Meter

Sewer Fitting
- Other
- End Cap
- Junction
- Taper

Sewer Maintenance Hole
- Other
- Manhole - Public
- Lamphole
- Vacuum Chamber

Sewer Connection

Sewer Connection Length

Sewer Pipe Non Pressure (Gravity)

Sewer Pipe Non Pressure Flow Direction

Sewer Pipe Pressure
- Not Categorised
- Rising or Pressure Main
- Vacuum Main

Sewer Pipe Pressure Flow Direction

On Site Treatment Facility

Private Main

Private Pump Station

APPENDIX D

DIAL BEFORE YOU DIG SEARCH RESULTS

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Working near nbn™ cables

nbn has partnered with Dial Before You Dig to give you a single point of contact to get information about **nbn** underground services owned by **nbn** and other utility/service provider in your area including communications, electricity, gas and other services. Contact with underground power cables and gas services can result in serious injury to the worker, and damage and costly repairs. You must familiarise yourself with all of the Referral Conditions (meaning the referral conditions referred to in the DBYD Notice provided by **nbn**).

Practice safe work habits

Once the DBYD plans are reviewed, the Four P's of Excavation should be adopted in conjunction with your safe work practices (which must be compliant with the relevant state Electrical Safety Act and Safe Work Australia "Excavation Work Code of Practice", as a minimum) to ensure the risk of any contact with underground **nbn** assets are minimised.

Plan: Plan your job ensuring the plans received are current and apply to the work to be performed. Also check for any visual cues that may indicate the presence of services not covered in the DBYD plans.

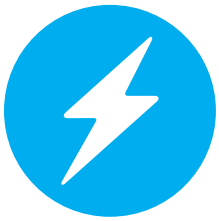
Pothole: Non-destructive potholing (i.e. hand digging or hydro excavation) should be used to positively locate **nbn** underground assets with minimal risk of contact and service damage.

Protect: Protecting and supporting the exposed **nbn** underground asset is the responsibility of the worker. Exclusion zones for **nbn** assets are clearly stated in the plan and appropriate controls must be implemented to ensure that encroachment into the exclusion zone by machinery or activities with the potential to damage the asset is prevented.

Proceed: Proceed only when the appropriate planning, potholing and protective measures are in place.

Working near **nbn**™ cables

Australia's broadband network



Identify all electrical hazards, assess the risks and establish control measures.



When using excavators and other machinery, also check the location of overhead power lines.

Workers and equipment must maintain safety exclusion zones around power lines.

Once all work is completed, the excavation should be re-instated with the same type of excavated material unless specified by **nbn**. Please note:

- Construction Partners of **nbn** may require additional controls to be in place when performing excavation activities.
- The information contained within this pamphlet must be used in conjunction with other material supplied as part of this request for information to adequately control the risk of potential asset damage.

Contact

In the event of the **nbn**™ network facility damage please call 1800 626 329

Disclaimer

This brochure is a guide only. It does not address all the matters you need to consider when working near our cables. You must familiarise yourself with other material provided (including the Referral Conditions) and make your own inquiries as appropriate.

nbn will not be liable or responsible for any loss, damage or costs incurred as a result of reliance on this brochure.

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DIAL BEFORE YOU DIG® www.1100.com.au

Job No 14389450

Phone: 1100
www.1100.com.au

Caller Details

Contact:	Mr Oliver Purton	**Caller Id:**	1621979	**Phone:**	0755034806
Company:	Arcadis Australia Pacific Pty Ltd	**Mobile:**	Not Supplied	**Fax:**	Not Supplied
Address:	Level 7 Premion Place Queen Street Southport QLD 4215	**Email:**	Oliver.Purton@arcadis.com		

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Private

Enquiry Date:	Start Date:	End Date:
13/06/2018	24/06/2018	01/07/2018

Address:
202 Baileys Mountain Road
Upper Coomera QLD 4209

Job Purpose:	Onsite Activity:
Excavation	Mechanical Excavation
Location of Workplace:	**Location in Road:**
Private Property	Not Supplied

- Check the location of the dig site is correct. If not submit a new enquiry.
- If the scope of works change, or plan validity dates expire, resubmit your enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Not Supplied

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days.
Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
72426069	APA Group (Allgas) Networks, Qld	0881154500	NOTIFIED
72426067	Energex, Electricity (Qld)	0736645400	NOTIFIED
72426070	NBN Co, Qld	1800626762	NOTIFIED
72426068	Telstra QLD, South East	1800653935	NOTIFIED

END OF UTILITIES LIST



APA Group
PO Box 6014 Halifax Street
South Australia 5000

13/06/2018

Company: Arcadis Australia Pacific Pty Ltd
Mr Oliver Purton
Level 7 Premion Place Queen Street
Southport
QLD 4215

Oliver.Purton@arcadis.com

Dear Mr Oliver Purton

Sequence Number: 72426069
Worksite Address: 202 Baileys Mountain Road
Upper Coomera
QLD 4209

RE: REQUEST FOR APA GROUP (APA) UNDERGROUND DIAL BEFORE YOU DIG

Dear Sir/Madam

In response to the above enquiry we wish to confirm that APA **operates underground plant** (Mains and / or Services) at or in the vicinity of the above address.

Please check that the following map represents the area you requested - if the area is not correct please contact our Dial Before You Dig Officer - (08) 8115 4500. If works are proposed adjacent to any underground plant operated by APA please ensure compliance with the attached "DUTY OF CARE"

Please find enclosed the following information in support of the above: -

1. A location map of the **suburb** the service is in and an A4 location map showing the **status** of APA underground plant (Mains and / or Services) adjacent to the subject site

2. DUTY OF CARE statement which forms **an integral part** of any information supplied by APA

For GAS EMERGENCIES 24 HOURS - 1800 GAS LEAK (1800 427 532)

Please note that as work on APA underground plant is ongoing any information supplied on their status can only be considered current for **30 days from the date of this response**. Expired locations, i.e., over 30 days from the date of this response, require a new Dial Before You Dig request to validate location information.

Should you have any questions with **regards to the attached information** please contact our Dial Before You Dig officer - (08) 8115 4500.

For any excavation works, including vacuum excavations, an "Authority to Work" Permit may be required and a Site Watch may need to be scheduled.

A minimum of 5 business days' notice is required to process permit applications. Permit applications can be made by: -

Post: Permit Applications QLD, PO Box 885 Hamilton Central QLD 4007 or

Email: permitsqld@apa.com.au or Phone: (07) 3215 6700 though an application will most likely be required

Charges may apply for Site Watch requests. Your sequence number may be requested when making your booking, please have this available when you request either a mains location or site watch.

For other enquiries please contact your gas retailer

To find out who your retailer is call 1800 657 567

Warning: if there are high or transmission pressure gas mains present in the vicinity of your area of interest, an APA employee must be in attendance during any excavation within 3 metres of high or transmission pressure mains, and an "Authority to Work" permit must be issued prior to work commencing.

Please contact us for a permit to work request if you believe your work is within this zone, by completing the "Authority to Work" request form attached and sending to APA. 5 days' notice is required prior to the commencement of any excavation to assess and allocate resources. Contact phone numbers are shown at the end of the notice of location.

Please Note: For some DBYD enquiries, you might receive 2 responses from the APA Group. Please read both responses carefully as they will relate to different assets. It is your responsibility to action all requirements set out in APA Group responses.

Please take some time to review the entire response document and check the information supplied and please let us have any feedback by sending an email to *DBYDNetworksAPA@apa.com.au* or contacting us direct on (08) 8115 4500.

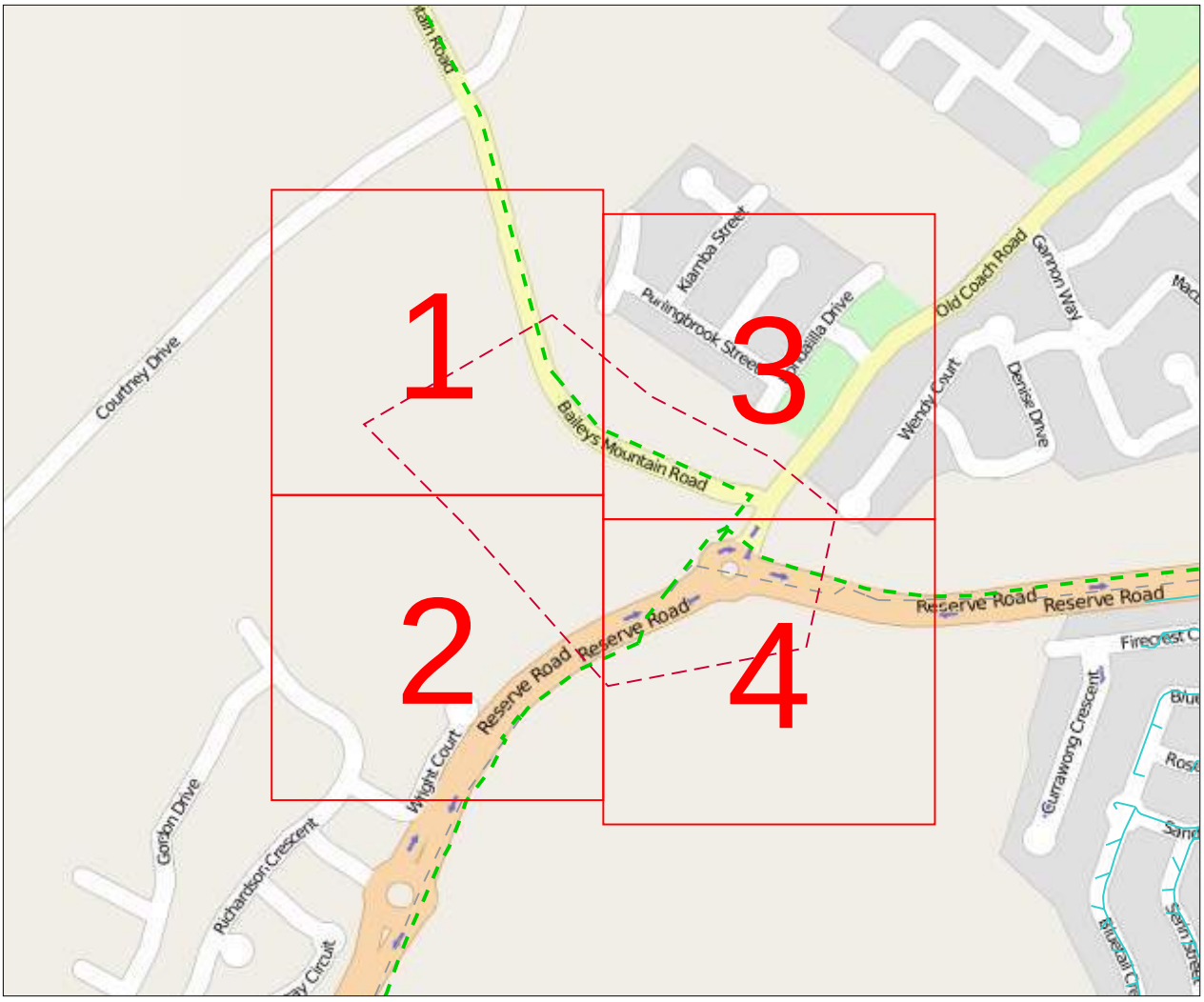
Yours faithfully

Dial Before You Dig Officer
APA Group

Email DBYDNetworksAPA@apa.com.au
Ph. (08) 8115 4500

13/06/2018 **SCALE: DO NOT SCALE** **REF NO:** 72426069

As work on APA underground plant is ongoing any drawing with an issue date of more than 30 days previous can no longer be considered valid. All persons planning civil works on any site are advised to contact APA to confirm location. All underground gas pipelines are the property of APA & are not to be accessed by unauthorised persons. All care is taken with preparation of the drawings & no responsibility is accepted for errors or omissions



Enquiry: 72426069

Papersize: A4 **Scale:** 1: 6000

0 0.07km

NORTH

Data Source

Pipeline Data Copyright APA Group, Property Parcels Copyright QLD Government, UBD Imagery – Copyright Sensis, DBYD Dig Location provided by DBYD.

operated by

This maps is created in colour and shall be printed in colour

Legend

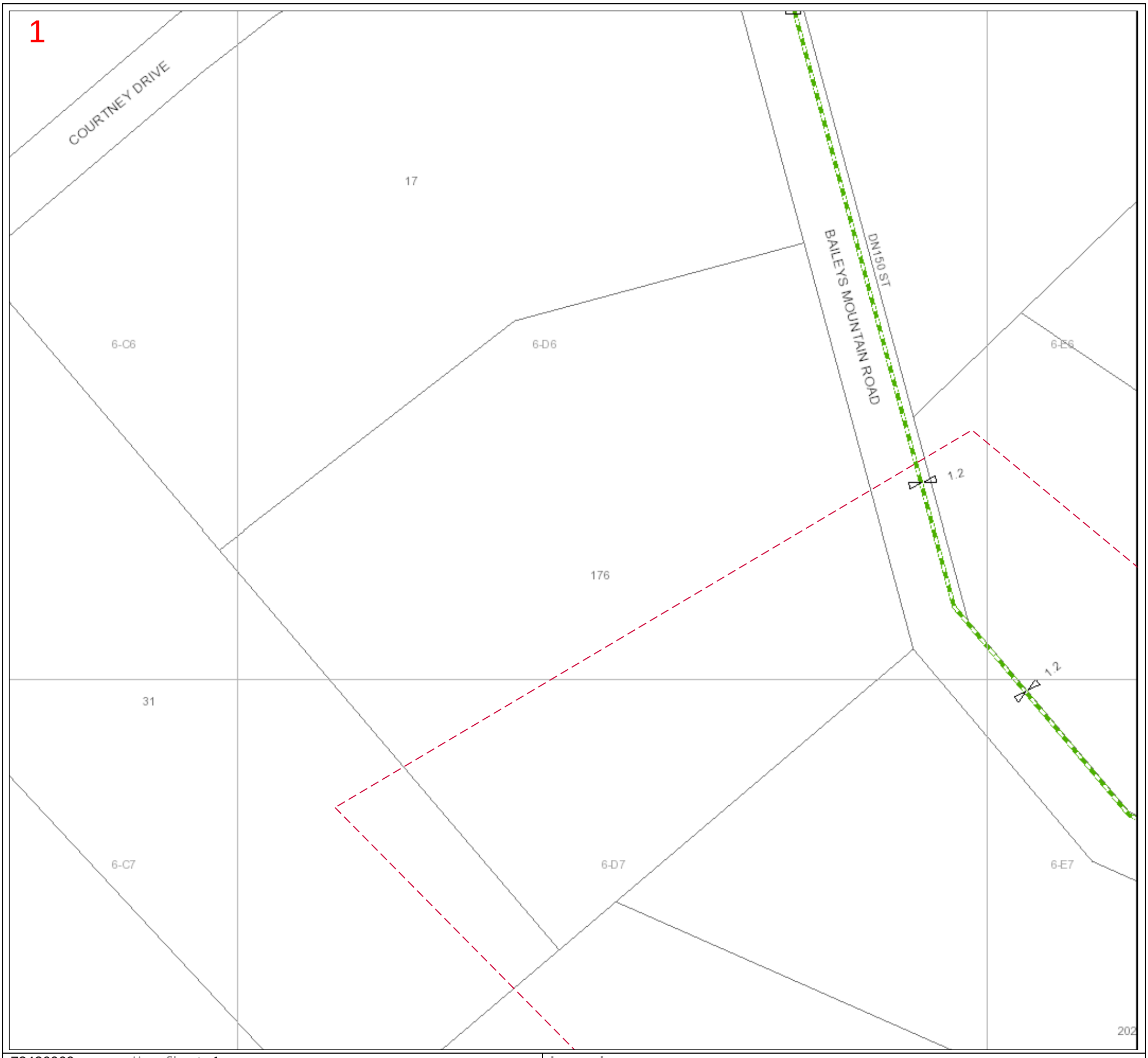
Distribution Main	Gas Assets and Fittings	Pipe Materials
Class 900 Transmission	Gate Station	CI Cast Iron
Class 600 Transmission	Regulator Station	CU Copper
Class 300 Transmission	Block/ Emergency Valve	GAL Wrought Galvanised Iron
High Pressure Steel	Isolation Valve	PGAL Poly Coated Wrought Galvanised Iron
High Pressure PE Trunk	Test Point	ST Steel
High Pressure/ Class 500	Syphon	NY/ NY11 Nylon
Medium Pressure PE/ Nylon	Anode	PE Polyethylene
Medium Pressure (Allgas)	Pipeline Marker	MDPE Medium Density Polyethylene
Low Pressure	Trace Wire Point	HDPE High Density Polyethylene
LPG	Reducer	DN Nominal Diameter
TLP	Pipe Connector/ Tee	OD Outside Diameter
Proposed/ Under Construction	Pipe Connector	
Idle Gas Pipe	End Cap	
Abandoned Gas Pipe		
Sleeve		

Examples: 40PE in DN80 CI — 40mm Polyethylene in an 80mm (Nominal Diameter) Cast Iron Sleeve

63PE INS — 63mm Polyethylene inserted in another pipe

Line/ Polygon Request

APA Group does not guarantee the accuracy or completeness of the map and does not make any warranty about the data. APA Group is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map.



72426069 Map Sheet: 1

Papersize: A3 Scale: 1: 1000

0 0.01km

NORTH

Map Key:

1	3
2	4

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
- High Pressure/ Class 500 (1)
- Medium Pressure PE/ Nylon
- Medium Pressure (Allgas)
- Low Pressure
- LPG
- TLP
- Proposed/ Under Construction
- Idle Gas Pipe
- Abandoned Gas Pipe
- Sleeve

(1) Medium Pressure in AGN/ Nylon in Allgas

Gas Assets and Fittings

- Gate Station
- R Regulator Station
- V Block/ Emergency Valve
- V Isolation Valve
- T Test Point
- S Syphon
- A Anode
- M Pipeline Marker
- W Trace Wire Point
- Reducer
- Pipe Connector/ Tee
- Pipe Connector
- End Cap

Pipe Materials

CI	Cast Iron
CU	Copper
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Examples:
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- Line/ Polygon Request

operated by apa

Data Source

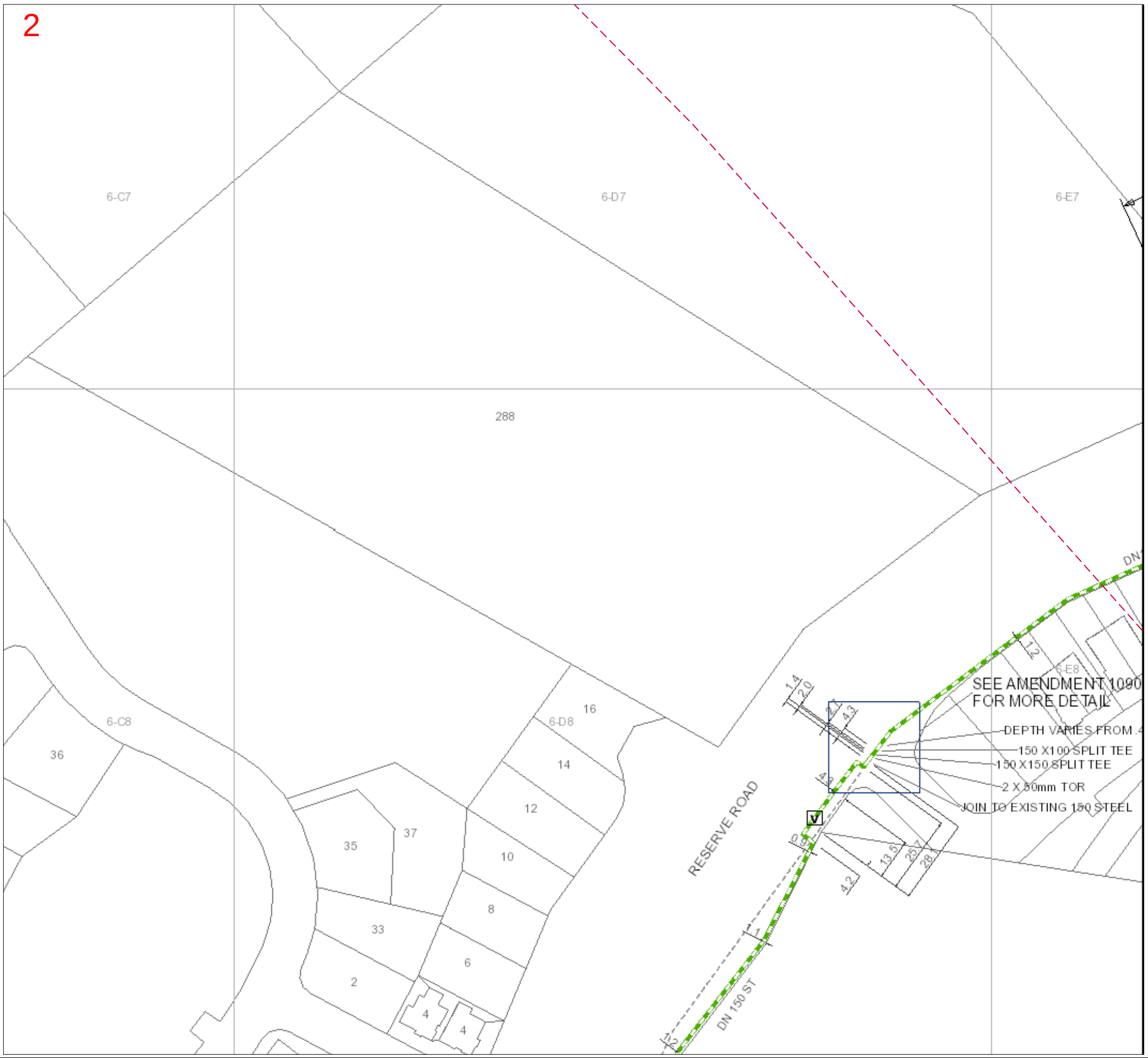
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The Essential First Step

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2



72426069 Map Sheet: 2

Papersize: A3 Scale: 1: 1000

0 0.01km

NORTH

Map Key:

1	3
2	4

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
- High Pressure/ Class 500 (1)
- Medium Pressure PE/ Nylon
- Medium Pressure (Allgas)
- Low Pressure
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- Proposed/ Under Construction
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(1) Medium Pressure in AGN/ Nylon in Allgas

Gas Assets and Fittings

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- S Syphon
- A Anode
- M Pipeline Marker
- W Trace Wire Point
- Reducer
- T Pipe Connector/ Tee
- = Pipe Connector
- End Cap

Pipe Materials

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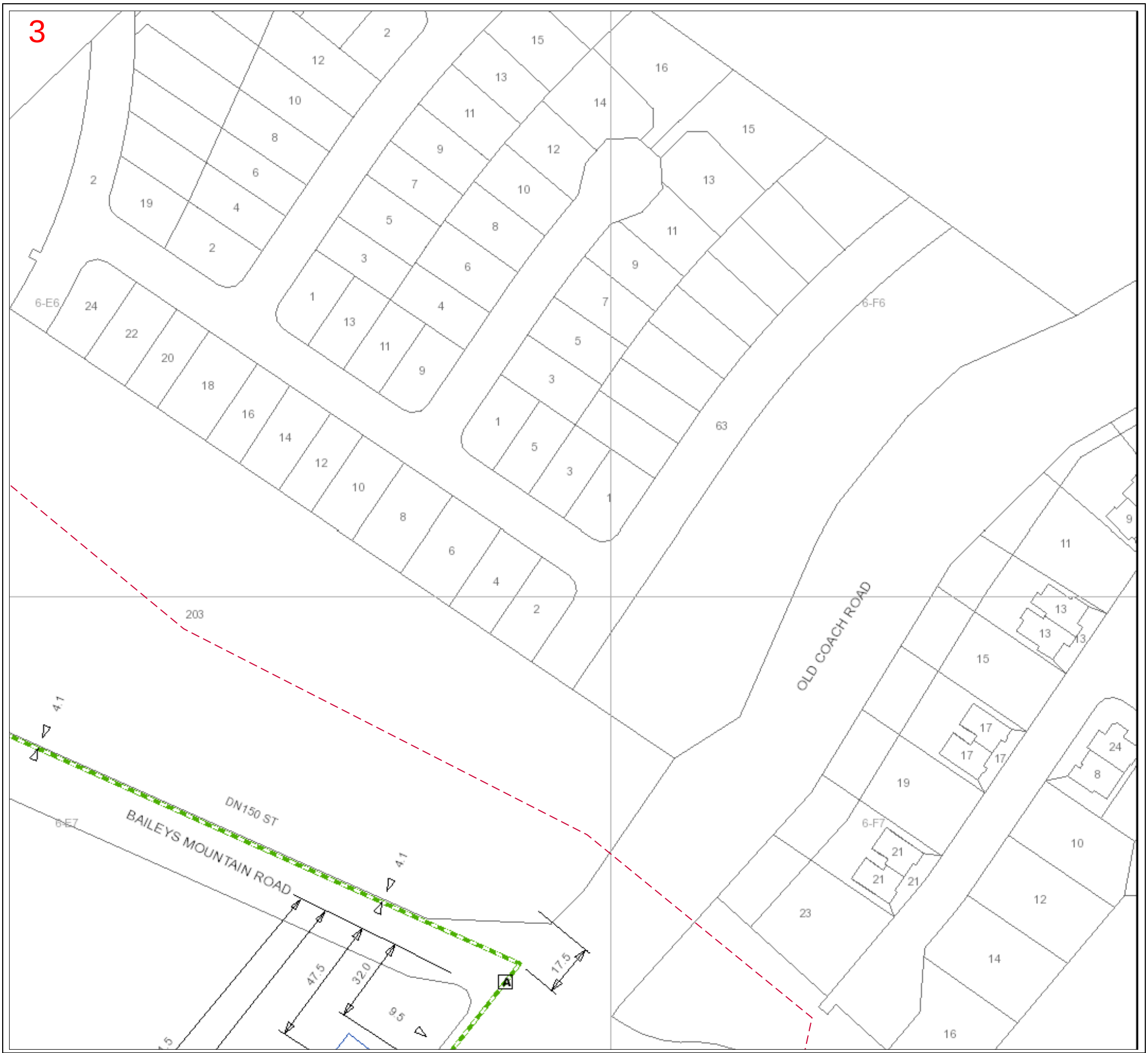
Line/ Polygon Request

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Data Source

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72426069 Map Sheet: 3

Papersize: A3 Scale: 1: 1000

0 0.01km

NORTH

Map Key:

1	3
2	4

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
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Gas Assets and Fittings

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Line/ Polygon Request

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Data Source

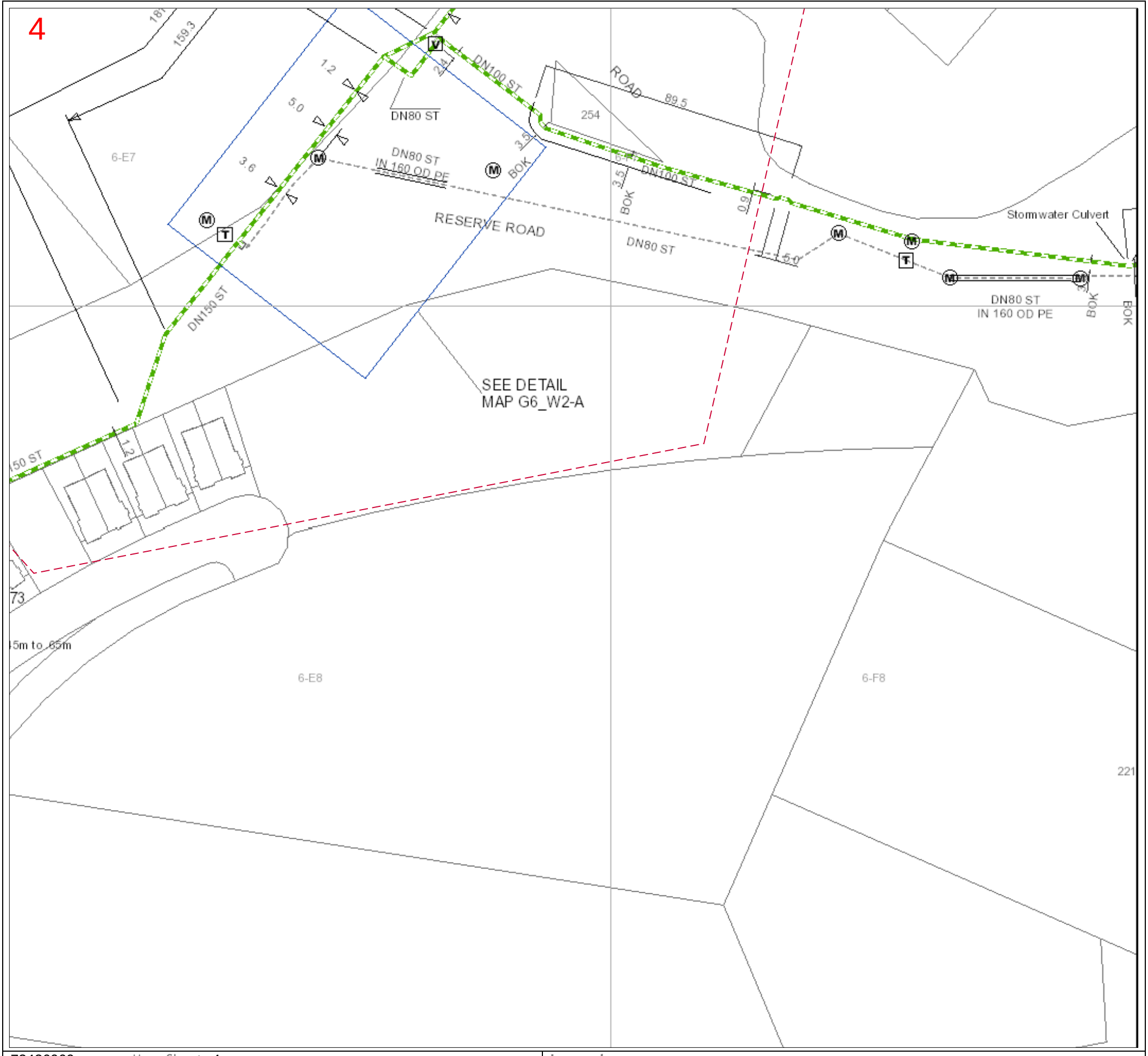
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4



72426069 Map Sheet: 4

Papersize: A3 Scale: 1: 1000

0 0.01km NORTH

Map Key:

1	3
2	4

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
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Working Around Gas Assets: Duty of Care and Responsibilities

It is illegal to interfere or tamper with gas infrastructure.
Offenders who interfere or tamper with gas infrastructure may be prosecuted under relevant legislation and there are very serious penalties for such offences

"Gas infrastructure" or "infrastructure" in this document refers to any infrastructure or property owned or operated by APA Group including, but not limited to natural gas mains, services and regulator/meter stations or regulator pits.

1. Planning Your Work

a. The constructor must:

i. Request plans of APA Group infrastructure for a particular location at a reasonable time before construction begins (at least 5 business days);
ii. Design for minimal impact and ensure protection of APA Group infrastructure, this includes networks managed by APA on behalf of Australian Gas Networks and Allgas; and
iii. Contact APA Group if their infrastructure is in any way affected by planned construction activities.

2. Before You Start Work

a. Please Note: **You will be responsible to pay for the repair of any damage by you to gas assets.**

b. You must obtain **Dial Before You Dig** (DBYD) documentation before any on-site construction or excavation commences. This document is to be read in conjunction with the Dial Before You Dig plans and other relevant documentation.
APA Group will provide free site plans if an APA Group infrastructure location request is made to APA on **(08) 8115 4500**

c. If DBYD documents indicate you will be working within 3m of a high pressure or transmission gas pipeline, you must complete and submit the **Authority to Work Request** provided with your DBYD documentation **five (5) business days** prior to commencing the work. Requests under five (5) business days will incur extra charges.

d. APA Group shall assess your Authority to Work Request and will inform you if a Site Watch is required. A Site Watch involves the presence of an APA representative at site to advise on locating and working around the asset. Where on-site location advice is provided, the constructor is responsible for all hand digging (potholing) to visually locate and expose APA Group infrastructure. Vacuum excavations may only be used if permission is granted by APA and if it is used on high pressure mains Site Watch will be required. **Site Watch services are charged at an hourly rate.**

e. The principal contractor for the site must provide APA Group with a written construction methodology for all works impacting or encroaching on APA infrastructure. All construction methodology documents will be reviewed by APA Group prior to the commencement of site works. Construction methodology documents must be submitted as part of an Authority to Work Request (send to permitsqld@apa.com.au).

f. Site Plans

i. Plans and/or details provided by APA Group through DBYD or otherwise are current for one (1) month from the date of dispatch and should be disposed of by shredding or any other secure disposal method after use.
ii. APA Group retains copyright in all plans and details provided in connection with any request.
iii. APA Group plans or other details are provided for the use of the applicant, its servants, employees, contractors and agents, and must not be used for any unauthorised purpose.
iv. APA Group plans are pipe indication diagrams only and indicate the presence of plant in the general vicinity of the geographical area shown. Exact ground cover and alignments cannot be given with any certainty as such levels can change over time.
v. APA Group, its servants, employees, or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and/or details so supplied to the applicant/constructor, its servants, employees, contractors and/or agents, and the applicant/constructor agrees to indemnify APA Group against any claim or demand for any such loss or damage.
vi. The constructor is responsible for all infrastructure damage occasioned to APA Group infrastructure.
vii. APA Group reserves all rights to recover compensation for loss or damage caused by interference or damage, including consequential loss and damages to its property and gas infrastructure.
viii. All care is taken in the preparation of location drawings and plans, but NO responsibility is accepted by APA Group for errors or omissions.

3. Working in the Vicinity of a Gas Pipeline

a. **Excavation** near Gas Mains and Services

PLEASE NOTE: Unless otherwise approved, mechanical excavation is not permitted above, or within 600mm of either side of APA Group infrastructure.

i. **Location of Gas Mains and Services:** Examining the DBYD documentation and other plans is not sufficient as reference points may change from the time of installation and recording on documentation. You MUST use appropriately qualified plant locators to accurately locate and prove the position of all assets and then validate these positions prior to commencing work. For all work to be done within 3.0 metres of APA Group infrastructure, the constructor is required to hand dig (pothole) and expose the plant, hence proving its exact location before work can commence. Vacuum excavation can cause failure of some types of gas mains and therefore APA Group must be contacted prior to any vacuum excavation.
Please note that new APA Group gas mains generally have a plastic warning tape or lightweight plastic board buried above the pipe but this is not the case for older mains or when pipe is laid by means of boring or located in conduit.

ii. **IMPORTANT NOTE:** Not all gas services (i.e. pipe from gas main to a gas meter in an individual property) are captured on APA Plans. Gas services shown on plans are indicative only and do not pinpoint the exact location of APA's asset. A gas service may also cross a road to reach a property. To confirm the presence of a gas service, please contact the APA DBYD number below for further information.

iii. **Installation of Utilities Parallel to Gas Mains and Services**: If construction work is being undertaken parallel to APA Group gas mains, then hand digging (potholing) at least every 4 m is required to establish the location of all gas mains. Nominal locations must be confirmed before work can commence. A minimum clearance of 600mm must be maintained from gas mains unless otherwise approved by APA. If an excavation exceeds the depth of the gas mains and it is likely that the covers or bedding material around the pipes will move, approval must be sought from APA Group's Capital Works team.

iv. **Installation of Utilities Across Gas Mains and Services:** A minimum clearance of 300mm above and below and APA Group gas mains must be maintained unless otherwise approved by APA. If the width or depth of the excavation is such that the gas mains will be exposed or unsupported, then APA Group must be contacted to determine whether the gas mains should be taken out of service, or whether they need to be protected or supported. Protective cover strips when removed must be replaced under APA Group supervision.

v. **Exposed Gas mains and Services:** Exposure of APA infrastructure shall be limited to potholing for location purposes. Any other exposure of pipe is not permitted unless expressly approved by APA Group. Exposed gas pipes must be protected by the constructor against the effects of heat by shielding or covering with a suitable material. Heating of exposed plastic pipes is dangerous. If depth of cover is compromised in any way due to works, please contact APA immediately.

vi. **Heavy machinery Operation over Gas Mains and Services:** Where heavy "Crawler" or "Vibration" type machinery is operated over the top of gas mains, a minimum cover of 750mm to the gas mains must be maintained using load bearing protection whilst the machinery is in operation.

vii. **Directional Drilling Near Gas Mains and Services:** When drilling parallel to gas mains, trial holes must be carefully hand dug at least every 4m to prove the actual location of the conduits/pipes before using drilling machinery. Where it is required to drill across the line of gas mains, the actual location of the gas mains must first be proven by the constructor by hand digging. A trench must be excavated one metre from the side of the gas mains where the auger will approach to ensure a minimum clearance of 600mm for gas mains can be maintained unless otherwise approved by APA.

viii. **Explosives:** Clearances must be obtained from APA Group's Networks Engineering Manager for use of explosives in the vicinity of gas mains. Please contact the APA Group.

b. **Damage Reporting**: All damage to conduits and pipes and any other gas infrastructure and property must be reported to APA Group no matter how insignificant the damage appears to be. Even very minor damage to protective coverings can lead to eventual failure through corrosion. All work in the vicinity of damaged infrastructure should cease and the area should be vacated until a clearance to continue work has been obtained from an APA Group officer. Please contact the Emergency number below to report damage.

c. **Solutions and Assistance**: If it is determined that APA Group infrastructure is likely to be impacted or encroached upon by planned construction, APA Group must be contacted to arrange for possible engineering solutions. If APA Group relocation or protection works are part of the agreed solution, then payment to APA Group for the cost of this work will be the responsibility of the principal contractor. APA Group will provide an estimated quotation for work on receipt of the order number before work will proceed.

d. **Reinstatement**: APA assets affected by third party works as highlighted above are to be reinstated as per APA requirements, potentially including but not limited to; warning tape/marker board, soft bedding/backfill materials, trench dimensions, depth of cover, trace wire for PE mains, compaction requirements, concrete protection, and surface re-instatement.

4. Contacting APA

GAS EMERGENCIES 24 HRS	GAS PLANT RELOCATIONS APA CAPITAL WORKS	APA GROUP GAS ASSET LOCATIONS TEAM (PERMITS OFFICE)	DIAL BEFORE YOU DIG SUPPORT
1800 GAS LEAK (1800 427 532)	PH: 07 3215 6709 FAX: 07 3215 6699 capitalworksqldnetworks@apa.com.au	PH: 07 3215 6700 FAX: 07 3215 6699 permitsqld@apa.com.au	PH: (08) 8115 4500

HIGH PRESSURE GAS DISTRIBUTION MAINS "AUTHORITY TO WORK" REQUEST

N.B. THIS IS NOT A PERMIT TO WORK

SITE ADDRESS: ……

SUBURB: ……UBD MAP REF:……

DBYD Sequence Number:…… Date of DBYD Enquiry…..

(Note: Only valid enquiries will be accepted and the currency of DBYD requests will affect your permit period. APA Group's DBYD requests are valid for 30 days only. Enquiries may need to be renewed and a new application may be required)

COMMENTS:……

……

BROAD DESCRIPTION OF WORK (please provide any approvals from APA Group related to these works)

……

……

……

WORK TO BE CARRIED OUT:

Class 1.	Location	
	Works crossing a high pressure gas mains	☐
Class 2.	Location	
	Works within 3 metres of a high pressure gas mains	☐
Class 3.	Location	
	Works involving large excavations that would cause ground movement, vibrations or blasting beyond 3m of a high pressure gas mains	☐
Class 4.	Location	
	Works within 1m of gas service or connection to industrial gas meter	☐

DETAILS OF WORK INVOLVED (Tick Applicable)

Excavation	☐	Change to surface level	☐
Service crossing (Gas CONNECTION)	☐	Boring	☐
Proving (Dial Before You Dig)	☐	Blasting	☐
Earthworks	☐	Road Construction/Change?	☐
Vacuum Excavation	☐	Other (give details)	☐

……

Relevant drawings, Block Plans etc, attached Yes ☐ No ☐

PROPOSED DATES AND TIMES	**From:**	**To:**
Excavation	…… / …… / 20… ..... am/pm	…… / ……/ 20… ..... am/pm
Backfill	…… / …… / 20… ..... am/pm	…… / ……/ 20… ..... am/pm

Insurance Cover – Current Level None ☐ $5M ☐ $10M ☐ $20M ☐ Other☐ _

NOTES

1. This Authority to Work applies only to work in the vicinity of the Gas Mains. It does not authorise work near or on the Gas Mains itself.
2. A minimum of 5 business days must be allowed between receipt by APA Group of this Request and a response. However, more time for notification may be necessary.
3. For Class 1 and Class 2 classifications, this application must be accompanied by a detailed sequence of events, outlining all aspects of work involved and work is not permitted until an Authority to Work is issued.
4. For class 1 and 2 Dial Before You Dig, APA Group will arrange for an inspector to be on site as necessary during the work. An inspector must be present at all times for works involving excavation within 1m of the Gas Mains. APA Group will advise the requirement for an inspector for other works within 3m of the Gas Mains.
5. The applicant is responsible for any damage resulting from the work and all consequential damages and losses arising from such damage and therefore must insure against every liability of the contractor in respect of or arising out of any loss of life, loss of or damage to property of person (both real and personal), arising out of or in any way connected to this permit.

Such insurance must be arranged for an indemnity of not less than $20 Million unless otherwise agreed.

Permit Requested By:(print name)…….Signature: ……Date …./…./….

Company:…… Postal Address:……..

Phone No:…… Fax number…… Email……

Requestors PO Number…….. Site Contact Details: Name……

Site Contact Number……

Principal Contractors Details(if required)…….

Principal Contractors Contact details:…….

Please be advised;
Under the Work Health and Safety Act 2011, each work place has an obligation to comply to Workplace Health and Safety Regulations and Codes of Practice.

APA Group brings to your attention Work Health and Safety Regulations 2011, Chapter 4: Hazardous Work. Failure to comply to the above regulation may result in APA Group reporting the non-compliance to Workplace Health and Safety.

Office use only
Received: Date …/…./…. Site Watch required? **Yes/No** (please circle)

Pipeline Officer:
(print name)……...Signature: ……Date: …/…/….

Further information can be requested via:
Post: **Permit Applications QLD**
PO Box 885 Hamilton Central QLD 4007
Phone: (07) 3215 6700 though an application will most likely be required
Email: permitsqld@apa.com.au

ENER□E□ DB□D RESPONSE
"ASSETS FO□ND - EXISTING"

Our search has re□ealed there is existing ENER□E□ □nderground Assets within the nominated search area□They are shown on the attached plan□s□□

To: Mr Oliver Purton	***DBYD Sequence No:*** 72426067
Company: Arcadis Australia Pacific Pty Ltd	***Date of Response:*** 13-Jun-2018
Address: Level 7 Premion Place Queen Street Southport QLD 4215	***Period of Plan Validity:*** 28 Days

Email Address: Oliver.Purton@arcadis.com	***Phone:*** 0755034806	***Mobile:*** Not Supplied	***Fax:*** Not Supplied

Location of Search: 202 Baileys Mountain Road Upper Coomera QLD 4209

UBD Map Ref: 6D6,6D7,6D8,6E6,6E7,6E8,6F7,6F8

External Comments (if any):

It is important that you note:

1. Please read and understand all the information and disclaimers provided – including the Terms and Conditions on the attached pages.
2. We have only searched that area which has been nominated. If this nominated area is not what you require, please resubmit another enquiry with DBYD
3. Plans provided by ENERGE□ are only an indication of the presence of Underground assets within the nominated locations provided are approximate and the plans are not suitable for scaling purposes as exact ground cover and alignments cannot be provided.
4. Plans provided by ENERGE□ do not show the presence of any Overhead Network.
5. That in addition to underground cables marked on attached plan there maybe underground Earth Conductors or Consumers Mains in the vicinity of the nominated work area(s) that are not marked on the plans.
6. This advice does not identify the presence of private underground cables (inc. consumers' mains) that may run from ENERGE□ mains onto private property. Assets located on private property are the responsibility of the owner for identification and location.
7. Underground Cable Locators can be found in the Yellow Pages under Electronic Detectors, or Underground Service Locators on an Internet search.
8. The ENERGE□ Dial Before You Dig information provides the vicinity of underground cable and will not be adequate for conveyancing purposes. A Solicitor's Search can be arranged through ENERGE□.
9. In the event that excavation does not commence within 28 days of receipt of a plan, a new plan should be obtained.
10. For Cable Support advice around the 33□v and 110□v Underground Networks please note that you should allow for a minimum of twenty (20) working days advance notice in your construction program to permit ENERGE□ time to allocate the necessary resources to carry out the investigations. Please contact the ENERGE□ DBYD team on the details listed below.
11. Immediately report life threatening emergencies to ENERGE□ on □□ □□ □2

ENERGE□ Limited - ABN 40 078 849 055
26 Reddacliff Street Newstead QLD 4006
GPO Box 1461 Brisbane Queensland 4001

24 Hour Loss of Supply □□ □2 □2
2□ □our Emergencies □□ □□ □2
General Enquires □□ □2 □□

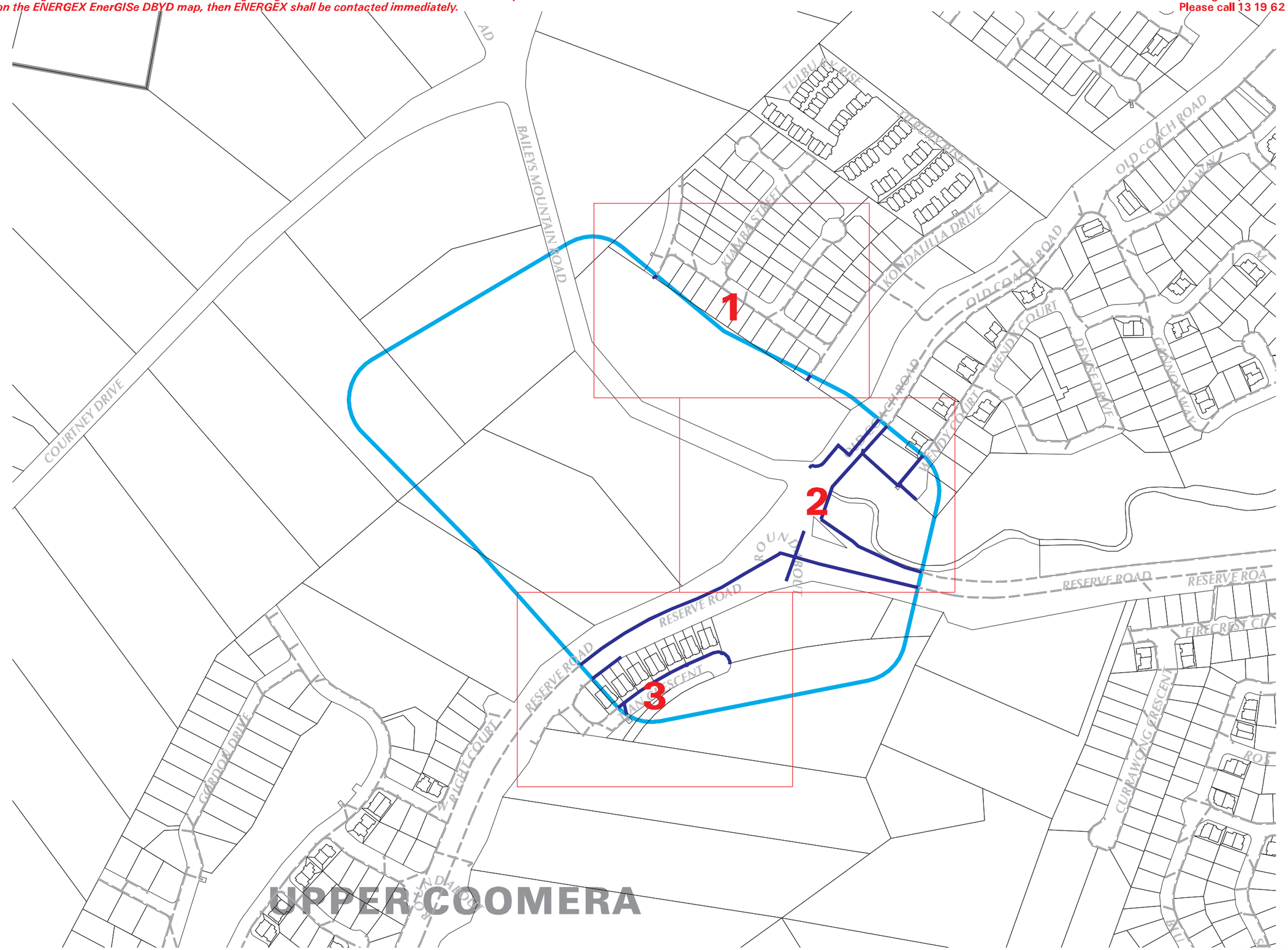
Contact ENERGEX DBYD Monday to Friday from 7 am to 3:30 pm on (07) 3664 5400 or dbyd@energex.com.au
www.energex.com.au

To resubmit or change the nominated search area contact DBYD via Phone 1100 or www.1100.com.au

PAPER SIZE A3

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISe DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations Please call 13 19 62



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

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energex

EnerGISe
DBYD

Date: 13 Jun 18 Time: 14.13.45
Requested By: DBYD

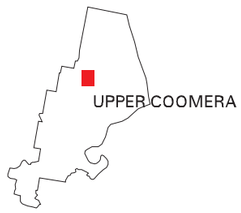
NOT TO SCALE

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Enquiry No: 72426067
KEY MAP

Enquiry Area

LOCALITY DIAGRAM



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All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISe DBYD map, then ENERGEX shall be contacted immediatelv.

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energex

EnerGISe

DBYD

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Requested By: DBYD

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Enquiry No: 72426067

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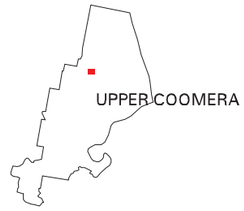
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- Cubicle Transformer
- Ring Main Unit
- Metering Unit
- Link Pillar
- Service Pillar
- Junction Pillar
- Pit
- Cable Joint
- Cable Termination
- Cable Marker
- Street Light Pole
- Earth
- Works Order Polygon
- Cable Voltage Less Than 33kV
- Cable Voltage 33kV or Higher
- Direct-Lay Cable
- Conduit
- Multi-Section Duct
- Trench
- Cable Tray
- Tunnel

N W E S

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LOCALITY DIAGRAM



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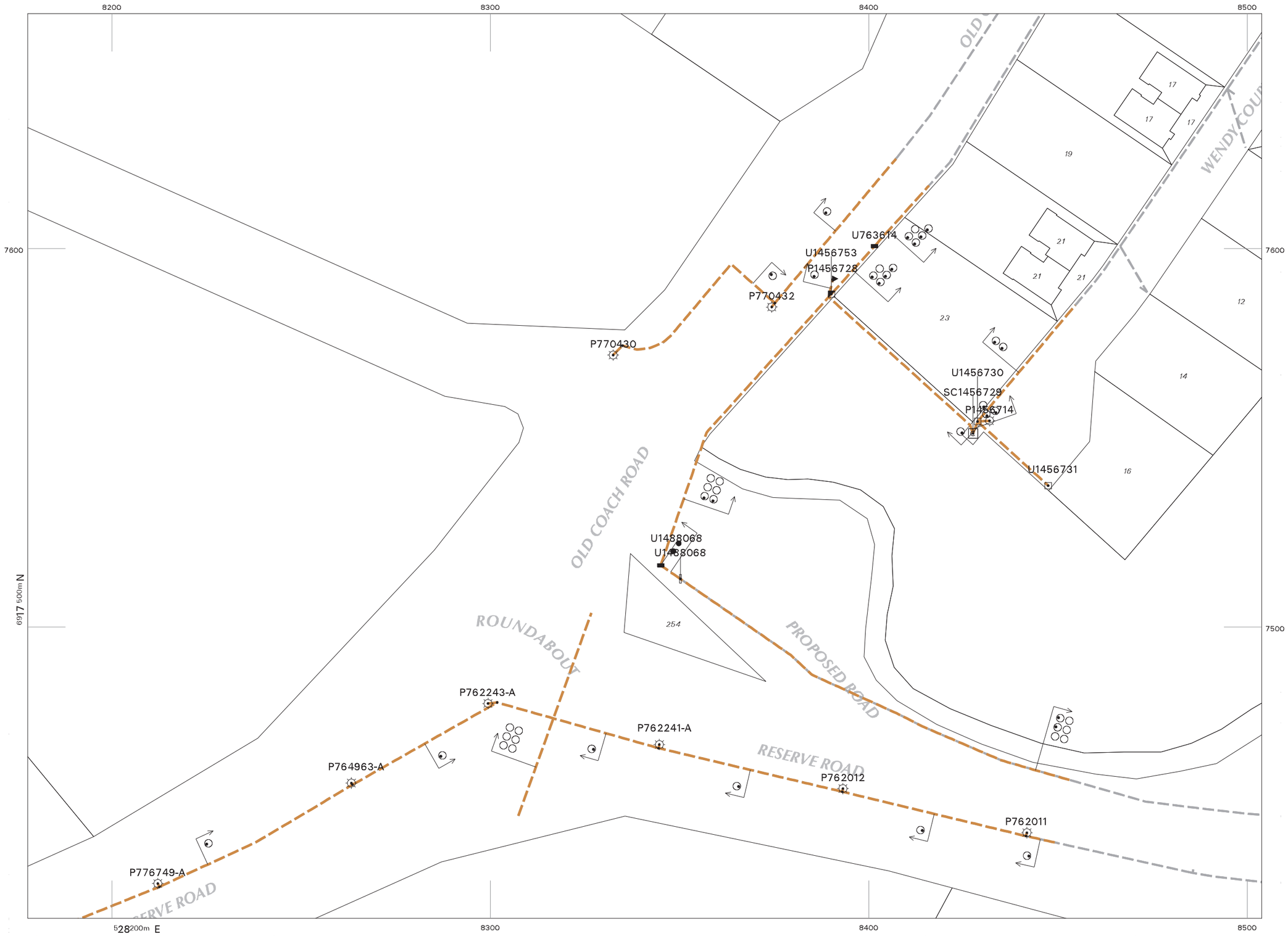
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energex

EnerGISe

DBYD

Date: 13 Jun 18 Time: 14.14.14
Requested By: DBYD

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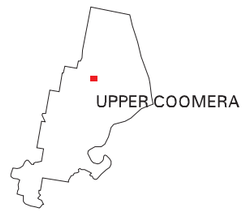
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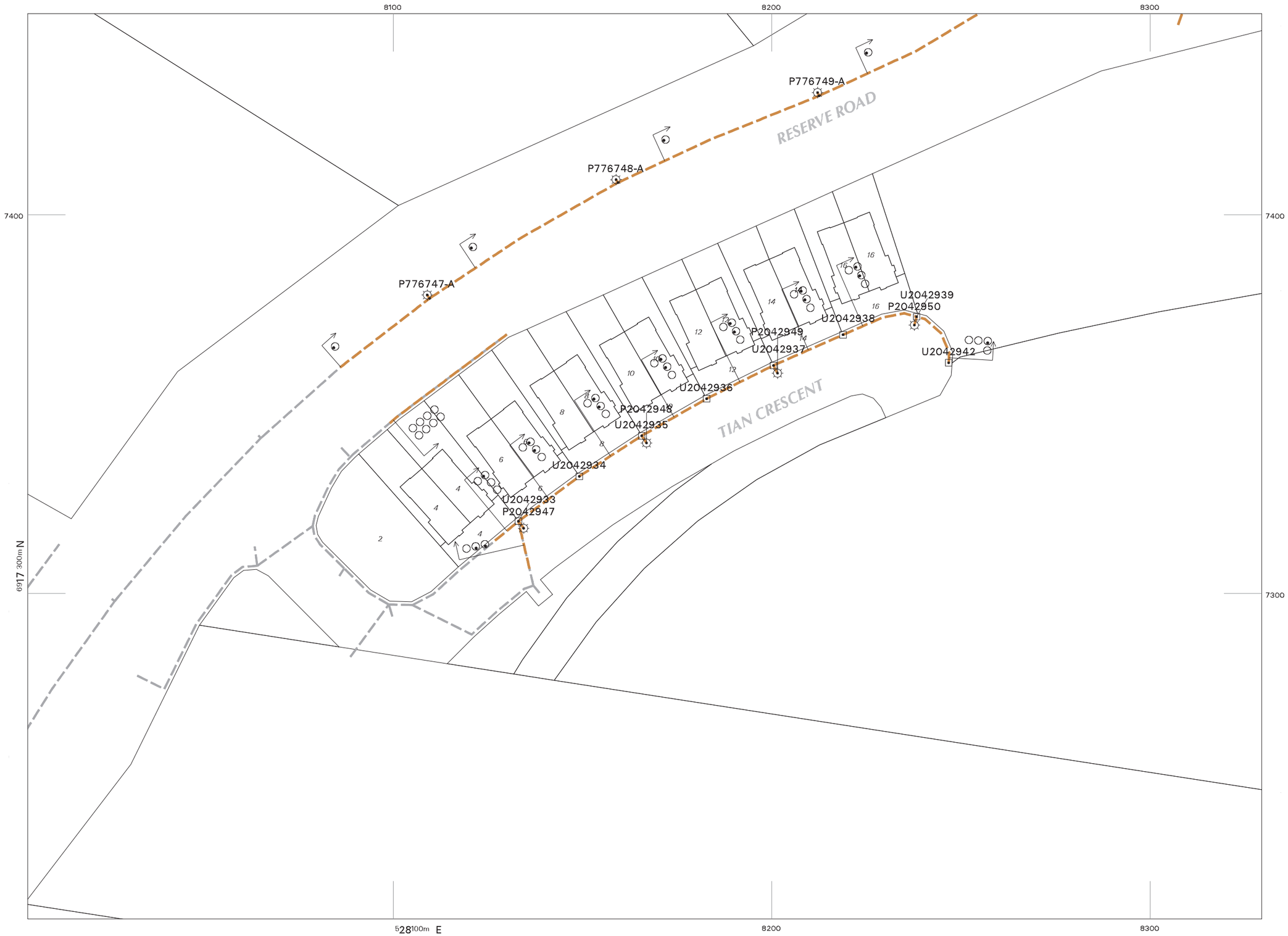
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energex

EnerGISe

DBYD

Date: 13 Jun 18 Time: 14.14.35
Requested By: DBYD

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Enquiry No: 72426067

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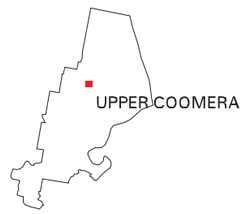
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- *Cubicle Transformer*
- *Ring Main Unit*
- *Metering Unit*
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- *Service Pillar*
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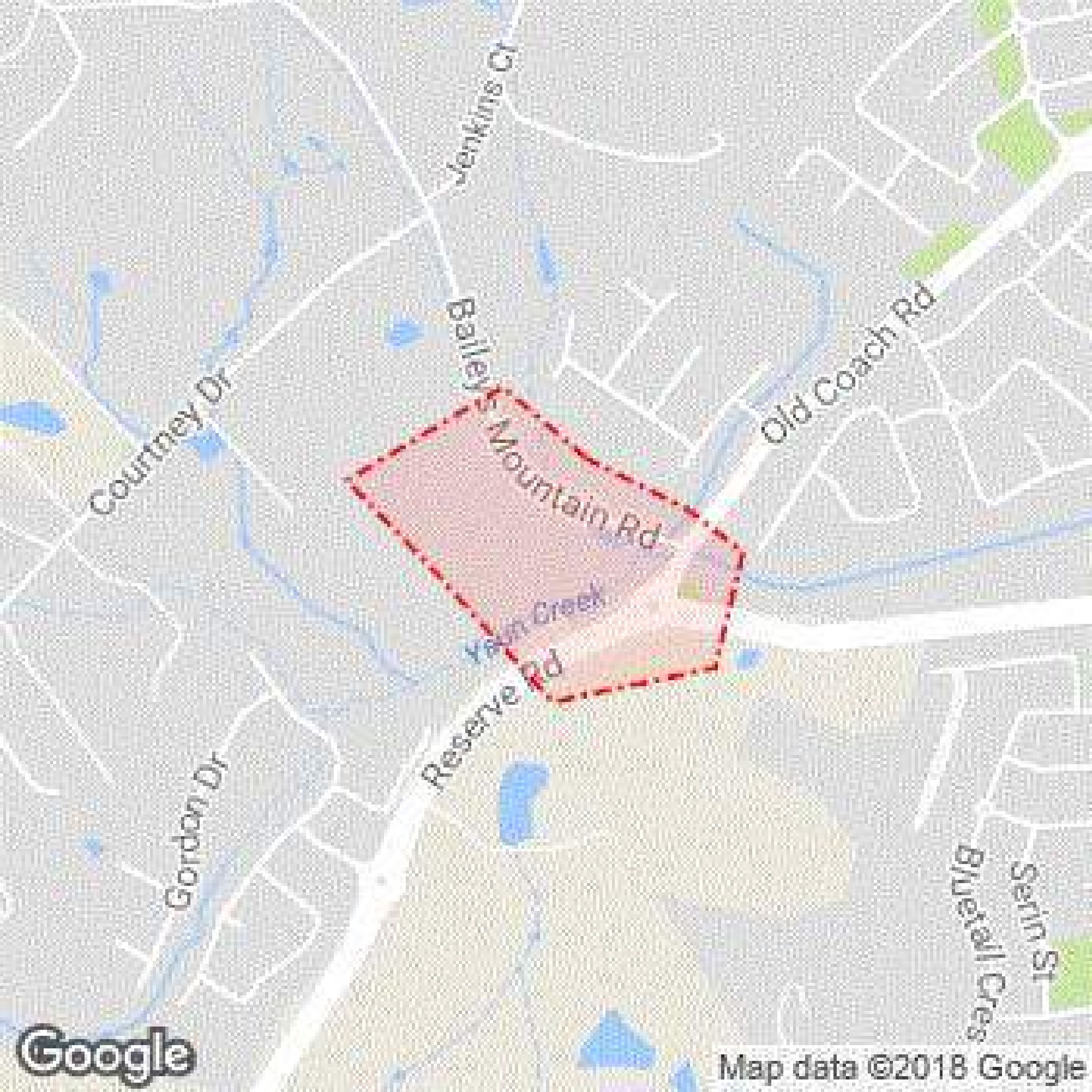
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Jenkins Cr
Courtney Dr
Valley View Rd
Mountain Rd
Old Coach Rd
Reserve Rd
Gordon Dr
Bluebell Cres
Serin St
Google
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Energex DBYD
Business Hours Contact
(7am – 3:30pm Weekdays)
Ph. (07) 3664 5400
Email - dbyd@energex.com.au

Dial Before You Dig (DBYD)

Terms and Conditions

Electricity Emergencies
All Areas – 2 ours
13 19 62

"Duty of Care" for Everyone"

Responsibilities – When Working in the Vicinity of Energex Plant

Everyone has a legal "Duty of Care" that must be observed, particularly when working in the vicinity of electrical plant. Electrical plant includes underground cables, conduits and other associated underground equipment. When discharging this "Duty of Care" in relation to Energex plant, the following points must be considered:

1. It is the responsibility of the architect, consulting engineer, developer, and head contractor in the project planning stages to design for minimal impact and protection of Energex plant.
2. It is the constructor's responsibility to:
   a) Anticipate and request plans of Energex plant for a particular location at a reasonable time before construction begins.
   b) Visually locate Energex plant by hand or vacuum excavation where construction activities may damage or interfere with Energex plant.
   c) Contact Energex (see above for details) if Energex plant is wholly or partly affected by planned construction activities.
   d) For proposed excavations within 500mm of any 33kV 110/132kV underground networks, please allow a minimum of 20 working days' notice in your construction program for Energex to review proposed designs, provide comment and allow some time for any required modifications to be made.
   e) To notify Energex if the information provided is found to be not accurate or assets are found on site that are not recorded on the Energex DBYD plans.
   f) Read and understand all the information and disclaimers provided

I PORTANT NOTES:

- **Plans and or details pro ided by Energex are current for one month from the date of dispatch** and should be disposed of by shredding or any other secure disposal method after use. A new DBYD enquiry must be made for proposed works/activities to be undertaken outside of the 30 day period.
- As the alignment and boundaries of road ways with other properties (and roads within road ways) frequently change, the alignments and boundaries contained within Energex plans and maps will frequently differ from present alignments and boundaries "on the ground". Accordingly, in every case where it appears that alignments and boundaries have shifted, or new road ways have been added, the constructor should obtain confirmation of the actual position of Energex cables and pipelines under the road ways. In no case should the constructor rely on statements of third parties in relation to the position of Energex cables and pipelines. It is the applicant's responsibility to accurately locate all services as part of the design and/or prior to excavation.
- Energex does not provide information on private underground installations, including consumers' mains that may run from Energex mains onto private property. Assets located on private property are the responsibility of the owner for identification and location.
- Energex retains copyright of all plans and details provided in connection with your request.
- Energex plans or other details are provided for the use of the applicant, its servants, or agents, and shall not be used for any unauthorised purpose.
- Energex plans are circuit diagrams or pipe indication diagrams only and indicate the presence of plant in the general vicinity of the geographical area shown. Exact ground cover and alignments cannot be given with any certainty as such levels can change over time.
- Energex, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Energex against any claim or demand for any such loss or damage.
- The constructor is responsible for all plant damages when works commence prior to obtaining Energex plans, or failure to follow agreed instructions, or failure to demonstrate all reasonable measures were taken to prevent the damage once plans were received from Energex.
- Energex reserves all rights to recover compensation for loss or damage caused by interference or damage, including consequential loss and damages to its cable network, or other property.
- All underground conduits are presumed to contain asbestos. Refer to "Code of Practice for the Management and Control of Asbestos in Workplaces NOHSC: 2018 (2005)
- Plans provided by Energex do not show the presence of any Overhead Network
- In addition to underground cables marked on attached plan there maybe underground Earth Conductors in the vicinity of the nominated work area(s) that are not marked on the plans.
- There may also be other buried assets such as tanks for fluid filled cables that do not appear on GIS plots but are shown on detailed as constructed drawings.
- Being aware of your obligations in s 304 Excavation work— underground essential services information under the Work Health and Safety Regulation 2011, Chapter 6 Construction work, Part 6.3 Duties of person conducting business or undertaking. This includes but is not limited to taking reasonable steps to obtain the current information providing this information to persons engaged to carry out the excavation work. For further information please refer to: - http://www.legislation.qld.gov.au/LEGISLTN/SLS/2011/11SL240.pdf
- Energex plans are designed to be printed in colour and as an A4 Landscape orientation.

2□ Conditions – □When Working in the Vicinity of Energex Plant□

2□ Records:
The first step before any excavation commences is to obtain records of Energex plant in the vicinity of the work. For new work, records should be obtained during the planning and design stage. The records provided by Energex must be made available to all construction groups on site. Where plant information is transferred to plans for the proposed work, care must be exercised to ensure that important detail is not lost in the process.

2□2 Location of Cables:
Examining the records is not sufficient, as reference points may change from the time of installation. Records must also be physically proven when working in close proximity to them. The exact location of plant likely to be affected shall be confirmed by use of an electronic cable and pipe locater followed by **careful hand or □acuum exca□ation to the le□el of co□er slabs or conduits**□ When conducting locations Please be aware that **no** unauthorised access is permitted to Energex Assets– including Pits, Low Voltage Disconnection Boxes, Low Voltage Pillars or High Voltage Link Boxes.

□**and or □acuum exca□ation must be used in ad□ance of exca□ators**□ In any case, where any doubt exists with respect to interpretation of cable records, Energex shall be contacted. For after hour's emergencies Energex should be contacted on Ph. 13 62 62.

2□ Electrical Cable Installation □ethods:
Energex cables are installed with a variety of protection devices including:

1. Clay paving bricks or tiles marked "Electricity" or similar (also unmarked)
2. Concrete or PVC cover slabs
3. PVC, A/C or fibro conduit, fibre reinforced concrete, iron or steel pipe
4. Concrete encased PVC or steel pipe
5. Thin plastic marker tape
6. Large pipes housing multiple ducts
7. Multiple duct systems, including earthenware or concrete 2-, 4-, and 6-way ducts and shamrocks

Note: Some cables are known to be buried without covers and cables may change depth or alignment along the route.

2□ Exca□ating Near Cables:
For all work within 2.5 m of nominal location, the constructor is required to hand or vacuum excavate (pothole) and expose the plant, hence proving its exact location before work can commence.

2□ Exca□ating Parallel to Cables:
If construction work is parallel to Energex cables, then hand or vacuum excavation (potholing) at least every 4 m is required to establish the location of all cables, hence confirming nominal locations before work can commence. *Generally, there is no restriction to excavations parallel to Energex cables to a depth not exceeding that of the cable. If an excavation exceeds the depth of the cables and it is likely that the covers or bedding material around the cables/pipes will move, Energex must be contacted .**Note: Cable depths & alignment may change suddenly**.*

2□ Separation from Cables:
Any service(s) must be located at the minimum separation as per the tables below:

Table □□□ inimum Separation Requirements for □nderground Ser□ices Running Parallel with Energex Assets

□□ inimum Separation required in mm□							
Voltage Level	□as	Communication or TV	Water		Sanitary drainage		Storm Water
			≤DN 2□□	□DN2□□	≤DN 2□□	□DN 2□□	
LV	250	100	500	□1000	500	1000	500
□**V**		300					
□Contact Energex/council to obtain specific separation distances							

Table 2□□ inimum Separation Requirements for □nderground Ser□ices Crossing Energex Assets

□□ inimum Separation required in mm□					
Voltage Level	□as	Communication or TV	Water	Sanitary drainage	Storm Water
LV □ □V	100	100	300	300	100

Where the above table does not list a separation requirement for a particular underground service then 300mm shall be used.

2□ Exca□ating Across Cables:
The standard clearance between services shall be maintained as set down in Table 2 above. If the width or depth of the excavation is such that the cables will be exposed or unsupported, then Energex shall be contacted to determine whether the cables should be taken out of service, or whether they need to be protected or supported. In no case shall a cable cover be removed without approval. A cable cover may only be removed under the supervision of an Energex authorised representative. Protective cover strips when removed must be replaced under Energex supervision. Under no circumstances shall they be omitted to allow separation between Energex cables and other services.

2□8 □ea□y □achinery Operation O□er Cables:
Where heavy "Crawler" or "Vibration" type machinery is operated over the top of cables, a minimum cover of 450 mm to the cable protective cover mains must be maintained using load bearing protection whilst the machinery is in operation. For sensitive cables (i.e. 33 and 110kV fluid and gas filled cables), there may be additional constraints placed on vibration and settlement by Energex.

2□ Directional Boring Near Cables:
When boring parallel to cables, it is essential that trial holes are carefully hand or vacuum excavated at regular intervals to prove the actual location of the conduits/cables before using boring machinery. Where it is required to bore across the line of cables, the actual location of the cables shall first be proven by hand or vacuum excavation. A trench shall be excavated one metre from the side of the cables where the auger will approach to ensure a minimum clearance of 500mm above and below all LV, 11kV, 33kV □ 110/132kV cables shall be maintained.

2 Explosives:
Explosives must not be used within 5 metres of cables, unless an engineering report is provided indicating that no damage will be sustained. Clearances should be obtained from Energex's Planning Engineer for use of explosives in the vicinity of Energex cables.

2 Damage Reporting:
All damage to cables, conduits and pipes must be reported no matter how insignificant the damage appears to be. Even very minor damage to cable protective coverings can lead to eventual failure of cables through corrosion of metal sheaths and moisture ingress.
All work in the vicinity of damaged plant should cease and the area should be vacated until a clearance to continue work has been obtained from an Energex officer.

2 2 Plant Solutions and Assistance:
If plant location plans or visual location of Energex plant by hand or vacuum excavation reveals that the location of Energex plant is situated wholly or partly where the developer or constructor plans to work, then Energex shall be contacted to arrange for possible engineering solutions.

If Energex relocation or protection works are part of the agreed solution, then payment to Energex for the cost of this work shall be the responsibility of the principal developer or constructor. Energex will provide an estimated quotation for work on receipt of the developer's or constructor's order number before work proceeds.

It will be necessary for the developer or constructor to provide Energex with a written Work Method Statement for all works in the vicinity of, or involving Energex plant. This Work Method Statement should form part of the tendering documentation and work instruction.

2 Remote or On-Site Location Advice: This service shall be provided at Energex's discretion:
In response to your request, Energex may provide a site visit when 33kV or above cables are present only, however any markings or pegs placed on the site will be indications of approximate equipment locations only. **All markings must be confirmed by careful hand or vacuum excavation**.

Energex may provide either remote over the phone or on-site location advice to assist in the location of Energex plant, including how to visually locate and protect the plant when excavating.

Where on-site location advice is provided, the constructor is responsible for all hand or vacuum excavation (potholing) to visually locate and expose Energex plant.

2 Vacuum Excavations Hydro Vac

When operating hydro vac equipment to excavate in vicinity of underground electrical assets (cables/conduits):

Fitted with:

- Nonconductive (neoprene rubber or equivalent) vacuum (suction) hose.
- Oscillating nozzle on pressure wand with water pressure adjusted to not exceeding 2000 psi.

Maintain a minimum distance of 200mm between end of pressure wand and underground electrical assets. DO NOT insert the pressure wand jet directly into subsoil.

Ensure pressure wand is not directly aimed at underground electrical assets (cables/conduits).

2 Safety Notices Underground Work

There is no exclusion zone applicable for underground electrical assets – conduits, cables (unless cable is damaged, or conductors or terminations have been exposed) therefore there is **no requirement for a written Safety Advice** to be obtained provided the work location does not contain overhead electric lines or other exposed live parts.

Thank you for your interest in maintaining a safe and secure Electricity Distribution network.

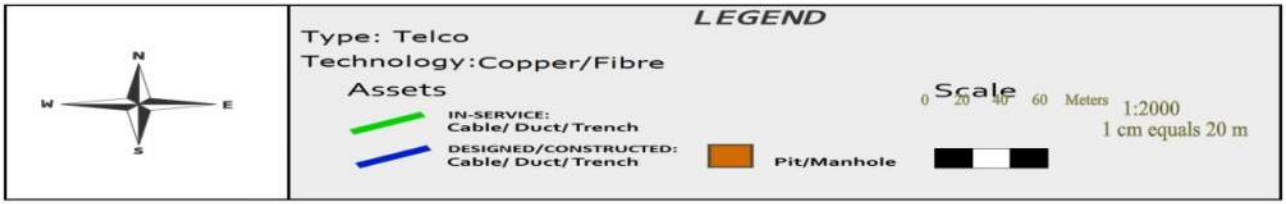
Energex welcomes your feedback on this document via email to dbyd@energex.com.au

Indicati□e Plans

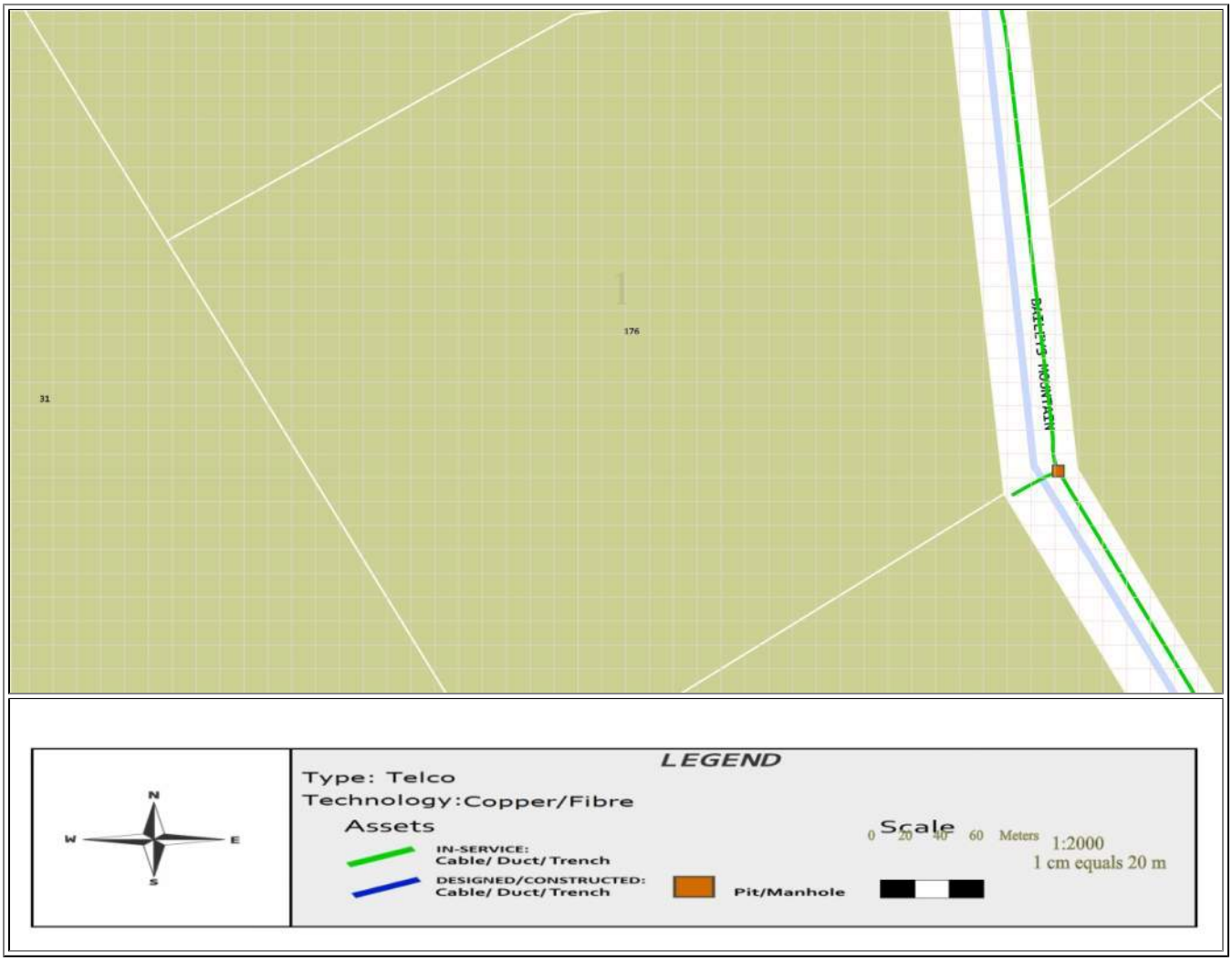
Issue Date:	13/06/2018
Location:	202 Baileys Mountain Road,Upper Coomera,QLD-4209

DIAL BEFORE YOU DIG www.1100.com.au

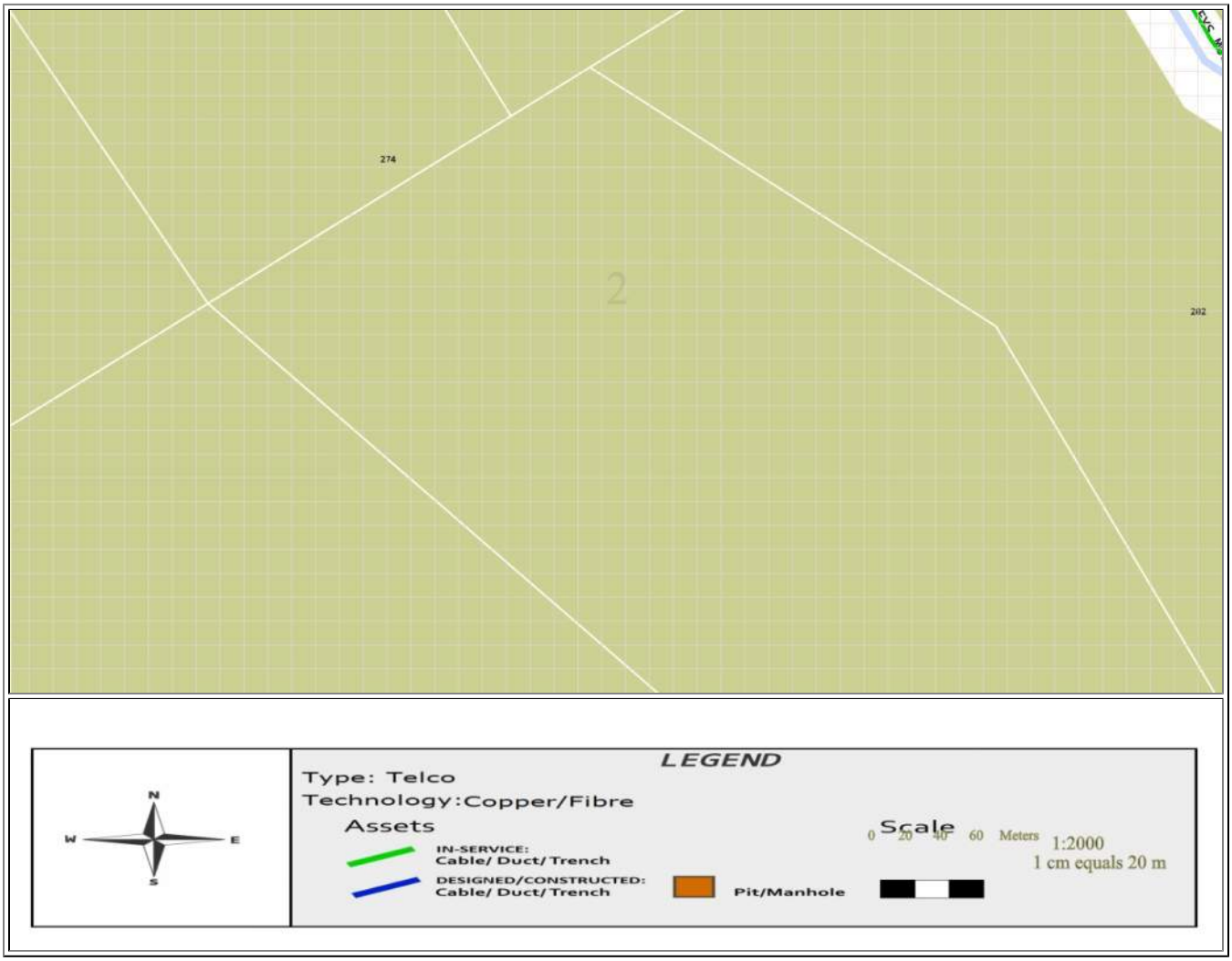
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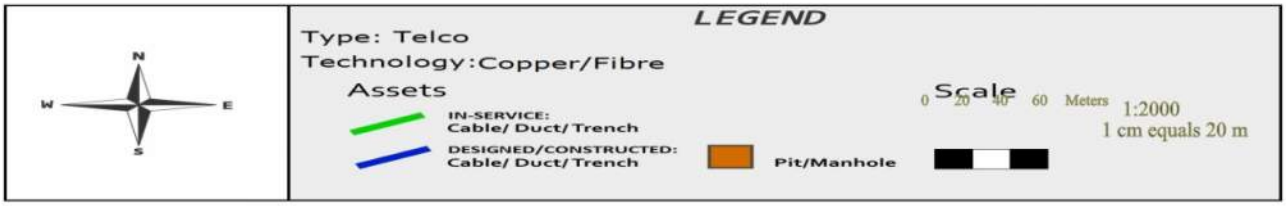


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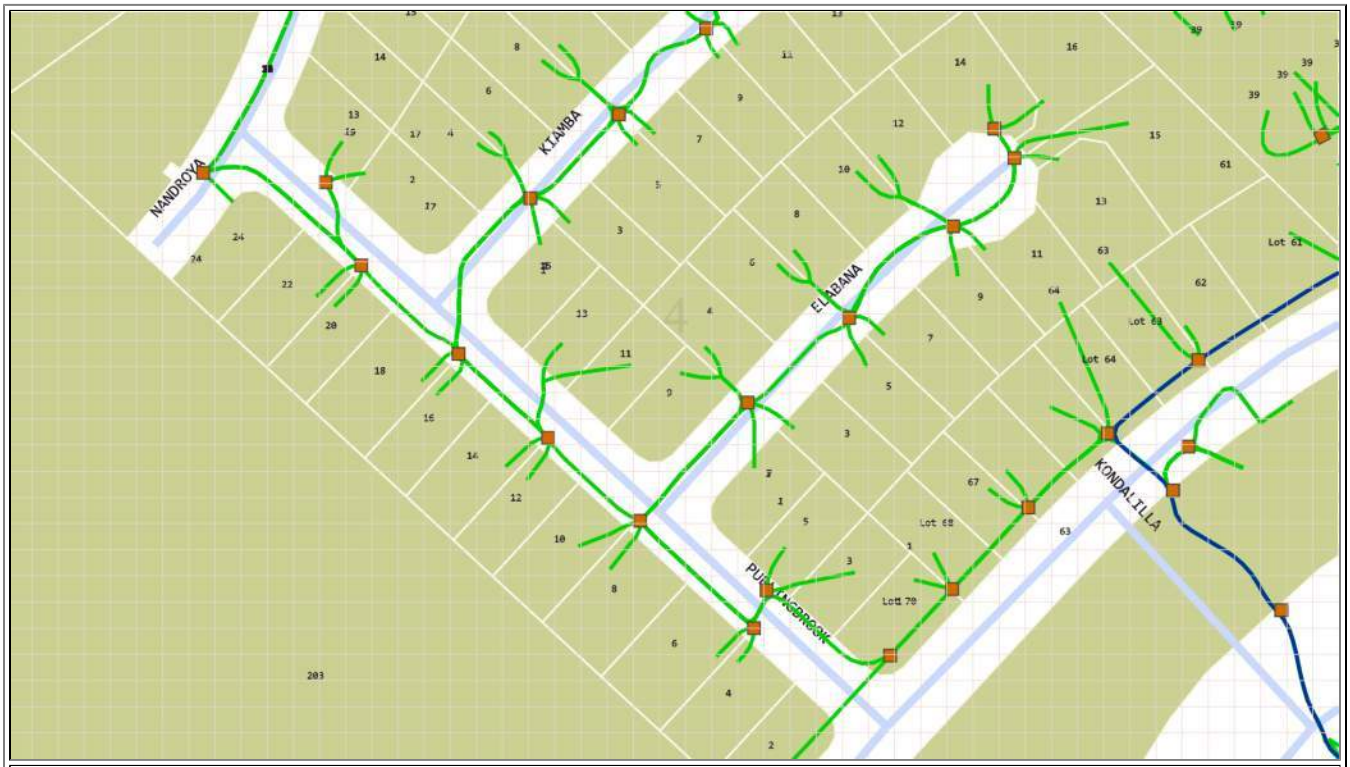


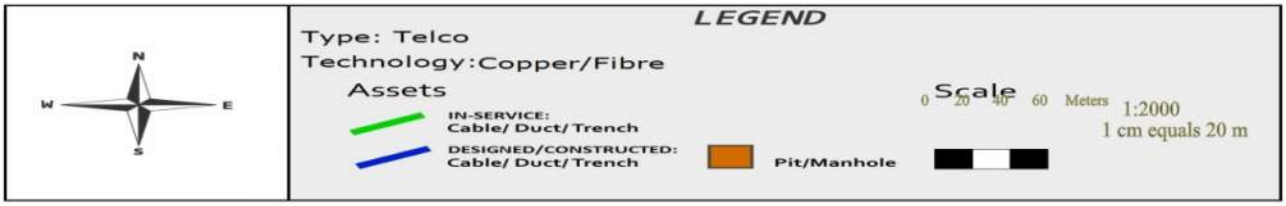
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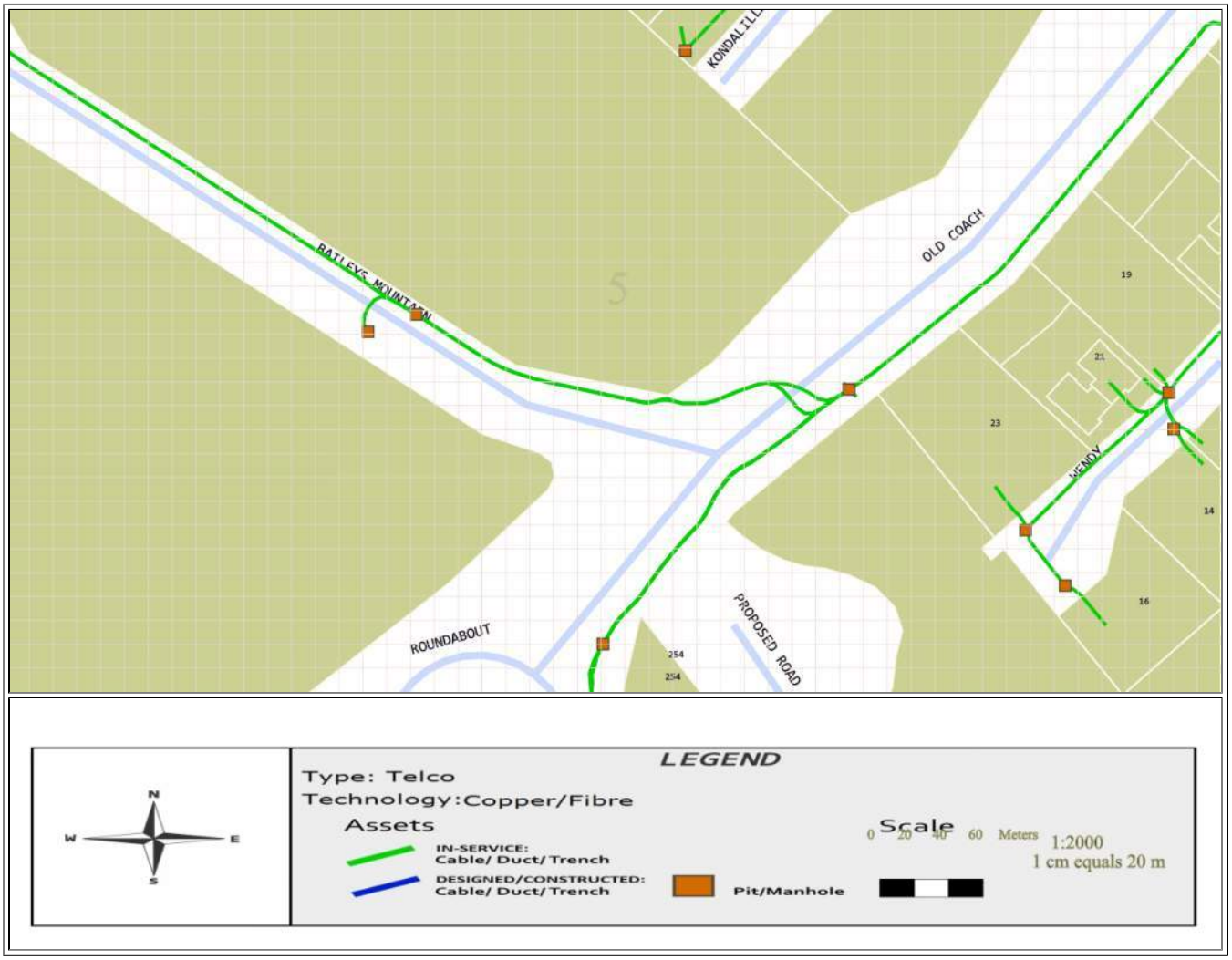


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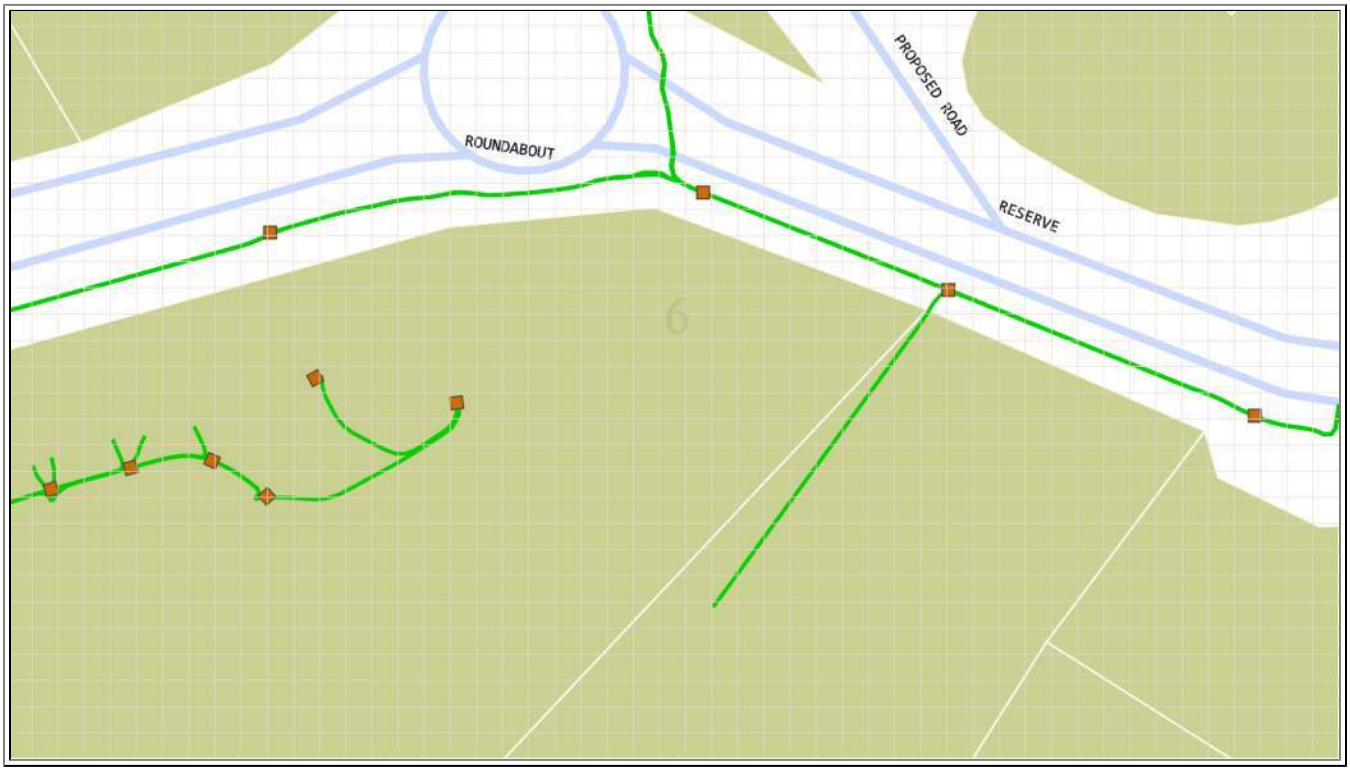




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Emergency Contacts

You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

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To:	Mr Oliver Purton
Phone:	0755034806
Fax:	Not Supplied
Email:	Oliver.Purton@arcadis.com

Dial before you dig Job #:	14389450	
Sequence #	72426070	
Issue Date:	13/06/2018	
Location:	202 Baileys Mountain Road,Upper Coomera,QLD-4209	

Information

The area of interest requested by you contains one or more assets.

nbn Assets	Search Results
Communications	Asset identified
Electricity	No assets

In this notice **NBN Facilities** means *underground fibre optic, telecommunications and/or power facilities, including but not limited to cables, owned and controlled by* ***nbn***

Location of Underground Power Facilities

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn's** records indicate that there **ARE nbn** Facilities in the vicinity of the location identified above ("Location").
- **nbn** indicative plan/s are attached with this notice ("Indicative Plans").

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- The Indicative Plan/s show general depth and alignment information only and are not an exact, scale or accurate depiction of the location, depth and alignment of **nbn** Facilities shown on the Plan/s.
- In particular, the fact that the Indicative Plans show that a facility is installed in a straight line, or at uniform depth along its length cannot be relied upon as evidence that the facility is, in fact, installed in a straight line or at uniform depth.
- You should read the Indicative Plans in conjunction with this notice and in particular, the notes below.
- You should note that, at the present time, the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables. As such, consistent with the notes below, particular care must be taken by you to make your own enquiries and investigations to precisely locate any power cables and manage the risk arising from such cables accordingly.
- The information contained in the Indicative Plan/s is valid for 28 days from the date of issue set out above.You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate **nbn** Facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Dial Before You Dig Service. If you are planning to excavate and require further information, please contact **nbn** on 1800 626 329. For any enquiries related to moving assets or Planning and Design activities, please visit the **nbn** Commercial Works website to complete the online application form.

Notes:

1. You are now aware that there are **nbn** Facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (CoA) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.

Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By accepting the plans,you are agreeing to these conditions. These conditions are in addition, and not in replacement of, any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own

investigations (including engaging appropriately qualified plant locators at your expense to locate **nbn** Facilities during any activities you carry out on site).

2. You acknowledge that **nbn** has specifically notified you above that the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables.
3. You should not assume that **nbn** Facilities follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
4. In carrying out any works in the vicinity of **nbn** Facilities, you must maintain the following minimum clearances:
    - 300mm when laying assets inline, horizontally or vertically.
    - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates.
    - 1000mm when operating mechanical excavators.
    - Adherence to clearances as directed by other asset owner's instructions and take into account any uncertainty for power cables.
5. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn** fibre optic,copper and coaxial cables,and power cable feed to **nbn** assets).Damage to underground electric cables may result in:
    - Injury from electric shock or severe burns, with the possibility of death.
    - Interruption of the electricity supply to wide areas of the city.
    - Damage to your excavating plant.
    - Responsibility for the cost of repairs.
6. You must take all reasonable precautions to avoid damaging **nbn** Facilities. These precautions may include but not limited to the following:
    - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likelihood of damage to the cable, for example: the blades of hand equipment should be aligned parallel to the line of the cable rather than digging across the cable.
    - If any undisclosed underground cables are located, notify **nbn** immediately.
    - All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
    - The safety of the public and other workers must be ensured.
    - All excavations must be undertaken in accordance with all relevant legislation and regulations.
7. You will be responsible for all damage to **nbn** Facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include, without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
8. You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

9. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any plans(including Indicative Plans) attached hereto. Except as expressly provided to the contrary in this information sheet or the attached plans(including Indicative Plans), all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

State/Territory	Documents
National	Work Health and Safety Act 2011
	Work Health and Safety Regulations 2011
	Safe Work Australia - Working in the Vicinity of Overhead and Underground Electric Lines (Draft)
	Occupational Health and Safety Act 1991
NSW	Electricity Supply Act 1995
	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
VIC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
QLD	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
SA	Electricity Act 1996
TAS	Tasmanian Electricity Supply Industry Act 1995
WA	Electricity Act 1945
	Electricity Regulations 1947
NT	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
ACT	Electricity Act 1971

Thank You,

Network Operations Centre - Assurance

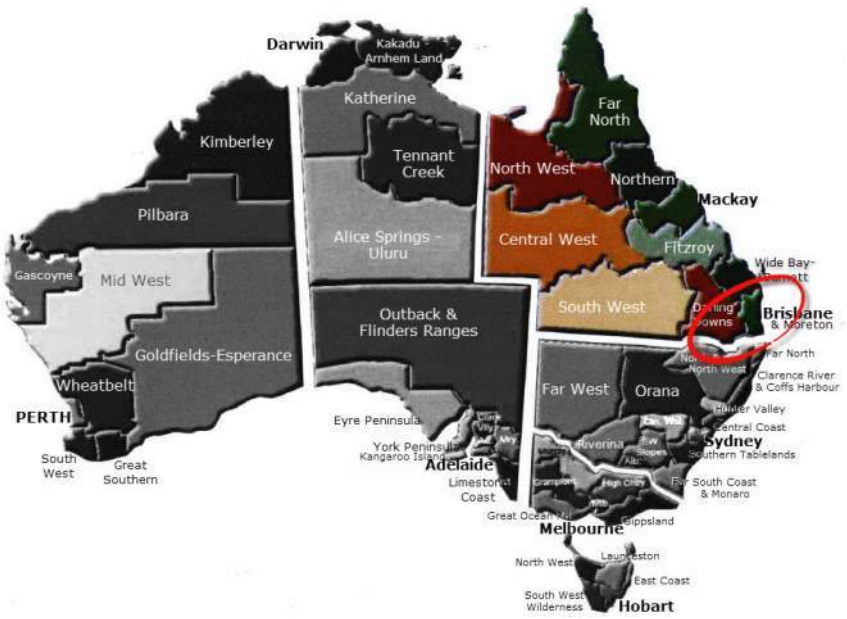
Date: 13/06/2018

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TELSTRA ACCREDITED PLANT LOCATORS – QUEENSLAND. SOUTH-EAST REGION

Regions – Queensland South-East

Telstra plans are intended to be indicative only. A plant location service (Telstra accredited) is required to identify the exact location of the plant and ensure that the asset is protected during construction work. It is your responsibility as part of your "Duty of Care" to engage an Accredited Plant Locator.

***Optic fibre cable locations** must be performed by a locator with Telstra optic fibre location accreditation.

Locators with Telstra optic fibre cable location accreditation are indicated by either a 'yes' in the 'Fibre' column or the DBYD Certified Locator Symbol.

DIAL BEFORE YOU DIG CERTIFIED LOCATOR

Please contact a Telstra accredited locator from the pages following (fees apply).

Telstra Accredited Plant Locators – Queensland South-East.

SOUTH EAST QLD

Company Name & service areas	*Fibre	Contact	
1 300 B4UDIG All areas		1300 248 344 admin@1300b4udig.com.au www.133b4udig.com.au	Phone Mobile Fax Email Web
1300 Locate Caboolture and surrounding districts		07 5499 3350 0407 570 441 07 5499 3353 admin@1300locate.com.au www.1300locate.com.au	Phone Mobile Fax Email Web
AAA Locating Toowoomba, Darling Downs, SE Qld and surrounding districts		0418 718 449 info@uul.com.au www.uul.com.au	Phone Mobile Fax Email Web
ABC Locators (Brownsdon & Sons Pty Ltd) Darling Downs, Southern Downs, Burnett, Lockyer Valley, Brisbane Valley, South East Qld, Northern NSW		0421 553 911 0407 423 499 abc.locate@gmail.com	Phone Mobile Fax Email Web
Abletech Underground South East Qld, Northern NSW, Rockhampton, Gladstone, Roma, Goondiwindi, Toowoomba, Charleville, Cunnamulla		0418 511 767 abletech@bigpond.net	Phone Mobile Fax Email Web
All Asset Locations Pty Ltd Sunshine Coast & Hinterland, Brisbane North, Brisbane Valley, Mary Valley, Gympie		0478 846 025 allassetlocations@gmail.com	Phone Mobile Fax Email Web
All Underground Pipe & Cable Location Pty Ltd Glass House Mountains, Sunshine Coast, Chinchilla & Kilcoy areas		0437 687 709 info@undergroundpclocation.com.au	Phone Mobile Fax Email
Alpha Plant Locations. Queensland – South-East, Central & Central West areas. New South Wales – North-East & North-West areas. Available to travel further if required.		0429 968 812 tombraun@bigpond.com	Phone Mobile Fax Email Web
ATTAIN Infrastructure Pty Ltd. Sunshine Coast Region Maroochydore Mooloolaba Nambour		1300 294 969 0438 922 200 brad@attain.com.au www.attain.com.au	Phone Mobile Fax Email Web
Auscom Qld Pty Ltd. Sunshine Coast region & Wide Bay		07 5446 6962 0431 973 670 auscom.qld@bigpond.com www.auscomqld.com	Phone Mobile Fax Email Web
Aussie Hydrovac Services Servicing South East Queensland, Central Queensland and Mines areas as required		07 3287 7818 0490 163 877 07 3287 7819 info@aussiehydrovac.com.au www.aussiehydrovac.com.au	Phone Mobile Fax Email Web
A.U.S. Locators Pty Ltd. Brisbane area		0408 857 024 auslocat@gmail.com	Phone Mobile Fax Email Web
BSure Locators All areas within the Wide Bay, Burnett, Central Queensland, Western Queensland.		0488 520 688 admin@bsurelocators.com.au www.bsurelocators.com.au	Phone Mobile Fax Email Web

Telstra Accredited Plant Locators – Queensland South-East.

C Locate South-East Queensland areas		0437 808 444 clocate@bigpond.com	Phone Mobile Fax Email Web
Construction Sciences Pty Ltd. All areas		1300 224 664 utilities@constructionsciences.net www.constructionsciences.net	Phone Mobile Fax Email Web
DC Locators Pty Ltd Ipswich, Brisbane, Lockyer Valley, Logan, Beaudesert, Scenic Rim, Somerset & Southern Downs area		07 3389 2313 0439 379 741 0419 679 741 dcloc@powerup.com.au	Phone Mobile Mobile Email Web
Downunder Locations (NSW) Pty Ltd South East Qld and Northern NSW – Brisbane to Ballina/Tweed Heads		0438 243 856 07 5523 0702 downunderlocations@gmail.com	Phone Mobile Fax Email Web
Dynamic Hydro Excavations. Brisbane, Gold Coast, Toowoomba, Sunshine Coast, Northern NSW, Ballina, Sydney and surrounding districts.		07 5564 8142 0421 406 642 sales@dynamicexcavations.com.au www.dynamicexcavations.com.au	Phone Mobile Fax Email Web
Earth Radar (Vac Group Operations Pty Ltd). QLD – Brisbane, Darling downs, Wide Bay/Burnett and Fitzroy areas, Gladstone to Sarina & Mackay districts and west to Blackwater area. NSW – Far North, Northern Rivers areas.		1300 822 835 0447 713 477 Nathan.hickson@earthradar.com.au www.earthradar.com.au	Phone Mobile Fax Email Web
Expert Service Locating Pty Ltd Sunshine Coast, South East Qld, Brisbane, Gold Coast and Northern NSW		0420 346 477 info@expertservicelocating.com.au www.expertservicelocating.com.au	Phone Mobile Fax Email Web
Eye Spy Cable & Pipe Pty Ltd. IPSWICH, Brisbane, Lockyer Valley, Logan, Beaudesert, Scenic Rim, Somerset, Gold Coast, Southern Downs and surrounding districts. Also Sunshine Coast & Northern NSW.		0419 652 604 07 3818 2764 eyespy.location@optusnet.com.au	Phone Mobile Fax Email Web
Farmer Enterprises & Co Pty Ltd All areas		07 4671 2443 0429 622 897 07 4671 2443 digalot1@bigpond.com	Phone Mobile Fax Email Web
Hannahbull Locations Thuringowa – Townsville and all areas in Qld.		07 4751 8931 admin@hannahbull.com.au	Phone Mobile Fax Email Web
Hydro Digga All of NSW, ACT & South East Qld		0447 774 000 locator@hydrodigga.com	Phone Mobile Fax Email Web
Hydrovac Excavations (Aust) Pty Ltd Brisbane, Ipswich, Toowoomba region, Gold Coast, Sunshine Coast, Gympie region & Northern New South Wales.		07 5433 1811 07 5433 1911 enquiries@hydrovac.com.au	Phone Mobile Fax Email Web
Lambert Locations Pty Ltd South East Queensland, Northern NSW		1300 150 035 0418 150 035 admin@lambertlocations.com.au www.lambertlocations.com.au	Phone Mobile Fax Email Web
Leaktech Australia. Brisbane region, Toowoomba, Chinchilla, Sunshine Coast, Gympie and all surrounding areas.		1300 053 257 0421 624 794 07 5437 2146 info@leaklocations.com.au www.leaktech.com.au	Phone Mobile Fax Email Web

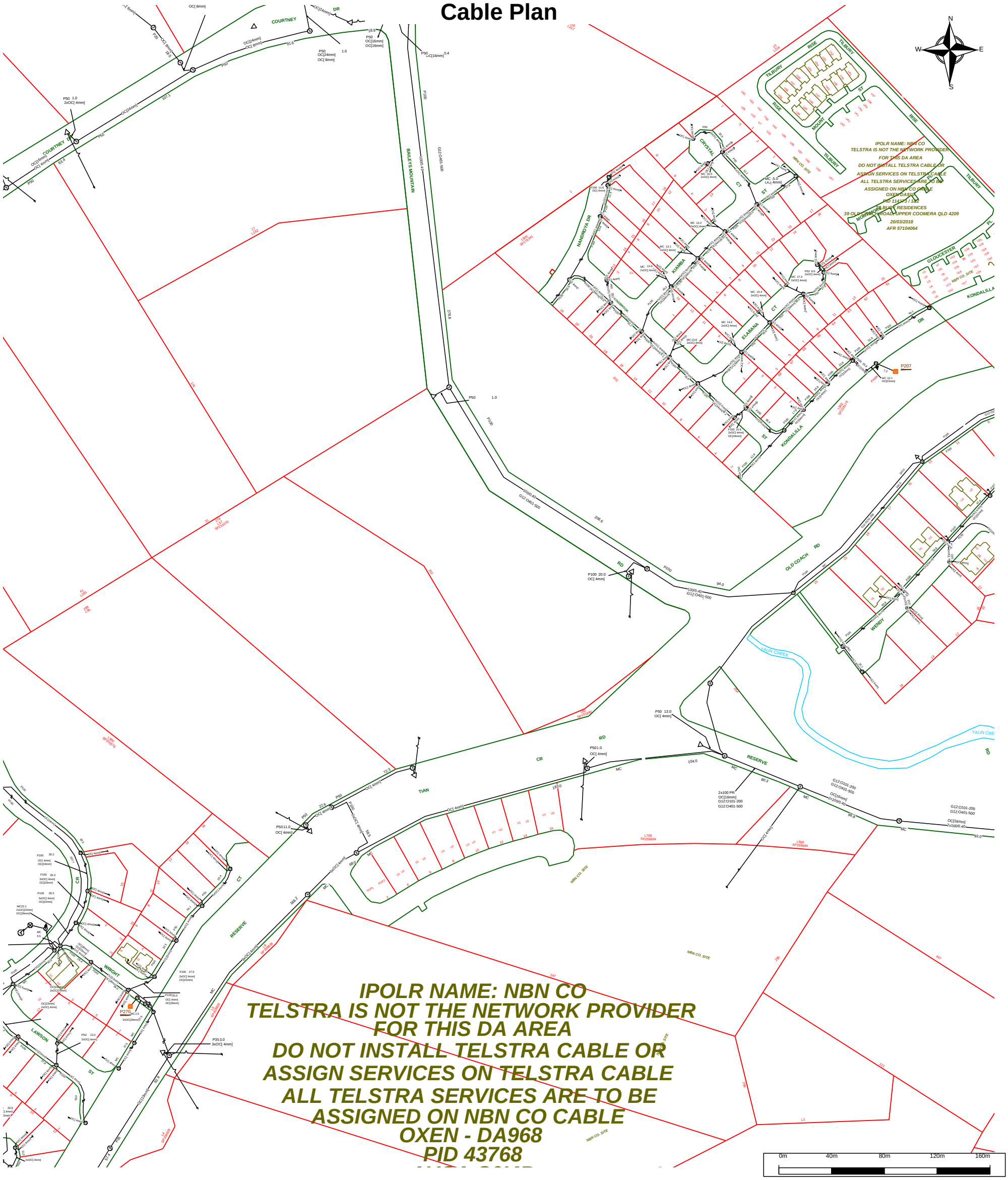
Telstra Accredited Plant Locators – Queensland South-East.

Locate And Detection Specialists Pty Ltd (LADS) Gold Coast, Brisbane, Sunshine Coast, Toowoomba, Northern NSW and surrounding regions.		0479 115 237 admin@ladsqld.com.au www.ladsqld.com.au	Phone Mobile Fax Email Web
Network Protection Specialists Tweed Heads, Brisbane, Gold Coast, Northern Rivers and surrounding districts		0418 257 527 nps.dean@gmail.com	Phone Mobile Fax Email Web
Orbital Underground Service Location All of QLD		1300 672 482 0423 006 286 07 5497 8384 locators@orbital.com.au	Phone Mobile Fax Email Web
Pin Point Locations (Nigel Mawby). Based in Bundaberg, servicing all surrounding areas.		0429 545 903 nigelamawby@bigpond.com	Phone Mobile Fax Email Web
Pipe Hawk CCTV Pty Ltd Brisbane & Gold Coast areas. And Northern Rivers		0435 558 533 admin@pipehawkcctv.com.au www.pipehawkcctv.com.au	Phone Mobile Fax Email Web
Protec Cable Locations Nambour, Sunshine Coast & Hinterland, Mary Valley, Gympie		0417 607 515 proteccable@bigpond.com	Phone Mobile Fax Email Web
Provac Australia Brisbane, Ipswich, Gold Coast, Northern NSW – and surrounding areas		1300 734 772 0450 268 012 enquiries@provac.net.au www.provac.net,au	Phone Mobile Fax Email Web
PULSE (Professional Underground Service Enterprises). Brisbane, Gold Coast, Sunshine Coast.		07 3245 1255 0490 837 772 07 3245 1255 stuart@pulseservices.net www.pulseservices.net	Phone Mobile Fax Email Web
RPS Australia East Pty Ltd Brisbane, Ipswich and surrounding areas		07 3237 8899 0418 842 970 simon.griffin@rpsgroup.com.au	Phone Mobile Fax Email Web
Safe Dig Vacuum Excavation Pty Ltd Mackay to Brisbane and surrounding areas		07 3376 0856 0408 880 262 07 3376 1258 admin@safedig.com.au	Phone Mobile Fax Email Web
Service Locate Pty Ltd. Brisbane & Gold Coast, Ipswich & Northern Rivers NSW		0424 906 777 admin@servicelocate.com.au www.servicelocate.com.au	Phone Mobile Fax Email Web
Shamrock Civil All of Queensland.		0424 605 497 shamrock@shamrockcivil.com.au	Phone Mobile Fax Email Web
Speciality Services Pty Ltd QLD Central, South & South-East.		07 4668 9909 0417 839 331 07 4662 7355 ops@specialityservicesqld.com.au	Phone Mobile Fax Email Web
SureSearch QLD = Sunshine Coast to Gold Coast including Brisbane, Toowoomba & surrounding districts		1300 884 520 0408 221 046 info@suresearch.com.au www.suresearch.com.au	Phone Mobile Fax Email Web

Telstra Accredited Plant Locators – Queensland South-East.

TVE Pty Ltd. Brisbane, Gold Coast, Sunshine Coast, all areas/districts/regions Western Suburbs		07 3802 2229 0419 828 998 niall@tveservices.com.au www.tveservices.com.au	Phone Mobile Fax Email Web
UTEC Solutions Pty Ltd. NSW based – also covers Queensland and Victoria		02 9389 0040 0439 994 881 tim@utecsolutions.com.au www.utecsolutions.com.au	Phone Mobile Fax Email Web
Utility I.D. – Underground Service & Cable Locators All areas Queensland and New South Wales		0401 202 515 info@utilityid.com.au www.utilityid.com.au	Phone Mobile Fax Email Web
Utility Location Services Brisbane, Gold Coast, Sunshine Coast, Lismore, Coffs Harbour		07 3807 3552 0499 775 095 07 3807 9899 ryan@utilitylocationservices.com.au www.utilitylocationservices.com.au	Phone Mobile Fax Email Web
Utility Mapping (Aust) Pty Ltd. Brisbane & surrounding areas		1300 MAPPING brisbane@utilitymapping.com.au www.utilitymapping.com.au	Phone Mobile Fax Email Web
Vac-it Pty Ltd. Brisbane Metro, NSW North regions and all districts between.		0488 761 092 vac.it.locations@gmail.com www.vac.it.com.au	Phone Mobile Fax Email Web

Cable Plan



Telstra	For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	
Generated On 13/06/2018 16:21:35	Sequence Number: 72426068
	CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

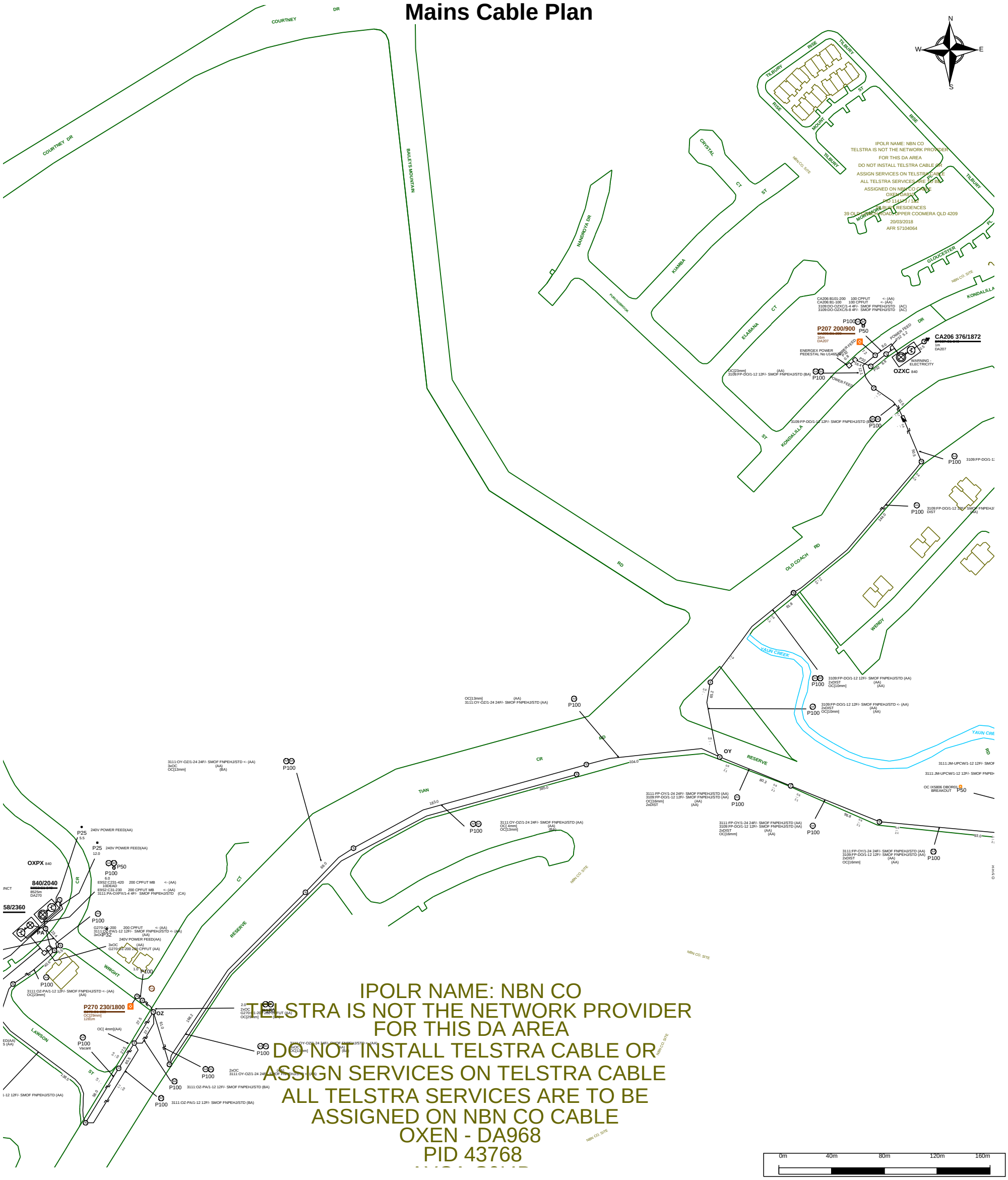
WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

Mains Cable Plan



Telstra

For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 13/06/2018 16:21:36

Sequence Number: 72426068

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

DUTY OF CARE

IT'S HOW WE CONNECT

TELSTRA CORPORATION ACN 051 775 556

IMPORTANT:

When working in the vicinity of telecommunications plant you have a "Duty of Care" that must be observed. Please read and understand all the information and disclaimers provided below.

Telstra network is complex and requires expert knowledge to interpret information, to identify and locate components, to pothole underground assets for validation and to safely work around assets without causing damage. If you are not an expert and/or qualified in these areas, then you must not attempt these activities. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers. The 5 P's to prevent damage to Telstra assets are listed below. Construction activities and/or any activities that potentially may impact on Telstra's assets must not commence without first undertaking these steps. Construction activities can include anything that involves breaking ground, potentially affecting Telstra assets.

If you are designing a project it is recommended that you also undertake these steps to validate underground assets prior to committing to your design.

(The following pages contain more detail on each step below and the contact details to seek further advice. AS5488-2013 is the Australian Standard for the Classification of Subsurface Utility Information.)

1 PLAN:

The essential first step in preventing damage -
You must have current Telstra plans via the DBYD process. Telstra advises that the accuracy of the information provided by Telstra conforms to Quality Level D as defined in AS5488-2013. This means the information is indicative only, not a precise location. **The actual location may differ substantially from that shown on the plans** - refer to steps 2 & 3 to determine actual location prior to proceeding with construction.

2 PREPARE:

The essential second step in preventing damage -
Engage a Telstra Accredited Plant Locator. To be able to trace and identify individual subsurface cables and ducts requires access to Telstra pits and manholes. Only a Telstra Accredited Plant Locator (TAPL) is authorised to access Telstra network for locating purposes. A TAPL can interpret plans, validate visible assets and access pits and manholes to undertake electronic detection of underground assets prior to further validation. All Telstra assets must be located, validated and protected prior to commencing construction. If you are not authorised to do so by Telstra, you must not access Telstra network or locate Telstra network. All Telstra Accredited Plant Locators are required to have DBYD Locator Certification.

3 POTHOLE:

The essential third step in preventing damage -
All Telstra assets must be positively identified (i.e. validated), by physically sighting them. For underground assets this can be done by potholing by hand or using non-destructive vacuum extraction methods (Refer to 'validation' as defined in AS5488-2013 QL-A). **Underground assets located by electronic detection alone (step 2), are not deemed to be 'validated' and must not be used for construction purposes.** Some TAPL's can assist with non-destructive potholing for validation purposes. **If you cannot validate the Telstra network, you must not proceed with construction**. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

4 PROTECT:

The essential fourth step in preventing damage -
Telstra assets must be protected to avoid damage from construction activities. Minimum working distances around Telstra network must be maintained. These distances are provided in this document. Telstra can also provide advice and assistance in regards to protection – refer to the following pages.

5 PROCEED:

Only proceed when the above steps have been completed.

STEP 1 - PLAN
Dial Before You Dig / Telstra Plans

The actual location of Telstra assets may differ substantially from that shown on the plans. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for the accuracy shown on the plans. Steps 2 and 3 must also be undertaken to determine actual location of network.

- Telstra DBYD plans are not suitable for displaying Telstra network within a Telstra exchange site. For advice on Telstra network within a Telstra exchange site contact Telstra Plan Service on 1800 653 935.
- Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose.
- Telstra plans or other details are provided only for the use of the applicant, its servants, agents or Telstra Accredited Plant Locators. The applicant must not give the plans or details to any parties other than these, and must not generate profit from commercialising the plans or details.
- Please contact Telstra Plan Services immediately should you locate Telstra assets not indicated on these plans.
- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
- Please ensure Telstra plans and information provided remains on-site at all times throughout the inspection, location and construction phase of any works.
- Telstra plans are valid for 60 days after issue and must be replaced if required after the 60 days.

- **Emergency situations - receiving Telstra plans** Telstra's automated mapping system (TAMS) will provide a fast response for emergency situations (faster than an operator can provide manually via a phone call - see below for fast response requirements). Automated responses are normally available 24/7.

  To receive a fast automated response from Telstra your request must **-**

  - Be a web request lodged at DBYD (**www.1100.com.au**). The request will be then forwarded to Telstra.
  - Contain your current email address so you can receive the automated email response.
  - Be for the purposes of 'mechanical excavation' or other ground breaking DBYD activity. (Requests with activity types such as conveyancing, planning & design or other non-digging activities may not be responded to until the next business day).
  - Be for an area less than 350 metres in size to obtain a PDF map (over 350 metres will default to DWF due to size) this does not include congested CBD areas where only DWF may be supplied.
  - Be for an area less than 2500 metres in size to obtain a DWF map (CBD's less)

- **Data Extraction Fees.** In some instances a data extraction fee may be applicable for the supply of Telstra information. Typically a data extraction fee may apply to large projects, planning and design requests or requests to be supplied in non-standard formats. For further details contact Telstra Plan Services.

- **Electronic plans - PDF and DWF maps** If you have received Telstra maps via email you will have received the maps as either a PDF file (for smaller areas) or DWF file (for larger area requests). All requests over approximately *350m or in congested CBD areas can only be supplied in DWF format. There are size limits on what can be provided. (* actual size depends on geographic location of requested area). If you are unable to launch any one of the softcopy files for viewing and printing, you may need to download and install one or more of the free viewing and printing products such as Adobe Acrobat Reader (for PDF files) or Autodesk Design Review (for DWF files) available from the internet

  - **Pdf files -** PDF is the default softcopy format for all requests for areas up to approx *350m in length. (*depends on geographic location of request). The PDF file is nominally formatted to A3 portrait sheet however it can be printed on any size sheet that your printer supports, e.g. either as the full sheet or selected areas to suit needs and legibility. (to print a selected area zoom up and print 'current view') If there are multiple layers of Telstra network you may receive up to 2 sheets in the single PDF file attachment supplied. There are three types or layers of network normally recorded - local network, mains cables or a combined layer of local and mains (usually displayed for rural or semi-rural areas). If mains cable network is present in addition to local cables (i.e. as separate layer in a particular area), the mains will be shown on a separate sheet. The mains cable information should be read in conjunction with the local cable information.

- **DWF files –** DWF is the default softcopy format for all requests for areas that are over 350m in length. Maximum length for a DWF automated response is approx 2500m - depending on geographic location of request (manually-processed plans may provide larger coverage). The DWF files differ from PDF in that DWF are vector files made up of layers that can be turned on or off and are not formatted to a specific sheet size. This makes them ideal for larger areas and for transmitting electronically.
    - ***How to view Telstra DWF files –***
      Telstra DWF files come with all layers turned on. You may need to turn individual layers on or off for viewing and printing clarity. Individual layer names are CC (main cable/conduit), DA (distribution area network) and sometimes a combined layer - CAC. Layer details can be viewed by either picking off the side menu or by selecting 'window' then 'layers' off the top menu bar. Use 'layers' to turn individual layers off or on (double click or right click on layer icon).
    - ***How to print Telstra DWF files –***
      DWF files can be printed on any size sheet – either their entirety or by selected areas of interest. Some DWF coverage areas are large and are not suited to printing legibly on a single A4 sheet - you may need several prints if you only have an A4 printer. Alternatively, an A3, A1 or larger printer could be used. To print, zoom in or out and then, by changing the 'print range' settings, you can print what is displayed on your screen to suit your paper size. If you only have a small printer, e.g. A4, you may need to zoom until the text is legible for printing (which is why you may need several prints). To print what is displayed on your screen the 'view' setting should be changed from 'full page' to 'current view'. The 'current sheet' setting should also be selected. You may need to print layers separately for clarity and legibility. (Details above on how to turn layers on or off)
    - ***How to change the background colour from white to black (when viewing) Telstra DWF files –***
      If using Autodesk Design Review the background colour can be changed by selecting 'Tools' then 'options' then 'sheet'. Tick the box 'override published paper colours' and select the colour required using the tab provided.

STEP 2 – PREPARE
Telstra Accredited Plant Locator (TAPL):

Utilising a TAPL is an essential part of the process to identify network and to trace subsurface network prior to validating. A TAPL can provide plan interpretation, identification and electronic detection. This will assist in determining the position of subsurface assets prior to potholing (validating). Some TAPL's can also assist in validating underground detected network. Electronic detection is only an indication of the existence of underground network and can be subject to interference from other services and local conditions. Electronic detection must not be used solely to determine location for construction purposes. The electronic (indicative) subsurface measurements must be proven by physically sighting the asset (see step 3 – Pothole).

- All TAPL's locating Telstra network must be able to produce a current photo ID card issued by Telstra. A list of TAPL's is provided with the Telstra Dial Before You Dig plans.
- All TAPL's in addition to the Telstra photo ID card must also have current DBYD Locator Certification with ID card.
- Telstra does not permit external parties (non-Telstra) to access or conduct work on Telstra network. Only Telstra staff, Telstra contractors or locators whom are correctly accredited are authorised to work on or access Telstra manholes, pits, ducts, cables etc. This is for safety as well as for legal reasons.
- The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the Telstra Accredited Plant Locator engaged. Telstra is not a party to any contract entered into between you and a Telstra Accredited Plant Locator.
- Payment for the site assistance will be your responsibility and payment details must be agreed before the engagement is confirmed.
- Telstra does not accept any liability or responsibility for the performance of or advice given by a Telstra Accredited Plant Locator. Accreditation is an initiative taken by Telstra towards the establishment and

maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.

- Neither the Telstra Accredited Plant Locator nor any of its employees are an employee or agent for Telstra. Telstra is not liable for any damage or loss caused by the Telstra Accredited Plant Locator or its employees.

- **Electronically derived subsurface measurements (e.g. depths/alignments by locating devices)**

  All locator provided measurements for Telstra assets must have the AS5488-2013 quality level specified - (e.g. QL-A, B, C or D). These quality levels define the accuracy of subsurface information and are critical for determining how the information is later used – for example if suitable for excavation purposes.

  1) ***An example of a subsurface measurement with no quality level specified – (i.e. not to be used)***

     Telstra cover - **0.9m**

     *The measurement above has no AS5488-2013 quality level specified and **must not** be provided by a locator or used for design or construction. This is because it is not known whether the measurement is actual or derived (where 'actual' means validated and 'derived' means assumed and not validated, e.g. electronic or other). Typically damages occur by constructors incorrectly using unvalidated measurements as actual measurements.*

  2) ***An example of a subsurface measurement with quality level B specified –***

     Telstra cover - **0.9m** (QL-B)

     Where (QL-B) complies with AS5488-2013 QL-B (for example an electronic location that complies with QL-B)

     (Note QL-B means it has not been validated and must not be used for construction purposes around Telstra network, however it would assist further investigation to determine the actual location)

  3) ***An example of a subsurface measurement with the quality level A specified –***

     Telstra cover - **0.6m** (QL-A)

     Where (QL-A) complies with AS5488-2013 QL-A (and is deemed suitable for excavation purposes). *In this example the asset has been electronically located first, (QL-B) and then physically exposed (QL-A).*

     Note -Telstra will seek compensation for damages caused to it its property and losses caused to Telstra and its customers if unvalidated subsurface measurements are used for construction and subsequently result in damage to Telstra assets. Only measurements conforming to AS5488-2013 (QL-A) are deemed by Telstra to be validated measurements.

- **Rural landowners** Where Telstra-owned cable crosses agricultural land, Telstra may provide on-site assistance with cable location. **You must contact Telstra Plan Services to determine eligibility and to request the service**.

  Please note the following –

  - If eligible, the location assistance must be approved and organised by Telstra. Telstra will not pay for a location that has not been approved and facilitated by Telstra (Telstra is not responsible for payment assistance when a customer engages a locator directly).
  - The exact location, including depth of cables**,** must be validated by potholing, which may not be covered by this service.
  - This service is nominally only available to assist private rural land owners.
  - This service nominally covers one hour on-site only, private lead-in locations are for lead-ins 100m or longer. Any time required in addition to Telstra-funded time can be purchased directly from the assigned Telstra Accredited Plant Locator.
  - This service does not apply to previously located network at the same location (i.e. it is a once off).
  - This service does not apply to other carriers' cables (marked as 'OC' on Telstra plans).

STEP 3 – POTHOLE

Validation as defined in AS5488-2013 (QL-A).

After utilising a Telstra Accredited Plant Locator and prior to commencing construction, any electronically detected underground network must be positively identified (validated) by physically sighting it. This can be done by careful hand digging or using non-destructive water jet methods to expose the network.

Manual potholing needs to be undertaken with extreme care and by employing techniques least likely to damage cables. For example, align shovel blades and trowels parallel to the cable rather than digging across the cable. Some Telstra Accredited Plant Locators are able to provide or assist with non-destructive potholing methods to enable validation of underground cables and ducts.

If you cannot validate the underground network then you must not proceed with construction. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Important note: *The construction of Telstra's network dates back over many years. Some of Telstra's pits and ducts were manufactured from asbestos-containing cement. You must take care in conducting any works in the vicinity of Telstra's pits and ducts. You must refrain from in any way disturbing or damaging Telstra's network infrastructure when conducting your works. We recommend that before you conduct any works in the vicinity of Telstra infrastructure that you ensure your processes and procedures eliminate any possibility of disturbing, damaging or interfering in any way with Telstra's infrastructure. Your processes and procedures should incorporate appropriate measures having regard to the nature of this risk. For further information -*

http://ucm.in.telstra.com.au/about/media/emergencies-incidents/asbestos/index.htm?ssSourceSiteId=consumer-advice

STEP 4 – Protect:

You must maintain the following minimum clearance distances between construction activity and the validated position of Telstra plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual validated location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of **actual validated location** of Telstra ducts.* *300mm compact clearance cover before compactor can be used across Telstra ducts.*
Boring Equipment (in-line, horizontal and vertical)	*Not within 2.0m of **actual validated location**.* *Constructor to hand dig or use non-destructive water jet method (pothole) and expose plant.*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Telstra ducts (or plant) with less than 600mm cover.* *Constructor to check actual depth via hand digging.*
Mechanical Excavators, Farm ploughing and Tree Removal	*Not within 1.0m of **actual validated location.*** *Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.*

- For blasting or controlled fire burning please contact Telstra Plan Services.
- If conducting roadworks all existing Telstra pits and manholes must be a minimum of 1.2m in from the back of kerb after the completion of your work.
- After the completion of any ground work in footways or roadway whereby the existing levels are being changed the depth of cover of the existing Telstra asset at the completion of work must not be less than the existing level before work commenced.

Regardless of whether the surface is being raised or lowered, any work impacting the depth of cover of Telstra underground assets should not commence before consultation with Telstra Network Integrity representatives, to discuss the possibility of '*protection*' or relocation (including lowering of the asset)".

- For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact Telstra Plan Services.

- If Telstra plant is situated wholly or partly where you plan to work (i.e. in conflict, where a pit or manhole would be in a driveway or other vehicle thoroughfare), then Telstra's Network Integrity Group must be contacted to discuss possible engineering solutions to protect Telstra assets.
  Please phone **1800 810 443** or email NetworkIntegrity@team.telstra.com

- You are not permitted to relocate or alter or repair any Telstra assets or network under any circumstances.

  It is a criminal offence under the *Criminal Code Act 1995* (Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

  Only Telstra and its contractors may access and conduct works on Telstra's network (including its plant and assets). This requirement is to ensure that Telstra can protect the integrity of its network, avoid disruption to services and ensure that the relocation meets Telstra's requirements.

- If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer, constructor or person for whom the work is performed. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works.
  Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com
  Further information -
  https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

  Damage to Telstra's network must be reported immediately -
  https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment

- You will be held responsible for all plant damage that occurs or any impacts to Telstra's network as a result of your construction activities. This includes interfering with plant, conducting unauthorised modification works and interfering with Telstra's assets in a way that prevents Telstra from accessing or using its assets in the future.

- Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

FURTHER INFORMATION - CONTACTS

NATURAL DISASTERS

Natural Disasters include (amongst other things) earthquakes, cyclones, floods and tsunamis.
In the case of such events, urgent requests for plans or information relating to the location of Telstra network can be made directly to Telstra Network Integrity Team Managers as follows:

NSW – John McInerney 0419 485 795

NT/WA/QLD – Glenn Swift 0419 660 147

SA/VIC/TAS - David Povazan 0417 300 947

TELSTRA PLAN SERVICES **-** for all Telstra Dial Before You Dig related enquiries

Email - **Telstra.Plans@team.telstra.com**

Phone - 1800 653 935 (general enquiries, business hours only)

Accredited plant locator enquiries -	Mike	0477 377 036
	Glen	0477 365 666
Telstra easements -	Glen	0477 365 666

***Please note** - to make a Telstra plan enquiry the plans must be current (within 60 days of issue). If your plans have expired you will need to submit a new request via DBYD prior to contacting Telstra Plan Services.*

Information for new developments (developers, builders, home owners)
Telstra Smart Communities - https://www.telstra.com.au/smart-community

Asset relocations
Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com

https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

Telstra offers free Cable Awareness Presentations, if you believe you or your company would benefit from this offer please contact Network Integrity on 1800 810 443 or NetworkIntegrity@team.telstra.com

PRIVACY NOTE

Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps your information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy

LEGEND

IT'S HOW WE CONNECT

For more info contact a Telstra Accredited Locater or Telstra Plan Services 1800 653 935

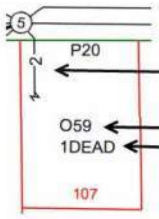
Exchange
(major cable present)

Footway access chamber
(can vary from 1-lid to 12-lid)

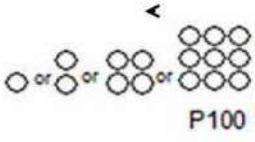
Pillar/cabinet
(above the ground / free standing)

Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V electricity.

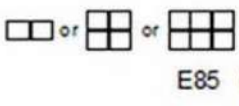
OC **other carrier**



2 pair lead-in to property from pit in street
1 pair working (pair ID 059)
1 pair dead (i.e. spare, not connected)



Single to multiple round conduit
Configurations 1, 2, 4, 9 respectively
(Attached text denotes conduit type and size)



Multiple square conduit
Configurations 2, 4, 6 respectively
(Attached text denotes conduit type and size)

Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Cable jointing pit
(number indicating pit type)

Elevated cable joint
(above ground joint on buried cable)

Telstra Plant in shared utility trench

Aerial Cable
(above ground)

Aerial Cable
(attached to joint use pole e.g. power)

Direct buried cable

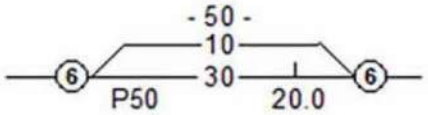
Marker post installed

Buried transponder

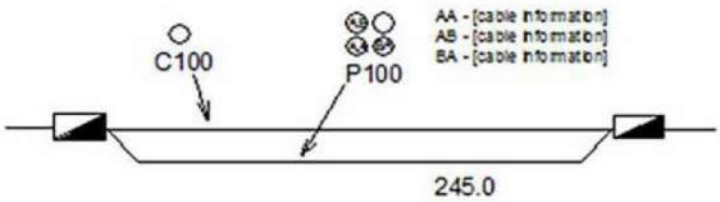
Marker, transponder

SMOF **Optical fibre cable direct buried**

Some examples of how to read Telstra plans:



One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

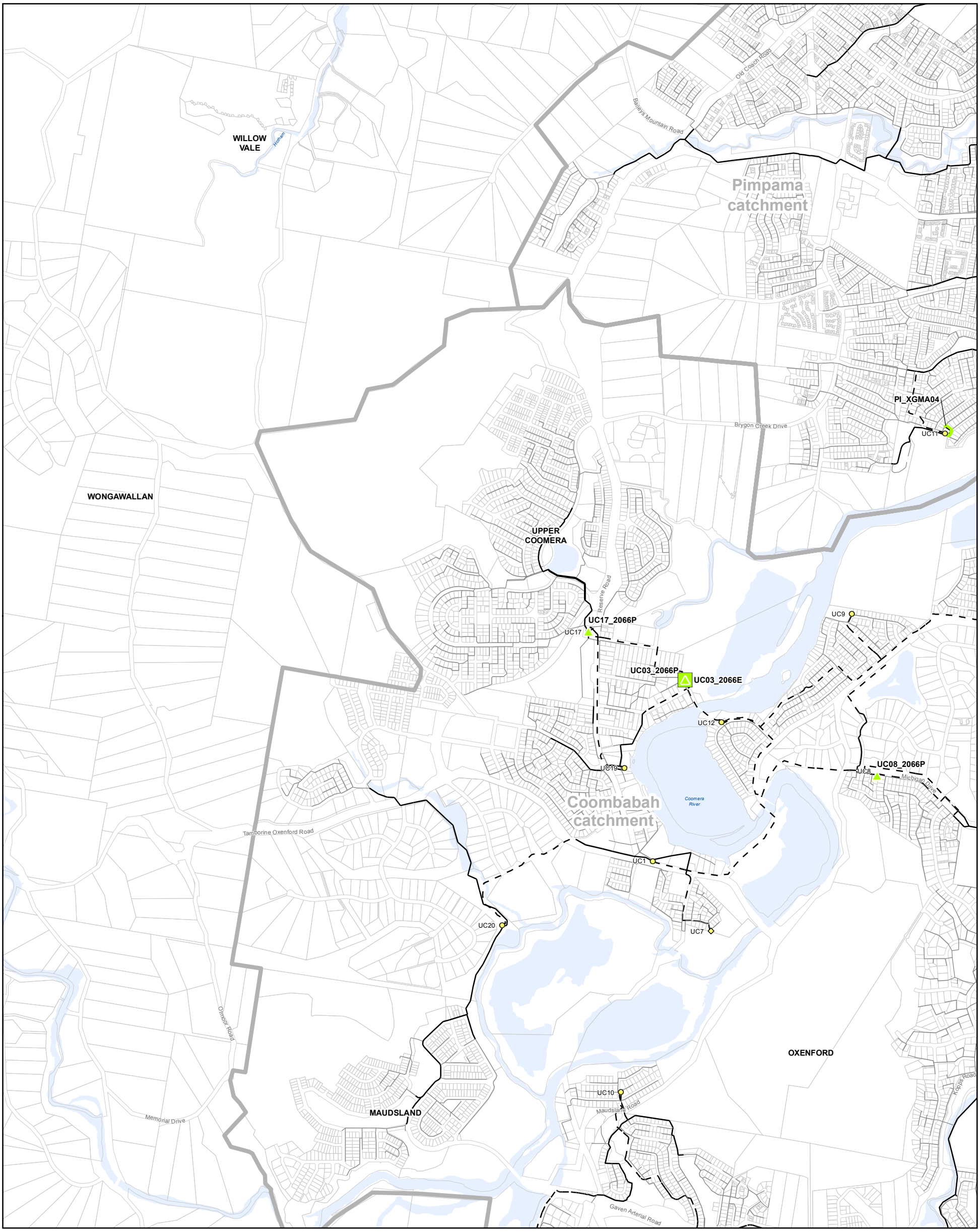
WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

APPENDIX E

2015 CITY PLAN PRIORITY INFRASTRUCTURE PLAN FOR WATER & SEWER

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Local Government Infrastructure Plan Map - Plan for trunk sewerage infrastructure (sewage collection and treatment) - map 20



Sewer gravity main | Sewer rising main | Pump station total power | Pump station operational capacity | Pump station emergency capacity | Sewerage treatment plant

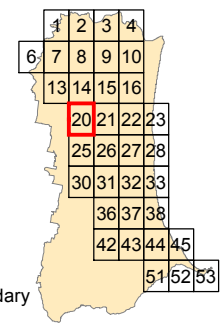
Existing infrastructure

- Trunk
- Non-Trunk

New/augmented trunk infrastructure

- 2021
- 2026
- 2031
- 2036
- Ultimate

- Sewerage service catchment
- Land affected by other development legislation, refer to Context map and Part 10 of the City Plan
- Cadastre boundary
- Local government area boundary
- Waterway or waterbody



City Plan

Disclaimer:
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Map Version 3.00
18 Jul 2017

Data Sources:
Sewer infrastructure - CoGC
Waterways - CoGC
Cadastre (February 2016) - State

Projection:
MGA94
Zone 56

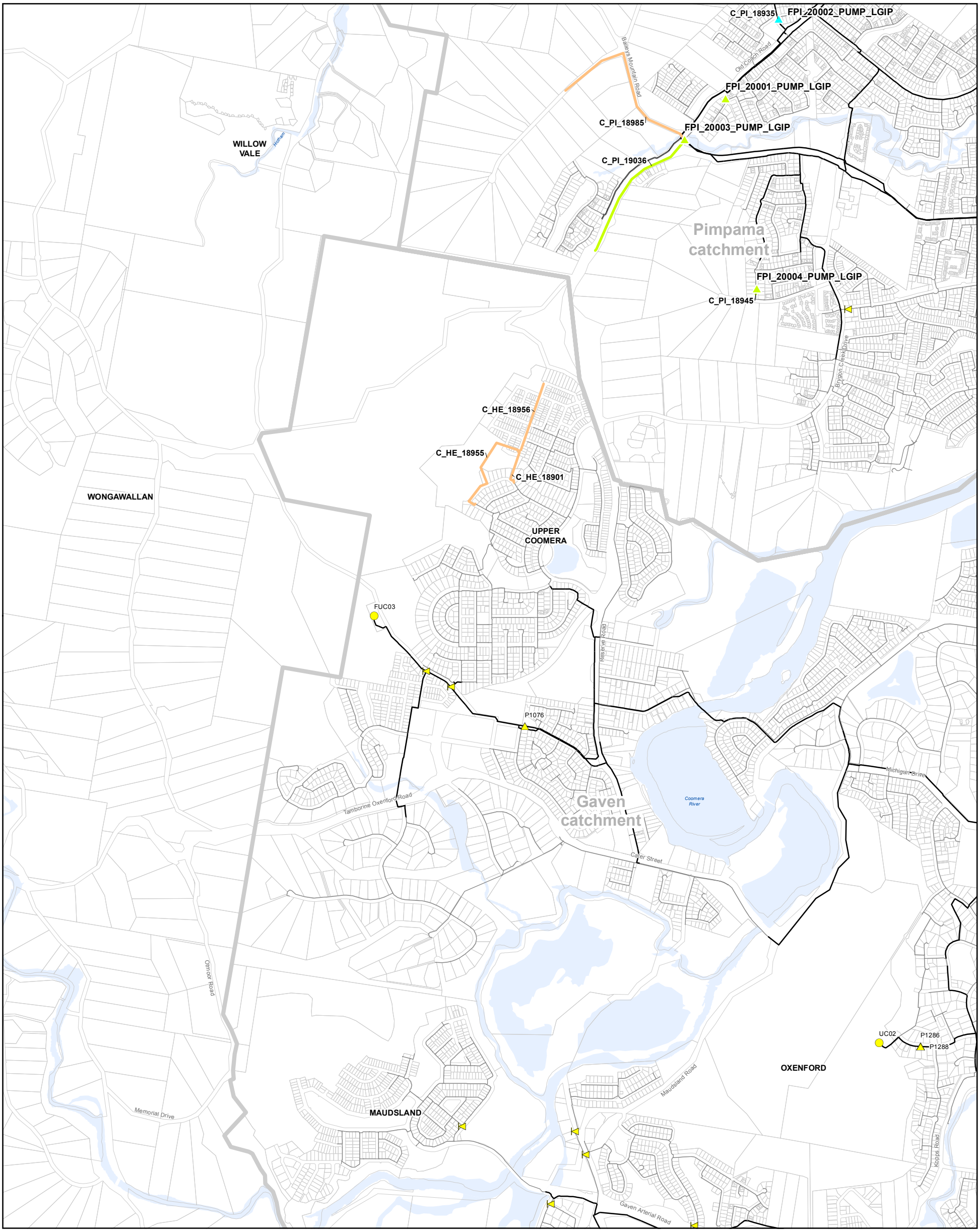
0 150 300 600 m

Approx Scale @ A3 1:20,000

CITY OF GOLDCOAST.

LGIP-PFTI-SEW-SCT-20 (40k ref: 5)

Local Government Infrastructure Plan Map - Plan for trunk water supply infrastructure - map 20



Existing infrastructure	Water main	Water pump station	Water reservoir	Water valve
Trunk				
Non-trunk				
New / augmented trunk infrastructure				
2021				
2026				
2031				
2036				
Ultimate				

- Existing SEQ Water pump station
- Existing SEQ Water reservoir
- Water supply service catchment
- Land affected by other development legislation, refer to Context map and Part 10 of the City Plan
- Cadastre boundary
- Local government area boundary
- Waterway or waterbody

1	2	3	4	
6	7	8	9	10
12	13	14	15	16
		20	21	22	23
		25	26	27	28
		30	31	32	33
			36	37	38	
			42	43	44	45
			49	50	51	52	53

City Plan

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Map Version 3.00
18 Jul 2017

Data Sources:
Water supply infrastructure - CoGC
Waterways - CoGC
Cadastre (February 2016) - State

Projection:
MGA94
Zone 56

0 150 300 600 m

Approx Scale @ A3 1:20,000

CITY OF GOLDCOAST.

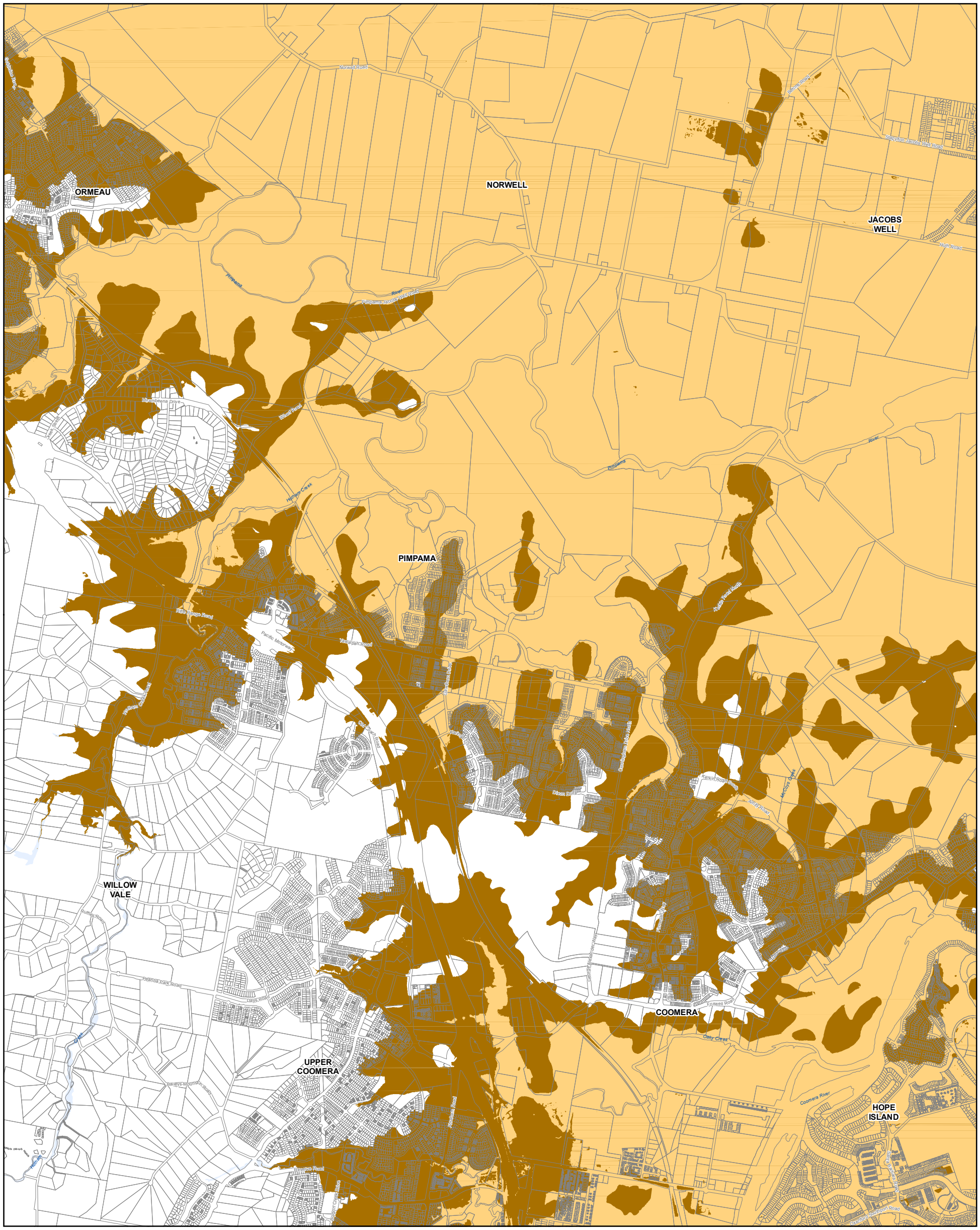
LGIP-PFTI-WAT-20 (40k ref: 5)

APPENDIX F

2015 CITY PLAN OVERLAY MAPS

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Acid sulfate soils overlay map - map 5



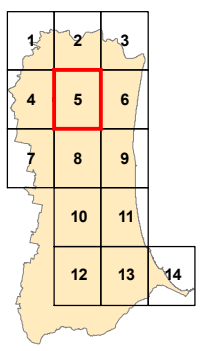
Land at or below 5m AHD

Land at or below 20m AHD

Property boundaries

Local government area boundary

Waterway or waterbody



City Plan

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Map version - 4
24 May 2018
Data source:
Acid sulfate soils - CoGC
Cadastre (Oct 2017) - State

Projection:
MGA94
Zone 56

N

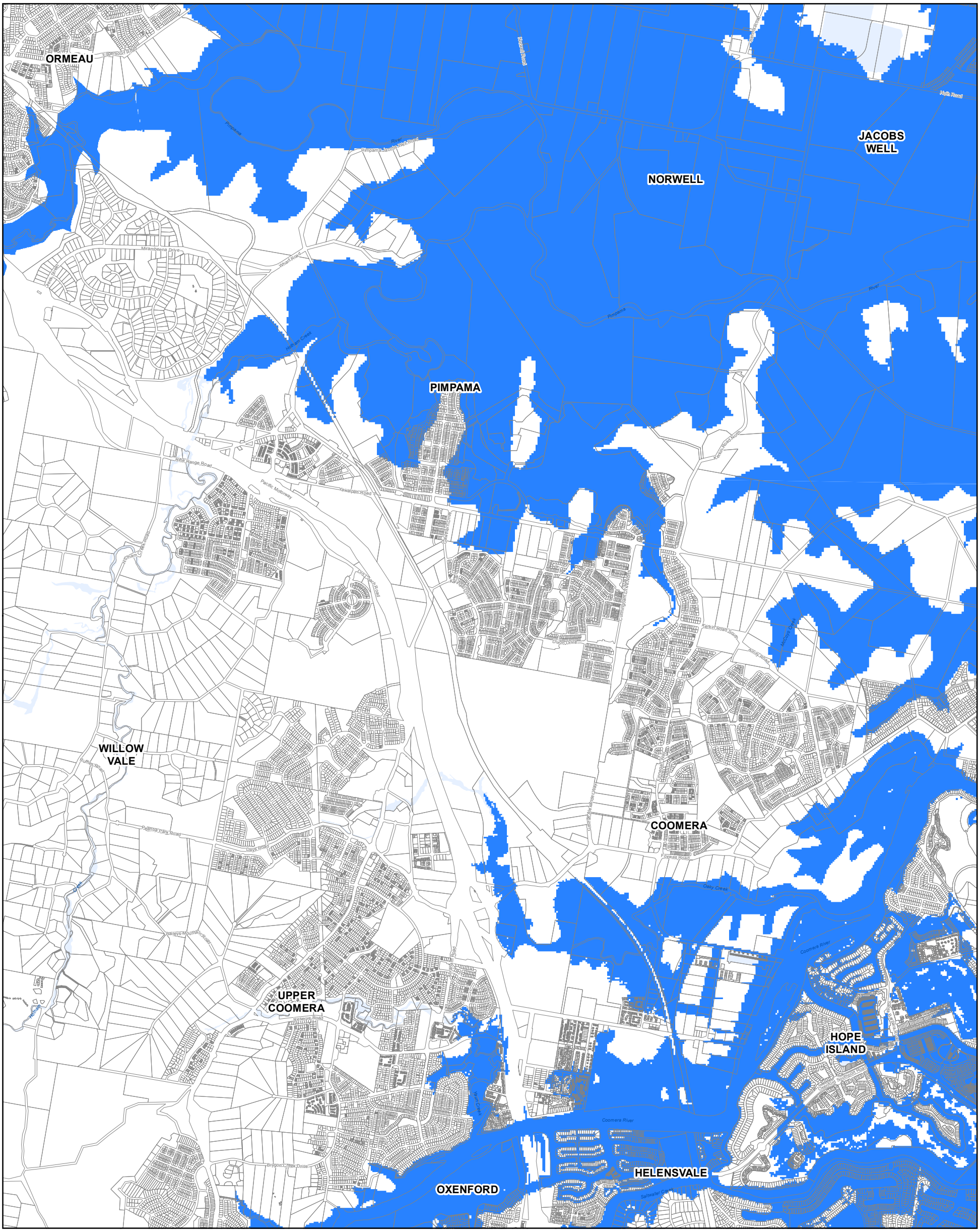
0 250 500 1,000 m

Approx Scale @ A3 1:37,000

CITY OF GOLDCOAST.

OMA1-5

Flood overlay map - map 5

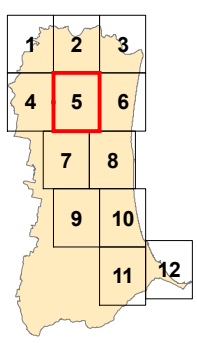


Flood assessment required

Property boundaries

Local government area boundary

Waterway or waterbody



Note:

This flood map does not in itself indicate whether any property has or has not been affected by floods. That conclusion requires separate interpretation or measurement.

Areas of potential flood inundation shown on this map have been compiled from various sources and hydraulic reports available at the date of issue. Whilst some of the inundation areas are based on computer hydraulic modelling of standard floods used for planning purposes, the information used to calibrate such models is usually based on reported flood marks which are often widely spaced and may not have been recorded at a particular flood's peak level.

City Plan

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Map version - 4
30 May 2018
Data source:
Flood - CoGC
Waterways - CoGC
Cadastre (Oct 2017) - State

Projection:
MGA94
Zone 56

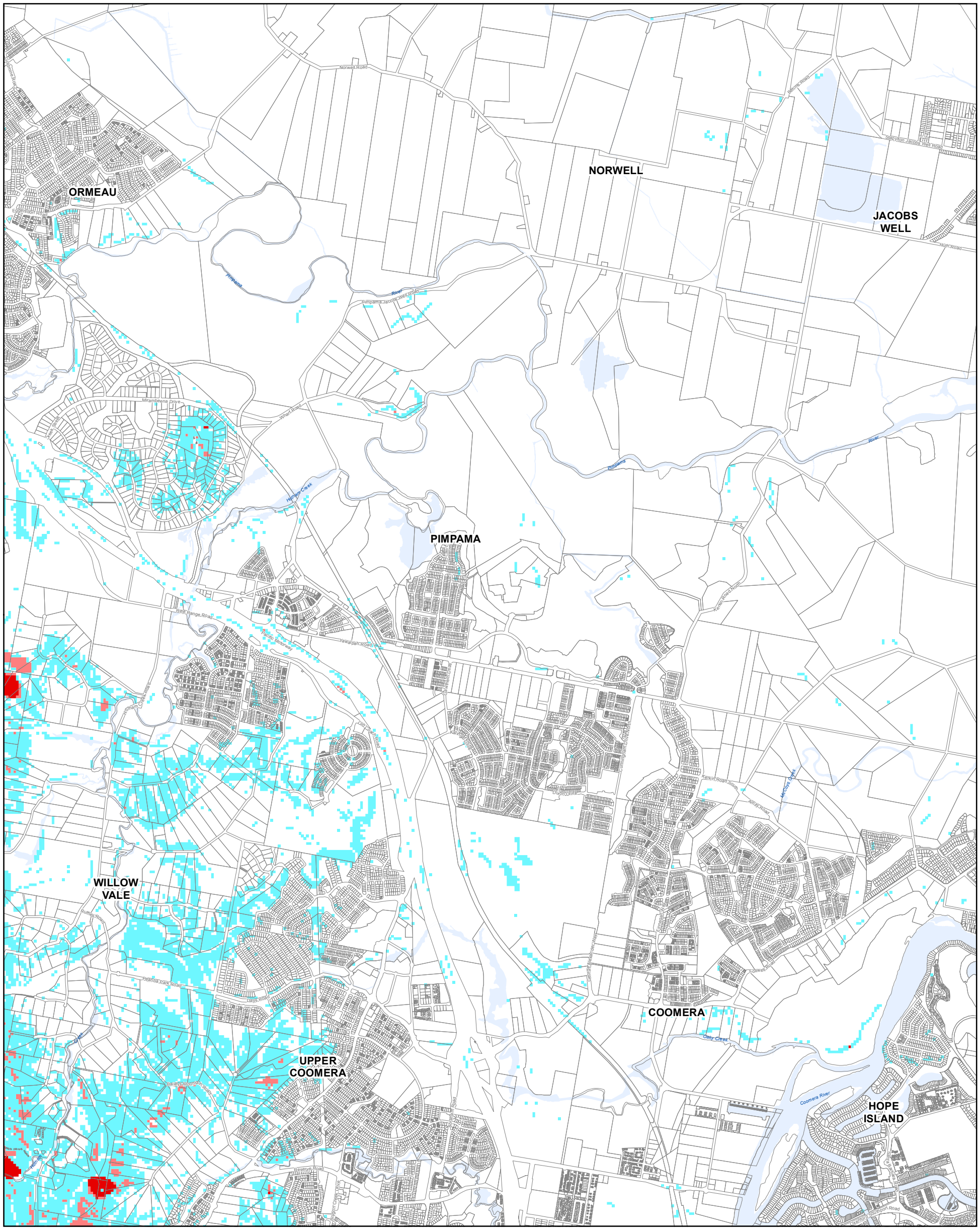
0 250 500 1,000 m

Approx Scale @ A3 1:37,000

CITY OF GOLDCOAST.

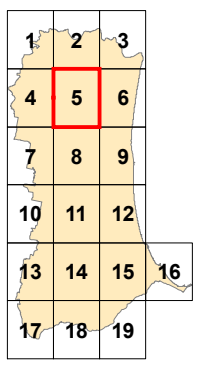
OMF1-5

Landslide hazard overlay map - map 5



Landslide hazard moderate
Landslide hazard high
Landslide hazard very high

Property boundaries
Local government area boundary
Waterway or waterbody



Note:
Land instability is based upon City of Gold Coast data to date.
For further information a GEOTECHNICAL STUDY should be undertaken.

City Plan

Disclaimer:
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Map version - 4
29 May 2018
Data source:
Landslide hazard - CoGC
Waterways - CoGC
Cadastre (Oct 2017) - State

Projection:
MGA94
Zone 56

N

0 250 500 1,000 m

Approx Scale @ A3 1:37,000

CITY OF GOLDCOAST.

OML1-5

ATTACHMENT 10

Ecological Assessment Report, prepared by Saunders Havill Group



URBAN PLANNING SERVICES



Ecological Assessment Report

202 Baileys Mountain Road
Prepared for Sandson Pty Ltd
31 July 2018

Job 8781

saunders havill group

Document Control

Document: Baileys Mountain Road Ecological Assessment Report (Issue C), prepared by Saunders Havill Group for Sandson Pty Ltd, dated 31 July 2018.

Document Issue

Issue	Date	Prepared By	Checked By
Issue A	13.07.2018	Olivia Short	Adam Hutchinson
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Prepared by
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Plan 1: Field Survey Plan
Plan 2: Tree Plot Survey
Plan 3: Development Assessment.
Plan 4: Tree Retention and Removal Plan
Plan 5: Connectivity Assessment

Acronyms

CGCC	City of Gold Coast Council
DAF	Department of Agriculture and Fisheries (Qld)
DAMS	Development Assessment Mapping System
DES	Department of Science and Environment
DLGRMA	Department of Local Government, Racing and Multicultural Affairs (Qld)
DNRME	Department of Natural Resources, Mines and Energy
EAR	Ecological Assessment Report
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EVNT	Endangered, Vulnerable or Near Threatened as listed under the NCA
MCU	Material Change of Use
MLES	Matters of Local Environmental Significance
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	*Nature Conservation Act 1992*
NCWR	*Nature Conservation (Wildlife) Regulation 2006*
PA	*Planning Act 2016* (Qld)
PMST	Protected Matters Search Tool
PR	*Planning Regulation 2017* (Qld)
ROL	Reconfiguration of a Lot
SARA	State Assessment Referral Agency (part of DILGP)
SPP	*State Planning Policy 2017* (Qld)
VMA	*Vegetation Management Act 1999* (Qld)
SRI	Significant Residual Impact

1. Introduction

Saunders Havill Group was engaged by Sandson Pty Ltd to prepare an Ecological Assessment Report (EAR) for land located at 202 Baileys Mountain Road, Upper Coomera described as Lot 58 on SP191940, which is intended to support a development application to City of Gold Coast. This report provides a review of the site's ecological values in accordance with Commonwealth, State and Local legislation.

Contextually, the site is located approximately 55 km south of Brisbane City and 4 km to the west of Coomera Train Station, with Coomera Town Centre to the south-east. The site is bound by Baileys Mountain Road to the east and Reserve Road to the south. Rural residential properties exist adjacent to the northern and western extents of the property. More broadly, the suburb of Upper Coomera is dominated by rural and residential land. Refer to **Figure 1** for site context and **Figure 2** for site aerial.

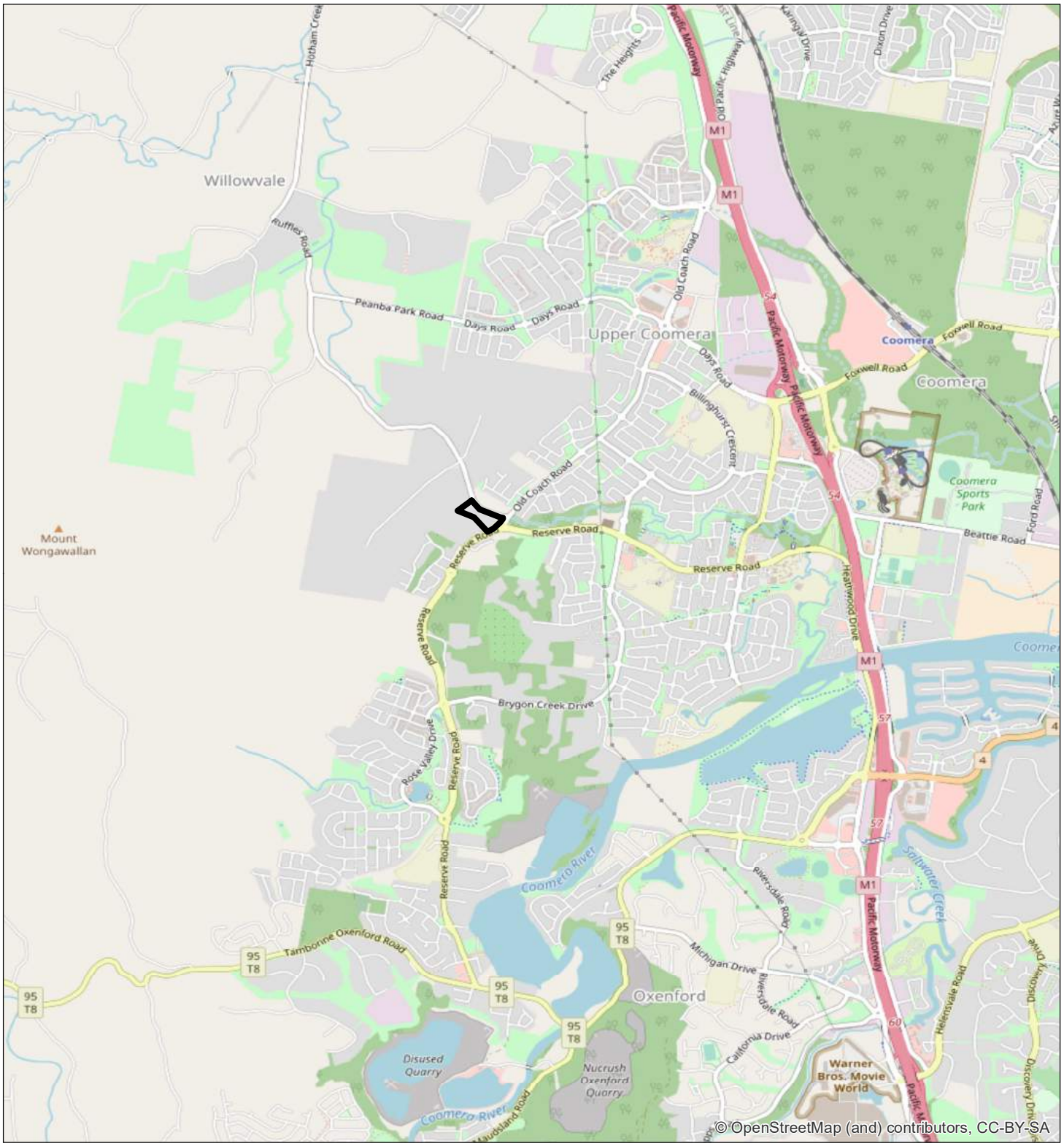
1.1. Property Summary

Table 1: Property Summary

Address	202 Baileys Mountain Road, Upper Coomera
RPD	Lot 58 on SP191940
Area	3.09 ha
VMA 1999	Category X (non-remnant), Category B (Least Concern & Of Concern), Essential Habitat & Watercourse
Fisheries 1994	Low and Moderate Waterway Barrier Works
MSES	MSES – Wildlife Habitat, Regulated Vegetation & Regulated Vegetation Intersecting a Watercourse
Koala Habitat	Medium Value Bushland & Low Value Rehabilitation
LGA	City of Gold Coast
Planning Scheme / Local Plan	Gold Coast City Plan
Environmental Overlays	Priority Species (State Significant Species & Koala Habitat Areas) Vegetation Management (General Priority Vegetation) Wetlands & Watercourse (Minor Watercourse Line)
Existing Land Use	Rural Residential
Proposed Land Use	Aged Care Facility

1.2. Purpose of the Report

The purpose of this EAR is to present the outcomes of field surveys, identify environmental site constraints, assess the potential of the project to impact on ecological features and respond to relevant City of Gold Coast Planning Scheme Polices and Codes. This report was prepared in accordance with the requirements of Gold Coast City Plan.



Legend

Site DCDB

Figure 1

Site Context

SANDSON PTY LTD

File ref. 8781 E Figure 1 Site Context A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 0.5 1 2 *km*

N

Scale (A4): 1:45,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018)



Legend

Site DCDB

Qld DCDB

Figure 2

Site Aerial

SANDSON PTY LTD

File ref. 8781 E Figure 2 Site Aerial A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018)

2. Ecological Assessment Methodology and Process

The following steps were undertaken in the preparation of this assessment:

1. Desktop Analysis;
2. Legislation and Policy Review;
3. Field Survey;
4. Impact Assessment and Development Analysis; and
5. Conclusion and Recommendations.

Details of the methodology undertaken for each of the assessment phases is provided in the following sections.

2.1. Desktop Analysis Methodology

Prior to the commencement of field surveys, a desktop analysis was conducted of Commonwealth, State and Local environmental databases and overlay mapping including the following:

- Commonwealth Matters of National Environmental Significance protected under the *Environment Protection and Biodiversity Conservation Act 1999* on and around the site using the Protected Matters Search Tool;
- *Nature Conservation Act 1992* listed threatened species on and around the site using the Wildlife Online Database;
- Public Environmental Databases including Atlas of Living Australia;
- State Government Environmental Overlay Mapping including:
    - Regulated Vegetation Maps under the *Vegetation Management Act 1999*;
    - Flora Survey Trigger Areas under the *Nature Conservation Act 1992*;
    - Fish habitat under the *Fisheries Act 1994*;
    - Watercourses under the *Water Act 2000*;
    - Weeds under the *Biosecurity Act 2014*; and
    - Matters of State Environmental Significance under the State Planning Policy (i.e. wetland protection areas, koala habitat etc.);
- Planning Scheme Documents and Maps.

A review of aerial photography history was undertaken to assist with the broad delineation of vegetation communities and to determine historical patters to local vegetation communities.

2.2. Field Survey Methodology

A field survey utilising the following methods was conducted to describe site ecological value:

2.2.1 Observational Survey for Significant Flora and Fauna, Habitat Trees and Biodiversity Values

The application area was walked to ensure all species (flora and fauna) were recorded and identified. Particular attention was paid to any threatened species that were listed as possibly occurring on or within the vicinity of the application area and specific micro-assemblages which may support these threatened species. This included observations for vertebrate fauna present on or that may utilise the study area, including fauna lists and significance status of species under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) including the JAMBA, CAMBA, ROKAMBA and the Bonn Convention, and Queensland's *Nature Conservation Act 1992* (NCA).

The observational survey included identification of ecological features and values such as broad vegetation communities, fauna habitats, and ecological corridors. Identification and description of the fauna habitats present within the area included any habitat trees. Specific attention was paid to flora and fauna species listed as being significant by the City of Gold Coast.

2.2.2 GPS Tree Plot

A tree survey was conducted across the site to locate and describe the vegetation values, namely the native mature tree specimens. A handheld Trimble GPS device is used to record sub-metre accurate locations (in some cases use survey accurate locations), and the following parameters of each tree specimen recorded:

- tree species, via a combination of observations of the gum nuts, buds, leaves, bark and growth form;
- diameter of the trunk of the tree is measured using the standard method of Diameter at Breast Height (DBH);
- height of the tree is measured using a laser rangefinder with three-point measurement capability (inclinometer);
- canopy spread;
- health assessment (i.e. canopy, trunk); and
- habitat values (for example, presence and/or number of hollows, nests, termites, scratches and scats).

The Tree Protection Zone (TPZ) of the tree was calculated using the formula outlined in Australian Standard AS4970-2009 – Protection of Trees on Development Sites (TPZ = DBH x 12). A TPZ should not be less than 2 metres no greater than 15 metres (except where crown protection is required.) The Structural Root Zone (SRZ) was calculated using the measured DBH and the following formula:

$$\text{SRZ radius} = (\text{DBH} \times 50)^{0.42} \times 0.64.$$

2.2.3 Ground-truthing of Vegetation Communities

Vegetation was ground-truthed and assessed again current *Vegetation Management Act 1999* (VMA) Regional Ecosystem mapping and pre-clear mapping. Surveys were undertaken in accordance with the requirements of the Gold Coast City Plan.

2.2.4 Waterway Assessment

Data recording sheets were completed at regular intervals along the waterway where the following information was collected:

- General description
- Channel Shape and Modifications
- In Stream Habitat
- Vegetation Quality and Cover (Embankments, channel and overall corridor)
- Bed, Bank and Bar Conditions (Erosion, Scouring, Sediment)
- Weed Cover

3. Legislation, Policy and Planning Instruments

3.1. Environment Protection and Biodiversity Conservation Act 1999

The Australian Government's key piece of environmental legislation is the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC aims to protect and manage matters of environmental significance which include nationally and internationally important flora, fauna, ecological communities and heritage places.

A search using the Commonwealth's Protected Matters Search Tool (PMST) for the site. The search provides a list of wetlands of international significance, threatened ecological communities and threatened species which have the potential to be temporarily or permanently located within a 5km radius from the central point of the site. Table 2 lists a summary of these results relevant to the site. The complete results of this search are included in Appendix A.

Table 2: EPBC Act PMST Search Results

Wetlands of International Importance		
Moreton Bay (Within 10 km of RAMSAR)		
Threatened Ecological Communities		
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community – (Endangered) Community likely to occur within area **Lowland Rainforest of Subtropical Australia** – (Critically Endangered) Community likely to occur within area **Subtropical and Temperate Coastal Saltmarsh** – (Vulnerable) Community likely to occur within area **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland** – (Critically Endangered) Community may occur within area		
Threatened Species		
Scientific Name	**Common Name**	**Status**
Birds		
Anthochaera phrygia	Regent Honeyeater	Critically Endangered
Botaurus poiciloptilus	Australasian Bittern	Endangered
Calidris canutus	Red Knot, Knot	Endangered
Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	Endangered
Dasyornis brachypterus	Eastern Bristlebird	Endangered
Diomedea antipodensis	Antipodean Albatross	Vulnerable

Threatened Species		
Scientific Name	**Common Name**	**Status**
Diomedea antipodensis gibsoni	Gibson's Albatross	Vulnerable
Diomedea exulans	Wandering Albatross	Vulnerable
Erythrotriorchis radiatus	Red Goshawk	Vulnerable
Geophaps scripta scripta	Squatter Pigeon (southern)	Vulnerable
Lathamus discolor	Swift Parrot	Critically Endangered
Limosa lapponica baueri	Bar-tailed Godwit (bauera), Wester Alaskan Bar-tailed Godwit	Vulnerable
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri)	Critically Endangered
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	Endangered
Macronectes halli	Northern Giant Petrel	Vulnerable
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered
Pachyptila turtur subantarctica	Fairy Prion (southern)	Vulnerable
Poephila cincta cincta	Southern Black-throated Finch	Endangered
Rostratula australis	Australian Painted Snipe	Endangered
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	Vulnerable
Thalassarche cauta steadi	White-capped Albatross	Vulnerable
Thalassarche eremita	Chatham Albatross	Endangered
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	Vulnerable
Thalassarche melanophris	Black-browed Albatross	Vulnerable
Thalassarche salvini	Salvin's Albatross	Vulnerable
Turnix melanogaster	Black-breasted Button-quail	Vulnerable
Fish		
Epinephelus daemelii	Black Rockcod, Black Cod, Saddled Rockcod	Vulnerable
Frogs		
Mixophyes fleayi	Fleay's Frog	Endangered
Insects		
Argynnis hyperbius inconstans	Australian Fritillary	Critically Endangered
Phyllodes imperialis smithersi	Pink Underwing Moth	Endangered
Mammals		
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Vulnerable

Threatened Species		
Scientific Name	**Common Name**	**Status**
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered
Petauroides volans	Greater Glider	Vulnerable
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable
Phascolarctos cinereus (combined populations of Qld, NSW and ACT)	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	Vulnerable
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Vulnerable
Pseudomys novaehollandiae	New Holand Mouse, Pookila	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Xeromys myoides	Water Mouse, False Water Rat, Yirrkoo	Vulnerable
Plants		
Arthraxon hispidus	Hairy-joint Grass	Vulnerable
Baloghia marmorata	Marbled Balogia, Jointed Baloghia	Vulnerable
Bosistoa transversa	Three-leaved Bosistoa, Yellow Satinheart	Vulnerable
Corchorus cunninghamii	Native Jute	Endangered
Cryptocarya foetida	Stinking Cryptocarya, Stinking Laurel	Vulnerable
Cryptostylis hunteriana	Leafless Tongue-orchid	Vulnerable
Endiandra floydii	Floyd's Walnut	Endangered
Endiandra hayesii	Rusty Rose Walnut, Velvet Laurel	Vulnerable
Lepidium peregrinum	Wandering Pepper-cress	Endangered
Macadamia integrifolia	Macadamia Nut, Queensland Nut Tree, Smoothshelled Macadamia, Bush Nut, Nut Oak	Vulnerable
Macadamia tetraphylla	Rough-shelled Bush Nut, Macadamia Nut, Roughshelled Macadamia, Rough-leaved Queensland Nut	Vulnerable
Phaius australis	Lesser Swamp-orchid	Endangered
Planchonella eerwah	Shiny-leaved Condoo, Black Plum, Wild Apple	Endangered
Plectranthus habrophyllus	-	Endangered
Randia moorei	Spiny Gardenia	Endangered
Samadera bidwillii	Quassia	Vulnerable
Sophora fraseri	-	Vulnerable
Thesium austral	Austral Toadflax, Toadflax	Vulnerable

Threatened Species		
Scientific Name	**Common Name**	**Status**
Reptiles		
Caretta caretta	Loggerhead Turtle	Endangered
Chelonia mydas	Green Turtle	Vulnerable
Delma torquata	Collared Delma	Vulnerable
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth	Endangered
Eretmochelys imbricate	Hawksbill Turtle	Vulnerable
Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle	Endangered
Natator depressus	Flatback Turtle	Vulnerable
Saiphos reticulatus	Three-toed Snake-tooth Skink	Vulnerable

3.2. Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NCA) classifies and protects significant areas (Protected Areas) and protects Threatened plant and animal species. The *Nature Conservation (Wildlife) Regulation 2006* (NCWR) lists plant and animal species presumed extinct, endangered, vulnerable, near threatened, least concern, international or prohibited. The schedules of this regulation were considered in this report using a Wildlife Online Database Search with a 5 km radius from the site. Species listed under the NCWR with the potential to occur around the subject site are shown in Table 3. Refer to Appendix B for full search results.

Table 3: NCA Wildlife Online Search Results

Scientific Name	Common Name	Status
Amphibians		
Adelotus brevis	Tusked Frog	Vulnerable
Crinia tinnula	Wallum Froglet	Vulnerable
Birds		
Erythrotriorchis radiatus	Red Goshawk	Endangered
Calyptorhynchus lathami lathami	Glossy Black Cockatoo (eastern)	Vulnerable
Ninox strenua	Powerful Owl	Vulnerable
Mammals		
Phascolarctos cinereus	Koala	Vulnerable
Petauroides volans volans	Southern Greater Glider	Vulnerable
Plants		

Scientific Name	Common Name	Status
Baloghia marmorata	Jointed Baloghia	Vulnerable
Eucalyptus curtisii	Plunkett Mallee	Near Threatened
Syzygium moorei	Durobby	Vulnerable
Macadamia integrifolia	Macadamia Nut	Vulnerable
Randia moorei	Spiny Gardenia	Endangered
Cupaniopsis newmanii	Long-Leaved Tuckeroo	Near Threatened
Planchonella eerwah	-	Endangered
Corchorus cunninghamii	-	Endangered
Endiandra floydii	-	Endangered
Cryptocarya foetida	Stinking Cryptocarya	Vulnerable

The Protected Plants regulatory framework under the NCA commenced on 31 March 2014, establishing approval triggers and processes for clearing protected plants. A Protected Plant is defined as all Extinct, Endangered, Vulnerable and/or Near Threatened (EVNT) plant species listed by name in Schedules 1-5 of the NCWR and Least Concern wildlife, not listed by name but identified as a plant indigenous to Australia in Schedule 6.

Under the amended NCA, a Protected Plant that is in the wild must not be 'taken', which includes being cleared, unless taking is under:

- a conservation plan applicable to the plant;
- a license, permit or other authority under a regulation; or
- an exemption under a regulation.

A search of the Protected Plants Flora Survey Trigger Map identified that the site is located within a High Risk Area for Protected Plants (refer **Figure 3**).

In accordance with the Protected Plants Guidelines, a flora survey must be undertaken of the clearing impact area, inclusive of a 100m buffer, and a permit to clear or an exemption confirmation must be obtained from the Department of Environment and Heritage Protection (EHP) prior to clearing. It should also be noted that no EVNT vegetation was located during the field assessment.



Legend

- Site DCDB
- Qld DCDB
- High risk area - flora survey trigger

Figure 3

NCA - Protected Plants
Flora Survey Trigger

SANDSON PTY LTD

File ref. 8781 E Figure 3 NCA A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018)

3.3. Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) is the key mechanism by which the Queensland Government protects the state's environmental resources pertaining to vegetation. Under the VMA, a series of maps delineate vegetation features across the landscape, which are each assigned a conservation value directly related to the remaining extent of these features in the landscape. The VMA also protects 'essential habitat' vegetation where listed threatened species have been known to occur.

Regulated Vegetation Management Mapping (shows vegetation categories used to determine clearing requirements. While areas shown on the map as Category X are not regulated under the VMA, those shown as Category A, B, C or R are subject to clearing requirements. The latter vegetation categories can only be cleared in accordance with an exemption, self-assessable vegetation clearing code, area management plan or development approval. A Supporting Map defining Regional Ecosystems, wetlands, watercourses and essential habitat, is provided with the Regulated Vegetation Management Map. Approval for clearing of native vegetation is required under the Planning Act 2016, specifically assessment is required against State Code 16: Native Vegetation Clearing of the State Development Assessment Provisions (SDAP) which are administered by the State Referral Assessment Agency (SARA) which is a division of the Department of Infrastructure, Local Government and Planning (DILGP).

A property search of the Regulated Vegetation Management Map identified the site as containing Category X (non-remnant) vegetation covering a large portion of the site (refer **Figure 4**). The site is also mapped as Category B Of Concern Regional Ecosystem 12.3.11 and Category B Least Concern Regional Ecosystem 12.11.24 (refer **Figure 5**). Category X non-remnant vegetation is not regulated under the VMA and therefore clearing is exempt within these areas. Clearing of Category B Of Concern and Least Concern vegetation within the site is exempt under Schedule 21 of the *Planning Regulation 2017* as the subject site is under 5 hectares. Additionally, a VMA mapped watercourse runs through the site.



Legend

- Site DCDB
- Qld DCDB

Regulated Vegetation

- Category A area - *Vegetation Offset/Compliance notices/VDecs*
- Category B area - *Remnant vegetation*
- Category C area - *High value regrowth vegetation*
- Category R area - *Reef regrowth watercourse vegetation*
- Category X area - *Vegetation not regulated under the VMA*
- Water
- Area not categorised

Figure 4

Regulated Vegetation Management Map

SANDSON PTY LTD

File ref. 8781 E Figure 4 RVMM A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018)



Legend

- Site DCDB
- Qld DCDB
- VM Watercourses
- VM Essential Habitat
- VM Wetland

Regional Ecosystems mapping

- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem

Figure 5

Regulated Vegetation Supporting Map

SANDSON PTY LTD

File ref. 8781 E Figure 5 RVSM A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018)

3.4. Biosecurity Act 2014

The *Biosecurity Act 2014*, which commenced on 1 July 2016, establishes a framework to regulate and control invasive plants and animals. Under the act, land owners are responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is known as the general biosecurity obligation (GBO).

The *Biosecurity Act 2014* categorises restricted matter (restricted plants and animals) into the following:

- Category 1: must be reported to an inspector within 24 hours (includes Red Imported Fire Ants, amongst others).
- Category 2: must be reported within 24 hours Biosecurity Queensland on 13 25 23.
- Category 3: must not be distributed either by sale or gift, or released into the environment.
- Category 4: must not be moved.
- Category 5: must not be kept.
- Category 6: must not be fed (animals).
- Category 7: must be euthanised (animals).

Restricted matters observed in the site area discussed in Section 4.

3.5. Other Queensland Environmental Legislation

Other Queensland environmental legislation has been reviewed in the context of the proposed development. Table 4 lists other relevant Queensland legislation that is not triggered by the proposed development, the purpose of the legislation, and its relevance to the proposed development site.

Table 4: Site Relevant to Other Queensland Environmental Legislation

Legislation	Purpose	Relevance to Development Site
Coastal Protection and Management Act 1995	The act seeks to protect the coastal resources of the coastal zone.	The site does not contain any coastal areas. Therefore, a response to State Code 8 is not required.
***State Planning Policy 2017* (SPP)**	Provides interim development assessment requirements which ensures that state interests are considered by local government when assessing development applications where the local government planning scheme does not yet integrate the State interests in the SPP. Matters of State Environment Significance (MSES) include	The site is mapped as containing MSES – Wildlife Habitat, Regulated Vegetation, and Regulated Vegetation intersecting a watercourse. MSES mapping overlays and requirements of the SPP were required to be incorporated into the Gold Coast City Plan and are reflected in City Plan overlays. Compliance with the

Legislation	Purpose	Relevance to Development Site
	Biodiversity, Coastal Environment, and Water Quality.	SPP is addressed through the provisions of the planning scheme.
***Planning Regulation 2017* – Schedule 11**	Deals with development within mapped Koala Habitat Areas by regulating the clearing of mapped Koala habitat and stipulating how it must be cleared. Schedule 10 Part 10 Division 1 of the Regulation outlines what is and is not prohibited development in a Koala habitat area. Schedule 11 of the Regulation sets the benchmarks for assessment in Koala Assessable Development Areas.	The site is mapped as being located outside the Koala Assessable Development Areas. The koala habitat mapping shows the site as containing Medium Value Bushland and Low Value Rehabilitation.

Refer to environmental searches in Appendix C for the location of the development site in regards to the above mapping layers.

3.6. *Fisheries Act 1994*

The Fisheries Act 1994 deals with the use, conservation and improvement of Queensland's fisheries resources and fish habitats. The legislation deals with the impact from coastal development on marine fish habitat, including protected marine plants, and declared fish habitat areas. Development proposals that modify, or have a temporary or permanent loss of fish habitat are assessed by the Department of Agriculture and Fisheries (DAF).

The site is mapped as containing two Fisheries Queensland waterways, a Low value waterway along the eastern border of the site, and a moderate value waterway along the southern border (**Figure 6**). Should any works be undertaken within the mapped waterways, a response to SDAP State Code 11: Marine Plants, State Code 12: Fish Habitat Areas and/or State Code 18: Waterway Barrier Works may be required.

3.7. Town Planning Instruments

The site is located within the jurisdiction of the City of Gold Coast and is subject to the provisions of the Gold Coast City Plan.

3.7.1 Gold Coast City Plan

Under the *Gold Coast City Plan 2015*, the application is zoned as Rural Residential (refer **Figure 7**).

The purpose of the Rural Residential Zone is to, *provide for residential development on large lots where local government infrastructure and services may not be provided on the basis that the intensity of residential development is generally dispersed*.

Under the City Plan, the proposed area is mapped within the following ecologically relevant overlays:

- **Environmental Significance (Vegetation Management)** – General priority vegetation and Regulated vegetation (refer **Figure 8**)
- **Environmental Significance (Priority Species)** – State significant species, Local significant species and koala habitat areas (refer **Figure 9**).
- **Environmental Significance (Wetlands and Watercourse)** – Waterway (refer **Figure 10**).

A response to the Environmental Significance Overlay Code is provided in **Appendix D**.



Legend

- Site DCDB
- Qld DCDB
- Fish habitat area

Waterways

Risk of Impact

- 1 - Low
- 2 - Moderate
- 3 - High
- 4 - Major
- Tidal waterway

Figure 6

Fisheries - Waterways for Waterway Barrier Works

File ref. 8781 E Figure 6 Fisheries A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:1,882 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018)



Legend

Site DCDB

Qld DCDB

City Plan Zoning

Medium density residential

Rural residential

Rural

Figure 7

Gold Coast City Plan 2015
Zoning

SANDSON PTY LTD

File ref. 8781 E Figure 7 Zoning A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018), Gold Coast Zoning (City of Gold Coast 2018)



Legend

- Site DCDB
- Qld DCDB

Vegetation Management

- High priority vegetation
- General priority vegetion
- Medium priority vegetation
- Regulated vegetation

Figure 8

Gold Coast City Plan 2015
Environmental Significance
Vegetation Management

SANDSON PTY LTD

File ref. 8781 E Figure 8 Vegetation Mngt A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

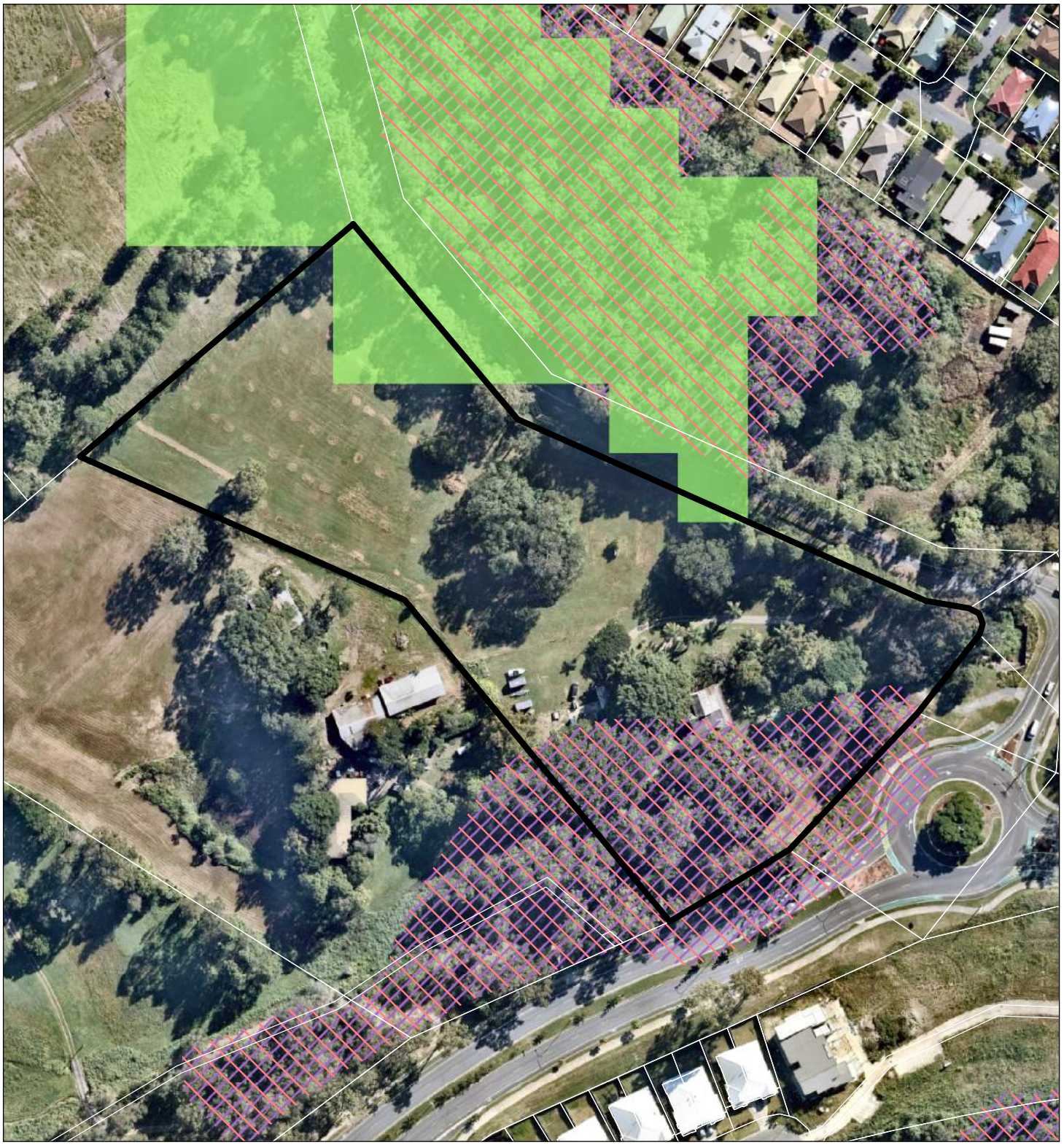
N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018), Gold Coast Zoning (City of Gold Coast 2018)



Legend

- Site DCDB
- Qld DCDB
- State significant species
- Local significant species
- Koala habitat areas

Figure 9

Gold Coast City Plan 2015
Environmental Significance
Priority Species

SANDSON PTY LTD

File ref. 8781 E Figure 9 Significant Species A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:2,000 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018), Gold Coast Significant Species (City of Gold Coast 2018)



Legend

- Site DCDB
- Qld DCDB
- Watercourse

Figure 10

Gold Coast City Plan 2015
Environmental Significance
Wetlands and Watercourses

SANDSON PTY LTD

File ref. 8781 E Figure 10 GCC Wetlands WCs A
Date *18/06/2018*
Project *202 Baileys Mountain Road, Upper Coomera*

0 10 20 40 60 80 *m*

N

Scale (A4): 1:1,882 [GDA 1994 MGA Z56]

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018), Aerial (Nearmap 2018), Gold Coast Wetlands and Watercourse (City of Gold Coast 2018)

4. Field Survey Results

Two (2) ecologists from Saunders Havill Group assessed the application site on 18th April, 2017 and again on the 15th June, 2018 with weather conditions fine and sunny. The entire site was walked to ensure all vegetation communities and species were recorded. Particular attention was paid to any threatened flora and habitat for any threatened fauna species that were listed as possibly occurring on or within the vicinity of the application area, and specific micro assemblage which may support these threatened species.

4.1. General Site Observation

The following observations have been made based on detailed field survey.

- The majority of the site has been cleared of native vegetation values and is regularly maintained through slashing. A small patch of remnant vegetation is mapped towards the sites southern property boundary which contains Least Concern RE12.11.5 and Of Concern RE12.3.11. Both of these regional ecosystem communities have been incorrectly mapped as a result of species composition (Plan 1).
- A number of large planted *Ficus macrophylla* (Moreton Bay Fig) trees were recorded scattered throughout the property and appeared to be remnants of old farming land with a number of horse paddocks observed throughout the broader landscape.
- Two mapped waterways are located adjacent to the sites South East property boundary adjacent to Reserve Road. Both waterways are highly modified and contain a significant infestation of introduced species.

4.2. Flora Survey Results

The following flora observations have been made based on detailed field survey:

- The EPBC Act PMST listed 3 Threatened Ecological Communities (TEC)s considered to have potential to be found within the area (refer Section 3.1). These are described as Lowland Rainforest of Subtropical Australia, Subtropical and Temperate Coastal Saltmarsh and White Box-Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. No TECs were observed on site. In addition, eighteen (18) EPBC Act listed flora species are listed as possible occurring on site with only one species identified as *Macadamia integrifolia* (Macadamia Nut) recorded on site. This species however had been planted amongst constructed or landscaped areas and is not considered to be occurring naturally on the property.
    - The Lowland Rainforest of Subtropical Australia TEC typically has high species richness. In Queensland, this TEC is part of a number of Regional Ecosystem communities including 12.3.1, 12.5.13, 12.8.3, 12.8.4, 12.8.13, 12.11.1, 12.11.10, 12.12.1 and 12.12.16. None of these regional ecosystem communities occur on site or within the immediate vicinity of the site.
    - The Subtropical and Temperate Coastal Saltmarsh TEC occurs within a relatively narrow margin of the Australian coastline and includes coastal areas under regular or intermittent tidal influence. It consists of mainly slat tolerant vegetation including grasses, herbs, sedges, rushes and shrubs. No conditions typical of this TEC are located on or adjacent to the site.

  - The White Box-Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is typically found further west towards the western portion of the south east Queensland bioregion. Regional ecosystem 12.8.16 contains some elements that may include this TEC however is not found on or near the application site.

- A search of the NCA Wildlife Online database listed eleven (11) threatened flora species as possibly occurring within the area (refer Section 3.2). Two *Macadamia integrifolia* (Macadamia Nut) specimens had been planted amongst other fruiting trees near the residence and is not considered to be occurring natural on the property.
- Regional Ecosystem mapping shows the site as containing approximately 0.34 hectares of Least Concern RE12.11.5 and 0.27 hectares of Of Concern RE12.3.11 with both remnant polygons extending into the adjacent property to the south and within road reserve.
  - Both polygons contain species which are not representative of each regional ecosystem community and include areas that are regularly maintained through slashing. The mapped Least Concern remnant polygon also contains infrastructure including an existing house and pool and constructed garden beds with landscaping species. The Of Concern remnant polygon associated with the waterway has also mapped a large part of the road reserve and includes areas regularly maintained through slashing.
  - The total area of the remnant polygon is approximately 1.65 hectares. With an analysis of aerial photography and with a realignment of remnant boundaries to not include the cleared road reserve and open paddocks, this polygon is less than one hectare in size and therefore would not be considered remnant under the *Vegetation Management Act* (Plan 1).
  - A number of planted landscaping species, both native and exotic, are recorded within the mapped remnant polygons, which are not consistent with the current regional ecosystem descriptions. Species recorded that do not represent either regional ecosystem community include *Mangifera indica* (Mango), *Livistonia australis* (Cabbage Tree Palm), *Grevillea robusta* (Silky Oak), *Castonospermum austral* (Black Bean), *Brachychiton acerifolius* (Illawara Flame Tree), *Melicope elleryana* (Pink Doughwood), *Ficus obliqua* (Small Leaf Fig) and *Ficus rubignosa* (Port Jackson Fig).
- A total of one hundred and three (103) flora species were recorded on site, consisting of forty three (43) native species and sixty (60) introduced species (refer Table 5). The majority of introduced species were recorded in the southern portion of the site amongst constructed gardens as well as along the mapped waterways.

4.2.1 Threatened Flora

For the purposes of this report, a significant flora species has been defined as a species that is:

- Scheduled as Critically Endangered, Endangered, Vulnerable or Conservation Dependent under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA); and/or
- Scheduled as Endangered, Vulnerable, or Near Threatened under the Queensland *Nature Conservation Act 1992* (NCA); and/or

- Gold Coast Council significant species. Gold Coast City Council has listed four hundred and sixty five (465) flora species as locally significant species in the City Plan.

Two (2) specimens identified as *Macadamia integrifolia* (Macadamia Nut) have been planted on site and is listed as a threatened species by all levels of government (Plan 1). Both specimens had been planted adjacent to the existing house towards the southern portion of the site.

4.2.2 Observed Flora

Table 5: Native Flora Species List

Scientific Name	Common Name
Acacia disparrima	Hickory Wattle
Acacia melanoxylon	Blackwood
Alphitonia excelsa	Soap Tree
Alpinia caerulea	Native Ginger
Brachychiton acerifolius	Illawara Flame Tree
Castanospermum australe	Black Bean
Chrysocephalum apiculatum	Yellow Buttons
Cordyline congesta	A Palm Lily
Corymbia intermedia	Pink Bloodwood
Cupaniopsis anacardioides	Tuckeroo
Dianella caerulea	Blueberry Lily
Eucalyptus microcorys	Tallowood
Eucalyptus propinqua	Small-fruited Grey Gum
Eucalyptus siderophloia	Grey Ironbark
Eucalyptus tereticornis	Forest Red Gum
Ficus benjamina	Weeping Fig
Ficus macrophylla	Moreton Bay Fig
Ficus obliqua	Small-leaved Fig
Ficus rubiginosa	Rock Fig
Ficus sp.	Fig (round leaf)
Geitonoplesium cymosum	Scrambling Lily
Glochidion ferdinandi	Cheese Tree
Goodenia rotundifolia	Star Goodenia
Grevillea robusta	Silky Oak
Imperata cylindrica	Blady Grass
Jagera pseudorhus	Foambark
Juncus usitatus	Common Rush
Livistona australis	Cabbage-tree Palm
Lobelia purpurascens	White Root

Scientific Name	Common Name
Lomandar longifolia	Mat Rush
Lophostemon confertus	Brush Box
Lophostemon suaveolens	Swamp Box
Macadamia integrifolia	Macadamia
Macaranga tanarius	Macaranga
Melaleuca viminalis	Weeping Bottlebrush
Melicope elleryana	Pink Doughwood
Oplismenus aemulus	Creeping Beard Grass
Pandanus tectorius	Pandanas
Parsonsia straminea	Monkey Rope Vine
Platycerium superbum	Staghorn
Pteridium esculentum	Bracken Fern
Themeda triandra	Kangaroo Grass
Waterhousia floribunda	Weeping Lillipilli

4.2.3 GPS Tree Plot Survey

A Tree Plot Survey was carried out on site locating and identifying all native trees with a trunk diameter (DBH) greater than 100 mm (measured at 1.4m above ground) or over 4 m in height, as well as exotic specimens within the ecologically dominant layer also located. Data for the GPS Tree Plot Survey have been extracted and summarised below. Refer to Plan 2 for the Tree Plot and Appendix E for the Tree Schedule.

- The GPS Tree Plot recorded 90 tree specimens across 27 species (refer Table 6 and Section 4.2.5, respectively).
- The most abundant species recorded was identified as *Eucalyptus siderophloia* (Grey Ironbark) which made up 16% of the Tree Plot Survey, followed by *Eucalyptus tereticornis* (Forest Red Gum) and *Corymbia intermedia* (Pink Bloodwood) which each contributed approximately 13 % and 8 % of the Tree Plot Survey. Table 6 provides a summary of the results of the Tree Plot Survey completed across the site.
- Table 7 provides a summary of the DBH recorded trees of the Tree Plot Survey and shows that 33% of the trees had a DBH less than 200m, and 52% had a DBH less than 400 mm. The remaining 47 % had a DBH greater than 400mm with over 11% retaining a trunk DBH greater than 1000mm.
- Ten (10) trees were recorded as part of the tree pot survey retaining a trunk DBH greater than 1000mm. These species are typical of properties throughout the broader landscape that have once been used for rural purposes. These large trees included *Ficus benjamina* (Weeping Fig), *Eucalyptus siderophloia* (Grey Ironbark), *Mangifera indica* (Mango), and *Ficus macrophylla* (Moreton Bay Fig).

Table 6: Tree Plot Summary

Scientific Name	Common Name	Number Recorded	Percentage Recorded (%)
Eucalyptus siderophloia	Grey Ironbark	15	16.67
Eucalyptus tereticornis	Forest Red Gum	12	13.33
Corymbia intermedia	Pink Bloodwood	8	8.89
Grevillea robusta	Silky Oak	7	7.78
Lophostemon confertus	Brush Box	7	7.78
Acacia disparrima	Hickory Wattle	6	6.67
Eucalyptus microcorys	Tallowood	5	5.56
Ficus macrophylla	Moreton Bay Fig	5	5.56
Mangifera indica	Mango	3	3.33
Acacia melanoxylon	Blackwood	2	2.22
Jagera pseudorhus	Foambark	2	2.22
Macadamia integrifolia	Macadamia	2	2.22
Brachychiton acerifolius	Illawara Flame Tree	1	1.11
Castanospermum australe	Black Bean	1	1.11
Cupaniopsis anacardioides	Tuckeroo	1	1.11
Eucalyptus propinqua	Small-fruited Grey Gum	1	1.11
Ficus benjamina	Weeping Fig	1	1.11
Ficus elastica	Rubber Fig	1	1.11
Ficus obliqua	Small-leaved Fig	1	1.11
Ficus rubiginosa	Rock Fig	1	1.11
Ficus sp.	Fig (round leaf)	1	1.11
Glochidion ferdinandi	Cheese Tree	1	1.11
Livistona australis	Cabbage-tree Palm	1	1.11
Lophostemon suaveolens	Swamp Box	1	1.11
Melicope elleryana	Pink Doughwood	1	1.11
Pandanus tectorius	Pandanas	1	1.11
Podocarpus elatus	Brown Pine	1	1.11
Waterhousia floribunda	Weeping Lillipilli	1	1.11
Total		**90**	**100%**

Table 7: Tree Plot DBH Summary

Total DBH (mm)	Number Recorded	Percentage Recorded (%)
100 – 199	14	15.56
200 – 299	16	17.78
300 – 399	17	18.89
400 – 499	12	13.33
500 – 599	9	10
600 – 699	6	6.67
700 – 799	1	1.11
> 800	15	16.67
Total Recorded	**90**	**100%**



Photo: Large Ficus tree adjacent to existing house.



Photo: Site regularly maintained through slashing.



Photo: Cleared open paddock, regularly slashed.



Photo: Mapped waterway opposite Reserve Road.



Photo: Mapped waterway adjacent to Baileys Mountain Road.

1. FIELD SURVEY



NOTES
This plan was prepared as a desktop assessment tool.
The information on this plan is not suitable for any other purpose.
Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
Qld State Cadastre and Mapping layers © State of Queensland (Department of Natural Resources and Mines) 2018. Updated data available at http://qldspatial.information.qld.gov.au/catalogue//
Aerial Imagery © Nearmap, 2018

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Legend

- Site DCDB
- Qld DCDB
- Field survey tracklog
- *Macadamia integrifolia* specimen

Regional Ecosystems mapping

- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem

Regional Ecosystems (ground-truthed)

- Ground-truthed Category A or B area containing of concern RE (1,619.7m²)
- Ground-truthed Category A or B area that is a least concern RE (2,905.7m²)

Issue	Date	Description	Drawn	Checked
C	31/07/2018	Preliminary	MC	AH

0 10 20 30 40 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:1,100 @ A3

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SANDSON PTY LTD

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ADDRESS/RPD: LOT 58 ON SP191940 *31/07/2018* *8781 E 01 Field Survey A*

2. TREE PLOT



NOTES
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The information on this plan is not suitable for any other purpose.
Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
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Aerial Imagery © Nearmap, 2018

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Legend

Site DCDB

Qld DCDB

Tree plot (SHG)

Native tree species (w/TPZ)

Non-native or planted native tree sp. (w/TPZ)

Survey accurate trees (provided by BDA 2018)

Tree location

Neighbouring lot

On boundary

Issue	Date	Description	Drawn	Checked
C	10/07/2018	Preliminary	MC	AH

0 5 10 20 30 40 50 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:1,200 @ A3

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BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ADDRESS/RPD: LOT 58 ON SP191940 *10/07/2018* *8781 E 01 Tree Plot C*

4.2.4 Mapped Waterways

Two fisheries waterways are mapped within the investigation area as low and moderate. Although both mapped waterways have been highly modified, both waterways contained permanent pooling.

- Native species were largely recorded within the canopy and sub-canopy layer however other introduced species dominated the flora observed throughout both waterways. *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus siderophloia* (Grey Ironbark) provides some evidence that the Of Concern Regional ecosystem once dominated the waterway areas.
- Other native species recorded throughout both waterways include *Acacia disparrima* (Hickory Wattle), *Alphitonia excelsa* (Soap Tree) and *Jagera pseudorhus* (Foambark). Other native trees were recorded amongst the tree plot survey however had been planted as part of landscaping purposes.
- The shrub and ground layers are dominated by introduced species including large areas dominated by *Sphagneticola trilobata* (Singapore Daisy).
- The waterway mapped as low is mapped as continuing along Baileys Mountain Road. The on site features have a drainage channel piped underneath the road and an overland flow path that flows upstream adjacent to the property boundary. No waterway features were observed within this portion of the site, which appears to be slashed in the drier parts of the year and is dominated *Ageratum houstonianum* (Blue Billy Goat Weed). Downstream contains a constructed dam and landscaped species along the edges, including a number of *Pinus elliotii* (Slash Pine).
- The fisheries waterway mapped as moderate within the southern extent of the site contains a greater diversity of flora species, however is dominated by weed species. There is a defined channel which at the time of the assessment contained pooled water, however the water had an orange appearance and slight odour. Embankments were obvious along the majority of the waterway, however wetland dependant species were largely absent apart from *Juncus usitatus* (Common Rush) and *Persicaria decipiens* (Slender Knot Weed). It is noted that scattered *Lophostemon suaveolens* (Swamp Box) were recorded along the embankments of the mapped waterway with a ground layer containing *Lomandra longifolia* (Mat Rush). The majority of the canopy is dominated by *Cinnamomum camphora* (Camphor Laurel) with a large *Ficus elastica* (Rubber Fig) also recorded throughout the waterway.
- Although remnant vegetation is mapped along the moderate fisheries waterway, this mapping is incorrect due to species composition and historical vegetation clearing. With the native trees remaining throughout the mapped polygon, this area is too small to be mapped under the VMA and therefore should not be regarded as remnant vegetation.



Photo: Northern part of low fisheries mapped waterway.



Photo: Moderate mapped waterway

4.2.5 Introduced Species

The following observations have been made based on field survey:

- Of the one hundred and three (103) flora species recorded across the site, sixty (60) are considered introduced flora species to the area (refer Table 8).
- Eight (8) of these species are listed as restricted matters under the *Biosecurity Act 2014* (discussed in Section 3.4) and another eight (8) are listed as 'other invasive plant'. Management of restricted invasive plans under the Act are to be managed at the Local Government level through a biosecurity plan that covers invasive plants and animals in its area.

Table 8: Introduced Species List

Scientific Name	Common Name	Restricted under Biosecurity Act 2014
Ageratina riparia	Mist Flower	
Ageratum houstonianum	Blue Billygoat Weed	
Ambrosia artemisiifolia	Annual Ragweed	Restricted Invasive Plant
Archontophoenix alexandrae	Alexandra Palm	
Asclepias curassavica	Red-head Cotton Bush	
Asparagus aethiopicus	Climbing Asparagus	Restricted Invasive Plant
Bidens pilosa	Cobblers Pegs	
Calyptocarpus vialis	Creeping Cinderella Weed	
Cascabela thevetia	Yellow Oleanda	
Celtis sinensis	Chinese Elm	
Centella asiatica	Pennywort	
Chloris gayana	Rhodes Grass	Other Invasive Plant
Chloris virgata	Feathertop Rhodes Grass	
Cinnamomum camphora	Camphor Laurel	Restricted Invasive Plant
Commelina diffusa	Wandering Jew	
Conyza bonariensis	Flaxleaf Fleabane	
Corymbia torelliana	Cadaghi	
Crassocephalum crepidioides	Thickhead	
Cynondon dactylon	Green Couch	
Cyperus involucratus	Umbrella Sedge	
Cyperus polystachyos	Bunchy Sedge	
Cyperus rotundus	Nutgrass	
Dypsis lutescens	Golden Cane Palm	
Erythrina crista-galli	Cockspur Coral Tree	
Ficus elastica	Rubber Fig	
Gomphrena globosa	Gomphrena	
Ipomoea cairica	Mile-a-minute	

Scientific Name	Common Name	Restricted under Biosecurity Act 2014
Jacaranda mimosifolia	Jacaranda	
Lantana camara	Lantana	Restricted Invasive Plant
Ligustrum sinense	Small Leaved Privet	Restricted Invasive Plant
Ludwigia peploides	Water Primrose	
Mangifera indica	Mango	
Megathyrsus maximus	Guinea Grass	
Melinis repens	Red Natal Grass	
Murraya paniculata	Mock Orange	Other Invasive Plant
Neonotonia wightii	Glycine	
Nephrolepis cordifolia	Fishbone Fern	
Ochna serrulata	Ochna	Other Invasive Plant
Paspalum dilatatum	Paspalum	
Passiflora suberosa	Corky Passion Vine	Other Invasive Plant
Pennisetum alopecuroides	Foxtail Grass	
Persicaria decipiens	Slender Knot Weed	
Pinus elliotii	Slash Pine	
Podocarpus elatus	Brown Pink	
Psidium cattleyanum	Guava	
Rivina humilis	Coral Berry	
Schefflera actinophylla	Umbrella Tree	Other Invasive Plant
Schinus terebinthifolius	Broadleaved Pepper	Restricted Invasive Plant
Senna pendula	Easter Cassia	Other Invasive Plant
Sida cordifolia	Flannel Weed	
Solanum mauritianum	Wild Tobacco Tree	Other Invasive Plant
Solanum nigrum	Blackberry Nightshade	
Solanum seaforthianum	Brazilian Nightshade	
Solanum torvum	Devils Fig	
Spathodea companulata	African Tulip Tree	Restricted Invasive Plant
Sphagneticola trilobata	Singapore Daisy	Restricted Invasive Plant
Stenotaphrum secundatum	Buffalo Grass	
Syragrus romanzoffiana	Cocus Palm	Other Invasive Plant
Urochloa mutica	Para Grass	
Yucca sp.	Yucca	

4.3. Fauna Observations

A basic fauna assessment was conducted across the site to identify and describe on-ground habitat features (e.g. habitat trees, fallen logs, termite mounts, roosting sites etc.), signs of fauna activity (e.g. scats, tracks, scratch marks on trees, nests etc.) and observations of species present within the area. Consideration was also given to the ecological significance of the site in the context of the local area and the broader region. No specific surveys for reptiles (e.g. pitfall traps) nor nocturnal animals (e.g. spotlighting) were used.

The following observations have been made based on field survey:

- Overall, the project area is considered highly modified having been subject to historical clearing and currently consists of cleared lawn areas that are regularly maintained with planted garden areas and scattered native and exotic trees. Consequently, habitat features such as fallen logs and dense leaf litter, which are preferred habitat for native fauna, are absent from the majority of the site.
- Two waterways are mapped on site, both of which have been highly modified. One of the mapped waterways is fed from pipes under Baileys Mountain Road and extends along the property boundary towards the south east property corner at Old Coach Road, where it is piped again. The other waterway extends along Reserve Road and is dominated by introduced weed species.
- Twenty-four (24) fauna species were observed on site or as fly over species (refer Table 9).
- Evidence and observations of site fauna concluded that site features and habitat are only suitable for some common, relatively urbanised fauna species, including avifauna and small reptiles.

Table 9: Fauna Species List

Species	Common Name
Bufo marinus	Cane Toad
Centropus phasianinus	Pheasant Coucal
Chenonetta jubata	Australian Wood Duck
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Corvus orru	Torresian Crow
Cracticus nigrogularis	Pied Butcherbird
Cryptoblepharus virgatus	Wall Skink
Dacelo novaeguineae	Laughing Kookaburra
Entomyzon cyanotis	Blue-faced Honeyeater
Gallinula tenebrosa	Dusky Moorhen
Grallina cyanoleuca	Magpie-lark
Gymnorhina tibicen	Australian Magpie
Hirundo neoxena	Welcome Swallow
Lampropholis delicata	Grass Skink
Malurus cyaneus	Superb Fairy-wren
Manorina melanocephala	Noisy Minor
Meliphaga lewinii	Lewin's Honeyeater

Species	Common Name
Physignathus leseurii	Eastern Water Dragon
Rhipidura leucophyrs	Willie Wagtail
Threskiornis molucca	Australian White Ibis
Trichoglossus chlorepidotus	Scaly-breasted Lorikeet
Trichoglossus haematodus	Rainbow Lorikeet
Trichosurus vulpecula	Common Brushtail Possum
Vanellus miles	Masked Lapwing

4.3.1 Threatened Species

No fauna species listed as threated under the EPBC Act nor NCA were recorded on site. Due to surrounding development, roads and highly modified vegetation values, the site is not considered to retain areas that contain specific habitat requirements for these listed species.

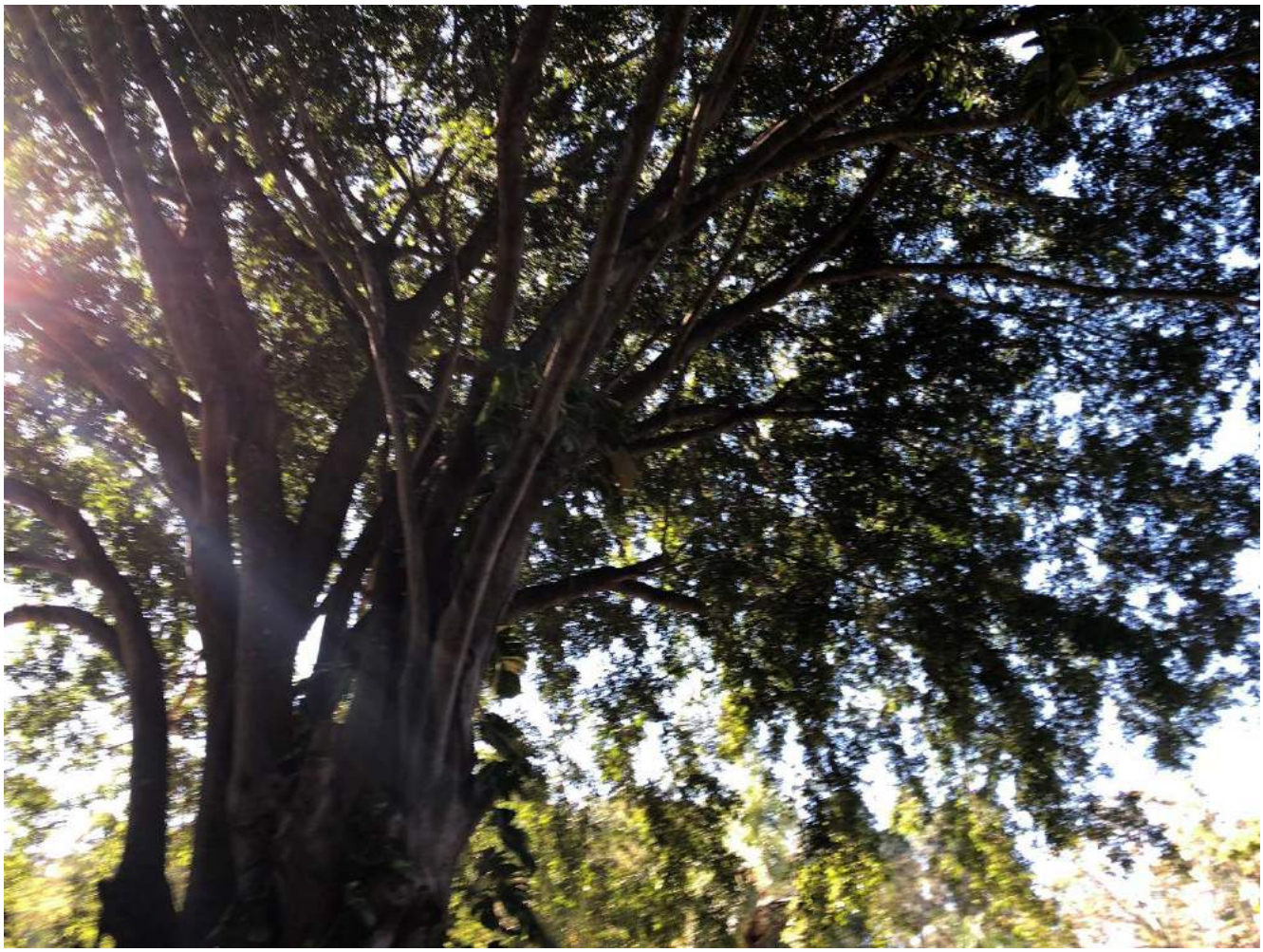


Photo: Large Fig trees scattered throughout the site.

5. Impact Assessment and Development Analysis

5.1. Proposed Development

The development proposal is for an aged care facility incorporating both independent living and retirement apartments, including new roads, stormwater treatment and associated car parking. The existing dwelling on-site is proposed to be retained as part of the development, and utilised as a colleague training facility. The site is zoned as Rural Residential under the Gold Coast City Plan and is located within an area that is transitioning from rural residential to a mixed low-medium density residential area.

The proposed development for Baileys Mountain Road is not considered to have a significant impact on any unique ecological values as the site was not recorded to contain any such values. Further, the site is relatively disturbed as a result of historical and current rural residential land uses, including vegetation clearing, construction of dwellings and rural residential land uses. It is also surrounded by roads and other cleared rural residential properties, with a number of residential developments currently going through approval processes proposed for neighbouring properties. The proposed development will result in the removal of trees across the site, however, as outlined in Section 4, this area has been historically maintained and contains only some scattered mature native tree specimens and several landscape and exotic tree specimens.

The proposed development does not involve clearing nor construction within the mapped waterway along the southern boundary of the subject site. Any existing habitat for fish or waterway dwelling fauna will be conserved in this area, and the retention of the surrounding vegetation will facilitate fauna movement across the site and wider landscape. The waterway mapped along the eastern boundary will be redefined and rehabilitated as part of the development. During the field survey, this waterway was observed as an overland flow path which consists of a drainage channel piped under Baileys Mountain Road. As no waterway features were observed on-site for this waterway, this area is proposed to undergo revegetation to increase fauna presence and enhance ecological functionality across the site (i.e. facilitate fauna movement and provide shelter). Given the extent of historical disturbance and severe weed incursion, the proposed retention and rehabilitation of the two waterways on-site will therefore ensure an overall ecological gain.

Due to the highly disturbed nature of the vegetation and the severe fragmentation within the broader Upper Coomera area, removal of site trees is not considered to result in a loss of habitat nor significant ecological features. **Plan 5** shows the connectivity opportunities within the broader Upper Coomera suburb, which indicates that the vegetation on-site does not have the potential to form part of a corridor in its current state. This is in part due to the highly degraded nature of the subject site, and the disturbed cleared rural residential allotments surrounding the site. The site is also separated from areas of connectivity by Baileys Mountain Road and Reserve Road.

5.2. Potential Impacts

The key potential ecological impacts associated with the development proposal are:

5.2.1 Vegetation Clearing

Clearing of vegetation to support the development will reduce vegetation cover and habitat for flora and fauna dependent on those ecosystems. Ecological field surveys did not identify any unique or significant biodiversity values within the clearing area. As such, the impact to vegetation will be minor.

5.2.2 Weeds

Increased vehicle movement during the construction phase has the potential to increase the spread of weeds in the area, particularly during the vegetation clearing phase. With implementation of standard mitigation measures, the project is likely to result in a negligible impact to ecological values due to the potential introduction/spread of weeds.

5.2.3 Vehicle Movements

During construction, a large number of vehicles will be required on the subject site. Direct impact from vehicle movements on threatened species and vegetation communities include:

- Damage or destruction of vegetation or fauna habitat by vehicles traversing these areas; and
- Fauna strike.

Indirect impacts include:

- Interference of fauna through visual and noise impacts. This in turn can affect feeding, roosting, breeding or nesting behaviour;
- Introducing and/or spreading weeds or feral animals carried on or in vehicles, resulting in deterioration or loss of vegetation and important fauna habitat; and
- Damage or destruction of vegetation and fauna habitat through smothering by dust generated by vehicles traversing the project area.

With implementation of standard mitigation measures, the project is likely to result in a temporary and minor impact to ecological values due to vehicular movements. Further, ecological field survey confirmed only common avi-fauna are present on the site.

5.2.4 Earthworks

Construction activities have the potential to generate dust emissions. Dust emissions during construction will be temporary. The main sources of dust will be generated via:

- Wheel-generated dust from the haul roads created for the construction phase;
- Dust lift-off from exposed surfaces (e.g. construction roads and pads);
- Earthworks, including construction of the embankments, and moving, dumping and shaping material; and
- Vegetation and soil clearing of the land.

Excessive deposition of dust on leaves of plants can suppress the growth and photosynthesis, resulting in reduced habitat quality for fauna. High levels of airborne dust can irritate the respiratory systems of fauna and potentially result in ingestion of dust-coated seeds and other foods. Excessive deposition of dust on open water bodies may also degrade water quality and overall habitat quality for fauna. With implementation of standard mitigation measures, the project is likely to result in a temporary and minor impact to ecological values due to the generation of dust.

5.2.5 Light emissions during construction

Artificial light can affect both nocturnal and diurnal animals by disrupting behavioural patterns, with quality of light (e.g. wavelength, colour), intensity and duration potentially evoking different faunal responses. Impacts from increased light levels include disorientation from, or attraction toward, artificial sources of light; mortality from collisions with structures; and effects on light-sensitive cycles of species (e.g. breeding and migration for fauna and flowering in plants). An artificial increase in lighting can also affect abundance of predators.

Presence and intensity of artificial light in the project area will temporarily increase during the construction phase; however, night works will not be common. Lighting will be directed to construction areas within the project area. Some light spillage will be inevitable and is likely to be contained. Potential impacts associated with light emissions will be temporary and unlikely to be significant.

With implementation of standard mitigation measures, the project is likely to result in a negligible impact to ecological values due to the use of light pollution during construction.

5.2.6 Noise and Vibration

Noise levels greater than existing ambient noise levels are expected during the construction within the project area. Sources of noise are likely to consist of noise in short, intense pulses from mobile plant equipment, and more prolonged noise, with consistent vibration, pitch and volume from generators, excavators and pumps, in addition from noise from vehicles.

Both steady continuous and single noise events have the potential to lead to ecological impacts. Construction noise is expected to elicit some avoidance response from fauna using the surrounding vegetation though,

with consideration of the extent of habitat available in the study area, this is likely to be a temporary and negligible to minor impact.

5.2.7 Waste disposal

Inappropriate disposal of non-hazardous wastes can attract vermin and other wildlife to site. This may exacerbate potential impacts (e.g. road mortality). Litter may also enter surrounding environments. With implementation of standard mitigation measures, the project is likely to result in a negligible impact to ecological values due to the generation and handling of waste.

5.2.8 Hazardous and dangerous goods

Spills and leaks from transfers (fuel, chemicals) and inadequate storage of dangerous goods and hazardous wastes could result in point-source contamination of surrounding land. Direct adverse impacts could include toxic impacts on vegetation (resulting in degradation or loss of vegetation and habitats), direct toxic impacts on fauna (from contact, inhalation or ingestion) or indirect impacts on threatened and migratory species from habitat loss. Direct adverse impacts on surface and groundwater quality are also possible.

With the application of standard mitigation and management measures, impacts from liquid and solid waste disposal will be avoided or localised and small in scale. Further to this, the likelihood of significant spillages is considered low. Therefore, the project is likely to result in a negligible impact to ecological values due to potential spills and leaks.

5.2.9 Increased human presence

Increased human activity during construction has the potential to disturb fauna both within adjacent habitat areas. Examples of impacts included heightened vigilance and predator avoidance, which can disrupt foraging and roosting efficiency, or deter wildlife from using particular areas. Impacts essentially represent a reduction in core habitat due to edge effects. The project is likely to result in a temporary and minor impact to ecological values due the increased human presence on site during construction.

5.3. Ongoing Disturbances

After completion of construction, the ongoing presence of infrastructure and increased human activity can continue to have potential for adverse direct and indirect impacts. The key continuing risks to ecological values include:

- Weed incursion;
- Vehicle movements;
- Noise and light; and
- Increased human presence.

Each potential impact associated with ongoing use of the site is described in detail in the following sections.

5.3.1 Weed Incursion

Landscaped gardens will introduce a variety of new and exotic species to the area. Garden escapes have the potential to be introduced into adjacent bushland areas through vectors such as birds, wind and runoff. Weed incursion will be ongoing and can be difficult to prevent. Nonetheless, the problem is often mostly constrained to edges of bushland that abut gardens and along urban waterways. However, as the site contains existing exotic and weed species along the waterways mapped by fisheries, the establishment of landscaped gardens and associated impacts mentioned are not considered to result in an impact to the ecological values currently exuded on-site.

The implementation of standard mitigation measures is, however, still required during the development. The project has the potential to result in a minor impact to ecological values due to the introduction and spread of weeds. However, considering the existing state of vegetation, particularly along the mapped waterways, the potential ecological impacts are considered to be low. Implementation of the recommended management and compensatory measures should result in an ecological gain across the site, particularly within the mapped waterways.

5.3.2 Vehicle Strike

Upon completion of the development, there will be a significant increase of vehicle traffic (compared to baseline conditions) and this will increase the likelihood of fauna strike. The probability of fauna strike is reduced due to the fact that most fauna will generally avoid urban areas. Notwithstanding this, a low number of macropods, as well as reptiles (i.e. snakes and lizards attracted to heat on roads) may occasionally enter the area and be at risk of vehicular strike. However, given the lack of evidence of macropods both on-site and on adjoining allotments, the risk of vehicle strike is considered to be negligible. Further, the area is already subject to heavy vehicular traffic due to surrounding land uses.

5.3.3 Noise and Light

Noise levels are likely to increase once the development is operational as there will be increased vehicular and pedestrian traffic. Road noise will be the primary source of noise impact. The establishment and use of garden paths through landscaped areas will also provide a source of noise and light due to pedestrian traffic. However, this is expected to be minor.

Artificial light from residences may affect nocturnal and diurnal animals by disrupting sleep and movement patterns, with quality of light (e.g. wave length, colour), intensity and duration potentially evoking different responses. Impacts from increased light levels include disorientation from or attraction toward artificial sources of light; mortality from collisions with structures; and effects on light-sensitive cycles of species (e.g. breeding and migration for fauna and flowering in plants). The presence and intensity of artificial light will have most impact at the edges of adjacent vegetation. Furthermore, the project is likely to result in a negligible impact to wildlife due to light spillage.

5.3.4 Increased Human Presence

Increased human activity associated with land uses within the development has the potential to disturb fauna species that exist within the broader area. Examples of impacts include heightened vigilance and predator avoidance, which can disrupt foraging and roosting efficiency, or deter wildlife from using particular areas. However, in consideration of Council's intent for urbanisation to occur within the vicinity of the proposed development site, the likely impacts to fauna as a result of the proposed development are likely to be minimal when considering the future occurrence of urban development's proximal to the subject site.

Therefore, increased human presence associated with the proposed development is expected to have a minor to moderate impact on flora and fauna.

5.4. Management and Compensatory Measures

A number of management and compensatory measures are proposed to minimise and offset impacts associated with the development. These include:

5.4.1 Vegetation Clearing and Management Plan

A Vegetation Clearing and Management Plan (VC&MP) should form part of the broader management document submitted as part of the Operational Works drawings for the project site.

The VC&MP should cover clearing of all vegetation listed in this report and include details on:

- Clearly shown trees to be removed
- All civil works likely to impact on existing vegetation
- Temporary and permanent exclusion and protection fencing
- Roles and responsibilities for site contractors, the developer and the consultant group
- Stockpiling and site access locations
- A clearing sequence plan showing the commencement of clearing and direction of removal (this should be in conjunction with the Fauna Management Plan to allow for the appropriate flushing of fauna towards safe havens and/or the application of an appropriate relocation program)
- Links to weed management and revegetation proposals
- The stock piling and reuse of cleared vegetation

5.4.2 Fauna Management Plan

A Fauna Management Plan (FMP) should be prepared for potential impacts of the construction phase covering the loss of vegetated areas, isolated trees and likely barriers and impediments to local dispersal.

The FMP should link closely with the VC&MP and include details on:

- Species surveyed as using the site with a focus on those most likely impacted by development works
- A list of relevant State and Commonwealth legislation constraints and controls for the above listed fauna
- A plan showing existing habitat opportunities and locations
- Details of the threats to existing fauna species

- Clearing sequence plan from the VC&MP
- Management and mitigation measures i.e. temporary use of fauna exclusion fencing
- Fauna spotter role, contacts and certification
- Specific fauna management procedures for potential or known habitat trees

5.4.3 Rehabilitation Plan

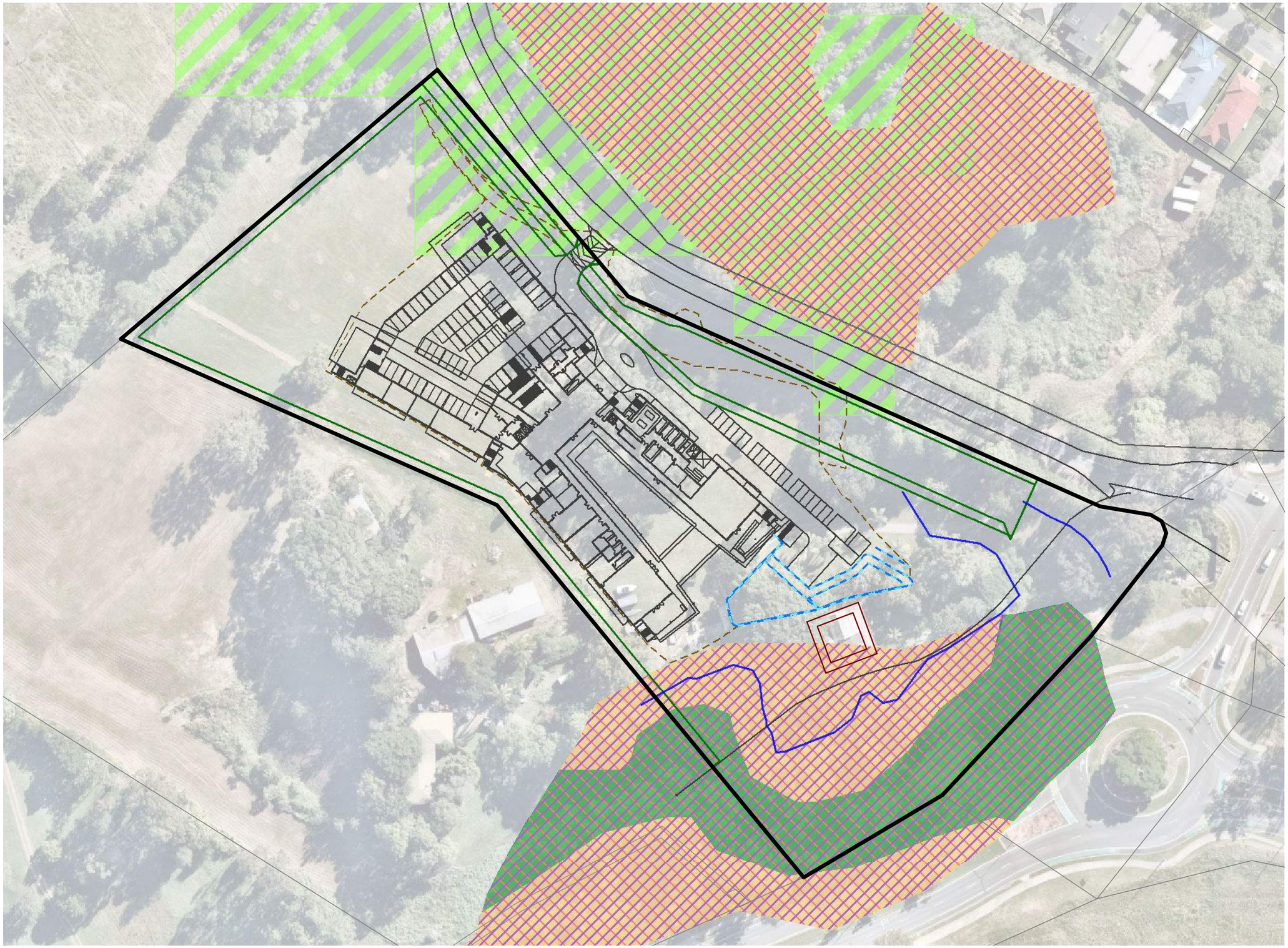
A Rehabilitation Plan should form part of the broader management document submitted as part of the operational works drawings for the project site, and will generally include information on:

- Rehabilitation approaches in accordance with SEQ Ecological Restoration Guidelines
- Existing and proposed contours
- Locations of services, earthworks
- Existing vegetation to be retained, removed
- Location of waterways and waterbodies
- Major weed infestations and proposed treatments
- Trail and path systems
- Buffer and setback lines
- Mass planting and revegetation areas

Proposed establishment and maintenance specifications

Refer to **Plan 3** for Development Assessment.

3.1 DEVELOPMENT ASSESSMENT



NOTES
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Legend

- Site DCDB
- Qld DCDB
- Design layout
- Existing building (to be retained)
- Stormwater
- Bioretention basin
- Landscape
- Earthworks interface
- State significant species
- Local significant species
- Koala Habitat
- Regulated vegetation

Vegetation management

- High priority vegetation
- General priority vegetation
- Medium priority vegetation

Issue	Date	Description	Drawn	Checked
B	31/07/2018	Preliminary	MC	AH

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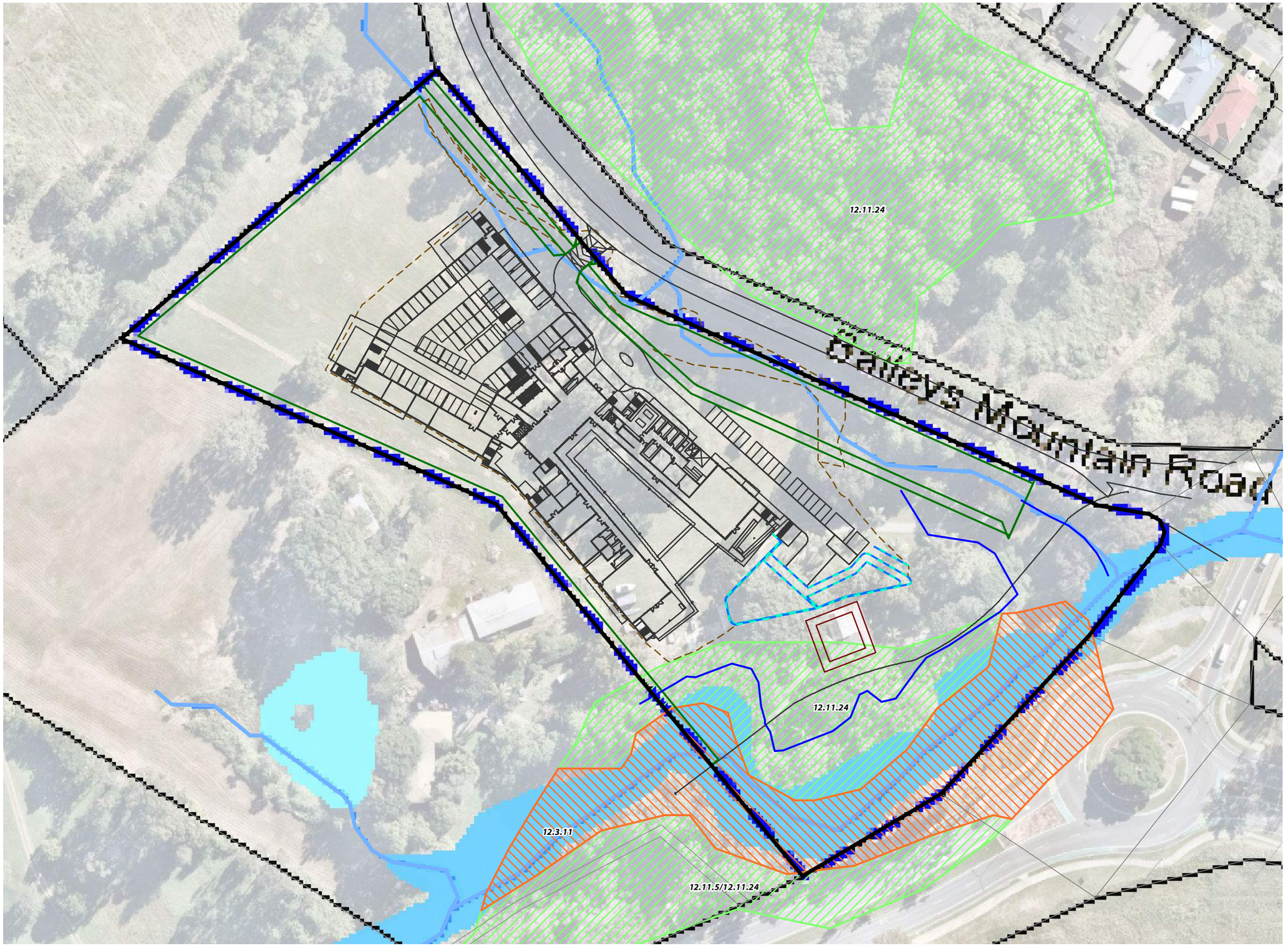
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3.2 DEVELOPMENT ASSESSMENT



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Legend

- Site DCDB
- Qld DCDB
- Design layout
- Existing building (to be retained)
- Stormwater
- Bioretention basin
- Landscape
- Earthworks interface
- MLES - Waterway
- MLES - Minor watercourse

Regional Ecosystems mapping

- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem

Issue	Date	Description	Drawn	Checked
B	31/07/2018	Preliminary	MC	AH

0 5 10 20 30 40 50 m

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4.1 TREE RETENTION REMOVAL PLAN



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Legend

- Site DCDB
- Qld DCDB
- Preliminary earthworks
- Design layout
- Existing building (to be retained)
- Stormwater
- Bioretention basin
- Landscape
- Design contours

Tree plot (survey accurate)

- Tree to be retained (w/TPZ)
- Tree retention status subject to Arborist report / final civil works design (w/TPZ)
- Tree to be removed (w/TPZ)
- Planted native tree species / non-native tree species

Tree location

- Neighbouring lot
- On boundary

Issue	Date	Description	Drawn	Checked
C	31/07/2018	Preliminary	MC	AH

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ADDRESS/RPD: LOT 58 ON SP191940 *31/07/2018* *8781 E 05 TRRP A*

4.2 TREE RETENTION REMOVAL PLAN



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Legend

- Site DCDB
- Qld DCDB
- Preliminary earthworks
- Design layout
- Existing building (to be retained)
- Stormwater
- Bioretention basin
- Landscape
- Design contours

Tree plot (survey accurate)

- Tree to be retained (w/TPZ)
- Tree retention status subject to Arborist report / final civil works design (w/TPZ)
- Tree to be removed (w/TPZ)
- Planted native tree species / non-native tree species

Tree location

- Neighbouring lot
- On boundary

Issue	Date	Description	Drawn	Checked
C	31/07/2018	Preliminary	MC	AH

0 5 10 20 30 m

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BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ADDRESS/RPD: LOT 58 ON SP191940 *31/07/2018* *8781 E 05 TRRP A*

5. CONNECTIVITY



NOTES
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Legend

- Site DCDB
- Qld DCDB
- QLD Roads
- Core habitat connectivity
- Limited habitat connectivity

Issue	Date	Description	Drawn	Checked
A	19/06/2018	Preliminary	MC	AH

0 100 200 400 600 800 1,000 m

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ADDRESS/RPD: LOT 58 ON SP191940 *19/06/2018* *8781 E 03 Connectivity A*

6. Conclusion

This EAR was prepared on behalf of Sandson Pty Ltd who seek to develop land at 202 Baileys Mountain Road, Upper Coomera for the purposes of an aged care facility, incorporating both independent living and retirement apartments. The existing dwelling on-site is proposed to be retained as part of the development, and utilised as a colleague training facility. This EAR provides a contemporary review of the ecological values across the site in accordance with Commonwealth, State and Local Government Legislation.

Overall, the following conclusions can be made:

- The site is typical of rural residential properties in the area, having been cleared of most vegetation and containing infestations of weeds due to historical and current land uses, and impacts from surrounding roads and increasing residential development.
- No threatened species nor Threated Ecological Communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* or *Nature Conservation Act 1992* were recorded across the site nor considered likely to occur due significant disturbance and absence of specific habitat features.
- The site is mapped as containing predominantly Category X non-remnant vegetation, with areas of Category B Least Concern and Of Concern Remnant Regional Ecosystems. These Remnant patches were ground-truthed and found to be incorrectly mapped, and should not be considered remnant.

  .
- The site is mapped as being located within the High Risk Area for Protected Plants under the *Nature Conservation Act 1992*. Whilst two *Macadamia integrifolia* specimens were observed on-site, these specimens were planted and are not considered "in the wild." An NCA exemption will be submitted to the Department of Environment and Science prior to clearing.
- The site is mapped as being located outside the Koala Assessable Development Areas under the SPRP. The koala habitat mapping shows the site as containing Medium Value Bushland and Low Value Rehabilitation. No response to Schedule 11 of the *Planning Regulations 2017* is required.
- Under the Gold Coast City Plan, the site is mapped as containing several Ecological Significance overlays:
    - Areas of habitat for State and Local significant species are mapped along the southern-most waterway, and Koala habitat areas in the north east portion of the site. Given the highly modified nature of the site and the prevalence of exotic and introduced flora species, the site is not considered to contain habitat for any EVNT fauna species.
    - The south west portion of the site is mapped as containing areas of Medium Priority Vegetation and Regulated Vegetation. This mapping is consistent with VMA Category B Of Concern and Least Concern mapped RE's. As previously outlined, this RE mapping is incorrect and should not be considered remnant vegetation.
    - Two waterways are mapped on-site in the south west portion and along the eastern border of the site. The waterway along the eastern border consists of a drainage channel piped under

Baileys Mountain Road and an overland flow path. No waterway features were observed on the property. The waterway within the southern extent of the site contains a defined channel with pooled water at the time of the assessment. However, wetland dependant species were largely absent and the waterway was dominated by weed species.

- The project area contains a diverse array of flora species typically found within a rural residential setting. A total of 103 flora species were recorded within the application area. Of these species 43 were native and 60 were introduced or planted species typical of rural residential properties. Eight species are listed as restricted plants under the *Biosecurity Act 2014* and will require specific levels of management.
- The GPS tree plot recorded 90 trees in total consisting of 27 species.
    - The most dominant species recorded is identified as *Eucalyptus siderophloia* (Grey Ironbark) representing over 16% of the surveyed specimens. *Eucalyptus tereticornis* (Forest Red Gum) and *Corymbia intermedia* (Pink Bloodwood) represents approximately 13% and 8% of specimens recorded within the tree plot survey respectively.
    - 52% of the trees recorded retained a trunk DBH between less than 400 mm. These results are typical of the non-remnant vegetation observed on site. Ten trees were recorded with a DBH of over 1000 mm, however these species are typical of properties throughout the broader landscape and are considered to be planted.
- Fauna recorded across the site included small reptiles and avifauna, which are likely to utilise the application area as part of a much broader home range. These species are considered common to the area and are typically encountered throughout urban areas within the Gold Coast LGA.

7. Appendices

Appendix A

Environment Protection and Biodiversity Conservation Act 1999

Protected Matters Search Tool Results

Appendix B

Nature Conservation Act 1992

Wildlife Online Search Results

Appendix C

Environmental Searches

Appendix D

Council Environmental Overlay Code Responses

Appendix E

Tree Plot Schedule

Appendix A

Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

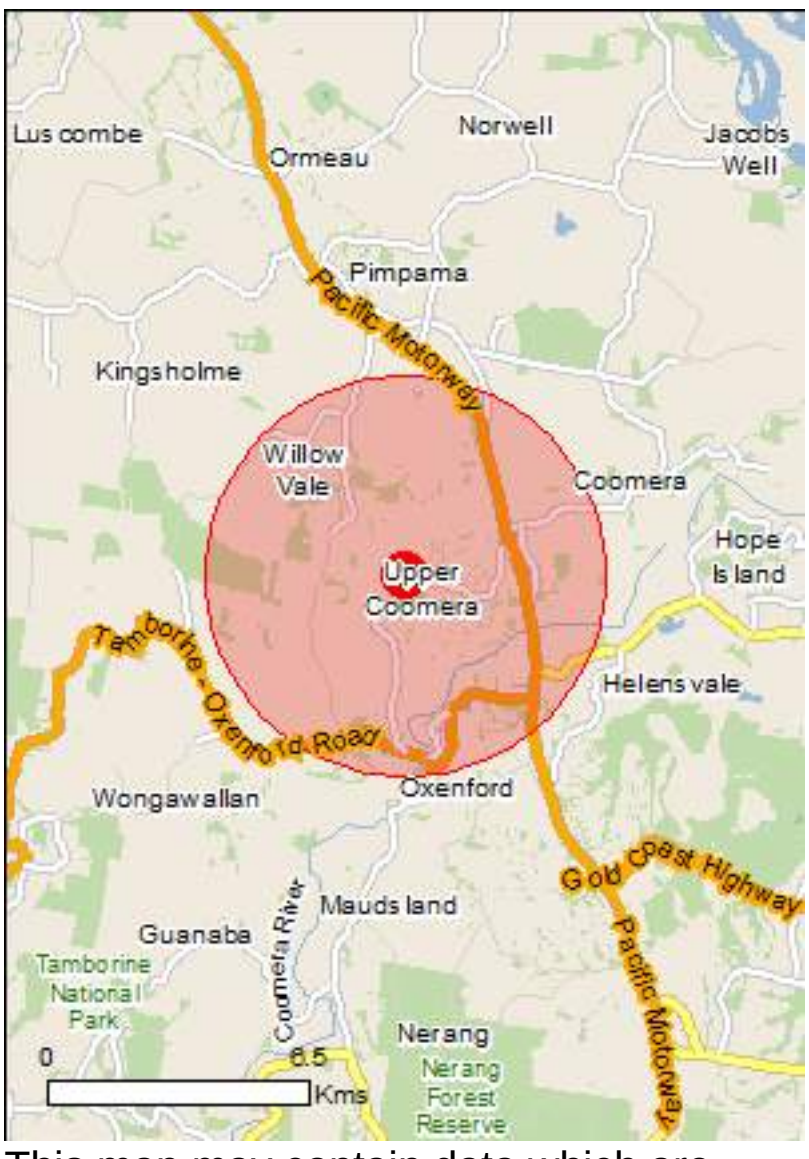
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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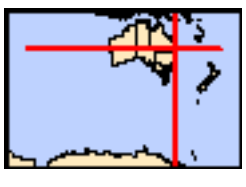
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	66
Listed Migratory Species:	41

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	46
Whales and Other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	40
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Moreton bay	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Frogs		
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat likely to occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Breeding may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat known to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat known to occur within area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area
Corchorus cunninghamii Native Jute [14659]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat known to occur within area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat likely to occur within area
Lepidium peregrinum Wandering Pepper-cress [14035]	Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat known to occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Planchonella eerwah Shiny-leaved Condoo, Black Plum, Wild Apple [17340]	Endangered	Species or species habitat likely to occur within area
Plectranthus habrophyllus [64589]	Endangered	Species or species habitat likely to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat likely to occur within area
Sophora fraseri [8836]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area

Name	Threatened	Type of Presence
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Orcaella brevirostris		
Irrawaddy Dolphin [45]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Saltwater Creek	QLD

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern,		Species or species

Name	Status	Type of Presence
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus africanus		habitat likely to occur within area
Climbing Asparagus, Climbing Asparagus Fern [66907] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993] Cabomba caroliniana		Species or species habitat likely to occur within area
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983] Chrysanthemoides monilifera subsp. rotundata		Species or species habitat may occur within area
Bitou Bush [16332] Cryptostegia grandiflora		Species or species habitat likely to occur within area
Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913] Dolichandra unguis-cati		Species or species habitat likely to occur within area
Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119] Genista monspessulana		Species or species habitat likely to occur within area
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] Hymenachne amplexicaulis		Species or species habitat likely to occur within area
Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754] Lantana camara		Species or species habitat likely to occur within area
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Opuntia spp.		Species or species habitat likely to occur within area
Prickly Pears [82753] Parthenium hysterophorus		Species or species habitat likely to occur within area
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566] Sagittaria platyphylla		Species or species habitat likely to occur within area
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483] Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		Species or species habitat likely to occur within area
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] Salvinia molesta		Species or species habitat likely to occur within area
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] Senecio madagascariensis		Species or species habitat likely to occur within area
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.86626 153.28587

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B

Nature Conservation Act 1992 Wildlife Online Search Results

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -27.8664
Longitude: 153.286
Distance: 5
Email: hannahsilcox@saundershavill.com
Date submitted: Tuesday 05 Jun 2018 12:43:05
Date extracted: Tuesday 05 Jun 2018 12:50:02

The number of records retrieved = 17

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Limnodynastidae	*Adelotus brevis*	tusked frog		V		1
animals	amphibians	Myobatrachidae	*Crinia tinnula*	wallum froglet		V		2
animals	birds	Accipitridae	*Erythrotriorchis radiatus*	red goshawk		E	V	1
animals	birds	Cacatuidae	*Calyptorhynchus lathami lathami*	glossy black-cockatoo (eastern)		V		14
animals	birds	Strigidae	*Ninox strenua*	powerful owl		V		2
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	115
animals	mammals	Pseudocheiridae	*Petauroides volans volans*	southern greater glider		V	V	1
plants	higher dicots	Euphorbiaceae	*Baloghia marmorata*	jointed baloghia		V	V	1/1
plants	higher dicots	Myrtaceae	*Eucalyptus curtisii*	Plunkett mallee		NT		1/1
plants	higher dicots	Myrtaceae	*Syzygium moorei*	Durobby		V	V	1/1
plants	higher dicots	Proteaceae	*Macadamia integrifolia*	macadamia nut		V	V	3/1
plants	higher dicots	Rubiaceae	*Randia moorei*	spiny gardenia		E	E	3/3
plants	higher dicots	Sapindaceae	*Cupaniopsis newmanii*	long-leaved tuckeroo		NT		2/1
plants	higher dicots	Sapotaceae	*Planchonella eerwah*			E	E	2/2
plants	higher dicots	Sparrmanniaceae	*Corchorus cunninghamii*			E	E	1
plants	lower dicots	Lauraceae	*Endiandra floydii*			E	E	8/7
plants	lower dicots	Lauraceae	*Cryptocarya foetida*	stinking cryptocarya		V	V	1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix C

Environmental Searches

Summary (SHG Ref: 8781)	
202 Baileys Mountain Road, Upper Coomera (Lot 58 on SP191940)	
Area: 3.09 ha	
Aerial	QLD Globe 2017
Protected Plants	High Risk Area
VMA	Category X (non-remnant), Category B (Of Concern & Least Concern), Essential Habitat (Koala) & Watercourse
SEQ Koala SPRP	Outside Koala SPRP
Koala Habitat	Medium Value Bushland & Low Value Rehabilitation
SARA	No
Fish Habitat	Qld waterways for waterway barrier works (Low & Moderate)
State Planning Provisions	Biodiversity (MSES – Wildlife Habitat, Regulated Vegetation, Regulated Vegetation intersecting a watercourse) Water Quality (Climatic Regions) Natural Hazards Risk (Bushfire hazard area, Flood Hazard area)
Council	City of Gold Coast
Planning Scheme	Gold Coast City Plan
Zoning	Rural residential
Environmental Overlays	Environmental Significance – Priority Species (State significant species & Koala habitat areas) Environmental Significance – Vegetation Management (General priority vegetation) Environmental Significance – Wetlands and Watercourse (Minor watercourse line)

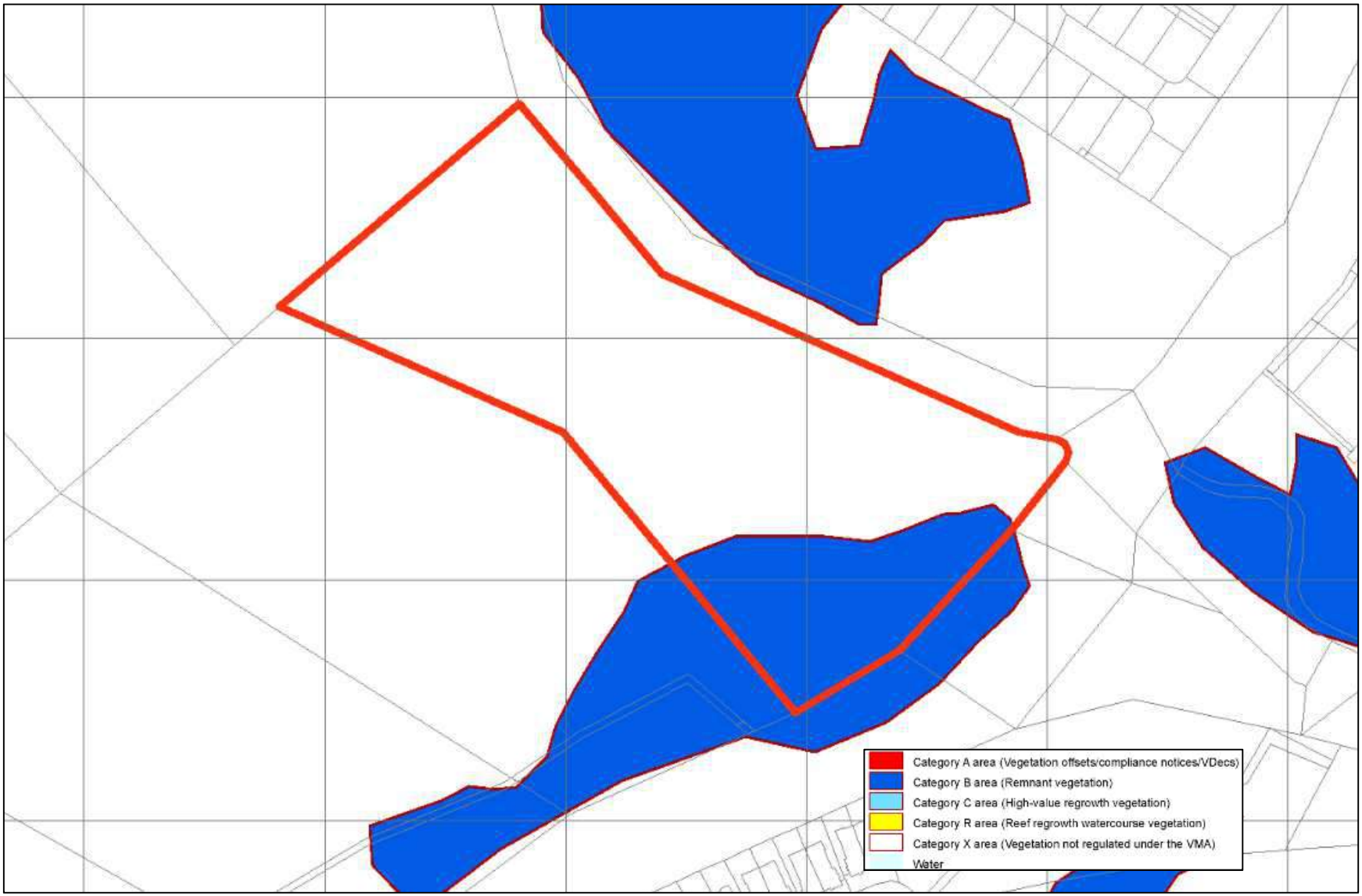
Aerial



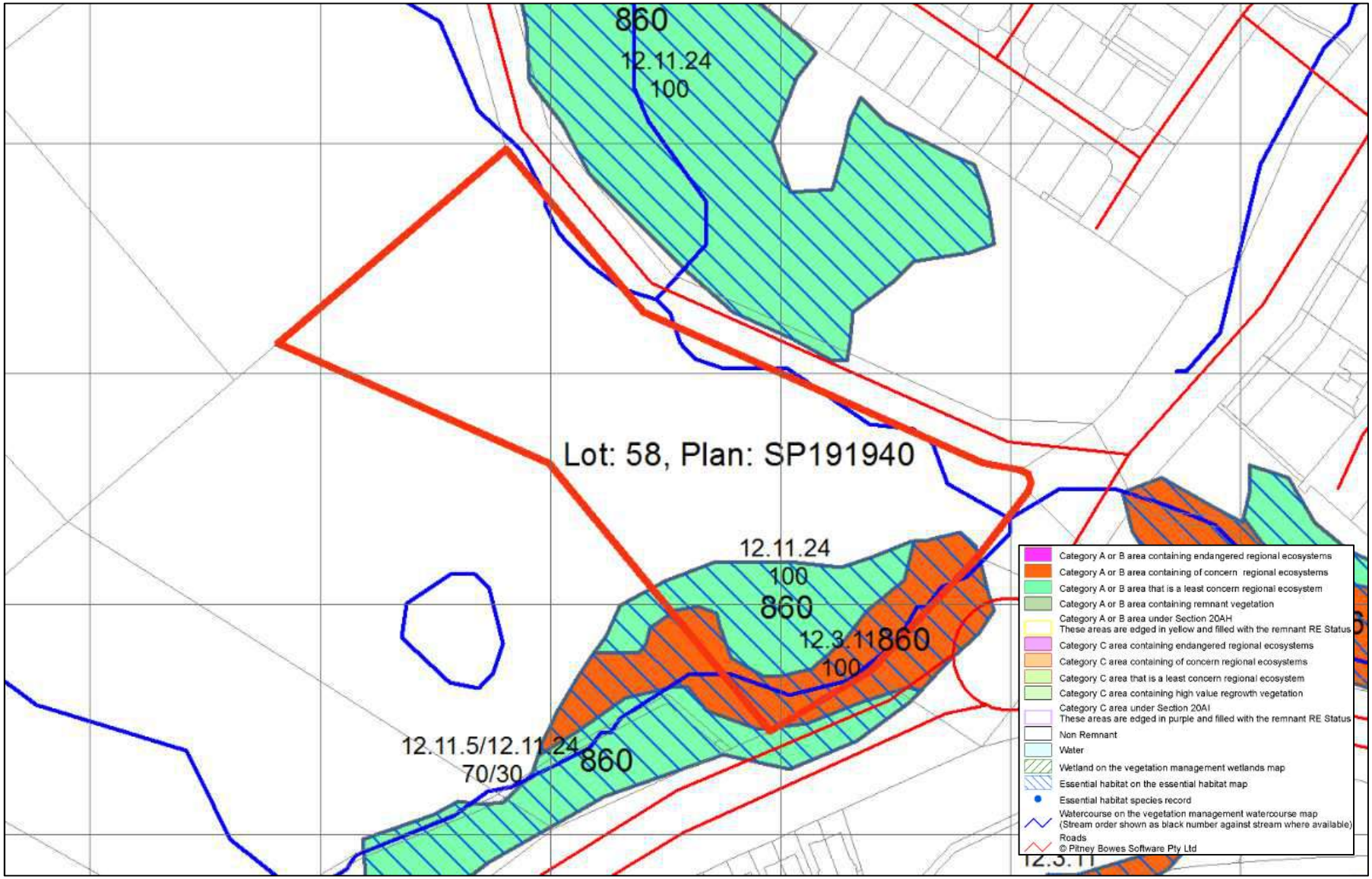
NCA Protected Plants Survey Trigger Map



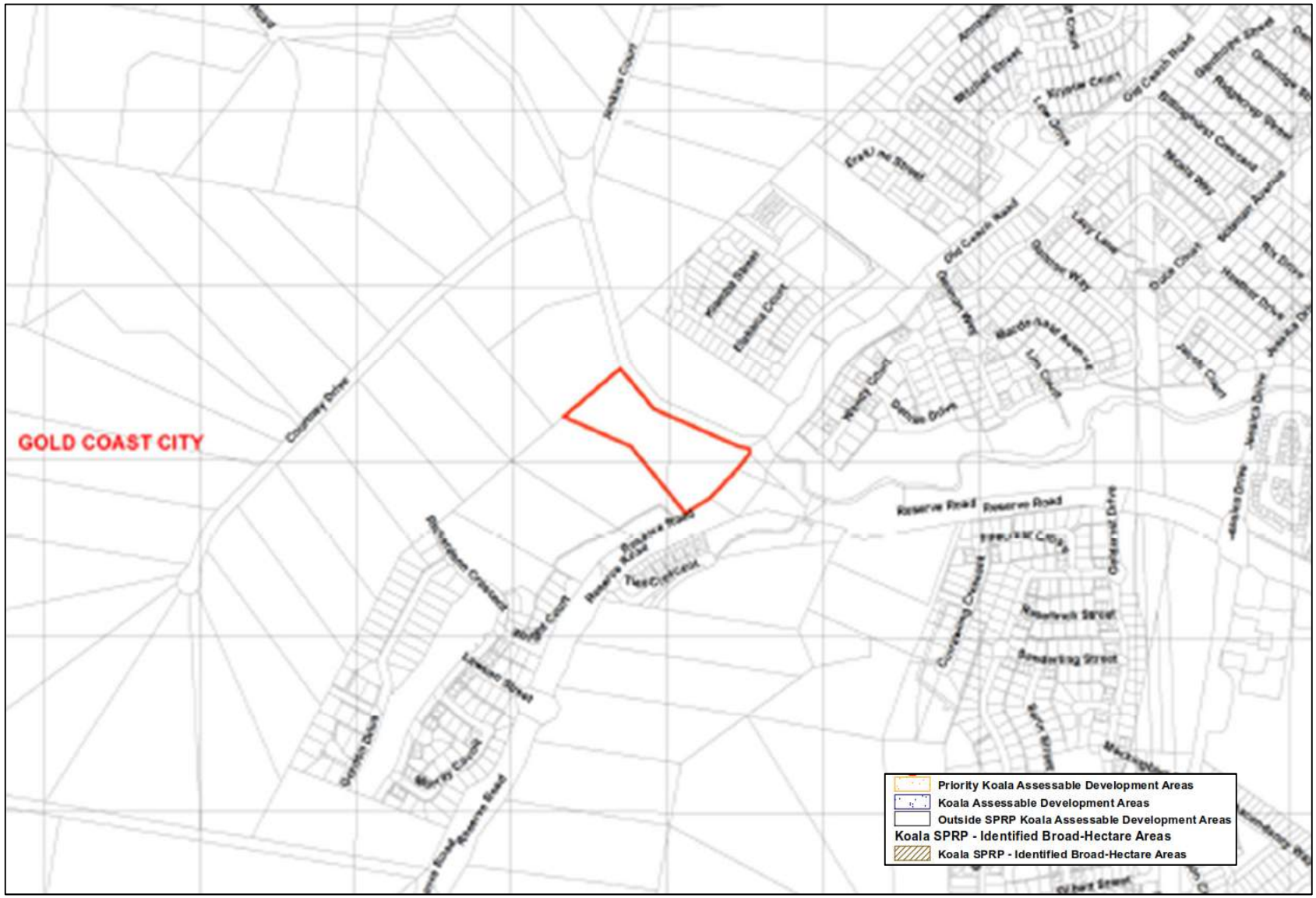
Regulated Vegetation Management Map



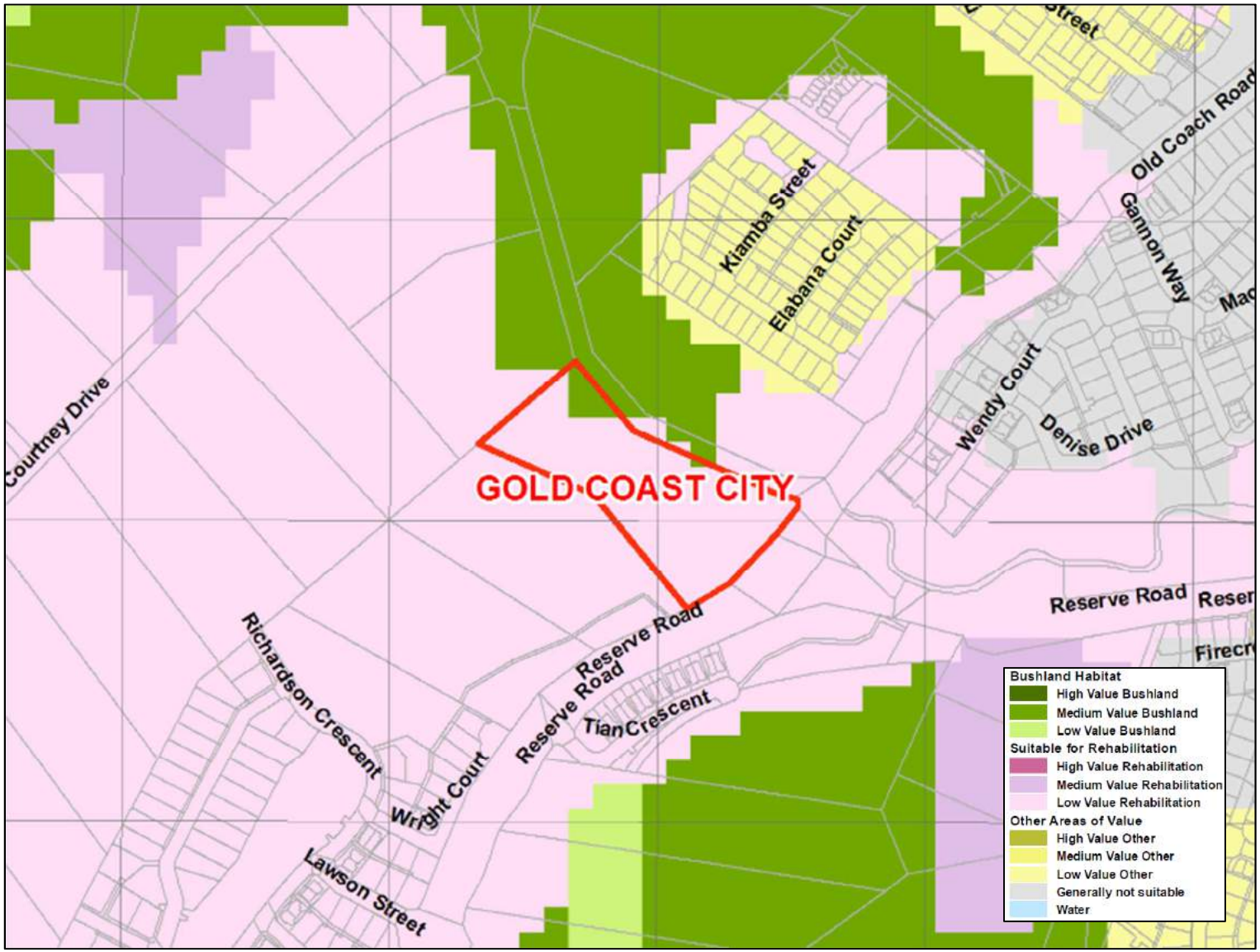
Vegetation Management Supporting Map



Koala SPRP


GOLD COAST CITY
Priority Koala Assessable Development Areas
Koala Assessable Development Areas
Outside SPRP Koala Assessable Development Areas
Koala SPRP - Identified Broad-Hectare Areas
Koala SPRP - Identified Broad-Hectare Areas

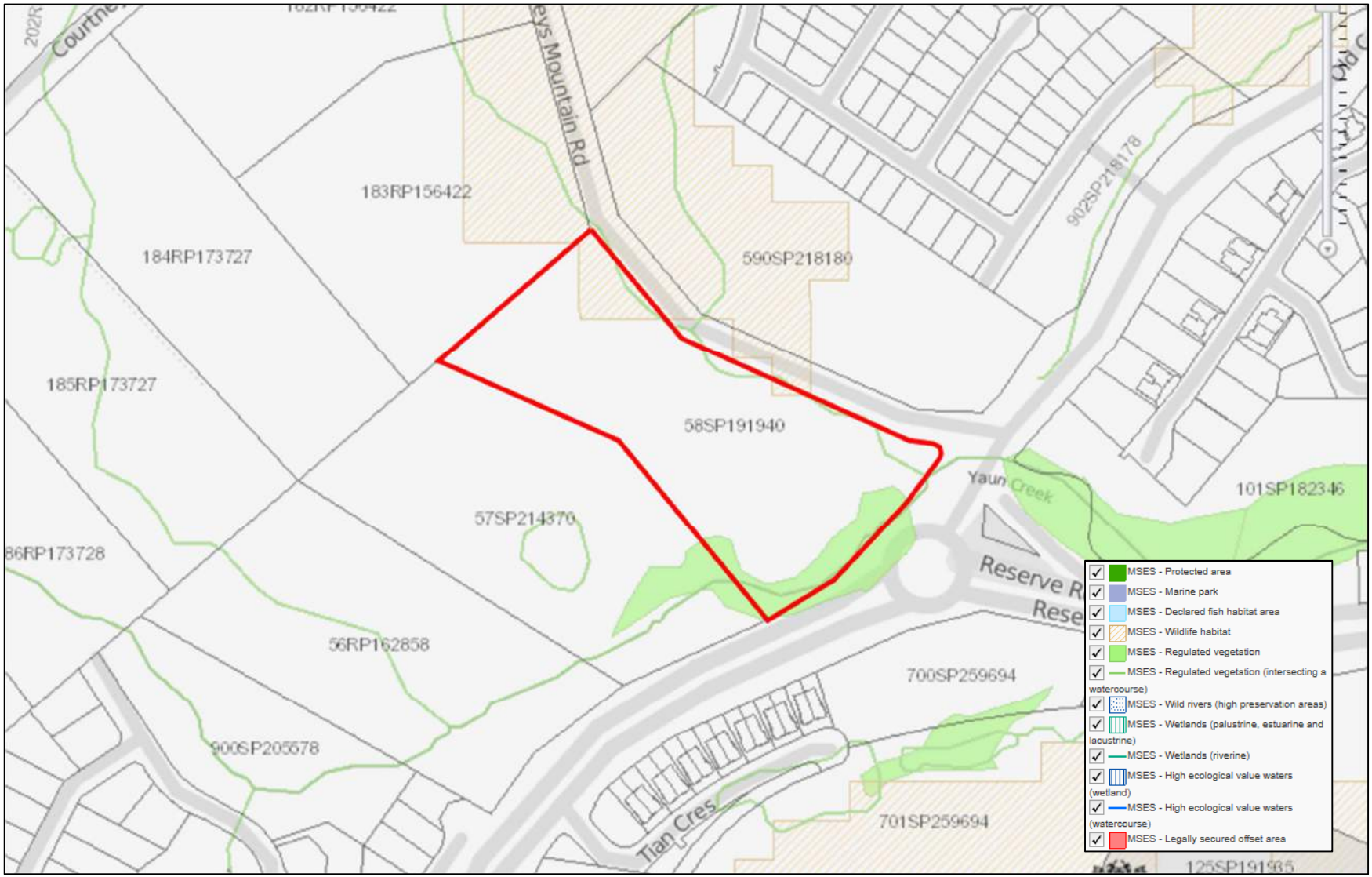
SEQ Koala Conservation



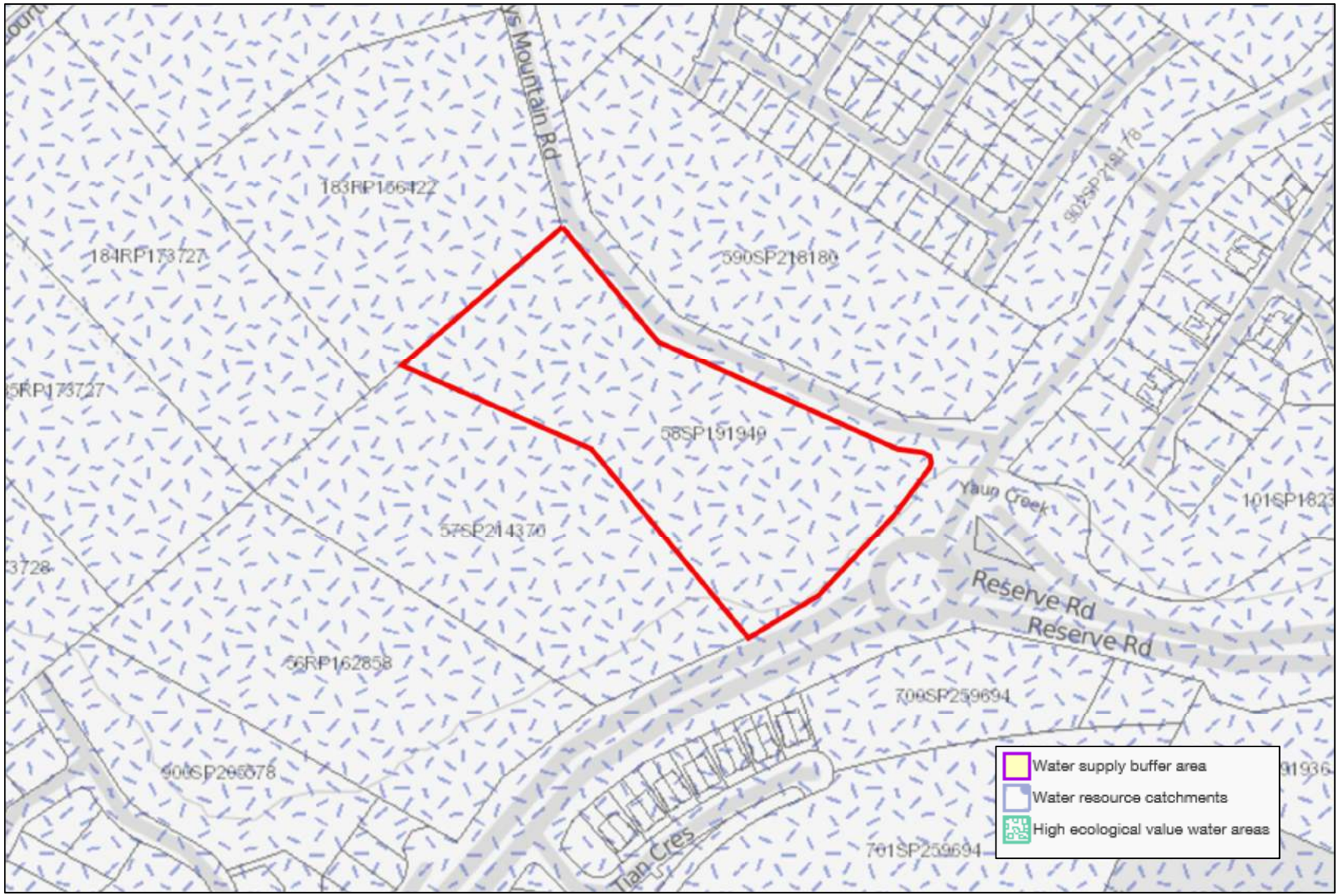
SARA – Coastal Protection, Fish Habitat & Wetland Protection Mapping



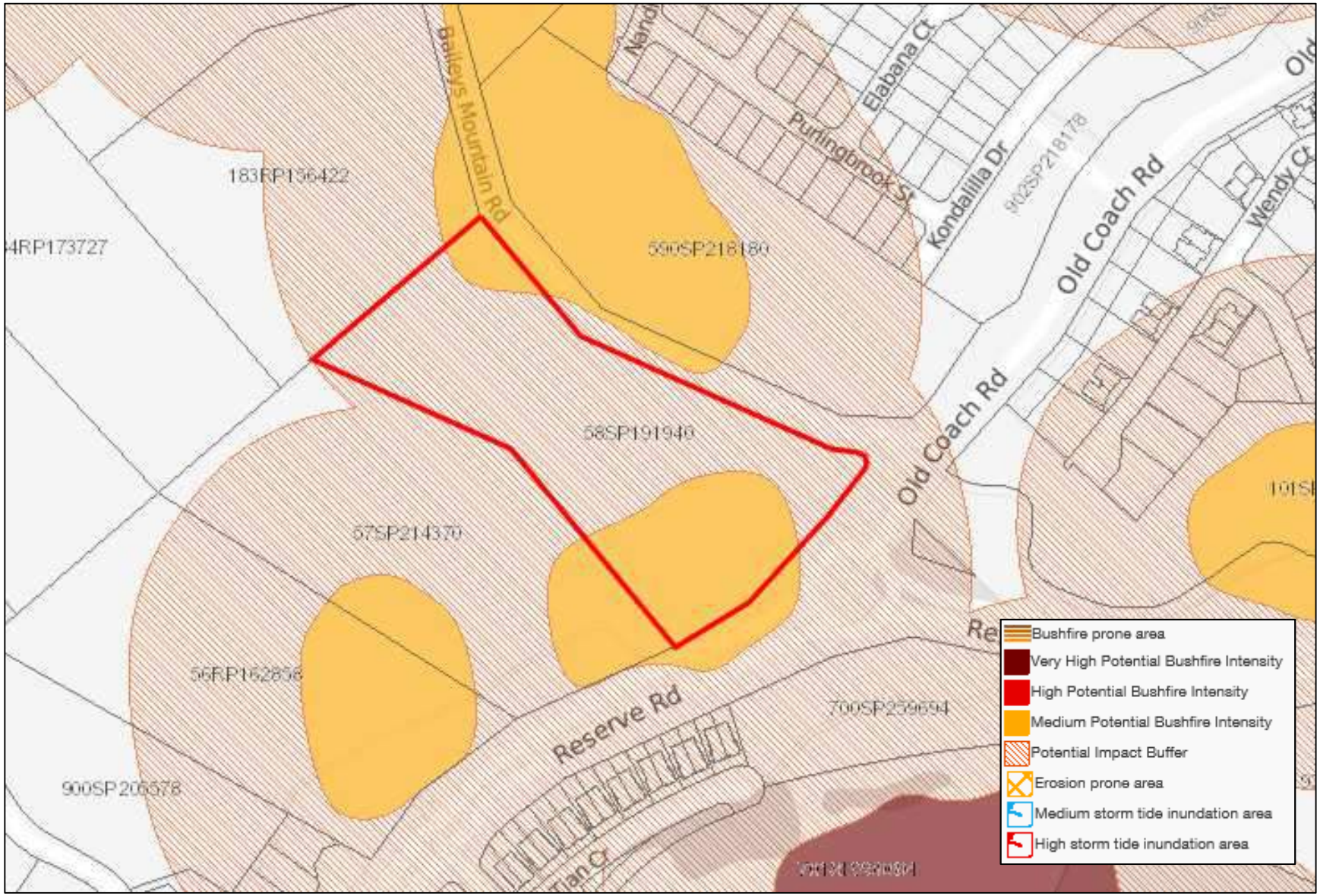
State Planning Policy- Biodiversity (MSES)



State Planning Policy – Water Quality



State Planning Policy – Natural Hazards



Gold Coast City Plan - Zoning



Gold Coast City Plan – Ecological Significance (Priority Species)



Gold Coast City Plan – Ecological Significance (Vegetation Management)



Gold Coast City Plan – Ecological Significance (Waterways and Wetlands)



Appendix D

Council Environmental Overlay Code Responses

Performance Outcomes	Acceptable Outcomes	Response
Ecological Site Assessment		
PO1 All matters of environmental significance on and adjacent to the development site are identified and protected. Note - An Ecological Site Assessment prepared in accordance with SC6.7 City Plan policy – Ecological site assessments, is Council's preferred method for addressing this performance outcome.	**AO1** Proposed works do not impact on: 1. areas identified on Environmental significance – vegetation management overlay map; 2. buffers to wetlands and watercourses being: 1. 100m from the mapped boundary of a State significant aquatic area, as identified on Environmental significance – wetlands and watercourse overlay map; 2. 100m from the outer landward boundary of a State significant wetland, as identified on Environmental significance – wetlands and watercourse overlay map; 3. 100m from the outer landward boundary of a Local significant wetland, as identified on Environmental significance – wetlands and watercourse overlay map; 4. 60m from the outer bank of a Major Watercourse identified on Environmental significance – wetlands and watercourse overlay map; or 5. 30m from the outer bank of a Watercourse identified on Environmental significance – wetlands and watercourse overlay map.; and 3. individual trees within areas mapped on the Environmental significance – priority species overlay map.	**Development complies with PO1** The application area is mapped as containing areas of environmental significance for State and Local Significant Species, Koala Habitat Areas, Regulated Vegetation and Medium Priority Vegetation and Minor Watercourse. However, within these mapped areas, the site does not contain any significant ecological features with the exception of scattered mature NJKHT in amongst regrowth vegetation. An ecological site assessment in accordance with SC6.7 CPP – Ecological Site Assessments was undertaken and the results are presented within this EAR. The site assessment identified that the majority of the site has been cleared of native vegetation values and is regularly maintained through slashing. Two waterways have been mapped on-site and ground truthed, however no other significant ecological features or areas of biodiversity values were identified within the application area. The proposed development maintains an adequate buffer to the mapped Watercourse along the southern border of the site, and includes rehabilitation with the waterway. The waterway adjacent to Baileys Mountain Road will also be redefined and rehabilitated as part of the development.

Performance Outcomes	Acceptable Outcomes	Response
		Whilst the proposed development does include some works within the mapped remnant vegetation, both the Least Concern and Of Concern remnant polygons were ground-truthed and found to be incorrectly mapped. Due to historical disturbance, species composition and existing infrastructure such as a house and road, the remnant polygon is less than one hectare in size and therefore would not be considered remnant under the *Vegetation Management Act*.
Biodiversity Areas		
PO2 Development does not impact on Protected Areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO2.1** No acceptable outcome provided.	**Not Applicable** The subject site is not located within a Protected Area on the Environmental Significance – biodiversity areas overlay map.
PO3 Development within the Hinterland to Coast Critical Corridors as identified on the Environmental significance – biodiversity areas overlay map is located and designed to: 1. provide corridors of sufficient dimensions and characteristics that will enable adequate movement of fauna through the site; 2. protect in situ matters of environmental significance and associated buffers; 3. protect in situ, vegetation identified on the Environmental significance – vegetation management overlay map and habitat for native flora and fauna; 4. link matters of environmental significance, existing corridors and/or conservation estate/reserves on adjacent properties;	**AO3.1** No acceptable outcome provided.	**Not Applicable** The subject site is not located within the Hinterland to Coast Critical Corridors as identified on the Environmental Significance – biodiversity areas overlay map.

Performance Outcomes	Acceptable Outcomes	Response
5. maintain and improve upon the regional connectivity of the Hinterland to Coast Critical Corridors; and 6. allow for the rehabilitation of disturbed, cleared or modified areas that form part of the Hinterland to Coast Critical Corridors. Note: Recommendations provided in an ecological site assessment (prepared in accordance with SC6.7 City Plan policy – Ecological site assessments) are Council's preferred method for determining corridor dimensions.		
PO4 Development within Hinterland Core Habitat Systems, Coastal Wetlands and Islands Core Habitat Systems and Substantial Remnant Areas as identified on the Environmental significance – biodiversity areas overlay map is located and designed to: 1. protect in situ matters of environmental significance and associated buffers; 2. protect in situ vegetation identified on the Environmental significance – vegetation management overlay map and habitat for native flora and fauna; and **3.** allow for the rehabilitation of disturbed, cleared or modified areas.	**AO4** No acceptable outcome provided.	**Not Applicable** The subject site is not located within the Hinterland to Coast Critical Corridors as identified on the Environmental Significance – biodiversity areas overlay map.
Wetland and Watercourse		
PO5 Buffers are provided to wetlands and watercourses identified on the Environmental significance – wetlands and watercourse overlay map to ensure the: 1. protection of matters of environmental significance mapped onsite or identified through an ecological site assessment;	**AO5.1** Buffers at least 100m wide are provided between the development and the mapped boundary of a State significant aquatic area, as identified on Environmental significance – wetlands and watercourse overlay map.	**Not Applicable** A State significant aquatic area is not mapped on or adjacent to the subject site.
	AO5.2	**Not Applicable**

Performance Outcomes	Acceptable Outcomes	Response
2. unimpeded movement of fauna along the watercourse; 3. water quality is maintained; 4. bank stability; and 5. protection of property and infrastructure. Note: The buffer width for wetlands is measured from the outer, landward boundary of the mapped wetland, as shown on Environmental significance – wetland and watercourse overlay map. Note: Recommendations provided in an ecological site assessment (prepared in accordance with SC6.7 City Plan policy – Ecological site assessments) is Council's preferred method for determining alternative buffer widths. Note: Artificial watercourses are to be addressed through the Coastal erosion hazard overlay code and map. Where a waterbody contains both natural and artificial banks, the natural banks are to be assessed in accordance with this performance outcome.	Buffers at least 100m wide are provided between the development and the outer landward boundary of a State significant wetland, as identified on Environmental significance – wetlands and watercourse overlay map.	A State significant wetland is not mapped on or adjacent to the subject site.
	AO5.3 Buffers at least 100m wide are provided between the development and the outer landward boundary of a Local significant wetland as identified on the Environmental significance – wetlands and watercourse overlay map.	**Not Applicable** A Local significant wetland is not mapped on or adjacent to the subject site.
	AO5.4 Buffers at least 60m wide are provided between the development and the outer bank of a Major Watercourse as identified on the Environmental significance – wetlands and watercourse overlay map.	**Not Applicable** A Major Watercourse is not mapped on or adjacent to the subject site.
	AO5.5 Buffers at least 30m wide are provided between the development and the outer bank of a watercourse as identified on the Environmental significance – wetlands and watercourse overlay map.	**Development complies with PO5** An appropriate buffer has been applied to the waterway based on extensive ecological surveys. The waterway will be retained and rehabilitated through development to ensure unimpeded movement of fauna along the watercourse, bank stability and maintained water quality.
Vegetation Management		
PO6 Regulated vegetation is protected in situ when it is: 1. identified on the Environmental significance – vegetation management overlay map; and	**AO6** Development does not impact on regulated vegetation.	**Not Applicable** The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.

Performance Outcomes	Acceptable Outcomes	Response
2. within biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.		
PO7 Development is designed to maintain regulated vegetation and minimise disturbance when it is: 1. identified on the Environmental significance – vegetation management overlay map; and 2. outside of biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO7** Development avoids impacts on regulated vegetation.	**Development complies with AO7** The proposed development entirely avoids the mapped regulated vegetation on-site. Of note, the area of mapped regulated vegetation is based upon the VMA mapped Of Concern remnant RE. This area was found to be incorrectly mapped and includes cleared areas and road reserve. Based on aerial imagery and on-ground observations, the area of regulated vegetation does not contain remnant vegetation and should not be mapped as such.
PO8 High priority vegetation as identified on the Environmental significance – vegetation management overlay map is protected in situ.	**AO8** No acceptable outcome provided.	**Not Applicable** High priority vegetation as identified on the Environmental significance – vegetation management overlay map is not mapped on the subject site.
PO9 Medium and general priority vegetation as identified on the Environmental significance – vegetation management overlay map within biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map is protected in situ.	**AO9** No acceptable outcome provided.	**Not Applicable** The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.
PO10 Vegetation is protected when it is: 1. identified as medium priority vegetation on the Environmental significance – vegetation management overlay map; and	**AO10** Vegetation is not damaged when it is: 1. identified as medium priority vegetation on the Environmental significance – vegetation management overlay map; and	**Development complies with AO10** The proposed development does slightly encroach on the mapped medium priority vegetation. However, as previously identified this mapping is based on the VMA Least Concern RE mapping, which was found to be incorrect. Areas mapped within the

Performance Outcomes	Acceptable Outcomes	Response
2. located outside the biodiversity areas identified on the Environmental significance – biodiversity areas overlay map.	2. located outside the Environmental significance – biodiversity areas overlay map. **OR** Where all attempts have been made to avoid and minimise damage to vegetation as stated above, any significant residual impact is offset consistent with the *Environmental Offsets Act 2014*, at a ratio of 3:1 (area) in accordance with SC6.8 City Plan policy – Environmental offsets. **OR** Damage to medium priority vegetation identified on the Environmental significance – vegetation management overlay map and located outside the biodiversity areas identified on the Environmental significance – biodiversity areas overlay map is for committed development	medium priority vegetation include road reserve, cleared and maintained lawn areas and a residence and associated structures. As such, this area is not considered to maintain medium priority vegetation. Any significant residual impacts to native vegetation identified as medium priority vegetation will be offset consistent with the *Environmental Offsets Act 2014*.
PO11 Disturbance to vegetation is minimised when it is: 1. identified as General priority vegetation on the Environmental significance – vegetation management overlay map; and 2. located outside the Environmental significance – biodiversity areas overlay map.	**AO11** Development avoids impacts on general priority vegetation. Any damage is minimised to the greatest extent possible.	**Not Applicable** General priority vegetation as identified on the Environmental significance – vegetation management overlay map is not mapped on the subject site.
PO12 Buffers are provided that protect the long term viability of high priority and regulated vegetation located on or adjacent to the site.	**AO12** Buffers at least 30m wide are provided between the development and any retained vegetation identified as high priority or regulated vegetation on the Environmental significance – vegetation management overlay map on or adjacent to the site.	**Not Applicable** The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.
Priority Species		
PO13	**AO13**	**Not Applicable**

Performance Outcomes	Acceptable Outcomes	Response
Assessable koala feed and shelter trees are protected in situ when they are located: 1. in koala habitat areas as identified on the Environmental significance – priority species overlay map; and 2. within biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	Development does not impact on assessable koala feed and shelter trees.	The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.
PO14 Assessable koala feed and shelter trees are protected when they are: 1. in koala habitat areas as identified on the Environmental significance – priority species overlay map; and 2. outside biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO14** Development avoids impacts on assessable koala feed and shelter trees. Any damage is minimised to the greatest extent possible.	**Development complies with AO14** A small area of the north eastern extent of the subject site is mapped as a koala habitat area. This area extends from the polygon located on the other side of Baileys Mountain Road, and is also mapped within the road reserve. Whilst some koala feed and shelter trees will be removed from within this area, the impacts have been avoided to the greatest extent possible. Koala feed and shelter trees will be utilised within the landscaping.
PO15 Site design provides safe koala movement opportunities by incorporating measures to maintain connectivity between areas of koala habitat on and adjacent to the site. Note: DEHP's Koala-Sensitive Design Guideline should be consulted for suitable measures to provide for safe koala movement.	**AO15** No acceptable outcome provided.	**Development complies with PO15** Given the already fragmented nature of the subject site from larger areas of suitable koala habitat, it is not considered appropriate to provide connectivity through the site. The waterway located within the southern extent of the site will be rehabilitated and could be ustilised for transient koalas to move through the site, however given the highly disconnected and disturbed nature of the subject site, it is highly unlikely koalas will utilise the site.
PO16	**AO16**	**Development complies with AO16**

Performance Outcomes	Acceptable Outcomes	Response
During the clearing and construction phases, measures are incorporated to protect koalas from death or injury.	Threats to koalas as a result of clearing and construction activities are mitigated by: 1. ensuring no tree in which a koala is present or a tree with a crown overlapping a tree containing a koala is cleared; 2. undertaking clearing of vegetation in stages, and ensuring: 1. no more than 1 ha is cleared per day for sites less than 6 ha in size; 2. no more than 2 ha is cleared per day for sites greater than 6 ha in size; 3. that between each stage there is at least 12 hours where no clearing occurs; and 4. koala habitat is always linked to allow koalas to move out of the site; 3. use of qualified koala spotters; 4. prohibition of domestic dogs and security dogs on site; and 5. use of koala safety fencing.	A Fauna Management Plan will be conditioned at the Operational Works stage which will address mitigation measures to ensure threats to koalas are minimised or eliminated.
PO17 State significant species, and their habitat, are protected in situ when it is: 1. identified on the Environmental significance – priority species overlay map, or through an ecological site assessment; and 2. within biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO17** Development does not impact on State significant species, and their habitat.	**Not Applicable** The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.
PO18 Development protects state significant species, and their habitat or is designed to minimise and mitigate impacts on habitat values when it is:	**AO18.1** Development avoids impacts on state significant species, and their habitat. **AO18.2**	**Development complies with AO18.2** A portion of the subject site is mapped as state significant species habitat based on Essential Habitat mapping under the VMA. However, the area was

Performance Outcomes	Acceptable Outcomes	Response
1. identified on the Environmental significance – priority species overlay map; and 2. outside of biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	Where development impacts on state significant species and their habitat, the following occurs: 1. flora species are propagated and used in rehabilitation and landscaping onsite; and 2. fauna species are safely relocated by a qualified fauna spotter catcher.	ground-truthed during ecological site survey and found not to contain remnant vegetation, nor does the area support habitat for any EVNT species. A rehabilitation plan will be prepared as part of operational works and will include flora species native to the area. A Fauna Management Plan will be conditioned at the Operational Works stage which will address mitigation measures to ensure threats to fauna are minimised or eliminated. The FMP will include measures such as the use of a Fauna Spotter Catcher, and will identify suitable fauna relocations areas.
PO19 Local significant species, and their habitat, are protected in situ when it is: 1. identified on the Environmental significance – priority species overlay map, or through an ecological site assessment; and 2. within biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO19** Development does not impact on local significant species, and their habitat.	**Not Applicable** The subject site is not located within a biodiversity on the Environmental Significance – biodiversity areas overlay map.
PO20 Development protects local significant species, and their habitat or is designed to minimise and mitigate impacts on habitat values when it is: 1. identified on the Environmental significance – priority species overlay map; and 2. outside of biodiversity areas as identified on the Environmental significance – biodiversity areas overlay map.	**AO20.1** Development avoids impacts on local significant species, and their habitat. **AO20.2** Where development impacts on local significant species and their habitat, the following occurs: 1. flora species are propagated and used in rehabilitation and landscaping onsite; and	**Development complies with AO18.2** A portion of the subject site is mapped as local significant species habitat based on Regional Ecosystem mapping under the VMA. However, the area was ground-truthed during ecological site survey and found not to contain remnant vegetation, nor does the area support habitat for any EVNT species.

Performance Outcomes	Acceptable Outcomes	Response
	2. fauna species are safely relocated by a qualified fauna spotter catcher.	A rehabilitation plan will be prepared as part of operational works and will include flora species native to the area. A Fauna Management Plan will be conditioned at the Operational Works stage which will address mitigation measures to ensure threats to fauna are minimised or eliminated. The FMP will include measures such as the use of a Fauna Spotter Catcher, and will identify suitable fauna relocations areas.
Fauna Management		
PO21 Development design and location provides for the safe movement of native fauna through the site.	**AO21** Where infrastructure crosses native fauna movement paths, the design of new development incorporates fauna friendly movement solutions. Note: Fauna friendly movement solutions developed in accordance with the *Queensland Government Fauna Sensitive Road Design Manual Volume 2: Preferred Practices***;** and the *QLD Government Koala-Sensitive Design Guidelines* is Council**'s** preferred method for addressing this outcome.	**Development complies with AO16** Proposed clearing will occur in accordance with a site specific Fauna Management Plan which will incorporate specific management and mitigation measures for Koala in accordance with best practice fauna management requirements.
PO22 Where fauna habitat is proposed to be damaged, management strategies must be implemented to ensure: 1. the native fauna is safely relocated to an area of similar habitat; 2. the sequence of habitat disturbance ensures that fauna is not isolated from adjoining areas of habitat; 3. fauna relocation occurs immediately prior to habitat disturbance; 4. accredited and experienced spotter catchers, licensed by the Queensland Parks and Wildlife Service, are to be present on the site to direct	**AO22** No acceptable outcome provided.	**Development complies with AO16** A Fauna Management Plan will be conditioned at the Operational Works stage which will address mitigation measures to ensure threats to fauna are minimised or eliminated. The FMP will include measures such as the use of a Fauna Spotter Catcher, and will identify suitable fauna relocations areas.

Performance Outcomes	Acceptable Outcomes	Response
and undertake the removal and relocation of fauna; and 5. where possible, damaged habitat and nesting sites are rehabilitated outside of development areas. Note: A Fauna Management Plan prepared by a suitably qualified person and in accordance with SC6.8 City Plan policy – Environmental management plans is Council's preferred method for addressing this outcome.		
Tenure, Ownership and Management Arrangements		
PO23 Matters of environmental significance and associated buffers, mapped areas as identified on the Environmental significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are suitably protected in perpetuity and will: 1. enable necessary fire management in accordance with an approved fire management plan and any adopted bushfire management plan; 2. allow unimpeded movement of native fauna through matters of environmental significance and associated buffers; 3. enable maintenance access and regular management; 4. enable auditing and reporting of maintenance and management activities; 5. provide for public access along major watercourses, where such access is consistent with the ecological functions; 6. allow for linkages and buffers to adjacent areas of ecological significance; and	**AO23** Matters of environmental significance and associated buffers, mapped areas as identified on the Environmental significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are transferred to Council ownership as Public Open Space. **OR** Where not required for public access, matters of environmental significance and associated buffers, and mapped areas as identified on the Environmental significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are retained in private ownership and protected under a statutory covenant (under the *Land Title Act 1994*). Note: Where the area is adjacent to existing **public open space**, or is a **buffer** to a major waterway, **Council**'s preference is for the land to be dedicated as **Public Open Space**.	**Development complies with AO23** Rehabilitated areas of the site will be protected in perpetuity. It is anticipated that this will be conditioned as part of the Operational Works approvals.

Performance Outcomes	Acceptable Outcomes	Response
7. allow for a coordinated approach to the management of adjacent areas of conservation estate.		
PO24 An Open Space Management Plan prepared in accordance with SC6.10 City Plan policy – Landscape work is prepared for areas to be dedicated to Council as Public Open Space.	**AO24** No acceptable outcome provided.	**Development complies with PO24** An Open Space Management Plan will be prepared at the Operational Works stage.
PO25 A Covenant Management Plan is prepared for areas to be protected under a statutory covenant. The management plan must include the following details: 1. rehabilitation area and strategy of works; 2. weed eradication and control requirements; 3. how the covenant area will be maintained and managed in perpetuity; 4. feral and domestic animal exclusion requirements; and **5.** required maintenance access.	**AO25** No acceptable outcome provided.	**Development complies with PO25** A Covenant Management Plan will be prepared if appropriate at the Operational Works stage.
Rehabilitation		
PO26 Disturbed, cleared or modified areas are rehabilitated where they form part of: 1. an ecological corridor; or 2. matters of environmental significance and associated buffers; or 3. areas identified within an Ecological Site Assessment as requiring rehabilitation. Note: A Rehabilitation Management Plan prepared in accordance with the *South East Queensland Ecological Restoration Framework* and SC6.8 City Plan policy –	**AO26** No acceptable outcome provided.	**Development complies with PO26** A Rehabilitation Management Plan will be conditioned at the Operational Works stage and will include details of the areas to be rehabilitated, and species to be planted.

Performance Outcomes	Acceptable Outcomes	Response
Environmental management plans is Council's preferred method for addressing this outcome.		

Appendix E

Tree Plot Schedule

Tree Schedule - 8781
202 Bailey Mountain Road, Upper Coomera (Sandson Pty Ltd)
19/06/2018

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value								
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
1	*Ficus benjamina*	Weeping Fig	1600		1600	20.0	24.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	Introduced	-	-	Typical	-	-	-	-	-	-		
2	*Eucalyptus siderophloia*	Grey Ironbark	540		540	22.0	9.0	6.5	2.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
3	*Eucalyptus propinqua*	Small-fruited Grey Gum	650		650	22.0	12.0	7.8	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	New	-	-	-	-		
4	*Eucalyptus tereticornis*	Forest Red Gum	580		580	24.0	13.0	7.0	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	Old	-	-	-	-		
5	*Eucalyptus siderophloia*	Grey Ironbark	1070		1070	21.0	14.0	12.8	3.4	Regular	-	-	-	-	Lopped	Typical	-	-	Trunk Dmg.	-	Typical	-	-	-	-	-	-		
6	*Eucalyptus tereticornis*	Forest Red Gum	885		885	24.0	14.0	10.6	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	Old	-	-	-	-		
7	*Mangifera indica*	Mango	1260		1260	18.0	17.0	15.0	3.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
8	*Ficus macrophylla*	Moreton Bay Fig	1200		1200	21.0	18.0	14.4	3.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
9	*Ficus macrophylla*	Moreton Bay Fig	1580		1580	24.0	25.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
10	*Ficus macrophylla*	Moreton Bay Fig	1610		1610	24.0	30.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
11	*Ficus macrophylla*	Moreton Bay Fig	1350		1350	18.0	16.0	15.0	3.8	One-sided	-	Thinning	Die-back	-	Lopped	Poor	-	Introduced	-	-	Poor	-	-	-	-	-	-		
12	*Ficus macrophylla*	Moreton Bay Fig	1500		1500	22.0	30.0	15.0	3.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
13	*Lophostemon suaveolens*	Swamp Box	980		980	19.0	14.0	11.8	3.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		ficus growing up trunk
14	*Eucalyptus tereticornis*	Forest Red Gum	900		900	16.0	14.0	10.8	3.2	Regular	-	Thinning	Die-back	Epicormic	Lopped	Poor	-	-	-	-	Typical	-	-	-	-	Termites	-		
15	*Eucalyptus microcorys*	Tallowood	760		760	26.0	14.0	9.1	2.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
16	*Mangifera indica*	Mango	1200		1200	10.0	10.0	14.4	3.6	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-		
17	*Mangifera indica*	Mango	255	185	315	10.0	5.0	3.8	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
18	*Podocarpus elatus*	Brown Pink	460		460	12.0	8.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
19	*Corymbia intermedia*	Pink Bloodwood	850		850	17.0	9.0	10.2	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
20	*Livistona australis*	Cabbage-tree Palm	225		225	11.0	5.0	2.7	1.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
21	*Grevillea robusta*	Silky Oak	380		380	16.0	6.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
22	*Castanospermum australe*	Black Bean	680		680	17.0	9.0	8.2	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
23	*Brachychiton acerifolius*	Illawara Flame Tree	460		460	19.0	7.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
24	*Grevillea robusta*	Silky Oak	265		265	17.0	5.0	3.2	1.9	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
25	*Ficus rubiginosa*	Rock Fig	310	180, 230, 250, 290, 180	600	14.0	8.0	7.2	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
26	*Melicope elleryana*	Pink Doughwood	140	120	184	10.0	5.0	2.2	1.6	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-		
27	*Acacia melanoxylon*	Blackwood	125		125	5.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-		
28	*Acacia disparrima*	Hickory Wattle	310		310	15.0	6.0	3.7	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
29	*Cupaniopsis anacardioides*	Tuckeroo	150	85	172	8.0	5.0	2.1	1.6	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-		
30	*Corymbia intermedia*	Pink Bloodwood	600		600	18.0	8.0	7.2	2.7	Regular	-	-	Die-back	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
31	*Eucalyptus tereticornis*	Forest Red Gum	200		200	16.0	4.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
32	*Acacia disparrima*	Hickory Wattle	185		185	9.0	4.0	2.2	1.6	One-sided	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
33	*Acacia melanoxylon*	Blackwood	140		140	7.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-		
34	*Grevillea robusta*	Silky Oak	430		430	18.0	7.0	5.2	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
35	*Ficus obliqua*	Small-leaved Fig	220	185	287	14.0	6.0	3.4	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
36	*Pandanus tectorius*	Pandanas	200	190, 190, 200	390	6.0	6.0	4.7	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
37	*Eucalyptus tereticornis*	Forest Red Gum	480		480	23.0	5.0	5.8	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value							
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
38	*Eucalyptus microcorys*	Tallowood	600		600	22.0	8.0	7.2	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
39	*Glochidion ferdinandi*	Cheese Tree	280	180	333	14.0	6.0	4.0	2.1	Regular	-	Thinning	Die-back	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
40	*Eucalyptus siderophloia*	Grey Ironbark	365		365	22.0	7.0	4.4	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
41	*Eucalyptus tereticornis*	Forest Red Gum	400		400	21.0	7.0	4.8	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
42	*Eucalyptus tereticornis*	Forest Red Gum	590		590	23.0	9.0	7.1	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
43	*Lophostemon confertus*	Brush Box	300	180	350	17.0	9.0	4.2	2.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
44	*Acacia disparrima*	Hickory Wattle	265		265	14.0	6.0	3.2	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
45	*Eucalyptus tereticornis*	Forest Red Gum	175		175	18.0	4.0	2.1	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
46	*Waterhousia floribunda*	Weeping Lillipilli	280	120	305	14.0	7.0	3.7	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
47	*Eucalyptus siderophloia*	Grey Ironbark	440		440	24.0	8.0	5.3	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
48	*Eucalyptus siderophloia*	Grey Ironbark	360		360	19.0	6.0	4.3	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
49	*Eucalyptus microcorys*	Tallowood	380		380	22.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	Minor	Native	-	-	Typical	-	-	-	-	-	-		
50	*Eucalyptus microcorys*	Tallowood	460		460	22.0	9.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
51	*Macadamia integrifolia*	Macadamia	160	130	206	7.0	3.0	2.5	1.7	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-		
52	*Eucalyptus siderophloia*	Grey Ironbark	205		205	17.0	7.0	2.5	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
53	*Lophostemon confertus*	Brush Box	190	70	202	13.0	6.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
54	*Corymbia intermedia*	Pink Bloodwood	130		130	12.0	2.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
55	*Eucalyptus siderophloia*	Grey Ironbark	280		280	19.0	6.0	3.4	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
56	*Corymbia intermedia*	Pink Bloodwood	195		195	16.0	5.0	2.3	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
57	*Corymbia intermedia*	Pink Bloodwood	385		385	22.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
58	*Corymbia intermedia*	Pink Bloodwood	240		240	15.0	6.0	2.9	1.8	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
59	*Eucalyptus siderophloia*	Grey Ironbark	520		520	22.0	9.0	6.2	2.5	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
60	*Lophostemon confertus*	Brush Box	180		180	13.0	6.0	2.2	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
61	*Lophostemon confertus*	Brush Box	275		275	15.0	7.0	3.3	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
62	*Eucalyptus siderophloia*	Grey Ironbark	380		380	21.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
63	*Acacia disparrima*	Hickory Wattle	260		260	15.0	3.0	3.1	1.9	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-		
64	*Acacia disparrima*	Hickory Wattle	260		260	12.0	4.0	3.1	1.9	Regular	-	Thinning	-	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-		
65	*Acacia disparrima*	Hickory Wattle	130		130	13.0	2.0	2.0	1.4	Regular	-	-	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-		
66	*Eucalyptus microcorys*	Tallowood	330		330	19.0	5.0	4.0	2.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
67	*Grevillea robusta*	Silky Oak	140		140	12.0	2.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
68	*Jagera pseudorhus*	Foambark	300		300	14.0	7.0	3.6	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
69	*Jagera pseudorhus*	Foambark	270	130	300	13.0	7.0	3.6	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
70	*Grevillea robusta*	Silky Oak	410		410	22.0	8.0	4.9	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
71	*Grevillea robusta*	Silky Oak	440		440	22.0	8.0	5.3	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
72	*Grevillea robusta*	Silky Oak	460		460	22.0	7.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
73	*Macadamia integrifolia*	Macadamia	260	200, 140, 280, 230, 240	562	13.0	7.0	6.7	2.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
74	*Lophostemon confertus*	Brush Box	190		190	16.0	5.0	2.3	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
75	*Eucalyptus siderophloia*	Grey Ironbark	120		120	11.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
76	*Ficus sp.*	Fig (round leaf)	200		200	16.0	6.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
77	*Lophostemon confertus*	Brush Box	385		385	16.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
78	*Lophostemon confertus*	Brush Box	260		260	16.0	6.0	3.1	1.9	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value								
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
79	*Eucalyptus siderophloia*	Grey Ironbark	220	170	278	12.0	5.0	3.3	1.9	Regular	-	-	Die-back	-	-	Poor	-	Native	-	-	Typical	-	-	-	-	-	-		
80	*Eucalyptus siderophloia*	Grey Ironbark	185		185	12.0	4.0	2.2	1.6	Regular	-	-	Die-back	-	Lopped	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
81	*Eucalyptus tereticornis*	Forest Red Gum	840		840	25.0	11.0	10.1	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
82	*Eucalyptus siderophloia*	Grey Ironbark	520		520	19.0	10.0	6.2	2.5	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
83	*Eucalyptus tereticornis*	Forest Red Gum	510		510	22.0	9.0	6.1	2.5	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
84	*Corymbia intermedia*	Pink Bloodwood	650		650	23.0	14.0	7.8	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
85	*Corymbia intermedia*	Pink Bloodwood	300	280	410	17.0	9.0	4.9	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
86	*Eucalyptus siderophloia*	Grey Ironbark	390		390	22.0	7.0	4.7	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
87	*Eucalyptus tereticornis*	Forest Red Gum	470		470	23.0	9.0	5.6	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-		
88	*Eucalyptus tereticornis*	Forest Red Gum	550		550	23.0	10.0	6.6	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		
89	*Eucalyptus siderophloia*	Grey Ironbark	560		560	23.0	11.0	6.7	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-		

ATTACHMENT 11

Site Based Stormwater Management Plan, prepared by Arcadis



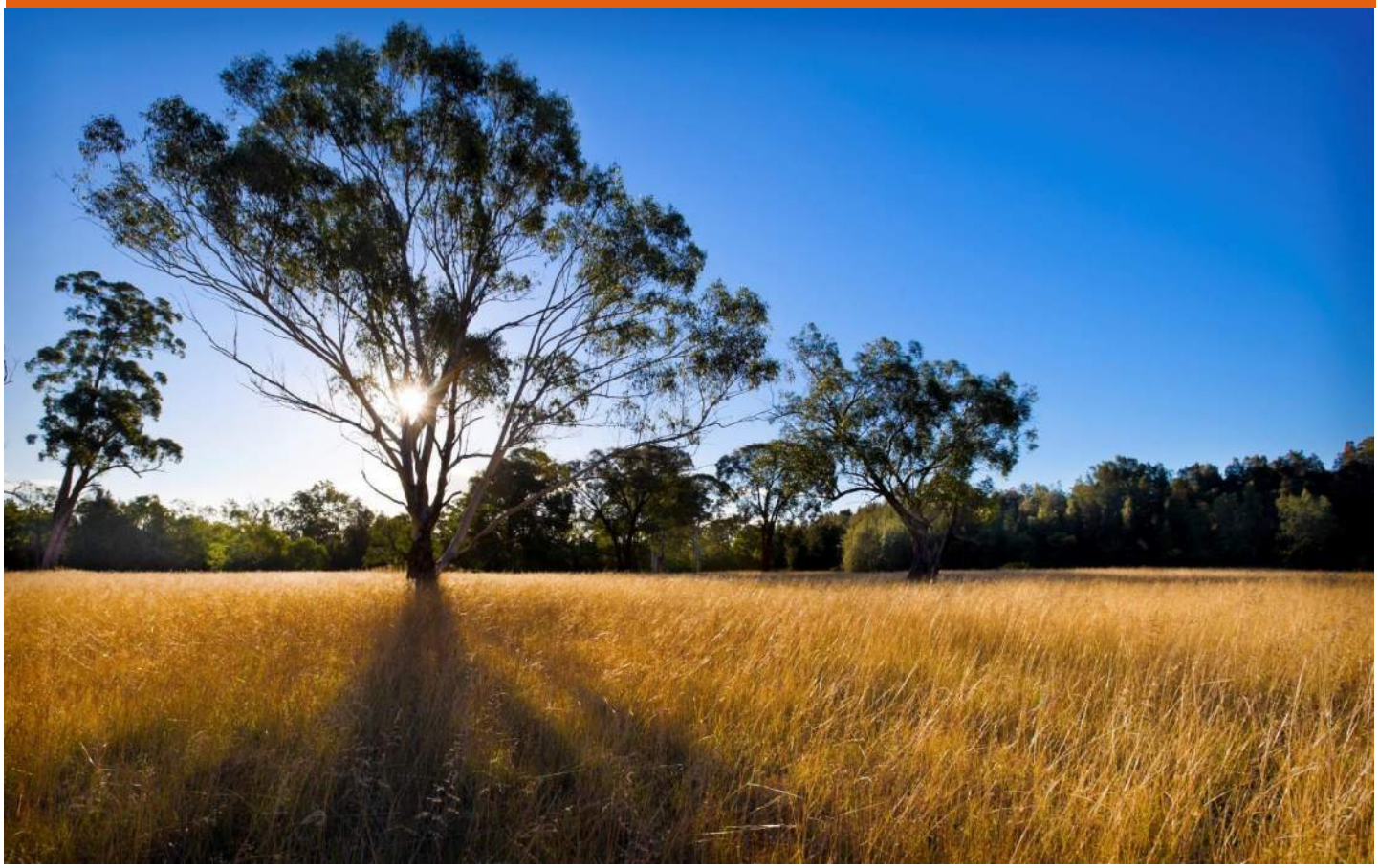
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ARCADIS Design & Consultancy for natural and built assets

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SITE BASED STORMWATER MANAGEMENT PLAN

26 JULY 2018



Incorporating Hyder

SANDSON PTY LTD
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SITE BASED STORMWATER MANAGEMENT PLAN

Author	Ashley Shepherd	
Checker	James Stockwell	
Approver	Darlan Castro RPEQ19918	
Report No	F0002-10022603-AAR	
Date	26/07/2018	
Revision Text	01	

This report has been prepared for Sandson Pty Ltd in accordance with the terms and conditions of appointment for 202 Baileys Mountain Road, Upper Coomera dated June 2018. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/07/2018	Draft Report	AS	JS
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1 EXECUTIVE SUMMARY

Sandson Pty Ltd has commissioned Arcadis to provide supporting documentation for a development application over the following allotment in Upper Coomera, QLD.

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

This application is to be lodged with City of Gold Coast (CoGC). The proposed development constitutes a development comprising of an aged care facility.

This report demonstrates the proposed development can be constructed and operated in accordance with the Water Sensitive Urban Design (WSUD) Requirements of Council, the South-East Queensland State Planning Policy (SPP 2017), the Queensland Development Code, the Queensland Urban Drainage Manual (QUDM), the Environmental Protection (Water) Policy (2009) and Gold Coast City Plan.

The primary objectives of this Site Based Stormwater Management Plan (SBSMP) are achieved as follows:

Lawful Point of Discharge

The site proposes to discharge to Old Coach Road Culvert System via overland flow, after receiving the necessary quality and quantity treatment. All stormwater will be will be discharged directly via overland flow to existing overland flow paths traversing through the site to the point of discharge, as is the current situation.

External Conveyance

2015 City Plan Flood Overlay Map – 5 indicates that the site is not subject to regional flooding however external catchment flows are conveyed through the site via two existing overland flow path. Yaun Creek traverse the site from south to north along the site's eastern boundary. A overland flow path traverses the site along the northern boundary running west to east joining Yaun Creek just upstream of the Old Coach Road culvert crossing. This report includes hydraulic assessment of these two overland flow paths showing that proposed development will safely convey flows up to the 100 year ARI whilst still maintain existing conditions at the site boundary.

Stormwater Quantity

This report includes stormwater quantity calculations which demonstrate an increase in peak flow rates to the point of discharge from the proposed development if left unattenuated, due to the change in stormwater catchment parameters. A detention basin has been designed to attenuate developed peak flow rates to no greater than existing peak flow rates up to the design 1% AEP. A detention basin of volume 625m^3 with a carefully designed outlet system is proposed to be located in the south-eastern corner of the site, external to the overland flow path, to attenuate developed flows to existing peak discharge conditions.

Stormwater Quality

The stormwater quality assessment demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of CoGC during the operational phase of the proposed development. The proposed treatment system involves the use of a bio retention basin with 150m^2 of filter media area. All the stormwater quality controls detailed in this document are contained within the development site and will remain a private asset. Regular maintenance of the treatment devices must be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Waterway Stability

This has been achieved by complying with Stormwater Quantity objectives for the 63% AEP flow.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works in accordance with requirements associated with Type 2 sediment discharge zones, comprising of a vehicle shakedown, sediment fences, sediment basin. It has been recommended during the reshaping of the existing overland flow paths that instream erosion and sediment control measures be adopted.

2 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The subject site is located at 202 Baileys Mountain Road, Upper Coomera, South-East Queensland, Australia on the following allotment:

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

The total area of the site is 30,870m².

2.2 LAND USAGE

In its current state the subject site described as 202 Baileys Mountain Road is occupied by a residential dwelling and shed structures.

A site locality plan is located below in Figure 2-1.



Figure 2-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

2.3 EXISTING TOPOGRAPHY

The site topography consists of moderately grading slopes (averaging <4%) with the site generally grading south-east towards both Baileys Mountain Road and Reserve Road. An existing topographic survey can be found in Appendix A.

The highest point of the site is at approximately RL39.0m AHD at the far north-west corner of the site on the northern boundary. The lowest point is approximately RL21.0m AHD located in the south-eastern corner of the site.

3 PROPOSED DEVELOPMENT

It is proposed to deliver a high-rise residential development with the following features;

- Aged Care Suites;
- Retirement Apartments
- Residents Amenities (Café, Kitchens, Library, Treatment Rooms, etc);
- Staff Facilities; and
- Carparking.

The existing dwelling on the site will be repurposed as a staff training facility.

A master plan of the proposed development has been provided in Figure 3-1 below.

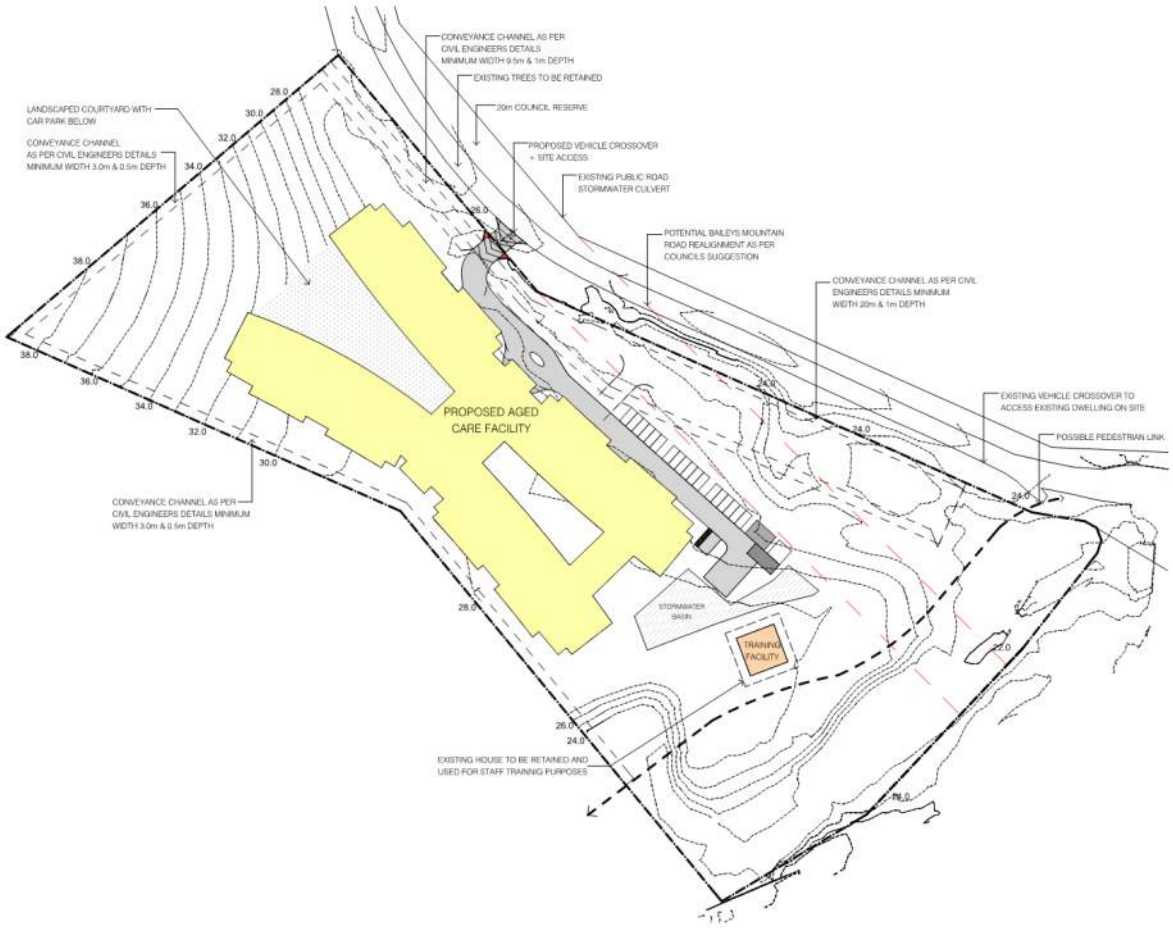


Figure 3-1 Development master Plan (Courtesy of BDA)

4 STORMWATER MANAGEMENT OBJECTIVES

In accordance with QUDM and The CoGC Planning Scheme 2015 Schedule 6.11: Land Development Guidelines the following objectives are investigated.

Lawful Point of Discharge

Achieve a lawful point of discharge by:

1 The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement and those locations described in SC6.11.4.4.5.2 of The City of Gold Coast Planning Scheme 2015 Schedule 6.11: Land Development Guidelines.

2 In discharging to that location, the discharge will not cause an actionable nuisance (i.e. a nuisance for which the current or some future neighbouring proprietor may bring an action or claim for damages arising out of the nuisance), or environmental or property damage.

Refer to Section 5 of this report.

Stormwater Quantity

Provide the following:

1. Achievable stormwater quantity control measures for discharge during both the construction and operational phases of development designed in accordance with the Queensland Urban Drainage Manual (QUDM) unless subject to specific requirements of SC6.11 City Plan policy – Land development guidelines;

2. on-site detention systems that are designed to restrict peak outflows for all events up to and including the 1% AEP pre-development conditions.

Refer to Sections 7 and 8 of this report.

Stormwater Quality

Achieve the following minimum reduction in mean annual loads from unmitigated development

1 Gross Pollutants (>5mm) – 90% reduction in mean annual load

2 Total Suspended Solids (TSS) – 80% reduction in mean annual load

3 Total Phosphorous (TP) – 60% reduction in mean annual load

4 Total Nitrogen (TN) – 45% reduction in mean annual load

Refer to Section 10 of this report.

Waterway Stability

Limit the post-developed peak 63% AEP event discharge within the receiving waterway to the pre-development peak 63% AEP event discharge.

This has been addressed as part of the Stormwater Quantity Assessment provided in Sections 7 and 8 of this report.

Frequent Flow

Achieve the following flow Management:

1 Baseflows (in particular winter baseflows) - >=10% of mean annual rainfall volume converted to baseflow (less than baseflow threshold of 0.4l/s/ha.

2 Surface flow - <=20% surface runoff days per annum measured as days where the maximum daily flow rate exceeds the baseflow threshold of 0.4l/s/ha

3 Flow Reduction - >=25% reduction in mean annual runoff volume from unmitigated development.

The site is discharging into an overland flow path that becomes highly urbanised east of the old coach culvert system. It is not foreseen that frequent flow requirements would apply to this site given this observation. It is noted the development proposes to utilise a bio retention system coupled with a detention system to mitigate the runoff effects of a developed site.

Erosion and Sediment Control

Do not release prescribed water contaminants (as defined in the Environmental Protection Act 1994 from the development site, or cause likely release should rainfall occur, unless all reasonable and practicable measures are taken to prevent or minimise the release and concentration of contamination.

This will require, minimising soil exposure and undertaking erosion control, drainage control and sediment control in accordance with the following

1 SC6.11 of this City Plan Policy

2 Relevant Healthy Waterways guidelines and documents

3 Urban Stormwater Planning Guideline (Queensland State Government

5 Best Practice Erosion and Sediment Control (IECA)

Refer to Section 11 of this report.

5 LAWFUL POINT OF DISCHARGE

5.1 EXISTING STORMWATER DRAINAGE

The following existing stormwater mains have been identified adjacent to the development site of the CoGC's asset infrastructure maps and survey (refer Appendix A and Appendix C for further details):

Council Stormwater Infrastructure

From the west to the east on Baileys Mountain Road;

- 2 x DN375 Stormwater mains crossing Baileys Mountain Road, located adjacent to the north-eastern site boundary;
- 2 x 750x1500 Stormwater box culverts crossing Baileys Mountain Road, located adjacent to the south-eastern corner of the site;

From the north to the south on Old Coach Road;

- 5 x 2700x1800 Stormwater box culverts crossing Old Coach Road, located to the east of the site;

From the South to the north on Reserve Road;

- 1 x DN900 stormwater main within the northern verge of Reserve Road;
- 1 x Stormwater manhole located adjacent to the site, within Reserve Road; and
- 10 x Stormwater drainage pits connected to DN375 stormwater mains within Reserve Road.

Site Stormwater Infrastructure

- 2 x DN1300 Reinforced Concrete Pipe (RCP) located beneath the existing driveway of the site;
- 1 x DN1200 RCP located beneath an alternative access driveway to the site off Reserve Road;
- 1 x DN675 Mild Steel (MS) pipe located in the north-eastern corner of the site;
- Natural drainage channel along the northern boundary of the site conveying flows from the north and the east of the site; and
- Natural drainage channel along the eastern boundary of the site that conveys flows from the east and the south that enter the site.

The existing stormwater discharge from the site is identified as discharging into the existing overland flow paths surrounding the site via overland flow before discharging through the box culverts to the east of the site beneath Old Coach Road. Please refer to Appendix A and Appendix B.

5.2 PROPOSED DISCHARGE CHARACTERISTICS AND QUDM TWO PART TEST

In the developed case, the site demonstrates compliance with the QUDM two part test as follows:

The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement.

The proposed development will demonstrate compliance with QUDM by discharging to the existing lawful point of discharge being the box culvert system beneath Old Coach Road. Runoff generated from the new development area of the site will be captured and processed through the elected stormwater treatment and detention devices prior to discharging to the discharge point. It

is proposed to maintain the same discharge characteristics by discharging it via overland flow for all events through the existing eastern drainage channel on site. Please refer to Figure 5-1 which schematically outlines the proposed drainage regime for the site.

That in discharging in that location, the discharge will not cause an actionable nuisance. In general terms this implies no worsening as a result of discharge.

Sections 6, 7 and 8 of this report provide detailed calculations and discussions illustrating no actionable nuisance anticipated.

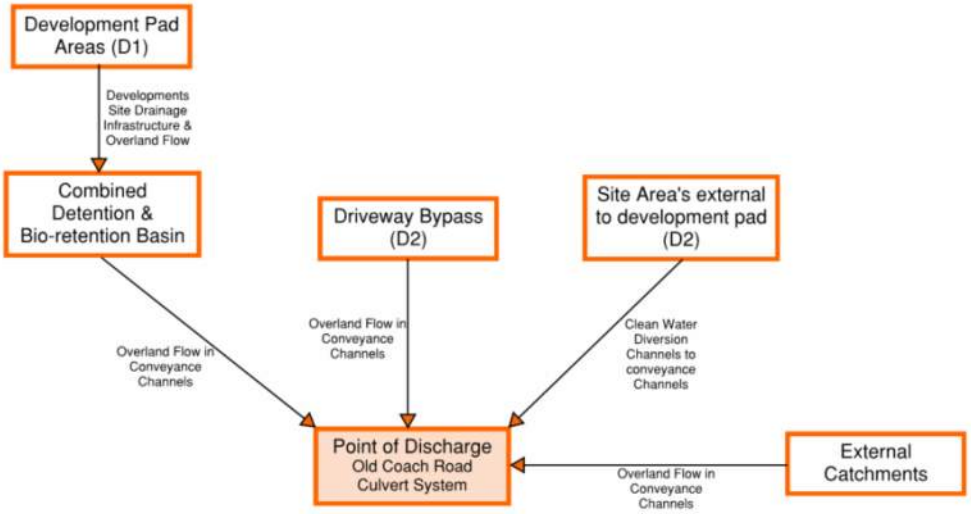


Figure 5-1 Developed Scenario Discharge Schematic

6 FLOODING AND CONVEYANCE MANAGEMENT

6.1 FLOOD MANAGEMENT

2015 City Plan Flood Overlay Map – 5 (refer to Appendix D) indicates that the site is not subject to regional flooding however an overland flow path does convey through the site. Please refer to Section 6.2 for more details regarding the conveyance of the channel.

6.2 EXTERNAL CATCHMENTS & CONVEYANCE MANAGEMENT

As noted above in Section 6.1 above the site has been identified as having an overland flow path conveying through it, as seen in Figure 6-1. There are existing overland flow paths that traverse through the site along the northern and eastern boundaries of the site. These two overland flow paths convey the flow from four external catchments (EXT1, EXT2, EXT4 & EXT4-1, EXT5) (Please refer to Appendix B for extent of each external catchment, catchment details and channel locations).

It noted there is one additional external catchment (EXT 3) that discharge through the site from the south. This southern catchment flow is conveyed via sheet flow across the site and is relatively small compared to aforementioned three external catchments. The main overland flow path, the eastern channel, which conveys the majority of the external flow through site is not proposed to be augmented as a part of this development and has been left in its existing natural state. It is proposed to augment the northern overland flow path in some section to accommodate the proposed development. The extent of works in this overland flow path can be seen in Appendix B. A hydraulic assessment will be undertaken in Section 9 of this report.

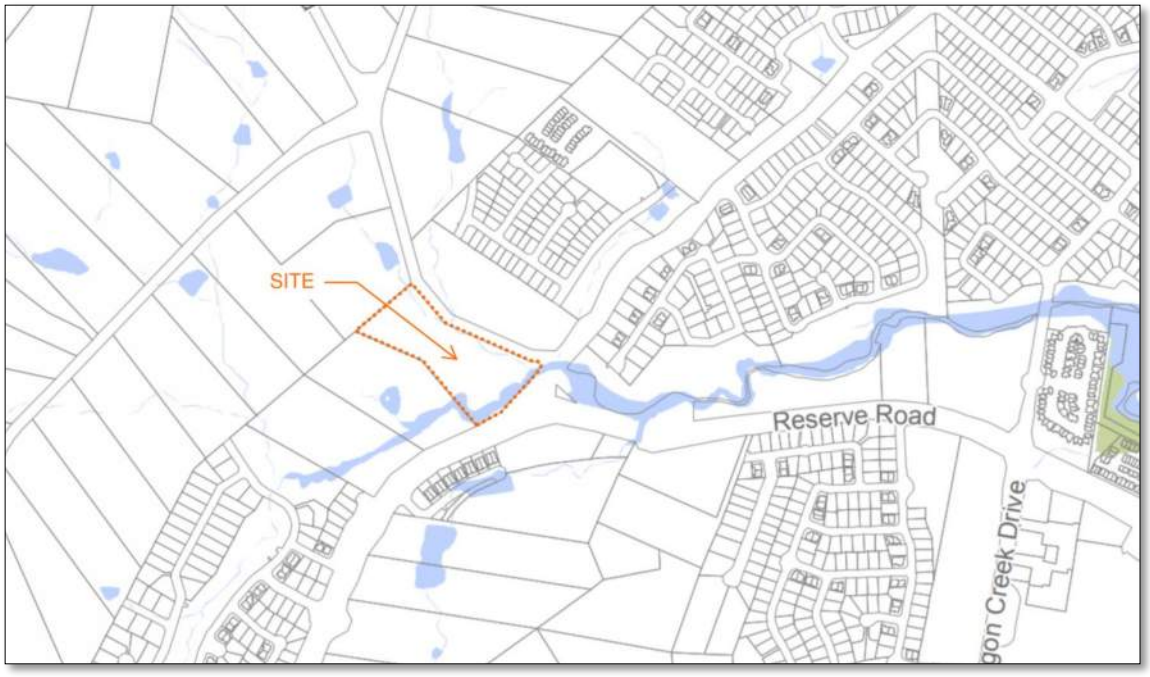


Figure 6-1 Extract from CoGC's Mapping

7 HYDROLOGICAL ASSESSMENT

7.1 TEMPORAL PATTERNS

Intensity Frequency Duration (IFD) data was derived in accordance with CoGC's 'Table 3.5-C Table of Rainfall Maps for Use in Gold Coast City. The data is summarised in Table 7-1 below:

Table 7-1 Site Specific IFD Data

Parameter	Value*
$^{1}I_{2}$	48.86
$^{12}I^{2}$	10.25
$^{72}I^{2}$	3.06
$^{1}I^{50}$	84.38
$^{12}I^{50}$	20.86
$^{72}I^{50}$	6.84
Geographical Factor F2	4.52
Geographical Factor F50	16.96
Map Skewness G	0

7.2 CATCHMENTS

The existing site contains one catchment that drains towards both the northern and eastern boundaries of the site before being channelled via existing overland flow paths on the aforementioned boundaries to the north-eastern corner of the site (point of discharge). The proposed development will maintain the same discharge characteristics. The catchment is shown in the engineering drawings included in Appendix B. External catchments will be assessed in Section 8 of this report to get more accurate flows for the Hydraulic Section of this report. The catchment will be assessed under two cases:

1 **Existing Case (E)** – the site in its existing state consisting of a single detached residential dwelling and Sheds;

2 **Developed (D)** – the site in its post-developed state as per the proposal.

Table 7-2 below summarises the catchment parameters used to assess the existing and developed flows. It is noted that the external catchments will be dealt with in Section 8 of the report.

Table 7-2 Catchment Parameters

CATCHMENT	E	D
Area (ha)	3.087	3.087
Slope (%)	>5%	>5%
Development Category	Rural Residential	Neighbourhood Centre
Impervious (%)	3	65
Coefficient of Runoff (C_{10})	0.7	0.9
Time of Concentration (minutes)	5	5

7.3 RATIONAL METHOD CALCULATIONS

In the existing and developed case analysis, the time of concentration for all catchment areas has been derived in accordance with Queensland Urban Drainage Manual (refer QUDM Section 4.6).

The coefficient of runoff for the catchment was determined using CoGC City Plan V5, Section SC6.11.4.4.8.

The Rational Method, as prescribed by QUDM Section 4.3, was then used to determine discharge flow rates for each sub-catchment for standard Average Exceedance Probability (AEP's) of 63%, 39%, 18%, 10%, 5%, 2% and 1% years (see Appendix E for the detailed calculation sheets). Table 7-3 below summarises the abovementioned calculations.

Table 7-3 Catchment Flow Rates Calculated Using the Rational Method

Catchment	Peak Flow rate for AEP's (m^3/s)						
	63%	39%	18%	10%	5%	2%	1%
E	0.422	0.562	0752	0.862	1.010	1.251	1.418
D	0.704	0.935	1.246	1.422	1.662	1.984	2.150
Difference	*0.282*	*0.373*	*0.494*	*0.560*	*0.652*	*0.733*	*0.732*

As observed through Rational Method calculations in Table 7-3, for catchments E & D an increase in peak flows is observed for the catchment following the inclusion of the proposed development. This is primarily due to the increase in impervious area. Due to limitations in the Rational Method combined with the size of the catchment, further detailed assessment of catchments E & D will be undertaken to ascertain peak flows and any attenuation requirements. Additionally, the sizing of the external catchments for the site will be undertaken in Section 8.

8 STORMWATER QUANTITY

8.1 OBJECTIVE

Stormwater discharge from the development must be detained to pre-development flow rates for all storm events up to and including the 1% AEP ("no-worsening"). Appropriate stormwater infrastructure for the site is therefore required to ensure that there is no increase in peak discharge flow rates for the downstream receiving infrastructure. On-site detention will be implemented to cater for storm events up to and including the 1% AEP event.

8.2 METHODOLOGY

For the site catchment identified as having the same peak flow rates when developed, a hydrologic model was created using XP-Rafts. The critical storm event was determined via an investigation of storm durations ranging from 5mins to 1080mins. The model was then used to assess on-site and route post-developed runoff through the proposed detention structures to determine the most efficient on-site detention systems which complies with the aforementioned objectives. It was also used to hydrologically route the external flows through the site to check the impact the developed site and basin will have on the longer duration peaks. This model was also used to ascertain the flows in the HEC-RAS model that was discussed in Section 6.2 of this report.

8.3 MODEL CONDITIONS

Two hydrologic conditions were modelled to appropriately demonstrate the storm water quantity objective:

- **Existing Scenario (E)** – The site in its pre-demolition state consisting of a residential dwelling and rural farms sheds;
- **Mitigated Scenario (D)** – The site is developed as per the proposal inclusive of proposed detention infrastructure.

In performing these scenarios, compliance with the objective of no hydraulic worsening downstream can be made. The site's performance has been assessed at its discharge locations which includes the effects of the upstream or bypass catchments where applicable. This methodology ensures that peak flow concentrations from the upstream catchments are assessed in conjunction with the detained on-site flows, in order to demonstrate 'true' results at the local point of discharge. It is noted that the developed site was split into further sub-catchments to ensure a more accurate representation of the proposed sites discharge regime. Please refer to Figure 5-1 for schematic of drainage regime.

The following catchment details in Table 8-1 were used within XP-Rafts for the purposes of the stormwater quantity assessment and HEC-RAS inflows in Section 6.2.

Table 8-1 XP-Rafts Catchment Details

Scenario	Catchment Name	Area (Ha)	Impervious Fraction (%)
Existing	E	3.087	3
Developed	D1	1.264	72
	D2*	1.823	3
External Catchments	EXT 1	26.675	15
	EXT 2	7.758	20
	EXT 3	0.414	20
	EXT 4	242.844	15
	EXT 4-1**	2.339	95
	EXT 5	16.425	60

*Includes small portion of road/driveway area that will bypass quantity and quality treatment
** Catchment that discharges up and including 10year AEP flows into the site via under road drainage from Reserve Road. Flows in excess of 10years bypass the site as they are conveyed by roadway to a downstream location of the site.

8.4 DETENTION SYSTEM DESIGN

Table 8-2 presents the design details for the proposed onsite detention system which is required to achieve the objective of no post development increase to pre-developed 63% to 1% AEP flow rates at the assessment point for the site. The detention system has been iteratively optimised to ensure peak performance.

Table 8-2 Summary of Proposed Detention Tank Parameters

Parameters	Value
Required Detention Volume*	625m^3
Required Detention Depth**	1.2m
Outlet Orifices***	DN100 orifice @ base of basin
	DN350 @ 0.5m above base of basin
Weir Outlet	2.5m wide weir @ 1.0m above base of basin
Emergency Weir Outlet	2m wide weir @ 1.1m above base of basin

*Volume required above 0.3m of extended detention for Bio-retention area
**Basin will have total depth of 1.5m to include 0.3m Bio-retention depth
***It is important that during detailed design appropriate trash screens should be included to potential orifice blockage.

The abovementioned detention system is proposed to be located in the north eastern of the site external to the external catchment overland flow paths. Engineering Drawings in Appendix B should be referred to for further details of the size and positioning of the proposed detention tank.

8.5 MODEL RESULTS

The following results have been captured from the XP-Rafts model as a result of implementing the above detention system. Table 8-3 below summarise the peak flow rates for the critical storm duration across the assessed AEP range at the assessment point for the for the developed site.

Table 8-3 Summary of Peak Local XP-Rafts Hydrologic/Hydraulic Results

Scenario	AEP (%)	63	39	18	10	5	2	1
Existing Scenario (E)	Peak Flow (m^3/s)	0.274	0.419	0.595	0.701	0.842	0.939	1.059
Mitigated Scenario (D1 & D2 @ Point of Discharge)	Peak Flow (m^3/s)	0.231	0.382	0.559	0.647	0.766	0.898	1.037
	Max Water Detention Depth in Basin (m)*	0.694	0.759	0.866	0.931	1.014	1.055	1.099

8.6 OBJECTIVE DISCUSSION

The above hydraulic investigation and runoff-routing exercise has demonstrated that suitable measures can be included in the design of the proposed development, to ensure that there is no increase in peak discharge being directed off-site to existing infrastructure for 63% AEP events to 1% AEP events. The regional check indicate that the site will have a negligible effect on the

overall drainage regime wider stormwater catchment network that converges on the development site.

8.7 SENSITIVITY CHECK & SAFETY CONSIDERATIONS

A sensitivity check was undertaken for the detention basin if blockage events occurred on the outlet orifices from the tank. This was done by applying 100% blockage on all the orifices and assessing if the weirs could facilitate the flow without surcharging from the basin area into the development. It is noted that the weirs will provide sufficient overflow capacity to convey the water below the top of basin level during a 100% outlet blockage event and prevent surcharge. It is noted that the basin has top level of RL25.75m and the sites building pads are at RL27.5m and RL27.0m, therefore should in the unlikely case the weirs fail as well there is additional freeboard.

Further details regarding the blockage event can be found in Appendix B.

Part of the proposed basin will utilise retaining walls to assist with interface to the required pad levels of the development. It is recommended that the basin be fenced off with barrier fencing and educational signage to mitigate risks of people unintentionally entering the basin. In addition to this and due to the nature of the development being for the elderly it is recommended that design safety report be undertaken prior to detailed design of the basin in accordance with QUDM Section 12.2. This report should examine design, construction and operational risks of the basin once the layout and other details have been finalised at the next phase of the project.

9 CONVEYANCE MANAGEMENT

9.1 MAJOR OVERLAND FLOW PATH (DETAILED HYDRAULIC ASSESSMENT)

9.1.1 OVERVIEW

External catchments are noted to discharge through the site. This section of the report will undertake a hydraulic assessment of the two primary overland flow path that traverse along the eastern and northern boundaries of the site.

9.1.2 OBJECTIVES

This section of the report investigates any changes to hydraulic conditions and mitigation measures required to appropriately manage the conveyance of stormwater via the existing creek and proposed formalised channel.

There are three primary objectives that will be achieved in this assessment:

1. No unacceptable worsening of hydraulic conditions external to the site;

Assessing changes in water level and velocity for potential adverse impacts between existing and developed scenarios.

2. Appropriate design of proposed northern overland flow path including cross drainage structure.

Ensuring the proposed overland flow path and cross drainage structure will safely convey flows through the site whilst providing suitable freeboard to proposed habitable floor levels including allowance for blockage. Modifications to this northern overland flow path are required to suit the development access and footprint provisions.

It is also noted that in accordance with City of Gold Coast City Plan Guidelines Schedule 6 4.5.10, building immunity for an aged care facility has been determined based on QUDM Table 7.3.2 which stipulates 200 year ARI immunity from overland flow.

9.1.3 METHODOLOGY

The U.S. Army Corps of Engineers Hydrologic Engineering Centre River Analysis System (HEC-RAS) Version 4.1 has been used for this exercise. HEC-RAS performs one-dimensional flow calculations using two-dimensional cross sections through the assigned river lines which have been generated using topographic data.

Various geometry models were created for the existing and development cases and the peak flow rates generated by the XP-RAFTS analysis used to determine the effects of the proposed development works.

9.1.4 MODEL PARAMETERS

9.1.4.1 EXISTING MODEL

Topography

- Generated from LiDAR data purchased by Arcadis. Source being State of Queensland (Department of Natural Resources and Mines) 2017.
- Schlencker Survey Digital Terrain Model (DTM)
- A geometric view of the existing case model can be seen in Appendix G.

Structures

- Reserve Road/Old Coach Road Culvert Structure - information has been determined from survey:
    - 3 x 2700x1800 Reinforced Concrete Box Culvert (RCBC);
    - 2x2700x2050 RCBC; and
    - Road Deck – 24m wide, with low point of RL23.08m AHD; and
- Internal Site Structures - information has been determined from survey:
    - 1 x 1200 diameter Reinforced Concrete Pipe (RCP) along Yaun Creek;
    - Road Deck – 7m wide, with low point of RL22.75m AHD;
    - 2 x 1300 diameter Reinforced Concrete Pipe (RCP) along Northern Overland flow path;
    - Road Deck – 3.8m wide, with low point of RL23.54m AHD;

Manning's

- Manning's values have been used as follows, based on recent aerial imagery assessment:
    - 0.1 has been used in densely vegetated areas including trees, typically within higher sections of banks;
    - 0.06 has been used for vegetated areas, where no or sparse trees are present, typically the within the overland flow path banks

9.1.4.2 DEVELOPED MODEL

Topography

- External areas - Generated from LiDAR data provided by Arcadis. Source being State of Queensland (Department of Natural Resources and Mines) 2017;
- Schlencker Survey Digital Terrain Model (DTM)
- Internal Site areas – based on preliminary bulk earthworks design.
- A geometric view of the developed case model can be seen in Appendix G.

Structures

- Reserve Road/Old Coach Road Culvert Structure - information has been determined from survey:
    - 3 x 2700x1800 RCBC;
    - 2x2700x2050 RCBC; and
    - Road Deck – 24m wide, with low point of RL23.08m AHD; and
- Internal Site Structures - information has been determined from survey:
    - 1 x 1200 diameter RCP along Yaun Creek;
    - Road Deck – 7m wide, with low point of RL22.75m AHD;
    - 2 x 1300 diameter RCP along Northern Overland flow path;
    - Road Deck – 3.8m wide, with low point of RL23.54m AHD;
- Internal Site Structures – Proposed Site Access:
    - 2 x 1200x900 RCBC; (Structure modelled with 50% blockage)
    - Road Deck – 7m wide, with low point of RL26.26m AHD;

Manning's

- Manning's values have been used as follows, based on recent aerial imagery assessment and proposed channel modifications:
    - 0.1 has been used in densely vegetated areas including trees, typically within higher sections of banks;
    - 0.06 has been used for vegetated areas, where no or sparse trees are present, typically the within the overland flow path banks

9.1.4.3 FLOW RATES

Tables below summarises the respective catchment node and corresponding HEC-RAS chainage location the flow has been applied. It is noted that the inflow in HEC-RAS is provided approximately 20-50m upstream of its catchment concentration node point which is considered conservative. HEC-RAS uses a cumulative input method for flows along a river string. It is noted that only the critical storm durations were used each Annual Exceedance Period (AEP).

Table 9-1 Flow Rates Used for Assessment of Hydraulic Afflux

Input Location			Flow Rate (m^3/s)			
River	Cross-Section	Flow Origin Catchments	39% AEP	10% AEP	1% AEP	0.5% AEP
Existing Scenario						
Baileys	340.92	EXT 2	1.157	1.918	2.782	4.962
Baileys	218.87	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys	190.3	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys	128.65	E -Site, EXT 1 &2	4.693	7.919	12.223	19.687
Reserve Rd (Yaum Creek)	344.25	EXT4 & EXT3	18.985	30.457	45.376	65.625
Reserve Rd (Yaum Creek)	91.26	EXT3, EXT4 & EXT4-1	21.788	35.628	52.69	84.366
Reserve Rd (Yaum Creek)	79.18	E -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Reserve Rd (Yaum Creek)	73.17	E -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Developed Scenario						
Baileys Rd	337.91	EXT 2	1.157	1.918	2.782	4.962
Baileys Rd	232.07	EXT 1 &2	1.157	1.918	2.782	4.962
Baileys Rd	222.42	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys Rd	127.75	D -Site, EXT 1 &2	4.693	7.919	12.223	19.687
Reserve Rd (Yaun Creek)	344.25	EXT4 & EXT3	18.985	30.457	45.376	65.625
Reserve Rd (Yaun Creek)	91.26	EXT3, EXT4 & EXT4-1	21.788	35.628	52.69	84.366
Reserve Rd (Yaun Creek)	79.18	D -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Reserve Rd (Yaun Creek)	73.17	D -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819

9.1.4.4 BOUNDARY CONDITIONS

The downstream boundary condition has been adopted in accordance with existing ground levels extracted from survey (Appendix A). The downstream boundary condition in HEC-RAS has been set as a "Normal Depth S=0.0083" to represent existing slope. We note that the model has been extended by approximately 30m downstream of the existing culvert crossing Old Coach Road to minimize the influence of the boundary condition to the site's water level, which are generally controlled by the existing culvert inlet capacity.

Upstream boundary condition has been set as Critical Depth for both overland flow paths.

9.1.4.5 MODEL LIMITATIONS

The following limitations are noted based on the adopted methodology:

- Detailed survey information is limited to a very close proximity to the site;
- Infrastructure under Baileys Mountain Road infrastructure has not been modelled;
- Other storm durations and recurrence intervals have not been assessed if not noted;
- No assessment of blockages to existing cross drainage structures internal to the site and external (Old Coach Road Culverts) to the site;
- No assessment of climate change impact on channel flows.
- No sensitivity assessment with high tailwater conditions;
- External catchments are not fully developed and undetained; and
- Dam is assumed to be full to downstream invert control.

9.1.5 HYDRUALIC RESULTS AND DISCUSSION

9.1.5.1 No Worsening of Conditions on External Properties

Table 9-2 below summarises peak water levels and velocities as well as changes in velocities for cross sections pertaining to external private or public property. Key points are:

- Minimal change in conditions upstream of the site. This is due to runoff been accepted both boundaries with minimal obstructions.
- Generally, a small reduction in water level is noted at the upstream cross-sections of the Norther Channel (Baileys Road). This reduction is caused by the increased efficiency in conveying flows through the site as a result of to the proposed channel.
- There is an isolated instance where the channel velocity increased by 0.58m/s, however in context of the majority results this is deemed negligible. Furthermore the minor increases do not exceed a velocity scour threshold.
- Water Levels have been checked downstream of the Baileys Mountain Road Infrastructure culvert crossings into the site half way along the site northern boundary. Results indicate that water levels in the developed case reduce by approximately 0.5m.
- The Culvert under bailey mountain road near the intersection of Old Coach has not been affected by the proposed works.

The proposed works on-site are therefore not envisaged to cause an impact on upstream or downstream property that could cause real damage

Table 9-2 Afflux Results for Overland flow path for Private Properties

Location Information			Existing		Developed		Change	
Location	Section (Existing)	Section (Developed)	Water Level (RLm)	Velocity (m/s)	Water Level (RLm)	Velocity (m/s)	Water Level (RLm)	Velocity (m/s)
39% AEPr								
Upstream - Yaum Creek	344.25	344.25	25.08	0.91	25.08	0.91	0	0
	298.73	298.73	24.31	1.9	24.3	1.93	-0.01	0.03
Upstream - Baileys Road	340.92	337.91	27.64	0.71	27.64	0.71	0	0
	317.57	314.57	26.82	0.95	26.82	0.95	0	0
	312.01	309.01	26.51	0.63	26.5	0.67	-0.01	0.04
Baileys Road Culvert Crossing	202.89	201.68	25.21	1.13	24.67	1.13	-0.54	0
Downstream	15.92	15.92	22.26	1.37	22.26	1.37	0	0
	3.34	3.34	22.17	1.32	22.17	1.32	0	0
10% AEP								
Upstream - Yaum Creek	344.25	344.25	25.38	1.01	25.38	1.01	0	0
	298.73	298.73	24.53	2.12	24.52	2.13	-0.01	0.01
Upstream - Baileys Road	340.92	337.91	27.71	0.81	27.7	0.81	-0.01	0
	317.57	314.57	26.86	1.12	26.86	1.12	0	0
	312.01	309.01	26.57	0.74	26.56	0.77	-0.01	0.03
Baileys Road Culvert Crossing	202.89	201.68	25.3	1.43	24.74	1.48	-0.56	0.05
Downstream	15.92	15.92	22.45	1.69	22.45	1.7	0	0.01
	3.34	3.34	22.37	1.53	22.37	1.53	0	0
1% AEP								
Upstream - Yaum Creek	344.25	344.25	25.68	1.13	25.68	1.13	0	0
	298.73	298.73	24.76	2.32	24.76	2.32	0	0
Upstream - Baileys Road	340.92	337.91	27.75	0.95	27.75	0.94	0	-0.01
	317.57	314.57	26.91	1.21	26.9	1.24	-0.01	0.03
	312.01	309.01	26.63	0.82	26.62	0.85	-0.01	0.03
Baileys Road Culvert Crossing	202.89	201.68	25.37	1.84	24.75	2.2	-0.62	0.36
Downstream	15.92	15.92	22.67	2.07	22.67	2.08	0	0.01
	3.34	3.34	22.6	1.75	22.6	1.75	0	0
0.5% AEP								
Upstream - Yaum Creek	344.25	344.25	25.99	1.28	25.99	1.28	0	0
	298.73	298.73	25.07	2.46	25.06	2.46	-0.01	0
Upstream - Baileys Road	340.92	337.91	27.86	1.01	27.87	1	0.01	-0.01
	317.57	314.57	26.98	1.48	26.97	1.52	-0.01	0.04
	312.01	309.01	26.75	0.98	26.83	0.78	0.08	-0.2
Baileys Road Culvert Crossing	202.89	201.68	25.49	2.33	24.83	2.8	-0.66	0.47
Downstream	15.92	15.92	23.01	2.71	23.01	2.72	0	0.01
	3.34	3.34	23	2.11	23	2.11	0	0

9.1.5.2 Proposed Northern Channel

The proposed augmentation to the overland flow path running along the sites northern boundary have been modelled in HEC-RAS to confirm the channel has capacity to safely convey flows through the site. As discussed in Section 9.1.4.2 the works also includes a culvert crossing to a proposed access driveway to the site.

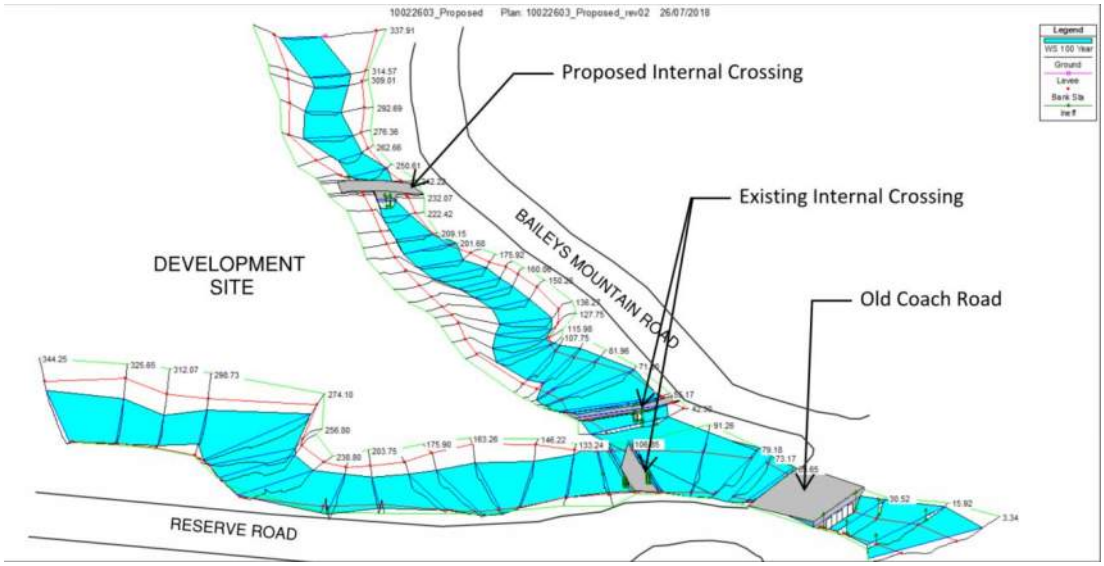


Figure 9-1 - 3D Perspective of Existing and Proposed Overland flow paths

The modelling results indicates that the channel velocities are generally below the scouring threshold for a vegetated channel being generally below 2.0m/s. Refer Table 9-3 below,

Table 9-3 Afflux Results for Northern Overland Flow Path

Reach	Section	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)
42	337.91	1% AEP	2.78	27.34	27.76	27.8	0.021304	0.92	3.03	13.07
42	314.57	1% AEP	2.78	26.59	26.9	26.98	0.066605	1.28	2.17	13.25
42	309.01	1% AEP	2.78	26.23	26.51	26.62	0.089531	1.51	1.85	11.11
42	292.69	1% AEP	2.78	25.88	26.34	26.37	0.006117	0.66	4.21	11.54
42	276.36	1% AEP	2.78	25.53	26.32	26.33	0.000965	0.33	8.4	16.17
42	262.66	1% AEP	2.78	25.25	26.31	26.32	0.000853	0.39	7.06	9.26
42	250.61	1% AEP	2.78	24.99	26.31	26.31	0.000329	0.26	10.68	13.41
42	242.22	1% AEP	2.78	24.82	26.29	26.3	0.000787	0.59	4.68	7.59
42	240.72	Culvert for Proposed New Vehicular Access (2 x 1200x900 RCBC)								
42	232.07	1% AEP	2.78	24.65	25.86	25.96	0.00581	1.44	1.93	5.84
42	222.42	1% AEP	11.16	24.71	25.69	25.83	0.016988	1.7	6.56	8.99
42	209.15	1% AEP	11.16	24.61	25.24	25.46	0.049342	2.08	5.36	12.32
42	201.68	1% AEP	11.16	24.21	24.75	24.99	0.087536	2.2	5.28	18.34
42	191.59	1% AEP	11.16	23.73	24.54	24.64	0.016508	1.39	8.04	15.13
42	175.92	1% AEP	11.16	23.3	24.52	24.55	0.002002	0.68	16.45	18.43
42	166.66	1% AEP	11.16	23.31	24.49	24.52	0.003286	0.85	13.14	15.09
42	160.06	1% AEP	11.16	23.31	24.45	24.5	0.004146	0.93	12.04	14.46
42	150.26	1% AEP	11.16	23.16	24.36	24.44	0.008759	1.2	9.34	13.41
42	136.27	1% AEP	11.16	22.98	24.33	24.36	0.002925	0.79	14.2	16.94
42	127.75	1% AEP	12.22	22.88	24.3	24.33	0.002699	0.77	15.85	18.55
42	115.98	1% AEP	12.22	22.92	24.26	24.3	0.003522	0.85	14.4	17.88
42	107.75	1% AEP	12.22	22.93	24.25	24.27	0.002181	0.69	17.92	22.51
42	95.16	1% AEP	12.22	22.95	24.22	24.24	0.001933	0.65	19.34	25.07
42	88.63	1% AEP	12.22	23.02	24.21	24.23	0.001915	0.65	19.74	25.79
42	81.96	1% AEP	12.22	22.98	24.21	24.22	0.001287	0.53	24.41	35.77
42	71.3	1% AEP	12.22	22.94	24.2	24.21	0.000692	0.43	30.42	37.19
42	55.17	1% AEP	12.22	22.16	24.18	24.19	0.001454	0.52	24.26	34.14
42	53.65	Existing Access Culvert (2 x 1300 diameter RCP)								
42	49.39	1% AEP	12.22	22.14	24.17	24.18	0.002648	0.63	20.48	29.39
42	42.3	1% AEP	12.22	22.83	23.69	24.1	0.03769	2.83	4.32	27.32

The driveway crossing has been assessed for a 1% AEP flows with 50% blockage, with results showing the maximum water level below the road level. As discussed in section 9.1.4.2 the proposed crossing will have 2 x 1200x900 RCBC; Figure 9-1 below shows the 1% AEP channel long section.

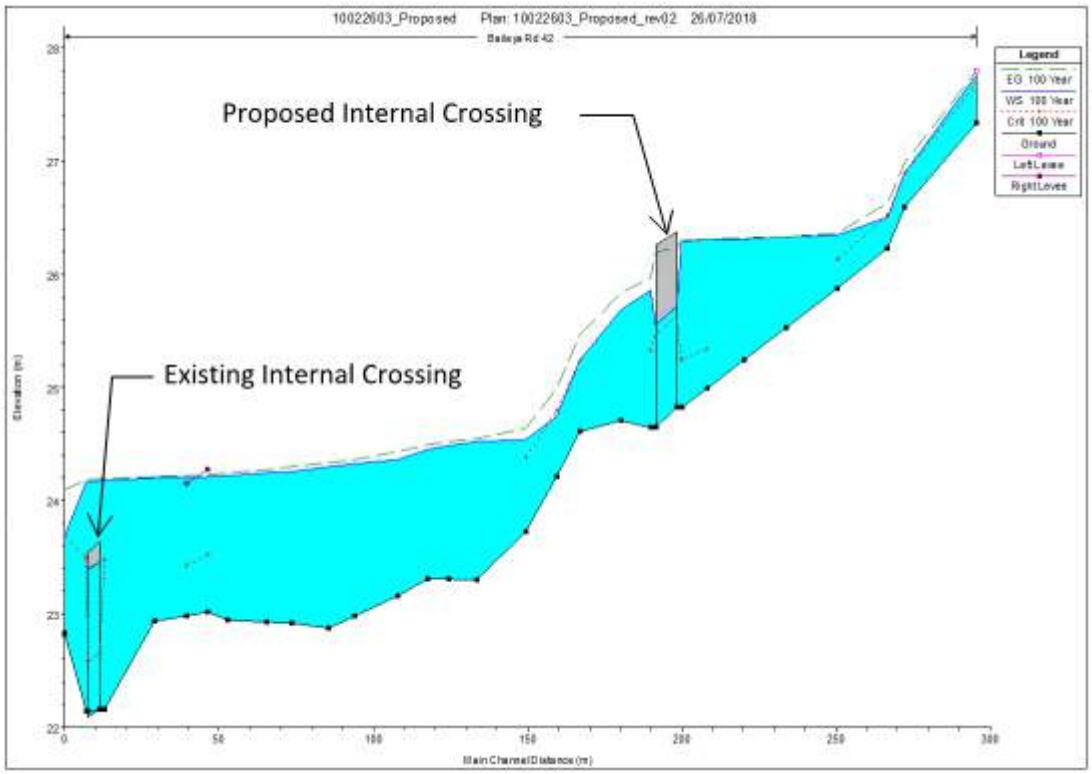


Figure 9-2 – Proposed Channel Long Section

As discussed in Section 9.1.2 freeboard was checked for 0.5% AEP event in accordance with QUDM Table 7.3.2. The results indicate that the water level in this event will reach approximately RL 26.74m AHD at the upstream of the culvert crossing as shown in Table 9-4. The building pad is set at RL27.5m AHD providing a minimum of 700mm of Freeboard.

Water Level was also checked throughout the channel to ensure freeboard is adequate.

Table 9-4 Afflux Results for Northern Overland Flow Path at New Vehicle Access Point

River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)
Baileys Rd	42	242.22	0.5% AEP	4.96	24.82	26.74
Baileys Rd	42	240.72		Culvert		
Baileys Rd	42	232.07	0.5% AEP	4.96	24.65	26.05

A complete set of results is provided in Appendix G.

9.2 MINOR DIVERSION CHANNELS (MANNING'S CALCULATION)

A Manning's calculation has been undertaken to ascertain the required channel dimensions to divert the site's smaller external catchments that do not enter the site through the two main overland flow paths. Table 9-5 outlines the required diversion channel to divert the flow around the development for .

Table 9-5 On-site Clean Water Diversion Channel Parameters

Parameter	Value
Location	Western & Southern Boundaries
Catchments*	EXT 3 & a portion of EXT 2
Peak Flow from Above Catchment	0.331m³/s
Depth of Channel	0.5m (0.2m Flow Depth + 0.3m Freeboard)
Base Width of Channel	1
Grade of Right Hand bank in Direction of Flow	1 in 2
Grade of Left Hand bank in Direction of Flow	1 in 2
Channel Slope	≈ 10%
Manning's n**	0.07
Max Velocity	1.26m/s
Channel Capacity	0.353m³/s

**Please refer to Appendix B for catchment locations*

***Manning's n was established from Brisbane City Council's Manning's roughness document (https://www.brisbane.qld.gov.au/sites/default/files/ncd_appendixc_part3.pdf)*

As seen in the above table, the clean water diversion parameters will have sufficient capacity to convey the onsite clean water past the proposed development pad.

It is noted that some of these channels will have be traversing down steep grade and will require instream velocity treatment to mitigate erosion. During detailed design velocity mitigation measures such as rock lining, proprietary geofabrics and riffle pools can be used to manage the velocities of these channels once further geotechnical properties of soils are known.

It is highlighted that the predicted 1% AEP velocity is 1.26m/s which do not present immediate concern, however, measures, as mentioned above, will be investigated.

10 OPERATIONAL PHASE STORMWATER QUALITY

10.1 ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

To prevent degradation of Gold Coast waterways and beaches, ecologically sustainable development principles have been embraced and regulated by the CoGC. Section 6.11.4 Water Sensitive urban design of the City Plan Land Development Guidelines indicates that "The overarching principles which apply to new development on the Gold Coast are:

- Avoid the creation of nuisance flow or hazard problems;
- Protect the quality of surface and ground waters during construction and operation of new development;
- Maintain the natural hydrologic behaviour of catchments;
- Protect existing natural features and ecological processes; and
- Integrate stormwater management infrastructure carefully in the urban and natural landscape."

With these principles in mind, the stormwater management objectives aim to:

- Identify the water quality and quantity objectives and performance criteria;
- Estimate the pollutant and flood storage loads; and
- Detail within the management plan, strategies aimed at achieving the required objectives.

Water quality objectives during both the construction and operational phases of a development are presented within CoGC City Plan– Section 6.11.4 and are detailed in this report.

Water quality parameters and the proposed limits applicable for this development have been selected in accordance with the SPP. The water quality reduction targets stipulated by these guidelines are presented in in Table 10-1 below:

Table 10-1 Water Quality Operational Phase Performance Criteria

Pollutant	Criteria
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants	90%

10.2 PROPOSED STORMWATER TREATMENT DEVICES

WSUD aims to minimise the impact of a development on the natural water cycle by reducing the export of pollutants, sediments and nutrients from the site into the natural watercourse. In order to treat the stormwater runoff from the site, various treatment devices can be used throughout the development area and these concepts can be integrated into the overall design of the road layouts, road cross sections, stormwater layouts and water supply reticulation systems. Stormwater from each development stage will follow a specially designed stormwater quality treatment train prior to discharge from the site, which will ensure compliance with the water quality objectives.

A treatment train has been proposed for the site which comprises of a number of individually designed treatment devices that collectively contribute to the achievement of whole site water quality objectives.

10.2.1 BIO-RENTENTION SYSTEM

A bio-retention area is a vegetated region where runoff is filtered through a filter media layer (e.g. sandy loam) as it percolates downwards to receiving underlying reticulation. Specific vegetation is to be incorporated into the landscaping of bio-retention areas which effectively reduce nutrient loads. Appendix A of Healthy Waterways' WSUD Technical Guidelines for South East Queensland provides guidance on selecting appropriate plant species for systems where plants have a functional role in stormwater treatment, such as the aforementioned bio-retention basins.

A typical example of a bio-retention area in operation with suitable vegetation is presented in Figure 10-1 below. A typical section is also presented in Figure 10-2 with further standard details and maintenance checklist enclosed as Appendix F of this report.



Figure 10-1 Example of Urban Bio-retention Garden Bed (Courtesy of Water by Design

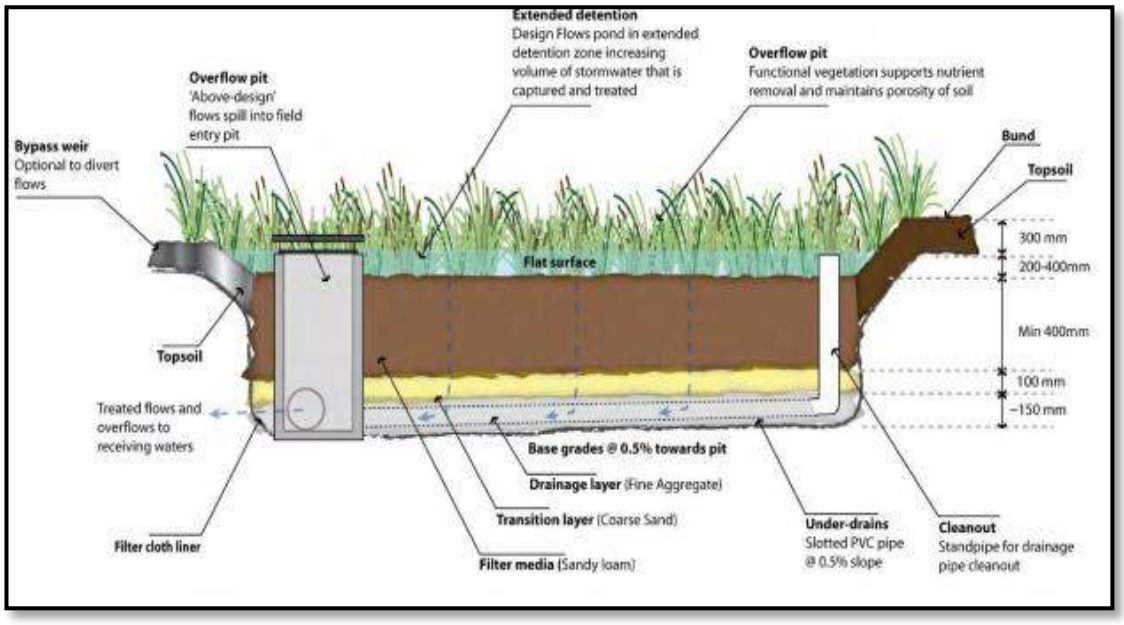


Figure 10-2 Example of Urban Bio-Retention Basin (Courtesy of Water by Design)

10.3 MODELLING OF THE DEVELOPED SITE (MUSIC)

Modelling of the site was undertaken using the 'Model for Urban Stormwater Improvement Conceptualisation (MUSIC)' as promoted by CoGC and the South East Queensland Healthy Waterways Partnership. The development was modelled using the split catchment approach. An appropriate type of land use was applied to all surface types within the developed catchments; where individual treatment devices were assigned the relevant modelling treatment parameters. Consequently, a treatment train was established for each the site, ensuring that water discharging from site adheres to the specified Water Quality Objectives.

Meteorological data for input into MUSIC was obtained from Beenleigh Bowls Station 40406 from the Bureau of Meteorology. Six minute time step rainfall data was obtained for the climate period from 1/1/1990 to 31/12/1999. The catchment parameters of the MUSIC modelling are specified within the South East Queensland Healthy Waterways Partnerships' Water by Design MUSIC Modelling Guidelines for South East Queensland Version 1 (2010), and have been modelled as such.

10.3.1 POLLUTANT SOURCE NODE DETAILS

The pollutant source node parameters input into the MUSIC model were determined using the South East Queensland Healthy Waterways Partnership's Water by Design MUSIC Modelling Guidelines for South East Queensland version 1 (2010), specifically Tables 3.7 and 3.8 for urban residential surface types. It is noted that all base flow parameters for roof surfaces are adopted as 0.00 or N/A. Landscape imperviousness was considered for ground areas to ensure an accurate representation of the pollutant generating areas.

A summary of the source nodes has been provided in Table 10-2 below. It is noted that the treatment area below is only for the proposed development catchment area (D1). The balance of site area (D2) will remain as per its existing conditions and will not be treated for stormwater quality. The small area of the new driveway that is included in catchment D2 has been accounted for as bypass in the music model.

Table 10-2 Summary of MUSIC Source Nodes

MUSIC Source Node	Imperviousness (%)	Area (ha)
Urban Resi – ROOF (D1)	100	0.595
Urban Resi – GROUND (D1)	31	0.534
Urban Resi – ROAD (D1)	100	0.135
Urban Resi - ROAD BYPASS (D2)	100	0.008

10.4 TREATMENT DEVICE DETAILS

Once the site is fully developed, the stormwater run-off from sub-catchments will be collected via a drainage system flowing into the treatment area which is located within the proposed detention basin located east of the new development pad and road. This basin operates offline to the overland flow paths that traverse through the site.

The modelling of the Bio retention system has been completed in compliance with the MUSIC Modelling Guidelines Version 1.0 - 2010. The Bio Retention treatment requirements are outlined below in Table 10-3.

Table 10-3 Bio Retention Requirements

Parameter	Bio-retention
Catchment Area (ha) to Basin	1.264
Minimum Filter Media Area (m²)	150
Batter Slope	1:2
Extended Detention Depth (m)	0.3
Minimum Filter Media Depth (m)	0.4
Drainage Layer Depths (m)	0.3
Saturated Hydraulic Conductivity (mm/hour)	200
Filter Media Total Nitrogen (mg/kg)	400
Filter Media Orthophosphate (mg/kg)	45

10.5 MUSIC MODEL LAYOUT AND RESULTS

Appropriate percentage impervious factors have been applied to all nodes according to Architectural layout in Appendix B. A diagrammatic view of the MUSIC model layouts and modelling results is presented in Figure 10-3 below:

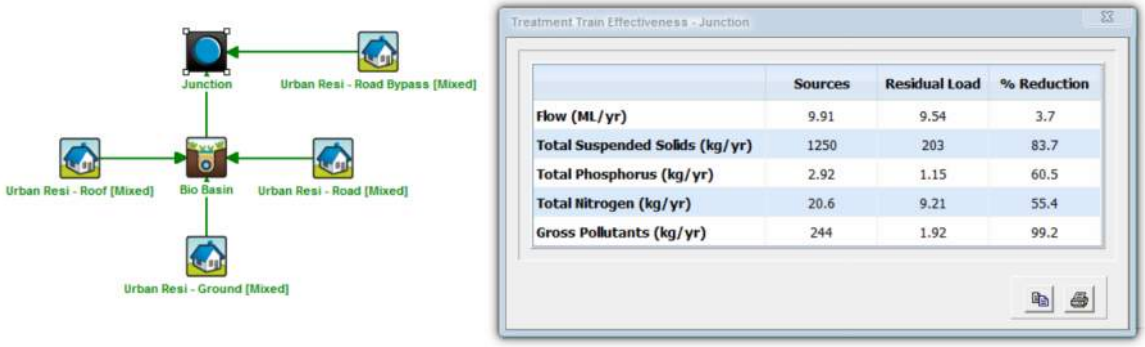


Figure 10-3 Music Model Layout and Results

11 STORMWATER QUALITY CONSTRUCTION PHASE

11.1 WATER QUALITY OBJECTIVES

Table 11-1 Construction Phase Quality Objectives (SPP and CoGC LDG)

Pollutant	Criteria
Drainage Control	Design life and design storm of temporary drainage works: **1.** Disturbed area open for <12 months—1 in 2 ARI; **2.** Disturbed area open for 12-24 months—1 in 5 ARI; **3.** Disturbed area open for > 24 months—1 in 10 ARI;
Erosion Control	**4.** Minimise exposure of disturbed soils at any time; **5.** Avoid or minimise large construction activities in the wet season; **6.** Divert water run-off from undisturbed areas around disturbed areas; and **7.** Use erosion risk ratings to determine appropriate erosion control measures.
Sediment Control	Use soil loss rates to determine appropriate sediment control measures Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water run-off Site discharge during sediment basin dewatering should not exceed 50 mg/L TSS and pH between 6.5–8.5
Stormwater Drainage / Flow Management	Hydraulics and hydrology—Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: • peak flow for the one-year and 100-year ARI event (respectively for aquatic ecosystems and flood protection); • run-off frequency and volumes entering receiving waters; and • Uncontrolled release of contaminated stormwater.
Water Quality Outcomes	Stormwater flows from undisturbed and disturbed areas—manage to help protect environmental values Coarse sediment—coarse sediment is retained on site Fine sediment—Site discharge during sediment basin dewatering has a TSS concentration less than 50 mg/L Turbidity—Site discharge during sediment basin dewatering has a turbidity (NTU) less than 10% above receiving waters turbidity— measured immediately upstream of the site Nutrients (N & P)—Nitrogen and phosphorus are managed through sediment control. pH—Site discharge during sediment basin dewatering has a pH range 6.5–8.5 Litter and other waste—Prevent litter/waste entering the site, the stormwater system or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins Hydrocarbons and other contaminants—Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. Wash down water—Wash down water is prevented from entering the stormwater system or internal watercourses that discharge from the site Cations and anions—Cations and anions including aluminium, iron and Sulfate are managed as required under an approved acid Sulfate soil management plan

Table 11-1 provides the construction phase stormwater quality objectives outline by the State Planning Policy. Additional relevant acts, policies and information that may be useful for construction phase planning include:

- Environmental Protection Act (1994);
- Environmental Protection (Water) Policy (2009);

- Queensland Development Code, Sediment and Erosion Control (2010); and
- Best Practice Erosion and Sediment Control for Building and Construction Sites Guidelines (2008).

11.2 EROSION AND SEDIMENT CONTROL PLAN PURPOSE

During the construction phase it shall be the Principal Contractor's responsibility to ensure the objectives of Table 11-1 are achieved.

The following section of this report provides a suggested framework for an Erosion and Sediment Control Plan. This includes recommended actions and responses for specific activities; monitoring and reporting; and construction of specifically designed site-specific sediment basins.

11.3 SPECIFIC ACTIVITIES

11.3.1 EROSION AND SEDIMENT CONTROL OF DISTRIBUTED LAND

During the construction phase it shall be the Principal Contractor's responsibility to ensure the following:

- Diversion of any clean water runoff that may interfere with land disturbance by the use of earth bunds, or other control devices deemed appropriate by a suitable supervisor;
- Reduction of sediment migration from disturbed land parcels by implementing silt fences, sediment basins or other control devices as deemed appropriate by a suitable supervisor;
- Where cut to fill operations produce a spoil it is recommended that the excess material be placed upstream of the excavation location to ensure any sediment runoff is directed back into the trench. Earth bunds or sediment fences may be required to control direction of sediment flow should the spoil be placed on the downstream side of the excavation site;
- Control measures such as a gully pit sediment barrier (see Arcadis drawings attached) shall be installed around inlet pits where required reducing the potential for sediment discharge into the surrounding stormwater system;
- Any sediment deposited from construction vehicles will be swept up and removed; and
- Erosion and sediment control devices may only be removed once disturbed lands which they are protecting are rehabilitated and capable of resisting further erosion.

11.3.2 SPOIL AND STOCKPILE MANAGEMENT

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase unless otherwise specified:

- The placement of spoil and stockpile material shall be kept at a maximum distance from stormwater inlets, gutters and stormwater pipes to reduce unnecessary sediment migration into nearby infrastructure;
- Spoil and stockpile material shall be placed in a way that reduces the likelihood of sedimentation, erosion and slippage. Advice from an appropriate project manager/representative shall be sought in this instance;
- Spoil or stockpile material that is deemed a contaminant shall be placed on a designated zone of either fill material, plastic or concrete with the installation of appropriate containment devices. Advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the severity of contamination; and

- It shall be the Project Manager's responsibility to foresee and develop appropriate control measures to prevent the impacts of spoil and stockpile material prior to construction activities. Monitoring and reporting shall also be required during the implementation of any given device associated with spoil and stockpile management.

11.3.3 EROSION CONTROL

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase:

- Traffic of any type shall be kept away from areas of rehabilitation to promote stabilisation of the zone;
- Where wind and water are acknowledged as potential erosion sources temporary protection shall be installed. Such measures only apply to zones of spoil, stockpile and land disturbance which are unlikely to receive works within a period of 6-8 weeks. Further advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the disturbance type and erosion source; and
- Once viable, final landscaping shall be undertaken on applicable zones to increase stability.

11.3.4 PERSONNEL TRAINING

It shall be the Principal Contractor's responsibility to oversee the following training protocols during the construction phase:

- Environmental management and incident reporting is to be included on all site induction courses; and
- All personnel are to receive adequate training in; work place health and safety issues, environmental management, best practice erosion and sediment control practices, incident reporting procedures and where applicable site inspection and maintenance procedures.

11.3.5 MISCELLANEOUS

- It is the Principal Contractor's responsibility to ensure erosion and sediment controls are operated and maintained in an effective operational condition. These structures are not allowed to accumulate sediment volume in excess of 70% sediment storage design capacity as per Section 6 of the Urban Stormwater Quality Planning Guidelines 2010;
- Sediment removed from control measures must be disposed of in a manner approved by the local Council that does not cause pollution and forms part of the Contractor's obligation;
- Any chemicals, fuel or oil stored on site shall be stored under cover in a bounded area or placed sufficiently above ground level to prevent contamination of surface water;
- A waste concrete receptor (disposal area) must be established if significant concreting is to occur on site. The site must be surrounded by perimeter bunds and be clearly signed; and
- A general waste collection area shall be established which is to include appropriate pollutant runoff controls, dependent on the nature of the waste.

11.4 PROJECT PERSONNEL RESPONSIBILITIES

A description of the key personnel involved with implementing the Erosion and Sediment Control Plan are listed in Table 10-11-2. It is recommended that all parties involved attend a pre-construction conference to discuss and clarify all issues associated with sediment and erosion control as well as this plan.

Table 10-11-2 Project Personnel Responsibilities

Project Role	Responsibilities
Superintendent	• Authorisation of this plan; and • Review and monitoring of this plan.
Contractor / Site Manager	• Implementation of this plan; • Monitoring of this plan; • Supervising any activities or requirements required by this plan; • Implementation of this plan; • Supervising any activities or requirements required by this plan; and • Ensuring all personnel are aware of the contractual agreements associated with this plan.
All Personnel	• Ensuring they are aware of the contractual agreements associated with this plan; and • Informing appropriate personnel of any issues that may arise with respect to the desired sediment and erosion control measures.

11.5 MONITORING AND RESPONSIBILITY

11.5.1 ALL PERSONNEL

It is the obligation of all personnel to report any failures in the erosion and sediment control works utilised during the projects life cycle. Any identified errors within the sediment and erosion control system shall be reported in writing to a relevant project manager. A formal inquiry shall be undertaken in accordance with the reported issue as well as the relevant party procedures (i.e. Principal Contractor).

11.5.2 CONTRACTOR/CONTRACTOR'S FOREMAN

It shall be the responsibility of the Contractor and Contractor's Foreman to monitor and report on the erosion and sediment control measures utilised in the construction phase. Inspections are to be undertaken:

- On a daily basis during earthworks, land disturbance, spoil or stockpile activities and rain events;
- Weekly during site inactivity; and
- Within 24 hours prior to expected rainfall and 18 hours prior to intense rainfall events.

The following shall be inspected or reported on:

- Erosion and sediment control devices are in the correct location and are working as defined by this plan;
- Drainage systems both internal and external to the site are operating effectively or to pre-construction efficiencies;
- Spilled material is removed if it can potentially mobilise via stormwater runoff or wind;
- Stabilisation of disturbed land parcels has been undertaken in an effective manner;
- Excess sediment has been removed from erosion and sediment measures appropriately if the device is operation ineffectively or requires decommissioning.; and
- It is understood that repairs, maintenance or reinstallation may be required if any control measures are operating inadequately, or if infrastructure is damaged due to inefficient operation of the outlined measures.

11.5.3 ENVIRONMENTAL REPRESENTATIVE

It shall be the responsibility of the environment representative to periodically inspect and report on the effectiveness of the erosion and sediment controls during the construction phase of the project. Technical advice shall be given to personnel outlying any uncertainty with regards to the; applicability, installation, operation, maintenance, removal or rehabilitation of any sediment and erosion control.

11.6 CONSTRUCTION PHASE SEDIMENT CONTROL DEVICES

As the site has been assessed as on catchments, it is appropriate to approach the assessment of construction phase sediment devices in a similar manner.

In accordance with the Best Practice Erosion and Sediment Control Manual (ICEA 2009) the construction phase catchment has been classified to determine the level of sediment and erosion control techniques required. The site is identified as per Table 4.4.6 (ICEA 2009) to be closest to the Southport locality and therefore attracts an average monthly rainfall depth of 56m to 205mm.

As the extent of soil disturbance is widespread, Type 2 techniques will be used in accordance with Table 4.5.3. This will require control techniques such as a vehicle shakedown at the site entry, sediment fences, sediment basins and check dams. Mulching and turf lining will also be used to help reduce erosion of the site during construction. It would be also be prudent to provide instream treatment for the overland flow paths when they are being reshaped to ensure that during any rain events the channels are adequately protected.

Detailed explanations of the measures can be found in the engineering drawings in Appendix B.

12 ASSET HANDOVER

All the stormwater quantity and quality controls detailed in this document are contained within the development site and will remain an asset of the development's property owner, Body Corporate or similar internal authority.

Regular maintenance of the stormwater quality treatment devices will be undertaken by the body corporate to ensure the continuing performance of the stormwater quality treatment train.

Additional information including standard integration drawings and maintenance requirements can be found in Appendix F.

13 CONCLUSION

This SBSMP has been prepared to provide a design proposal and guide to the stormwater quantity and quality management techniques for the proposed development.

The primary objectives of this Site Based Stormwater Management Plan (SBSMP) are achieved as follows:

Lawful Point of Discharge

The site proposes to discharge to Old Coach Road Culvert System via overland flow, after receiving the necessary quality and quantity treatment. All stormwater will be will be discharged directly via overland flow to existing overland flow paths traversing through the site to the point of discharge, as is the current situation.

External Conveyance

2015 City Plan Flood Overlay Map – 5 indicates that the site is not subject to regional flooding however external catchment flows are conveyed through the site via two existing overland flow path. Yaun Creek traverse the site from south to north along the site's eastern boundary. A overland flow path traverses the site along the northern boundary running west to east joining Yaun Creek just upstream of the Old Coach Road culvert crossing. This report includes hydraulic assessment of these two overland flow paths showing that proposed development will safely convey flows up to the 100 year ARI whilst still maintain existing conditions at the site boundary.

Stormwater Quantity

This report includes stormwater quantity calculations which demonstrate an increase in peak flow rates to the point of discharge from the proposed development if left unattenuated, due to the change in stormwater catchment parameters. A detention basin has been designed to attenuate developed peak flow rates to no greater than existing peak flow rates up to the design 1% AEP. A detention basin of volume 625m^3 with a carefully designed outlet system is proposed to be located in the south-eastern corner of the site, external to the conveyance channel, to attenuate developed flows to existing peak discharge conditions.

Stormwater Quality

The stormwater quality assessment demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of CoGC during the operational phase of the proposed development. The proposed treatment system involves the use of a bio retention basin with 150m^2 of filter media area. All the stormwater quality controls detailed in this document are contained within the development site and will remain a private asset. Regular maintenance of the treatment devices must be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Waterway Stability

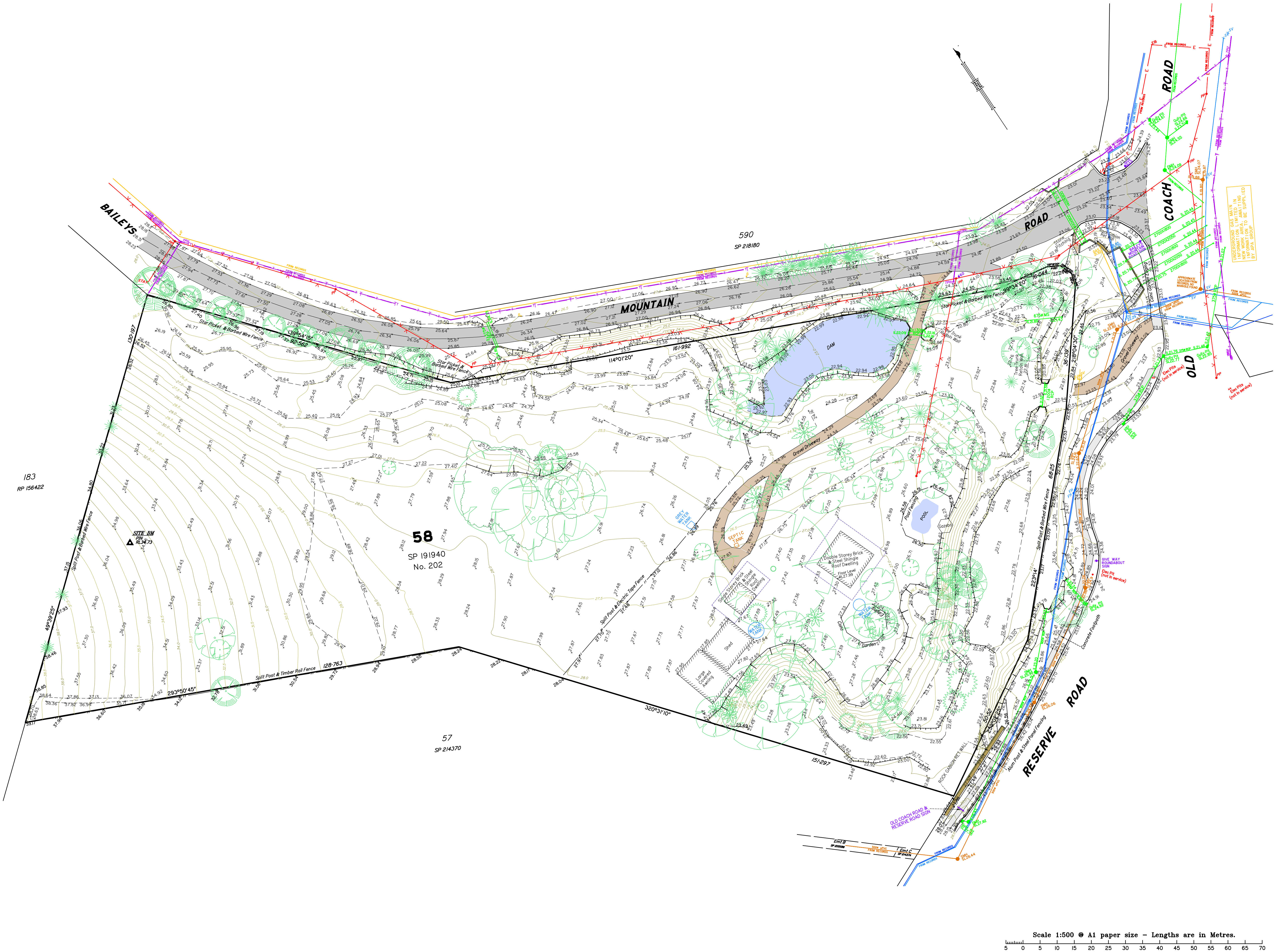
This has been achieved by complying with Stormwater Quantity objectives for the 63% AEP flow.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works in accordance with requirements associated with Type 2 sediment discharge zones, comprising of a vehicle shakedown, sediment fences, sediment basin. It has been recommended during the reshaping of the existing overland flow paths that instream erosion and sediment control measures be adopted.

APPENDIX A

SITE SURVEY



Scale 1:500 @ A1 paper size – Lengths are in Metres.

⚠ General Notes

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AMENDMENTS

DESCRIPTION	DATE

SCHLENCKER SURVEYING (QLD)
Gold Coast ♦ Brisbane
Con□ultant□in Surve□in□, Ma□□in□& Develo□ment
A.B.N□36 909 833 411
PO Box 41,
Helen□vale QLD 4212□
Suite 206,
Helen□vale Pro□e□□ional Centre
3 Sir Jo□n Overall Dr□,
Helen□vale QLD 4212□
P□□(07) 5573 6744
Fax□(07) 5573 6755
Mob□0413 945 959
EMAIL□mail□ □□□net.au

DETAIL & LEVEL SURVEY

Lot 58 on SP191940

GOLD COAST CITY COUNCIL

202 BAILEYS MOUNTAIN ROAD,
UPPER COOMERA□

Level Datum □AHD Derived
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TREE DETAILS

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Scale 1:500 @ A1 paper size – Lengths are in Metres.

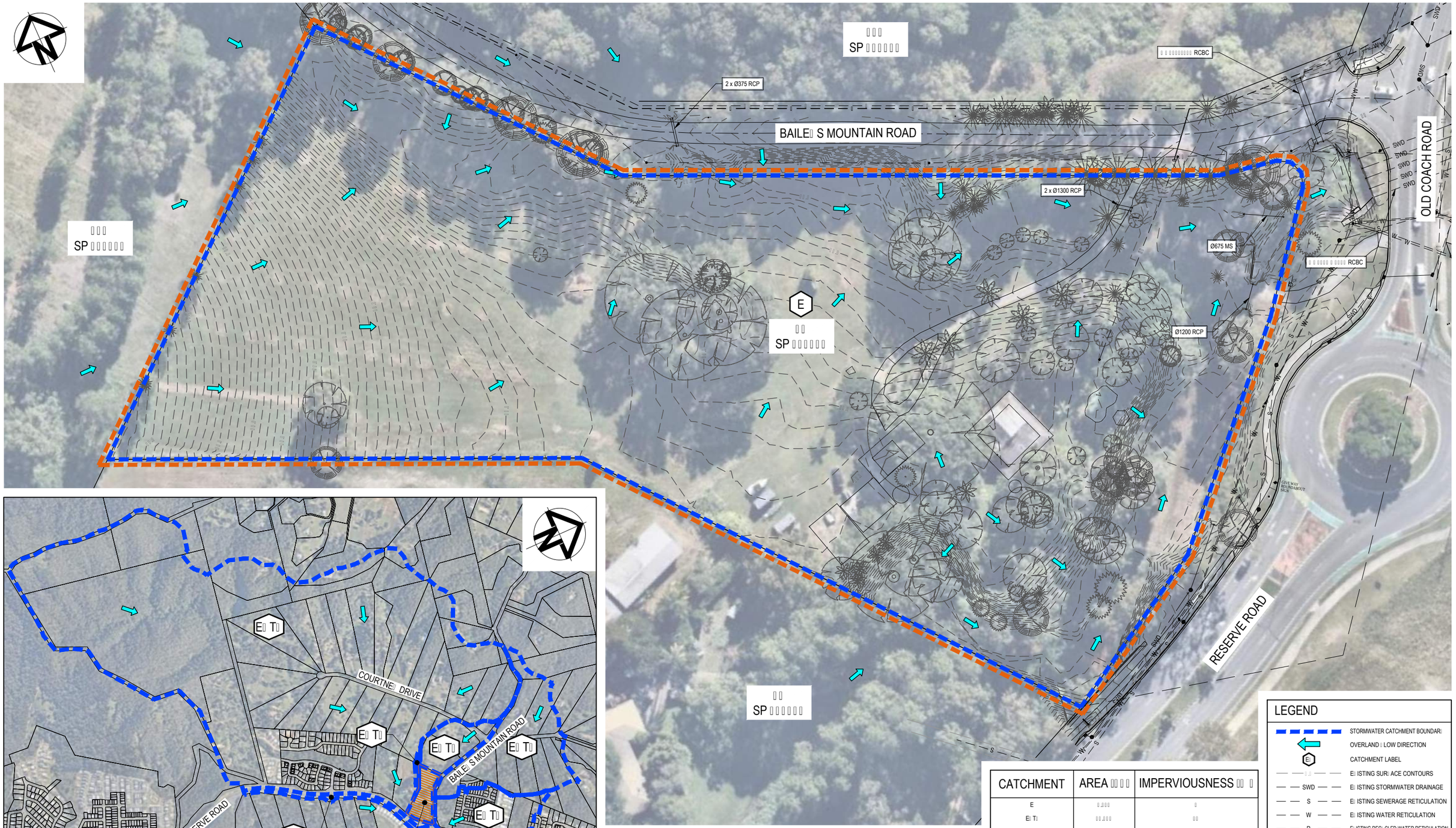
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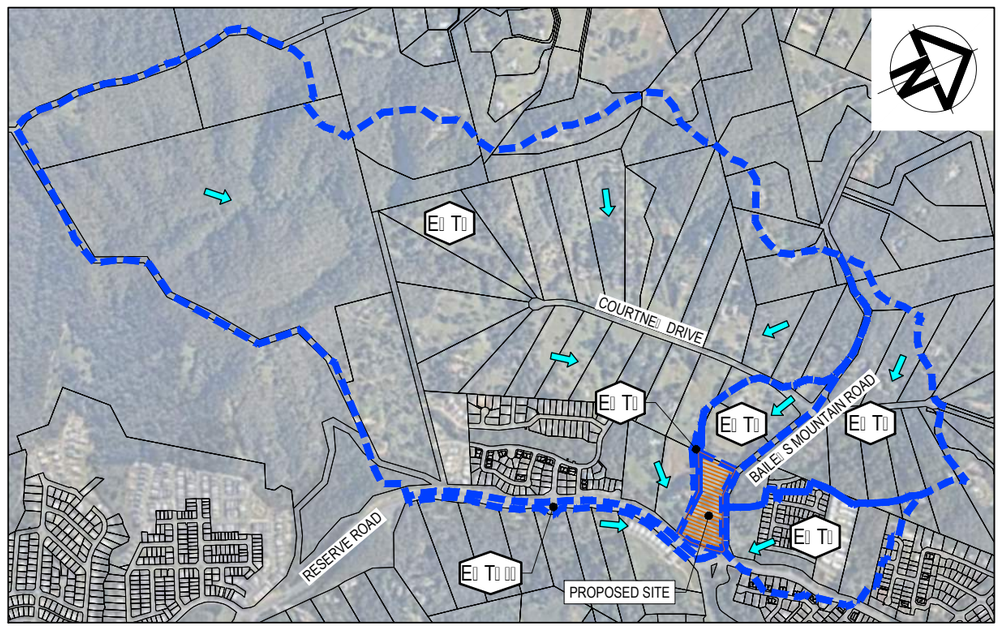
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APPENDIX B

ENGINEERING DRAWINGS





E TERNAL CATCHMENT

SCALE

NOTES

. AERIAL IMAGER COURTES O NEARMAP.

CATCHMENT	AREA	IMPERVIOUSNESS
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LEGEND

- STORMWATER CATCHMENT BOUNDAR
- OVERLAND LOW DIRECTION
- E CATCHMENT LABEL
- E ISTING SUR ACE CONTOURS
- SWD E ISTING STORMWATER DRAINAGE
- S E ISTING SEWERAGE RETICULATION
- W E ISTING WATER RETICULATION
- R E ISTING REC CLED WATER RETICULATION
- E ISTING OVERHEAD ELECTRICAL
- E ISTING UNDER GROUND ELECTRICAL
- E ISTING GAS RETICULATION
- SITE BOUNDAR

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S

SCHLENCKER SURV ING

BDA ARCHITECTURE

SANDSON PT LTD

PRELIMINAR
NOT TO BE USED OR CONSTRUCTION

R.P.E. N

A

AHD

Dr N. AHE
D A. SHEPHERD
Pr J. STOCKWELL
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BAILE S MOUNTAIN ROAD
UPPER COOMERA

PRE DEVELOPED STORMWATER CATCHMENT PLAN

ARCADIS

Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289

Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N. Pr N. I

DA — —

LEGEND

- STORMWATER CATCHMENT BOUNDAR
- OVERLAND LOW DIRECTION
- D CATCHMENT LABEL
- INTERNAL LOW DIVERSION CHANNEL
- E TERNAL LOW DIVERSION CHANNEL
- BIORETENTION / DETENTION BASIN
- BIORETENTION ILTRATION AREA
- PROPOSED SUR ACE CONTOURS
- E ISTING SUR ACE CONTOURS
- PROPOSED RETAINING WALL
- SWD — E ISTING STORMWATER DRAINAGE
- S — E ISTING SEWERAGE RETICULATION
- W — E ISTING WATER RETICULATION
- R — E ISTING REC CLED WATER RETICULATION
- E ISTING OVERHEAD ELECTRICAL
- E ISTING UNDER GROUND ELECTRICAL
- E ISTING GAS RETICULATION
- STAGE BOUNDAR

NOTES

1. AERIAL IMAGER COURTES O NEARMAP.
2. PROPOSED IN RASTRUCTURE SUBJECT TO DETAILED DESIGN OPERATIONAL WORKS COUNCIL APPROVAL AND BUILDING H DRAULIC DESIGN.
3. RE ER TO DA OR BIORETENTION / DETENTION BASIN DETAILS.

CATCHMENT	AREA	IMPERVIOUSNESS
D	.	
D	.	

POST DEVELOPED STORMWATER UALIT TABLE

CATCHMENT AREA TO BASIN	.
MINIMUM FILTER MEDIA AREA (m²)	
BATTER SLOPE	
E TENDED DETNENTION DEPTH	.
MINIMUM ILTER MEDIA DEPTH	.
DRAINAGE LA ER DEPTHS	.
SATURATED H DRAULIC CONDUCTIVIT	
ILTER MEDIA TOTAL NITROGEN	/A
ILTER MEDIA ORTHOPHOSPHATE	/A

SP

CULVERT CROSSING

2 x Ø375 RCP

BAILE S MOUNTAIN ROAD

2 x Ø1300 RCP

RCBC

OLD COACH ROAD

Ø675 MS

RCBC

DRIVEWA TO BE READJUSTED

Ø1200 RCP

BASIN ACCESS

DIVERSION CHANNELS. RE ER TO STORMWATER MANAGEMENT REPORT OR DETAILS.

SP

SP

RESERVE ROAD

	ORIGINAL ISSUE	N	AS		
I	D	B	C d	RPE	D

S

SCHLENCKER SURV ING

BDA ARCHITECTURE

C

SANDSON PT LTD

S

PRELIMINAR

NOT TO BE USED OR CONSTRUCTION

A r d

R.P.E N

S

Or S

A

H D

AHD

Grid

Dr N. AHE

D A. SHEPHERD

Pr M J. STOCKWELL

© C r r d

Pr

BAILE S MOUNTAIN ROAD UPPER COOMERA

T

POST DEVELOPED STORMWATER CATCHMENT PLAN

ARCADIS

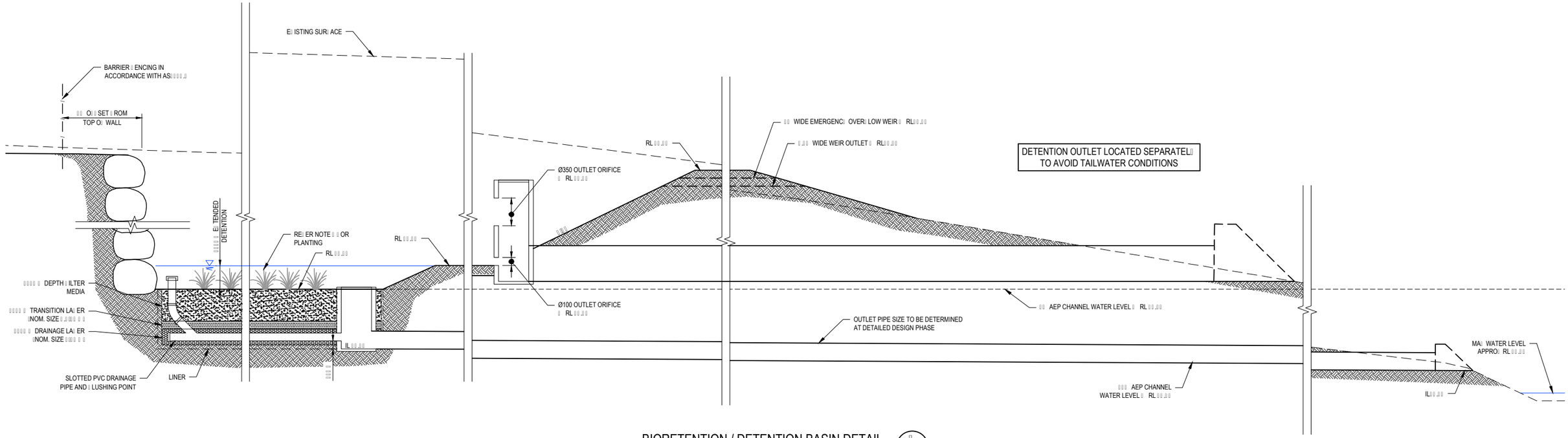
Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
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arcadi com

Dr N. Pr N. I

DA — —

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BIORETENTION / DETENTION BASIN DETAIL

DA

	ORIGINAL ISSUE	NJ	AS		
		BJ	CJd	RPE	DJ

SCHLENCKER SURVEYING

BDA ARCHITECTURE

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A
AHD

R.P.E. N

DRAWN N. AHE
DESIGNED A. SHEPHERD
PROJECT MANAGER J. STOCKWELL

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PROJECT
BAILEYS MOUNTAIN ROAD
UPPER COOMERA

TITLE
BIORETENTION / DETENTION BASIN DETAILS

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DRAWING NO. — — REVISION

E:\CAD\C\C\C\C\d\B\D\d.dwg PM

LEGEND

- SILT FENCE
- CHECK — SAND BAG CHECK DAM
- CONSTRUCTION ENTRY/EXIT PAD
- SP — SEDIMENT POND
- DIVERSION CHANNEL
- PROPOSED SURFACE CONTOURS
- EXISTING SURFACE CONTOURS
- PROPOSED RETAINING WALL
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWERAGE RETICULATION
- W — EXISTING WATER RETICULATION
- R — EXISTING RECYCLED WATER RETICULATION
- EXISTING OVERHEAD ELECTRICAL
- EXISTING UNDER GROUND ELECTRICAL
- EXISTING GAS RETICULATION
- SITE BOUNDARY

NOTES

1. AERIAL IMAGERY COURTESY OF NEARMAP.
2. PROPOSED INFRASTRUCTURE SUBJECT TO DETAILED DESIGN (OPERATIONAL WORKS) COUNCIL APPROVAL AND BUILDING HYDRAULIC DESIGN.
3. REFER TO DA [illegible] DA [illegible] FOR EROSION & SEDIMENT CONTROL DETAILS.
4. SEDIMENT POND SIZING TO BE DETERMINED AT DETAILED DESIGN PHASE.

SP [illegible]

SP [illegible]

SP [illegible]

WORKS IN OVERLAND FLOW TO BE STABILISED IMMEDIATELY FOLLOWING COMPLETION

BAILEYS MOUNTAIN ROAD

OLD COACH ROAD

RESERVE ROAD

CLEAN WATER DIVERSION CHANNELS AROUND SITE

SPACING T.P.

GIVE WAY ROUNDABOUT ACCESS

[illegible]	ORIGINAL ISSUE	NJ	AS			[illegible]
Issue	Description	By	Chkd	RPEQ	Date	

Scale [illegible]

Surveyor: SCHLENCKER SURVEYING

Architect: BDA ARCHITECTURE

[illegible] Drawings should be read in conjunction with all relevant Engineering Plans and Specifications

Client: SANDSON PTY LTD

Status: PRELIMINARY
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Approved — RPEQ No.

Original Size: A1

Horizontal Datum: AHD

Drawn: N. AHEE

Designed: A. SHEPHERD

Project Manager: J. STOCKWELL

Checked

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Project: [illegible] BAILEYS MOUNTAIN ROAD UPPER COOMERA

Title: CONCEPT EROSION & SEDIMENT CONTROL PLAN

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Drawing No. DA [illegible] — [illegible] — [illegible]

Project No. [illegible]

Issue [illegible]

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SITE ACCESS

. PRIOR TO THE COMMENCEMENT O SITE WORKS THE LOCATION O THE SITE ACCESS POINTS MUST BE VERI IED WITH THE RELEVANT REGULATOR AUTHORIT .

. SITE ACCESS MUST BE RESTRICTED TO THE MINIMUM PRACTICAL NUMBER O LOCATIONS.

. SITE E IT POINTS MUST BE APPROPRIATE MANAGED TO MINIMISE THE RISK O SEDIMENT BEING TRACKED ONTO SEALED PUBLIC ROADWA S.

. INSTALL SEDIMENT ENCING /OR BARRIER ENCING TO CON INE INGRESS TO EGRESS ROM THE SITE TO STABILISED ACCESS POINTS ONL .

. STORMWATER RUNO ROM ACCESS ROADS STABILISED ENTR /E IT POINTS MUST DRAIN TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.

CONSTRUCTION E IT ROCK PAD

MATERIALS

. ROCK WELL GRADED HARD ANGULAR EROSION RESISTANT ROCK NOMINAL DIAMETER O TO SMALL DISTURBANCES OR TO LARGE DISTURBANCES. ALL REASONABLE MEASURES MUST BE TAKEN TO OBTAIN ROCK O NEAR UNI ORM SIZE.

. OOTPATH STABILISING AGGREGATE TO GRAVEL OR AGGREGATE.

. GEOTE TILE ABRIC HEAV DUT NEEDLE PUNCHED NON WOVEN ILTER CLOTH BIDIM A OR E UIVALENT.

INSTALLATION

. CLEAR THE LOCATION O THE ROCK PAD REMOVING STUMPS ROOTS OTHER VEGETATION TO PROVIDE A IRM OUNDATION SO THAT THE ROCK IS NOT PRESSED INTO SO T GROUND. CLEAR SU ICIENT WIDTH TO ALLOW PASSAGE O LARGE VEHICLES BUT CLEAR ONL THAT NECESSAR OR THE E IT. DO NOT CLEAR ADJACENT AREAS UNTIL THE RE UIRED EROSION SEDIMENT CONTROL DEVICES ARE IN PLACE.

. I THE E POSED SOIL IS SO T PLASTIC OR CLA E PLACE A SUB BASE O CRUSHED ROCK OR A LA ER O HEAV DUT ILTER CLOTH TO PROVIDE A IRM OUNDATION.

. PLACE THE ROCK PAD ORMING A MINIMUM THICK LA ER O CLEAN OPEN VOID ROCK.

. I THE ASSOCIATED CONSTRUCTION SITE IS UP SLOPE O THE ROCKPAD THUS CAUSING STORMWATER RUNO TO LOW TOWARD THE ROCK PAD THEN ORM A MINIMUM HIGH LOW CONTROL BERM ACROSS THE ROCK PAD TO DIVERT SUCH RUNO TO A SUITABLE SEDIMENT TRAP.

. THE LENGTH O THE ROCK PAD SHOULD BE AT LEAST WHERE PRACTICABLE AS WIDE AS THE ULL WIDTH O THE ENTR OR E IT AT LEAST . THE ROCK PAD SHOULD COMMENCE AT THE EDGE O THE O SITE SEALED ROAD OR PAVEMENT.

. LARE THE END THE ROCK PAD WHERE IT MEETS THE PAVEMENT SO THAT THE WHEELS O TURNING VEHICLES DO NOT TRAVEL OVER UNPROTECTED SOIL.

. I THE OOTPATH IS OPEN TO PEDESTRIAN MOVEMENT THEN COVER THE COARSE ROCK WITH INE AGGREGATE OR GRAVEL OR OTHERWISE TAKE WHATEVER MEASURES ARE NEEDED TO MAKE THE AREA SA E.

SOIL STOCKPILE MANAGEMENT

. TOPSOIL SHALL BE STRIPPED STOCKPILED OR LATER USE ONSITE.

. ALL REASONABLE PRACTICABLE MEASURES MUST BE TAKEN TO OBTAIN THE MA IMUM BENE IT ROM E ISTING TOPSOIL INCLUDING

  (i) WHERE THE PROPOSED AREA OF SOIL DISTURBANCE DOES NOT EXCEED 2500m², & THE TOPSOIL DOES NOT CONTAIN UNDESIRABLE WEED SEED THE TOP O SOIL LOCATED WITHIN AREAS O PROPOSED SOIL DISTURBANCE INCLUDING STOCKPILE AREAS MUST BE STRIPPED STOCKPILED SEPARATEL ROM THE REMAINING SOIL.

  (ii) WHERE THE PROPOSED AREA OF SOIL DISTURBANCE EXCEEDS 2500m², & THE TOPSOIL DOES NOT CONTAIN UNDESIRABLE WEED SEED THE TOP O SOIL MUST BE STRIPPED STOCKPILED SEPARATEL ROM THE REMAINING TOPSOIL SPREAD AS A INAL SUR ACE SOIL.

  (iii) IN AREAS WHERE THE TOPSOIL CONTAINS UNDESIRABLE WEED SEED THE A ECTED SOIL MUST BE SUITABL BURIED OR REMOVED ROM THE SITE.

. STOCKPILES O ERODIBLE MATERIAL THAT HAS THE POTENTIAL TO CAUSE ENVIRONMENTAL HARM I DISPLACED MUST BE

  (i) APPROPRIATEL PROTECTED ROM WIND RAIN CONCENTRATED SUR ACE LOW E CESSIVE UP SLOPE STORMWATER SUR ACE LOWS.

  (ii) LOCATED AT LEAST M PRE ERABL MI ROM AN HAZARDOUS AREA RETAINED VEGETATION ROADS CONCENTRATED WATER LOW.

  (iii) LOCATED UP SLOPE O AN APPROPRIATE SEDIMENT CONTROL S STEM.

  (iv) PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER S NTHETIC MULCH OR VEGETATIVE I THE MATERIALS ARE LIKEL TO BE STOCKPILED OR MORE THAN DA S.

  (v) PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER S NTHETIC MULCH OR VEGETATIVE I THE MATERIALS ARE LIKEL TO BE STOCKPILED OR MORE THAN DA S DURING THOSE MONTHS THAT HAVE A HIGH EROSION RISK.

  (vi) PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER S NTHETIC MULCH OR VEGETATIVE I THE MATERIALS ARE LIKEL TO BE STOCKPILED OR MORE THAN DA S DURING THOSE MONTHS THAT HAVE AN E TREME EROSION RISK.

. A SUITABLE LOW DIVERSION S STEM MUST BE ESTABLISHED IMMEDIATEL UP SLOPE O A STOCKPILE O ERODIBLE MATERIAL THAT HAS THE POTENTIAL TO CAUSE ENVIRONMENTAL HARM I DISPLACED I THE UP SLOPE CATCHMENT AREA DRAINING TO THE STOCKPILE EXCEEDS 1500m².

ILTER SOCKS CONCENTRATED LOW

MATERIALS

. SOCKS: MINIMUM Ø200mm SYNTHETIC OR BIODEGRADABLE TUBES MANUFACTURED FROM NON-WOVEN OR COMPOSITE ABRIC SUITABLE OR THE "ILTRATION" O COURSE SEDIMENT.

. ILL MATERIALS: STRAW CANE MULCH COMPOSTED MATERIAL AS COARSE SAND OR CLEAN AGGREGATE

INSTALLATION

. ENSURE THE SOCKS ARE PLACED INDIVIDUALL OR COLLECTIVEL AS A SINGLE SEDIMENT TRAP SUCH THAT

  (i) LEAKAGE AROUND OR UNDER THE SOCKS IS MINIMISED

  (ii) ADJOINING SOCKS ARE TIGHTL BUTTED OR OVERLAPPED AT LEAST .

  (iii) THE SUR ACE AREA O POTENTIAL WATER PONDING UP SLOPE O EACH SEDIMENT TRAP IS MA IMISED.

  (iv) TO THE MA IMUM DEGREE PRACTICAL ALL SEDIMENT LADEN WATER WILL PASS THROUGH THE ORMED POND BE ORE LOWING OVER THE DOWN SLOPE END O THE SEDIMENT TRAP.

DRAINAGE CONTROL

. WHEREVER REASONABLE PRACTICABLE STORMWATER RUNO ENTERING THE SITE ROM E TERNAL AREAS NON SEDIMENT LADEN /CLEAN STORMWATER RUNO ENTERING A WORK AREA OR AREA O SOIL DISTURBANCE MUST BE DIVERTED AROUND OR THROUGH THAT AREA IN A MANNER THAT MINIMISES SOIL EROSION THE CONTAMINATION O THAT WATER OR ALL DISCHARGES UP TO THE SPECI IED DESIGN STORM DISCHARGE.

. DURING THE CONSTRUCTION PERIOD ALL REASONABLE PRACTICABLE MEASURES MUST BE IMPLEMENTED TO CONTROL LOW VELOCITIES IN SUCH A MANNER THAT PREVENTS SOIL EROSION ALONG DRAINAGE PATHS AT THE ENTRANCE E IT O ALL DRAINS DRAINAGE PIPES DURING ALL STORMS UP TO THE RELEVANT DESIGN STORM DISCHARGE.

. TO THE MA IMUM DEGREE REASONABLE PRACTICABLE ALL WATERS DISCHARGED DURING THE CONSTRUCTION PHASE MUST DISCHARGE ONTO STABLE LAND IN A NON EROSIVE MANNER AT A LEGAL POINT O DISCHARGE.

. DURING THE CONSTRUCTION PERIOD ROO WATER MUST BE MANAGED IN A MANNER THAT MINIMISES SOIL EROSION THROUGHOUT THE SITE SITE WETNESS WITHIN ACTIVE WORK AREAS.

EROSION CONTROL

. THE APPLICATION O LI UID BASED DUST SUPPRESSION MEASURES MUST ENSURE THAT SEDIMENT LADEN RUNO RESULTING ROM SUCH MEASURES DOES NOT CREATE A TRA IC OR ENVIRONMENTAL HAZARD.

. ALL TEMPORAR EARTH BANKS LOW DIVERSION S STEMS EMBANKMENTS ASSOCIATED WITH CONSTRUCTED SEDIMENT BASINS MUST BE MACHINE COMPACTED SEEDED MULCHED OR THE PURPOSE O ESTABLISHING A TEMPORAR VEGETATIVE COVER WITHIN DA S A TER GRADING.

. UNPROTECTED SLOPE LENGTHS MUST NOT E CEED M ON AN E UIVALENT VERTICAL ALL O M.

. THE CONSTRUCTION STABILISATION O EARTH BATTERS STEEPER THAN (H V) MUST BE STAGED SUCH THAT NO MORE THAN VERTICAL METRES O AN BATTER IS E POSED TO RAIN ALL AT AN INSTANT.

. S NTHETIC REIN ORCED EROSION CONTROL MATS BLANKETS MUST NOT BE PLACED WITHIN OR ADJACENT TO RIPARIAN ZONES WATERCOURSES I SUCH MATERIALS ARE LIKEL TO CAUSE ENVIRONMENTAL HARM TO WILDLI E OR WILDLI E HABITATS.

. A MINIMUM GROUND COVER MUST BE ACHIEVED ON ALL NON COMPLETED EARTHWORKS E POSED TO ACCELERATED SOIL EROSION I URTHER CONSTRUCTION ACTIVITIES OR SOIL DISTURBANCES ARE LIKEL TO BE SUSPENDED OR MORE THAN DA S DURING THOSE MONTHS WHEN THE E PECTED RAIN ALL IS LESS THAN MINIMUM COVER WITHIN DA S I BETWEEN MINIMUM COVER WITHIN DA S I BETWEEN MINIMUM COVER WITHIN DA S I GREATER THAN . ALTERNATIVE TO ABOVE

EROSION CONTROL MAT LINING

. EROSION CONTROL MATS MUST BE STORED AWA ROM DIRECT SUNLIGHT OR COVERED WITH ULTRAVIOLET PROTECTIVE SHEETING UNTIL THE SITE IS READ OR THEIR INSTALLATION.

. VEHICLES CONSTRUCTION E UIPMENT MUST NOT BE PERMITTED TO MANEUVER OVER THE MATTING UNLESS IT HAS BEEN COVERED WITH A LA ER O SOIL OR GRAVEL AT LEAST THICK.

. I THE CHANNEL IS TO BE GRASSED PREPARE A SMOOTH SEED BED O APPRO IMATEL O TOPSOIL SEED ERTILISE WATER RAKE TO REMOVE AN REMAINING SUR ACE IRREGULARITIES.

. E CAVATE A DEEP B WIDE ANCHOR TRENCH ALONG THE ULL WIDTH O THE UPSTREAM END O THE AREA TO BE TREATED.

. AT LEAST O THE MAT MUST BE ANCHORED INTO THE TRENCH WITH THE ROLL O MATTING RESTING ON THE GROUND UP SLOPE O THE TRENCH.

. WHEN SPREADING THE MATS AVOID STRETCHING THE ABRIC. THE MATS SHOULD REMAIN IN GOOD CONTACT WITH THE SOIL.

. THE INSTALLATION PROCEDURE MUST ENSURE THAT THE MAT ACHIEVES RETAINS GOOD CONTACT WITH THE SOIL.

. DAMAGED MATTING MUST BE REPAIRED OR REPLACED.

TUR LINED

. TUR SHOULD BE USED WITHIN HOURS O DELIVER OTHERWISE ENSURE THE TUR IS STORED IN CONDITIONS APPROPRIATE OR THE WEATHER CONDITIONS . A SHADED AREA.

. MOISTENING THE TUR A TER IT IS UNROLLED WILL HELP MAINTAIN ITS VIABILIT .

. TUR SHOULD BE LAID ON A MINIMUM BED O ADE UATEL ERTILISED TOPSOIL. RAKE THE SOIL SUR ACE TO BREAK THE CRUST JUST BE ORE LA ING THE TUR .

. DURING THE WARMER MONTHS LIGHTL IRRIGATE THE SOIL IMMEDIATEL BE ORE LA ING THE TUR .

. ENSURE THE TUR IS NOT LAID ON GRAVEL HEAVIL COMPACTED SOILS OR SOILS THAT HAVE BEEN RECENTL TREATED WITH HERBICIDES.

. ENSURE THE TUR E TENDS UP THE SIDES O THE DRAIN AT LEAST ABOVE THE ELEVATION O THE CHANNEL INVERT OR AT LEAST TO A SU ICIENT ELEVATION TO ULL CONTAIN E PECTED CHANNEL LOW.

. ON CHANNEL GRADIENTS O (H V) OR STEEPER OR IN SITUATIONS WHERE HIGH LOW VELOCITIES . VELOCIT . /S ARE LIKEL WITHIN THE IRST TWO WEEK OLLOWING PLACEMENT SECURE THE INDIVIDUAL TUR STRIPS WITH WOODEN OR PLASTIC PEGS.

. ENSURE THAT INTIMATE CONTACT IS ACHIEVED MAINTAINED BETWEEN THE TUR THE SOIL SUCH THAT SEEPAGE LOW BENEATH THE TUR IS AVOIDED.

. WATER UNTIL THE SOIL IS WET BELOW THE TUR . THEREA TER WATERING SHOULD BE SU ICIENT TO MAINTAIN PROMOTE HEALTH GROWTH.

ROCK LINED

. ALL ROCK MUST BE HARD WEATHER RESISTANT DURABLE AGAINST DISINTEGRATION UNDER CONDITIONS TO BE MET IN HANDLING PLACEMENT OPERATION.

. ALL ROCK MUST HAVE ITS GREATEST DIMENSION NOT GREATER THAN TIMES ITS LEAST DIMENSIONS.

. THE ROCK USED IN ORMATION O THE DRAIN MUST BE EVENL GRADED WITH B WEIGHT LARGER THAN THE SPECI IED NOMINAL ROCK SIZE HAVE SU ICIENT SMALL ROCK TO ILL THE VOIDS BETWEEN THE LARGER ROCK. DIRT INES SMALLER ROCK MUST NOT E CEED B WEIGHT.

. THE DIAMETER O THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN TIMES THE NOMINAL ROCK SIZE. SPECI IC GRAVIT TO BE AT LEAST .

. ILTER CLOTH GEOTE TILE ABRIC HEAV DUT NEEDLE PUNCHED NON WOVEN ILTER CLOTH MINIMUM BIDIM A OR E UIVALENT.

. PRIOR TO PLACEMENT ALL ROCKS MUST BE VISUALL CHECKED OR SIZE ELONGATION CRACKS DETERIORATION OTHER VISIBLE DE ECTS. THE DEGREE THOROUGHNESS O SUCH CHECKING MUST BE APPROPRIATE OR THE POTENTIAL CONSE UENCES ASSOCIATED WITH AILURE O THE STRUCTURE OR PURPOSE OR WHICH THE MATERIAL WILL BE USED.

. A ILTER CLOTH UNDERLA IS SPECI IED PLACE THE ILTER ABRIC DIRECTL ON THE PREPARED OUNDATION. MORE THAN ONE SHEET O ILTER CLOTH IS RE UIRED OVER THE AREA OVERLAP THE EDGE O EACH SHEET AT LEAST SECURE ANCHOR PINS AT MINIMUM M SPACING ALONG THE OVERLAP.

. ENSURE THE ILTER CLOTH IS PROTECTED ROM PUNCHING OR TEARING DURING INSTALLATION O THE ABRIC THE ROCK. REPAIR AN DAMAGE B REMOVING THE ROCK REPLACING WITH ANOTHER PIECE O ILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE E ISTING ABRIC A MINIMUM O .

. PLACEMENT O ROCK SHOULD OLLOW IMMEDIATEL A TER PLACEMENT O THE ILTER LA ER. PLACE ROCK SO THAT IT ORMS A DENSE WELL GRADED MASS O ROCK WITH A MINIMUM O VOIDS.

. PLACE ROCK LINING TO THE E TENT DEPTH INDICATED WITHIN THE APPROVED PLANS.

. ENSURE THE ROCK IS PLACED IN AN APPROPRIATE MANNER TO AVOID DISPLACING UNDERL ING MATERIALS OR PLACING UNDUE IMPACT ORCE ON THE BEDDING MATERIALS.

. ENSURE THE ROCK IS PLACED WITH A MINIMUM THICKNESS O TIMES THE NOMINAL ROCK SIZE (D) .

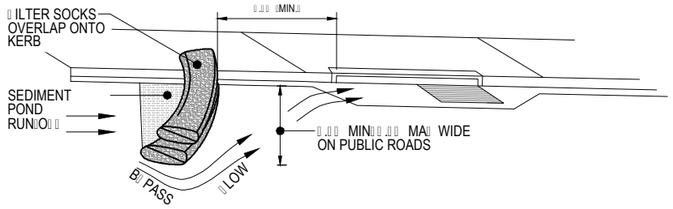
. ENSURE MATERIALS THAT ARE D LARGER ARE POSITIONED LUSH WITH THE TOP SUR ACE WITH ACES SHAPES MATCHED TO MINIMISE VOIDS.

. ENSURE PROJECTIONS ABOVE OR DEPRESSIONS UNDER THE SPECI IED TOP SUR ACE ARE LESS THAN O THE ROCK LA ER THICKNESS. THE AVERAGE SUR ACE PLANE O THE INISHED ROCK IS DE INED AS THE PLANE WHERE O THE TOPS O ROCKS WOULD CONTACT.

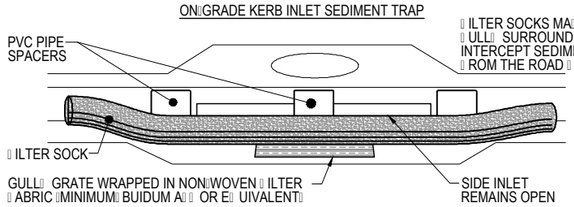
. ENSURE THE COMPLETED CHANNEL HAS SU ICIENT DEPTH AS SPECI IED OR THE TI PE O CHANNEL MEASURED ROM THE CHANNEL INVERT AVERAGE SUR ACE PLANE ALONG CHANNEL INVERT TO THE TOP O THE EMBANKMENT. THE AVERAGE SUR ACE PLANE O THE INISHED ROCK IS DE INED AS THE PLANE WHERE O THE TOPS O ROCKS WOULD CONTACT.

. TO THE MA IMUM DEGREE PRACTICABLE THE MATERIAL BETWEEN LARGER ROCK MUST NOT BE LOOSE OR EASIL DISPLACED B THE E PECTED LOW.

. A TER PLACEMENT O THE ROCK LINING ENSURE THE DRAIN HAS A CONSTANT ALL IN THE DESIRED DIRECTION REE O OBSTRUCTIONS.

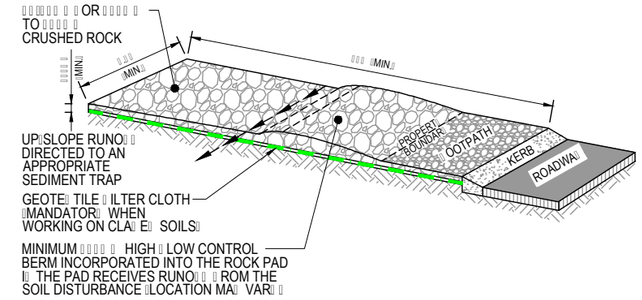


ON GRADE KERB INLET SEDIMENT TRAP

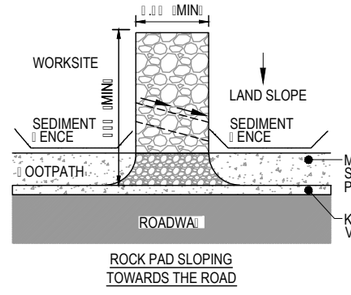


SAG INLET SEDIMENT TRAP

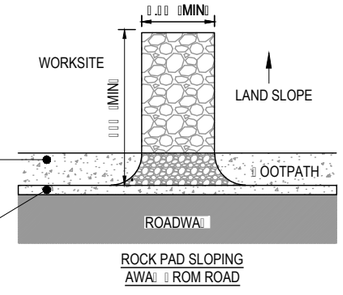
ILTER SOCKS CONCENTRATED LOWS



ROCK ENTR /E IT PAD OR CONSTRUCTION SITES



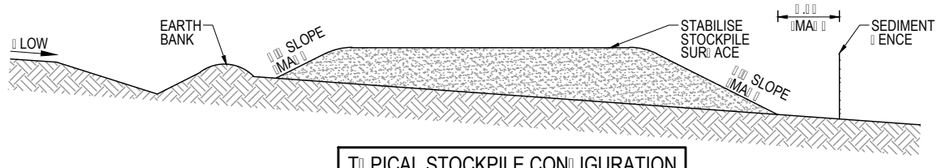
ROCK PAD SLOPING TOWARDS THE ROAD



ROCK PAD SLOPING AWA ROM ROAD

CONSTRUCTION E IT ROCK PAD

CONSTRUCTION SITES ONL



TYPICAL STOCKPILE CONFIGURATION

	ORIGINAL ISSUE	N	AS			
I	D	B	C d	RPE	D	

S
NOT TO SCALE

S r
SCHLENCKER SURV ING

Ar
BDA ARCHITECTURE

C
SANDSON PT LTD

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PRELIMINAR
NOT TO BE USED OR CONSTRUCTION

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Dr
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Or S r
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A. SHEPHERD
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AHD
Pr M r
J. STOCKWELL
Grid
C r r d

Pr
BAILE S MOUNTAIN ROAD
UPPER COOMERA

T
EROSION SEDIMENT CONTROL DETAILS SHEET

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Dr N . Pr N . I
DA — — —

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SEDIMENT CONTROL

. OPTIMUM BENE IT MUST BE MADE O EVER OPPORTUNIT TO TRAP SEDIMENT WITHIN THE WORK SITE AS CLOSE AS PRACTICABLE TO ITS SOURCE.

. SEDIMENT TRAPS MUST BE INSTALLED OPERATED TO BOTH COLLECT RETAIN SEDIMENT.

. THE POTENTIAL SA ET RISK O A PROPOSED SEDIMENT TRAP TO SITE WORKERS THE PUBLIC MUST BE GIVEN APPROPRIATE CONSIDERATION ESPECIALL THOSE DEVICES LOCATED WITHIN PUBLICL ACCESSIBLE AREAS.

. ALL REASONABLE PRACTICABLE MEASURES MUST BE TAKEN TO PREVENT OR AT LEAST MINIMISE THE RELEASE O SEDIMENT ROM THE SITE.

. SUITABLE ALL WEATHER MAINTENANCE ACCESS MUST BE PROVIDED TO ALL SEDIMENT CONTROL DEVICES.

SEDIMENT ENCE

. SEDIMENT ENCE TO BE INSTALLED ALONG A LINE O CONSTANT GROUND ELEVATION WHEREVER PRACTICAL.

. BOTH ENDS O THE SEDIMENT ENCE TO E TEND UP THE SLOPE AT LEAST .

. SUPPORT POST TO BE SPACED A MA IMUM UNLESS THE ENCE IS SUPPORTED B A TOP WIRE OR MESH BACKING IN WHICH CASE MA IMUM SPACING.

. ENCE RETURNS SHALL BE INSTALLED AT MA IMUM SPACING I ENCE IS INSTALLED ALONG THE CONTOUR OTHERWISE TO MA IMUM SPACING DEPENDING ON SLOPE.

. MINIMUM STAPLES OR TIE WIRES PER STAKE.

MATERIALS

. ABRIC POL PROP LENE POL AMIDE N LON POL ESTER OR POL ETH LENE WOVEN OR NON WOVEN ABRIC AT LEAST IN WIDTH A MINIMUM UNIT WEIGHT O GSM. ALL ABRICS TO CONTAIN ULTRAVIOLET INHIBITORS STABILISERS TO PROVIDE A MINIMUM O MONTHS O USEABLE CONSTRUCTION LI E ULTRAVIOLET STABILIT E CEEDING .

. ABRIC REIN ORCEMENTS WIRE OR STEEL MESH MINIMUM GAUGE WITH A MA IMUM MESH SPACING O .

. SUPPORT POSTS/STAKES: 1500mm² (MIN.) HARDWOOD, 2500mm² (MIN.) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE OR ATTACHING ABRIC.

INSTALLATION O A SPILL THROUGH WEIR

. LOCATE THE SPILL THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END O THE ENCE.

. ENSURE THE CREST O THE SPILL THROUGH WEIR IS AT LEAST ABOVE THE GROUND ELEVATION.

. SECURE TIE A HORIZONTAL CROSS MEMBER WEIR TO THE SUPPORT POSTS/STAKES EACH SIDE O THE WEIR. CUT THE ABRIC DOWN THE SIDE O EACH POST OLD THE ABRIC OVER THE CROSS MEMBER APPROPRIATEL SECURE THE ABRIC.

. INSTALL A SUITABLE SPLASH PAD /OR CHUTE IMMEDIATEL DOWN SLOPE O THE SPILL THROUGH WEIR TO CONTROL SOIL EROSION APPROPRIATEL DISCHARGE THE CONCENTRATED LOW PASSING OVER THE WEIR.

INSTALLATION ABRIC DROP INLET PROTECTION

. ENSURE THAT THE INSTALLATION O THE SEDIMENT TRAP WILL NOT CAUSE UNDESIRABLE SA ET OR LOODING ISSUES.

. WHERE POSSIBLE E CAVATE A TRENCH AROUND THE INLET STRUCTURE.

. SPACE STAKES EVENL AROUND THE PERIMETER O THE STORMWATER INLET AT A MA IMUM SPACING SECUREL DRIVE THEM INTO THE GROUND.

. WHERE NECESSAR INSTALL A HORIZONTAL SPILL THROUGH WEIR TO LIMIT THE MA IMUM HEIGHT WATER PONDING AROUND THE STRUCTURE.

. ENSURE THE MA IMUM POND HEIGHT WILL NOT CAUSE A SA ET HAZARD INCLUDING UNDESIRABLE LOODING O AN ADJACENT PROPERT OR ROADWA . WHEREVER PRACTICAL THE SPILL THROUGH WEIR SHOULD BE AT LEAST ABOVE GROUND LEVEL.

. I A SPILL THROUGH WEIR IS NOT INSTALLED THEN RAME THE TOP O THE STAKES WITH HORIZONTAL CROSS MEMBERS.

. CUT ABRIC ROM A CONTINUOUS ROLL TO ELIMINATE JOINTS.

. PLACE THE BOTTOM O ABRIC IN THE E CAVATED TRENCH

. SECUREL ASTEN THE ABRIC TO THE STAKES CROSS MEMBERS AT THE ABRIC JOINT OVERLAP THE ABRIC TO THE NE T STAKE.

. BACK ILL THE TRENCH WITH AT LEAST O AGGREGATE OR COMPACTED SOIL. I A TRENCH CANNOT BE E CAVATED LA THE BOTTOM O ABRIC EVENL ON THE GROUND SUR ACE COVER WITH A LA ER O AGGREGATE NOT EARTH OR SOIL.

. WHERE RE UIRED INSTALL A LOW CONTROL BUND TO MAINTAIN THE SPECI IED POOL DEPTH CONTROL THE MOVEMENT O WATER.

. TAKE ALL NECESSAR MEASURES TO MINIMISE THE SA ET RISK CAUSED B THE STRUCTURE TO PREVENT UNSA E ENTR INTO THE STORMWATER INLET.

SEDIMENT BASIN

. REMOVE ALL VEGETATION TOPSOIL ROM UNDER THE DAM WALL ROM WITHIN THE STORAGE AREA.

. PREPARE THE SITE UNDER THE EMBANKMENT B RIPPING AT LEAST TO HELP BOND COMPACTED ILL TO THE E ISTING SUBSTRATE.

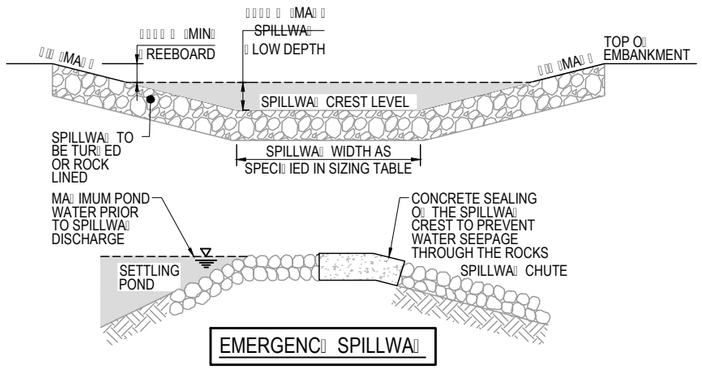
. OR EARTH EMBANKMENT MATERIAL T PE COMPACTION RE ER TO DTMR SPECI ICATION MRTS SECTION FOR WATER RETAINING EMBANKMENTS.

. CONSTRUCT EMERGENC SPILLWA .

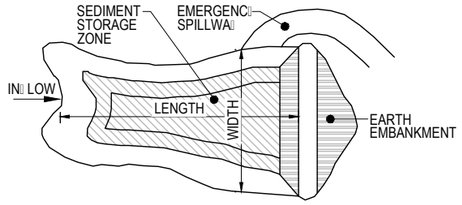
. INSTALL MARKER POST SHOWING MA IMUM STORAGE SETTLING ZONE VOLUMES.

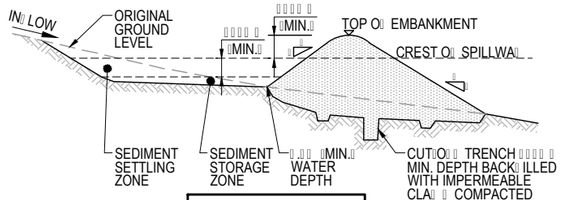
. AS CONSTRUCTED PLANS MUST BE PREPARED OR ALL CONSTRUCTED SEDIMENT BASINS ASSOCIATED EMERGENC SPILLWA S. SUCH PLANS MUST APPROPRIATEL VERI THE BASINS DIMENSIONS LEVELS VOLUMES MUST BE SUBMITTED TO THE RELEVANT REGULATOR AUTHORIT WITHIN CALENDAR DA S O THE CONSTRUCTION O EACH BASIN.

. BASINS SHOULD BE APPROPRIATEL ENCED MARKED B WARNING SIGNS I UNSUPERVISED PUBLIC ACCESS IS LIKEL PUBLIC SA ET IS AT RISK.

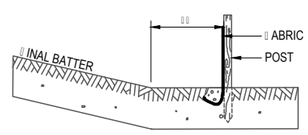


EMERGENC SPILLWA

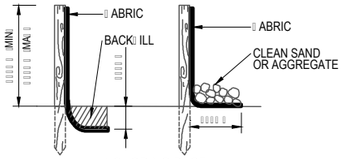




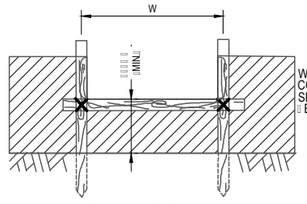
SEDIMENT BASIN

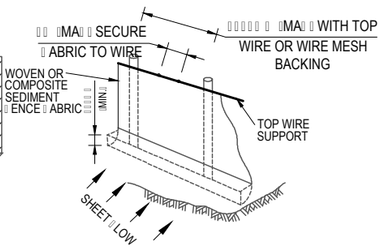


LOCATION O ENCE RELATIVE TO BASE O SLOPE

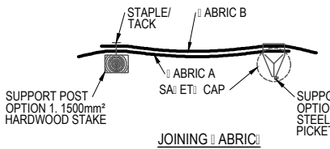


ANCHORING BASE O ABRIC

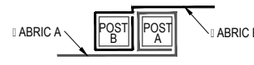




INSTALLATION WITH TOP WIRE SUPPORT

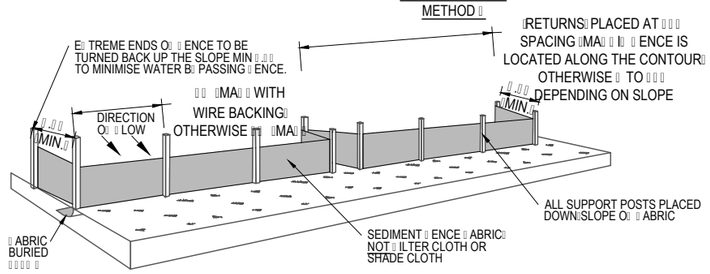


JOINING ABRIC METHOD



ABRIC TO OLD AROUND EACH STAKE ONE ULL TURN. STAKE B TO BE DRIVEN TIGHTL AGAINST STAKE A. THE TOPS O BOTH STAKES TO BE SECURED WITH WIRE.

JOINING ABRIC METHOD



INSTALLATION O SEDIMENT ENCE

SEDIMENT ENCE

	ORIGINAL ISSUE	N	AS			
I	D n	B	C d	RPE	D	

S
NOT TO SCALE

S r r
SCHLENCKER SURV ING

Ar
BDA ARCHITECTURE

C
SANDSON PT LTD

S
PRELIMINAR
NOT TO BE USED OR CONSTRUCTION

A r d
R.P.E. N

S	N.T.S.	Or I S r n	
Or S	A	Dr N. AHE	
H D	AHD	D d A. SHEPHERD	
Grid		Pr M r J. STOCKWELL	

C n r r d

Pr
BAILE S MOUNTAIN ROAD
UPPER COOMERA

T
EROSION SEDIMENT CONTROL DETAILS SHEET

ARCADIS
Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289
Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N. Pr N. I
DA

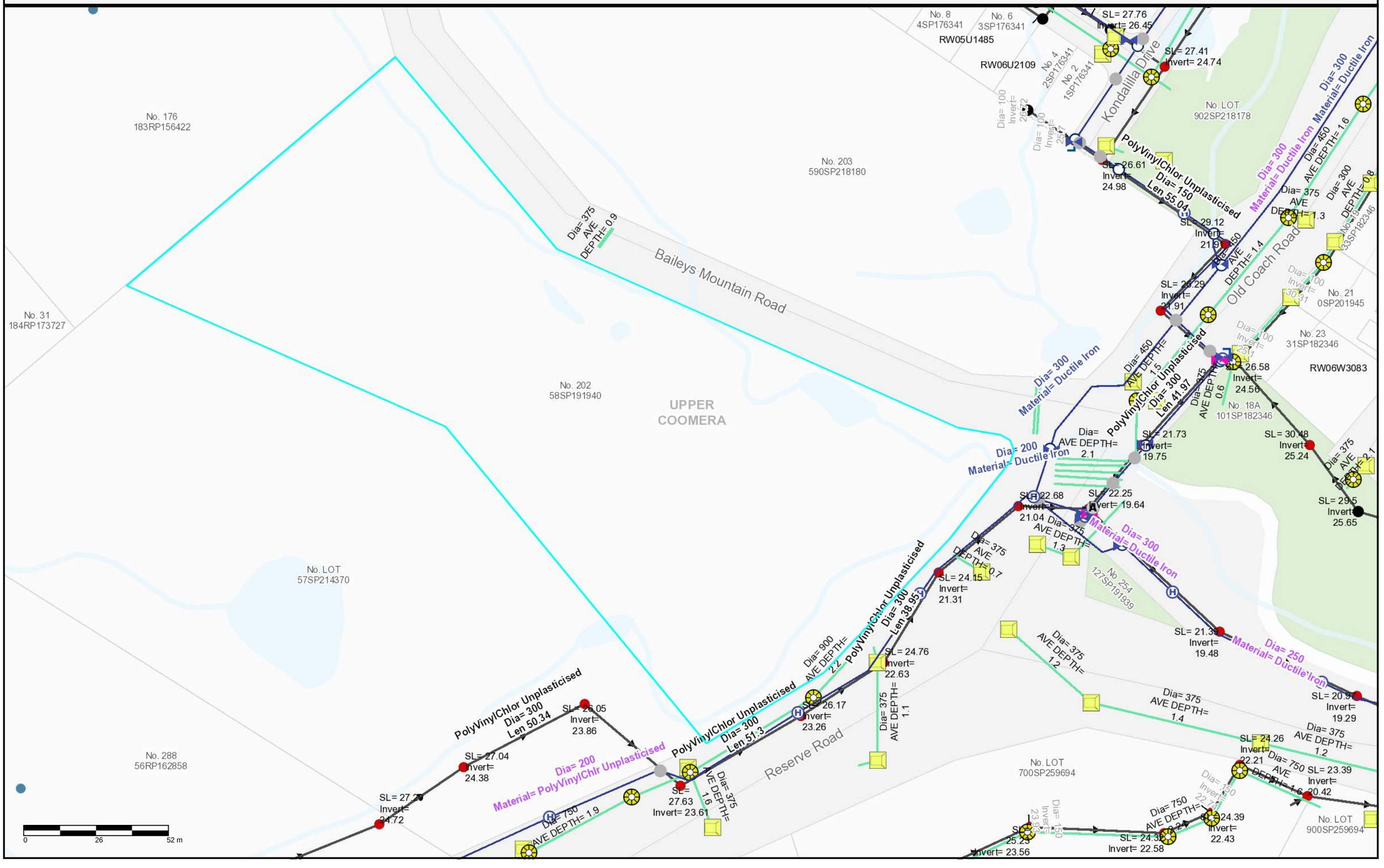
E:\CAD\C\C\C\C\ d\E D .d

/J /V PM V

APPENDIX C

CoGC SIS MAP

L58 SP191940 REF 202 Baileys Mountain Rd



CITY OF GOLDCOAST.

Disclaimer: Gold Coast City Council, Queensland 2014 or The State of Queensland 2014. No Warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Legend

Water Valve
- Other
- Altitude Valve
- Air Release
- Pressure Relief Valve
- Service Valve
- Stop Valve
- Major Supply
- Bypass
- Actuated Valve
- Dialysis
- Non-return/Reflux Valve
- Pressure Reducing
- Scour
- DMA Boundary
- Reservoir Zone

Water Hydrant

Water Fitting
- Other
- Cross Link
- End
- Gibault
- Sampling Point
- T - Joint.
- Taper
- Swabbing Chamber

Water Maintenance Hole

Water Pipe Potable

Raw Water Fitting
- Not Categorized
- Raw Endcap Fitting
- Raw Junction Fitting
- Raw Reducer Fitting

Raw Water Valve

Raw Water Main

Drainage Pit
- Other
- Inlet Gully
- Manhole
- Pit
- Roof water Inspection Chamber
- Roof water Outlet to Swale

Drainage Pipe

Sewer Meter

Sewer Fitting
- Other
- End Cap
- Junction
- Taper

Sewer Maintenance Hole
- Other
- Manhole - Public
- Lamphole
- Vacuum Chamber

Sewer Connection

Sewer Connection Length

Sewer Pipe Non Pressure (Gravity)

Sewer Pipe Non Pressure Flow Direction

Sewer Pipe Pressure
- Not Categorised
- Rising or Pressure Main
- Vacuum Main

Sewer Pipe Pressure Flow Direction

On Site Treatment Facility

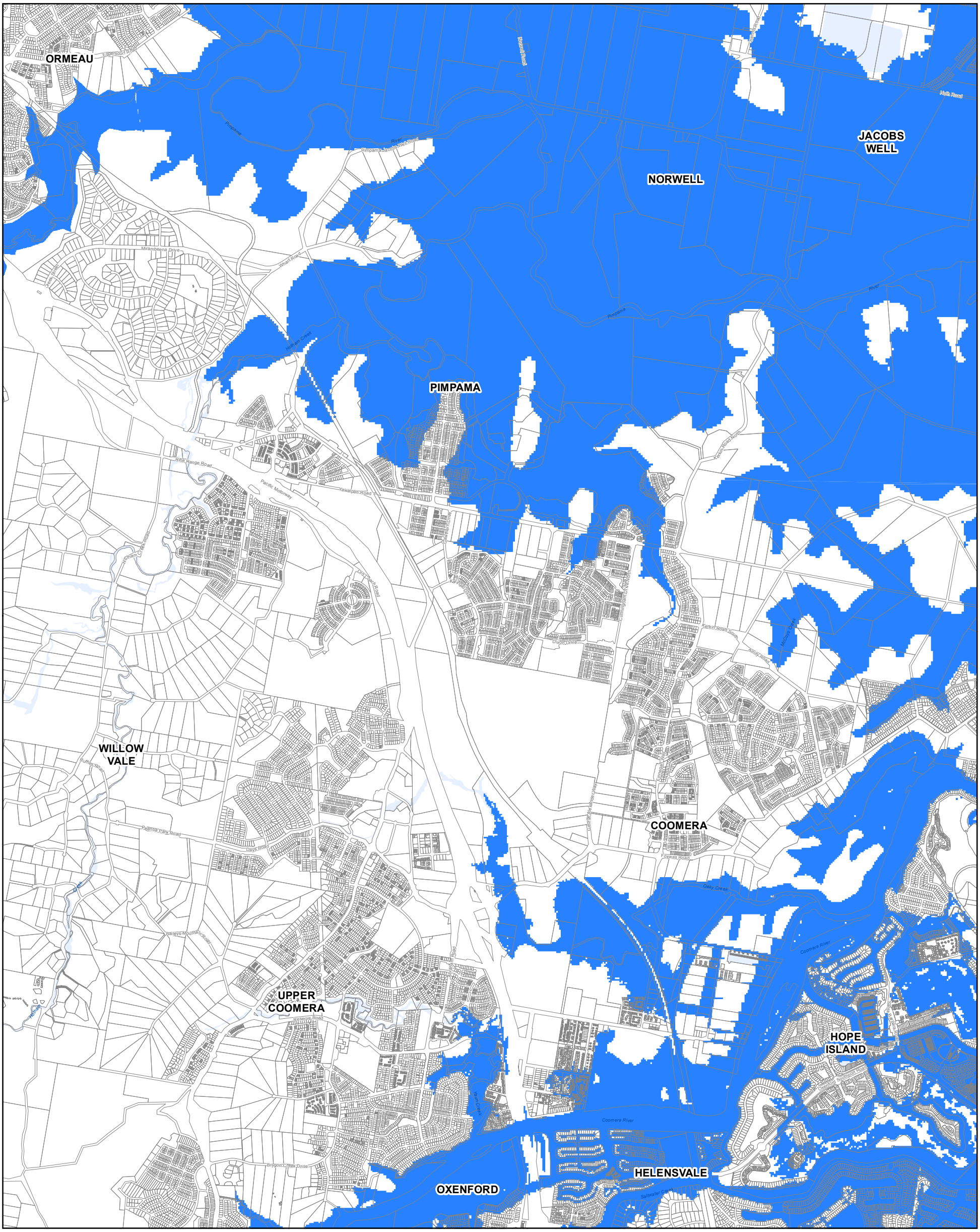
Private Main

Private Pump Station

APPENDIX D

2015 CITY PLAN OVERLAP MAPS

Flood overlay map - map 5

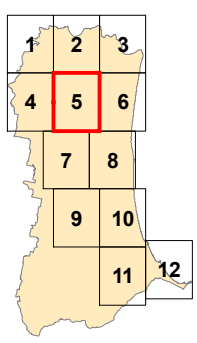


Flood assessment required

Property boundaries

Local government area boundary

Waterway or waterbody



Note:

This flood map does not in itself indicate whether any property has or has not been affected by floods. That conclusion requires separate interpretation or measurement.

Areas of potential flood inundation shown on this map have been compiled from various sources and hydraulic reports available at the date of issue. Whilst some of the inundation areas are based on computer hydraulic modelling of standard floods used for planning purposes, the information used to calibrate such models is usually based on reported flood marks which are often widely spaced and may not have been recorded at a particular flood's peak level.

City Plan

Disclaimer:
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© State of Queensland 2018. No warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Map version - 4
30 May 2018
Data source:
Flood - CoGC
Waterways - CoGC
Cadastre (Oct 2017) - State

Projection:
MGA94
Zone 56

0 250 500 1,000 m

Approx Scale @ A3 1:37,000

CITY OF GOLDCOAST.

OMF1-5

APPENDIX E

RATIONAL METHOD CALCULATIONS

EXISTING CATCHMENT 1

DESIGNED BY:	AS
DATE:	27/06/2018
JOB:	202 Baileys Mountain Road
JOB No:	10022603

This spreadsheet provides a summary of the Rational Method Calculations.

TIME OF CONCENTRATION

The time of concentration was determined by as per QUDM Section 4.6

CATCHMENT:	**E**	
CATCHMENT AREA:	**3.078**	**ha**

TOTAL TIME OF CONCENTRATION: 12.67 mins

COEFFICIENT OF RUNOFF

In accordance with QUDM section 4.6 and CoGC Land Development Guidelines SC6.11

Case	Slope (%)	Runoff Coefficient C_{10}	Development Category
1	> 5%	0.7	Rural Residential

Table of Frequency Factors F_y							
A.E.P. (%)	63	39	18	10	5	2	1
Frequency Factor F_y	0.8	0.85	0.95	1	1.05	1.15	1.2

DESIGN RAINFALL

Design rainfall was derived using the GCCC LDGL rainfall isopleth charts

Map 1	$^{2}I_{1}$	=	48.86
Map 2	$^{2}I_{12}$	=	10.25
Map 3	$^{2}I_{72}$	=	3.06
Map 4	$^{50}I_{1}$	=	84.38
Map 5	$^{50}I_{12}$	=	20.86
Map 6	$^{50}I_{72}$	=	6.84

Map 8 Geographical Factor F_2:	=	4.52
Map 9 Geographical Factor F_{50}:	=	16.96
Easting (m)	=	-
Northing (m)	=	-
Map Skewness G:	=	0

DESIGN FLOWS

Design flows were derived using the Rational Method in accordance with QUDM section 4.03

$$Q_y = (2.78 \times 10^{-3}).C_y.{}^{t}I_y.A$$

Where:

Q_y	=	peak flow rate (m^3/s) for Average Exceedence Period (AEP) of y years
C_y	=	runoff coefficient for AEP for y years
A	=	area of catchment
$^{t}I_y$	=	average rainfall intensity (mm/h) for a design duration of t hours and an AEP of y years

Using the information presented above, design flows were calculated and are presented in the following table.

DEVELOPED INTERNAL CATCHMENT			
RATIONAL METHOD FOR CALCULATION OF DISCHARGE QUDM Equation 4.01 - *Q=C.I.A/360*			
AEP	**RAINFALL INTENSITY**	**COEFFICIENT OF RUNOFF**	**DISCHARGE**
%	I (mm/hr)	C	Q (m3/sec)
63	88.1	0.56	**0.422**
39	110.4	0.595	**0.562**
18	132.3	0.665	**0.752**
10	144	0.7	**0.862**
5	160.7	0.735	**1.010**
2	181.8	0.805	**1.251**
1	197.5	0.84	**1.418**

ARCADIS Design & Consultancy for natural and built assets

DEVELOPED CATCHMENT 1

DESIGNED BY:	AS
DATE:	27/06/2018
JOB:	202 Baileys Mountain Road
JOB No:	10022603

This spreadsheet provides a summary of the Rational Method Calculations.

TIME OF CONCENTRATION

The time of concentration was determined by as per QUDM Section 4.6.

CATCHMENT:	**D**	
CATCHMENT AREA:	**3.078**	**ha**

TOTAL TIME OF CONCENTRATION: 6.8 mins

COEFFICIENT OF RUNOFF

In accordance with QUDM section 4.6 and CoGC Land Development Guidelines SC6.11

Case	Slope (%)	Runoff Coefficient C_{10}	Development Category
1	> 5%	0.90	Neighbourhood Centre

Table of Frequency Factors F_y							
A.E.P. (%)	63	39	18	10	5	2	1
Frequency Factor F_y	0.8	0.85	0.95	1	1.05	1.15	1.2

DESIGN RAINFALL

Design rainfall was derived using the GCCC LDGL rainfall isopleth charts

Map 1	$^{2}I_{1}$	=	48.86
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Map 8 Geographical Factor F_2:	=	4.52
Map 9 Geographical Factor F_{50}:	=	16.96
Easting (m)	=	-
Northing (m)	=	-
Map Skewness G:	=	0

DESIGN FLOWS

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$$Q_y = (2.78 \times 10^{-3}).C_y.{}^{t}I_y.A$$

Where:

Q_y	=	peak flow rate (m^3/s) for Average Exceedence Period (AEP) of y years
C_y	=	runoff coefficient for AEP for y years
A	=	area of catchment
$^{t}I_y$	=	average rainfall intensity (mm/h) for a design duration of t hours and an AEP of y years

Using the information presented above, design flows were calculated and are presented in the following table.

DEVELOPED INTERNAL CATCHMENT

RATIONAL METHOD FOR CALCULATION OF DISCHARGE

QUDM Equation 4.01 - *Q=C.I.A/360*

AEP	RAINFALL INTENSITY	COEFFICIENT OF RUNOFF	DISCHARGE
%	I (mm/hr)	C	Q (m3/sec)
63	114.4	0.72	**0.704**
39	143	0.765	**0.935**
18	170.4	0.855	**1.246**
10	184.8	0.9	**1.422**
5	205.7	0.945	**1.662**
2	232.1	1	**1.984**
1	251.5	1	**2.150**

APPENDIX F

BIO RETENTION CHECKLIST

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST

Asset I.D.		Inspected By:	
Site:		Date:	
		Time:	
Constructed By:		Weather:	
		Contact During Visit:	

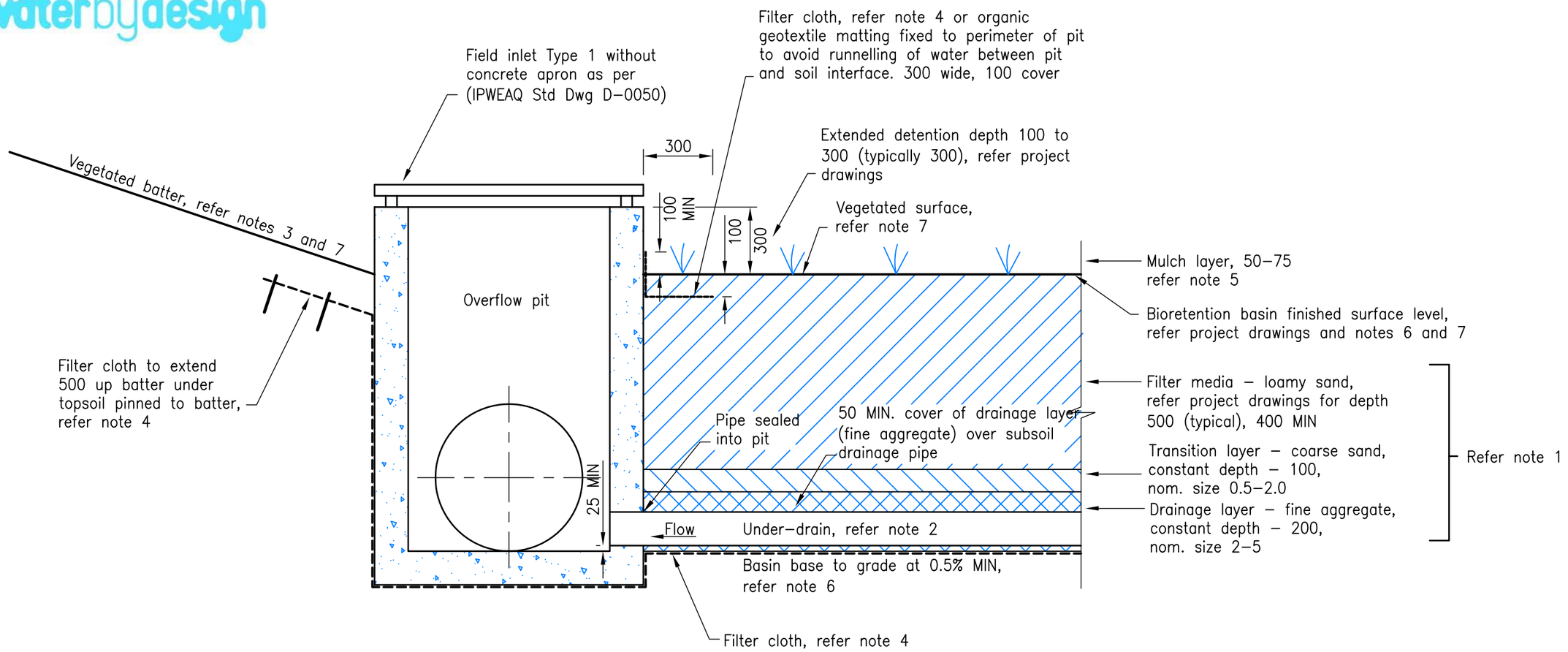
Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N	Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N
DURING CONSTRUCTION & ESTABLISHMENT									
A. FUNCTIONAL INSTALLATION					Structural components				
Preliminary Works					15. Location and configuration of inflow systems as designed				
1. Erosion and sediment control plan adopted					16. Location and levels of overflow pits as designed				
2. Temporary traffic/safety control measures					17. Under-drainage connected to overflow pits as designed				
3. Location same as plans					18. Concrete and reinforcement as designed				
4. Site protection from existing flows					19. Set down to correct level for flush kerbs (streetscape applications only)				
Earthworks and Filter Media					20. Kerb opening width as designed				
5. Bed of basin correct shape and slope									
6. Batter slopes as plans					B. SEDIMENT & EROSION CONTROL (IF REQUIRED)				
7. Dimensions of bioretention area as plans					21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin				
8. Confirm surrounding soil type with design					22. Silt fences and traffic control in place				
9. Confirm filter media specification in accordance with Step 4					23. Temporary protection layers in place				
9. Provision of liner (if required)									
10. Under-drainage installed as designed					C. OPERATIONAL ESTABLISHMENT				
11. Drainage layer media as designed					24. Temporary protection layers and associated silt removed				
12. Transition layer media as designed (if required)					Vegetation				
14. Extended detention depth as designed					25. Planting as designed (species and densities)				
					26. Weed removal and watering as required				

FINAL INSPECTION									
1. Confirm levels of inlets and outlets					6. Check for uneven settling of banks				
2. Confirm structural element sizes					7. Under-drainage working				
3. Check batter slopes					8. Inflow systems working				
4. Vegetation as designed					9. Maintenance access provided				
5. Bioretention filter media surface flat and free of clogging									

COMMENTS ON INSPECTION
ACTIONS REQUIRED
Inspection officer signature:

BIORETENTION BASIN MAINTENANCE CHECKLIST				
Inspection Frequency:	1 to 6 monthly	Date of Visit:		
Location:				
Description:				
Asset I.D.				
Site Visit by:				
INSPECTION ITEMS:		Y	N	Action Required (details)
Sediment accumulation at inflow points?				
Litter within basin?				
Erosion at inlet or other key structures?				
Traffic damage present?				
Evidence of dumping (e.g. building waste)?				
Vegetation condition satisfactory (density, weeds etc)?				
Watering of vegetation required?				
Replanting required?				
Mowing/slashing required?				
Clogging of drainage points (sediment or debris)?				
Evidence of ponding?				
Damage/vandalism to structures present?				
Surface clogging visible?				
Drainage system inspected?				
Resetting of system required?				
COMMENTS				

BIORETENTION BASIN ASSET TRANSFER CHECKLIST		
Asset I.D.		
Asset Location:		
Construction by:		
'On-maintenance' Period:		
TREATMENT	Y	N
System appears to be working as designed visually?		
No obvious signs of under-performance?		
MAINTENANCE	Y	N
Maintenance plans and indicative maintenance costs provided for each asset?		
Vegetation establishment period completed (2 years)?		
Inspection and maintenance undertaken as per maintenance plan?		
Inspection and maintenance forms provided?		
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER	Y	N
Sediment accumulation at inflow points?		
Litter within basin?		
Erosion at inlet or other key structures?		
Traffic damage present?		
Evidence of dumping (e.g. building waste)?		
Vegetation condition satisfactory (density, weeds etc)?		
Watering of vegetation required?		
Replanting required?		
Mowing/slashing required?		
Clogging of drainage points (sediment or debris)?		
Evidence of ponding?		
Damage/vandalism to structures present?		
Surface clogging visible?		
Drainage system inspected?		
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER		
ASSET INFORMATION	Y	N
Design Assessment Checklist provided?		
As constructed plans provided?		
Copies of all required permits (both construction and operational) submitted?		
Proprietary information provided (if applicable)?		
Digital files (e.g. drawings, survey, models) provided?		
Asset listed on asset register or database?		



BIORETENTION BASIN OVERFLOW PIT DETAIL

NOTES:

1. Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration 'Practice Note 1: In Situ Measurement of Hydraulic Conductivity". The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands (Water by Design).
2. Under–drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (Typically ø100–150). Pipe should not be installed with a filter sock surrounding pipe. Under–drainage pipes shall be sealed into pits using grout or other approved watertight seal.
3. Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.
4. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
5. Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.
6. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits, pipes and base levels must be noted on project drawings.
7. Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
8. All dimensions are in millimetres unless otherwise noted.

These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

Rv.	DATE	REVISIONS
A	13/01/2010	ORIGINAL ISSUE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
OVERFLOW PIT

DRAWING No.
WSUD–001
Rv. A

NOTES:

1. Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration "Practice Note 1: In Situ Measurement of Hydraulic Conductivity". The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design).

2. Under–drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (typically Ø100–150). Pipe joins should be glued using plumbing cement. Pipe should not be installed with a filter sock surrounding pipe. Under–drainage pipes shall be sealed into pits using grout or other approved watertight seal.

3. Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.

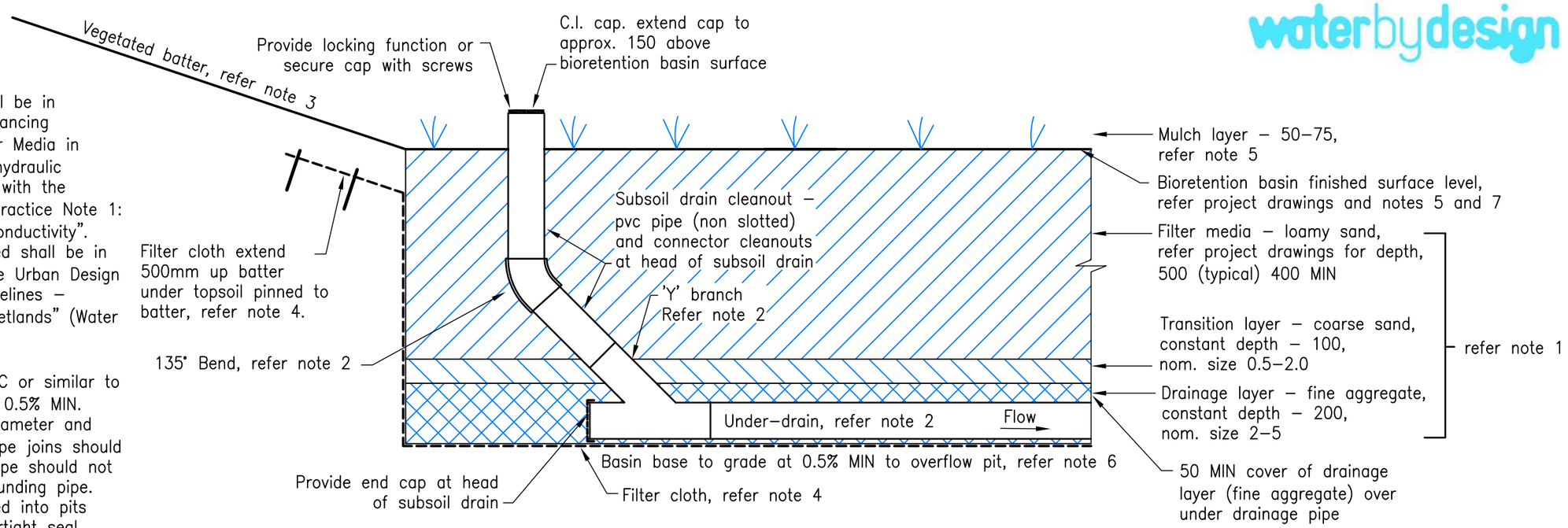
4. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the 'Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).

5. Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.

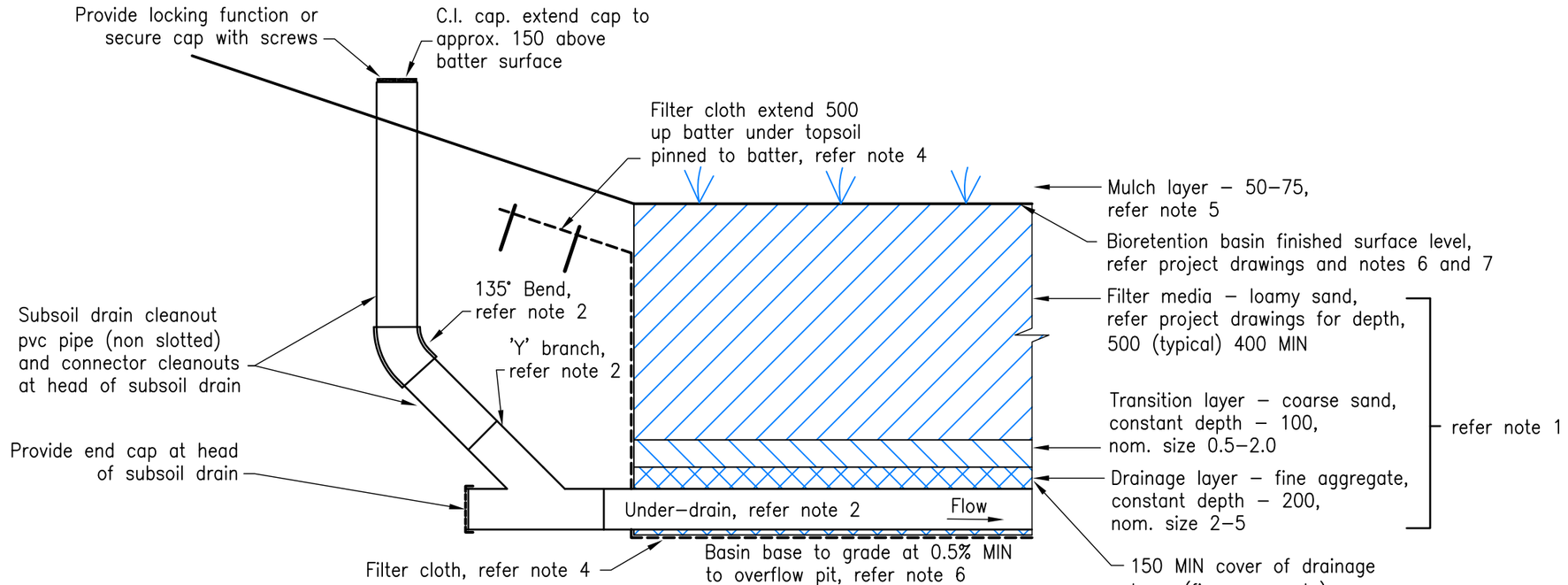
6. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits and pipes and base levels must be shown on project drawings.

7. Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).

8. All dimensions are in millimetres unless otherwise noted.



BIORETENTION UNDER–DRAIN CLEANOUT – IN BASIN



BIORETENTION UNDER–DRAIN CLEANOUT – IN BATTER

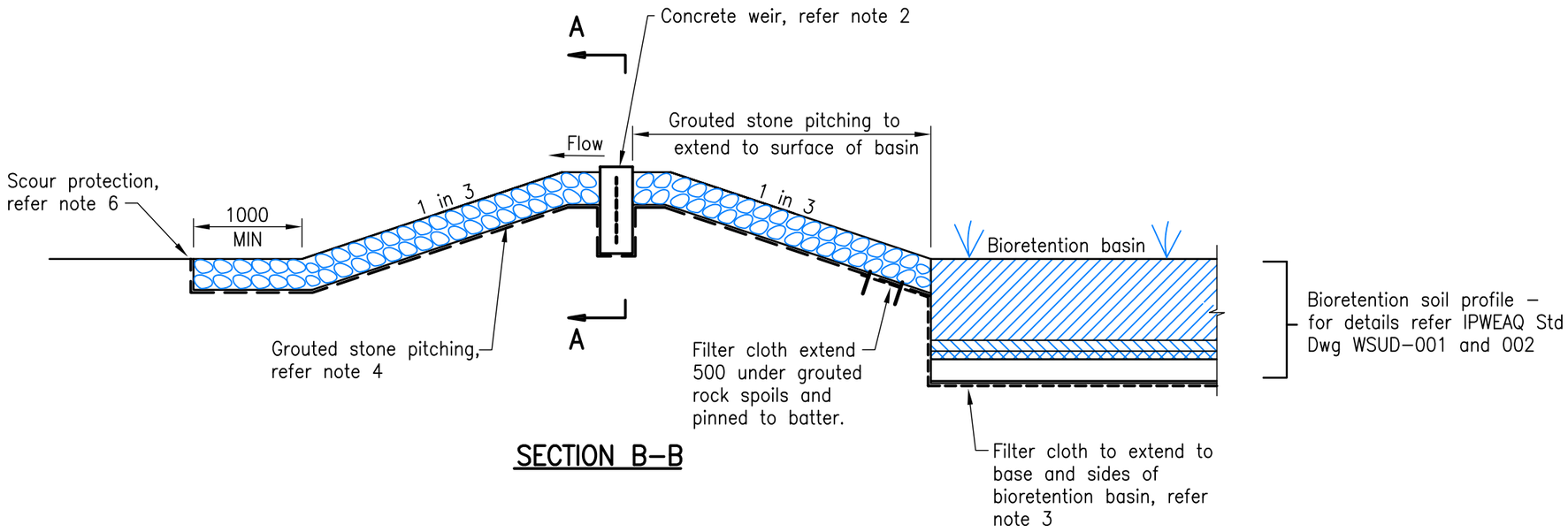
These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

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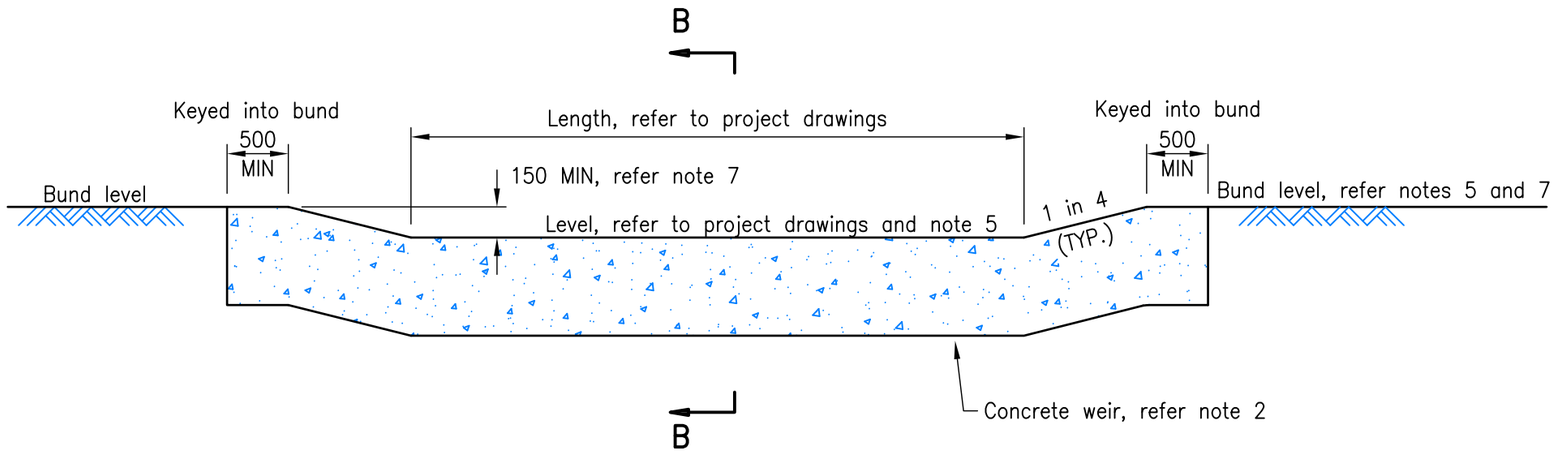
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
UNDERDRAIN CLEANOUT

DRAWING No.
WSUD–003
A



SECTION B–B



SECTION A–A

NOTES:

1. Insitu material to be tested and approved by geotechnical engineer prior to weir construction.
2. Concrete weir – 300 wide x 800 high concrete (N32) with SL81 mesh placed centrally.
3. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
4. Grouted stone pitching – stones 75–100, 300 thick on filter cloth, refer note 3. Refer landscape drawings and project drawings for plant specification and details. Geotechnical engineer to confirm compaction requirements for bund subsoil. Option to drill 100 cores through to subsoil to provide voids for planting (subject to flow velocities and local government requirements). Refer landscape drawings for planting details.
5. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances and bund levels must be noted on project plans.
6. For extent and details of scour protection refer to project drawings.
7. Bund level, refer to project drawings for minimum freeboard requirements. Bund levels must be noted on project drawings.
8. All dimensions are in millimetres unless otherwise noted.

These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

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INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION BASIN
WEIR DETAILS

DRAWING No.

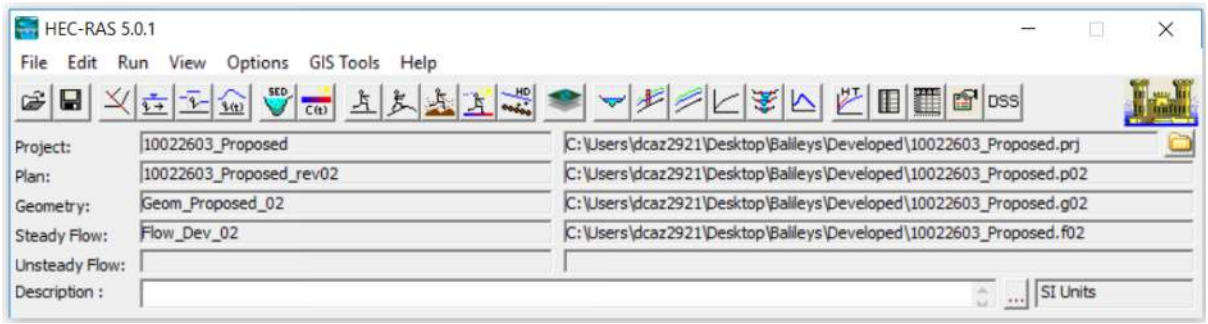
WSUD–006

Rv. A

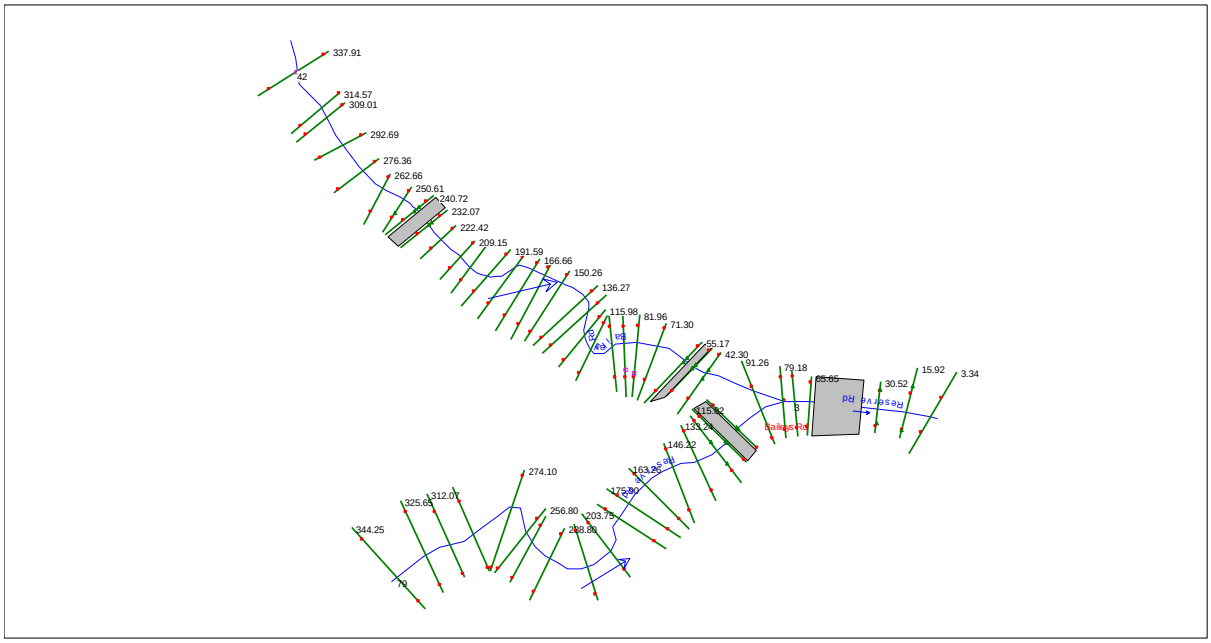
APPENDIX G

HEC-RAS DATA TABLES & GEOMETRIC VIEW OF MODELS

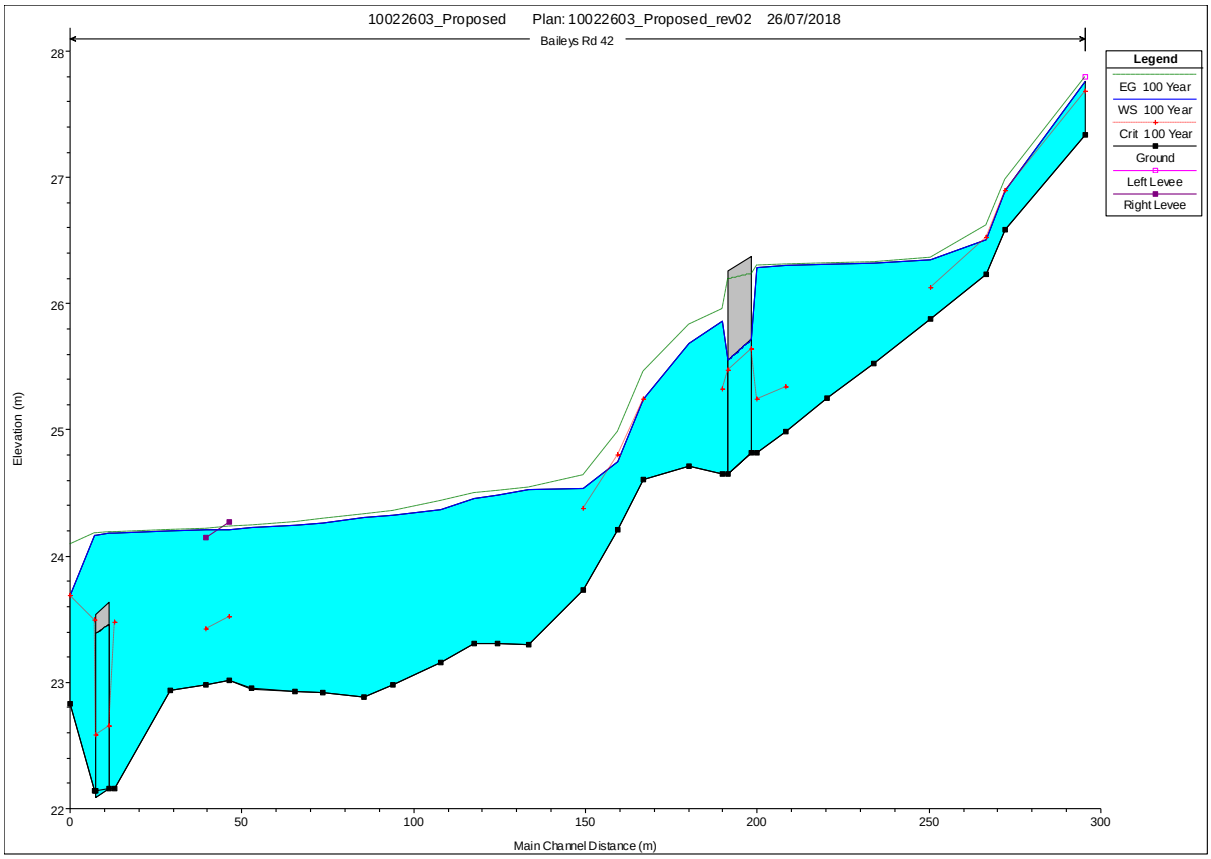
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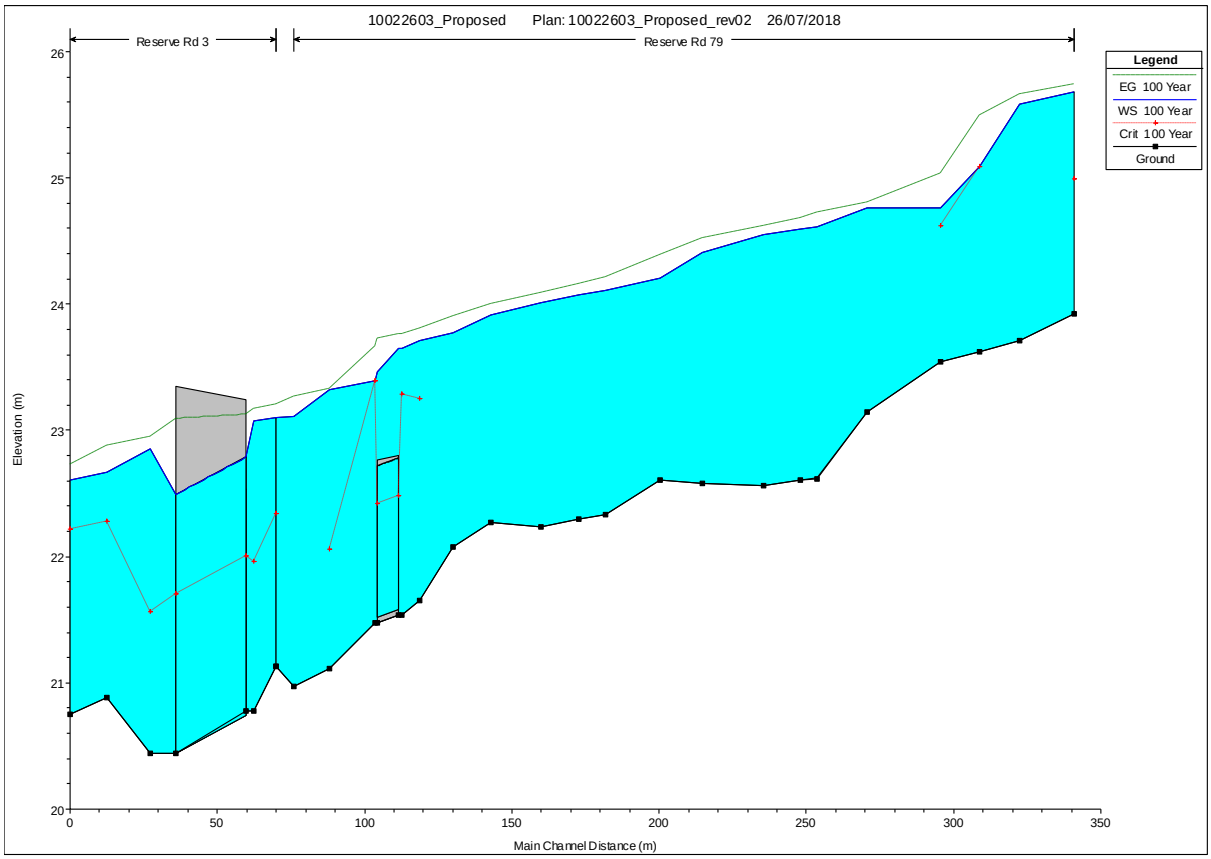


PLAN VIEW



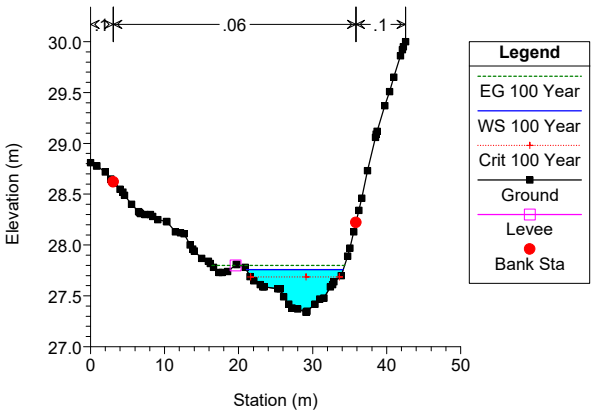
LONG SECTIONS



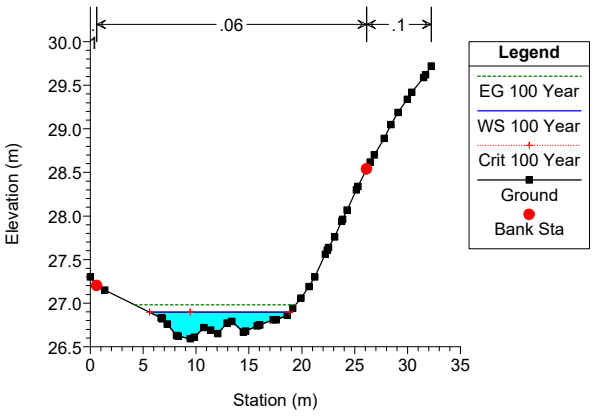


CROSS SECTIONS

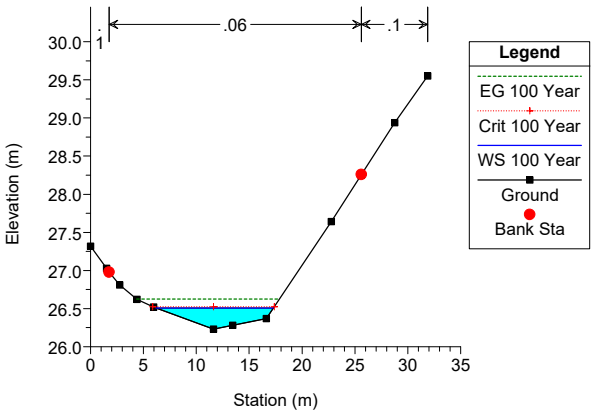
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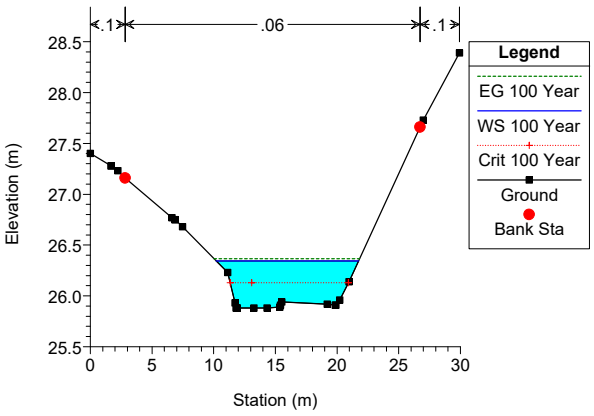
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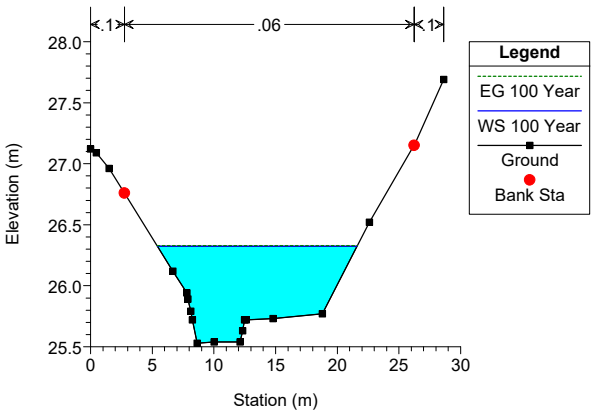
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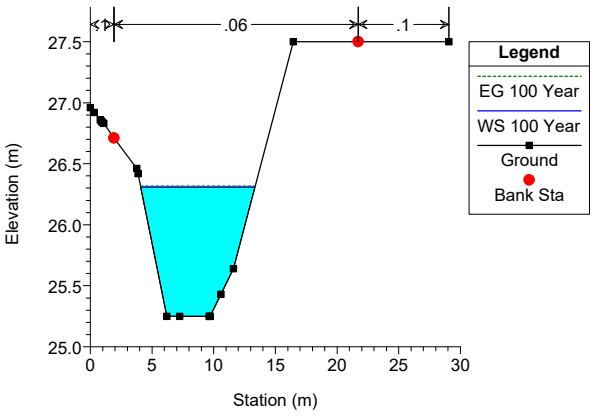
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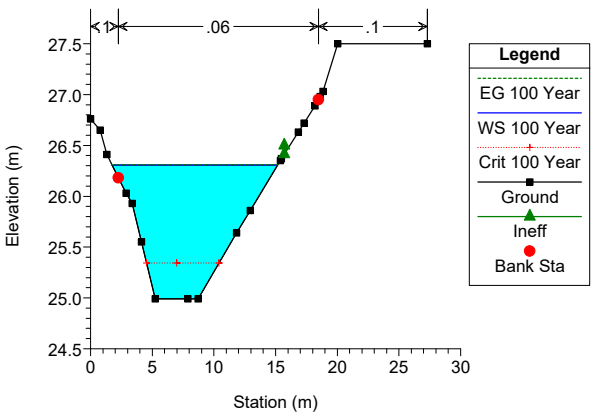
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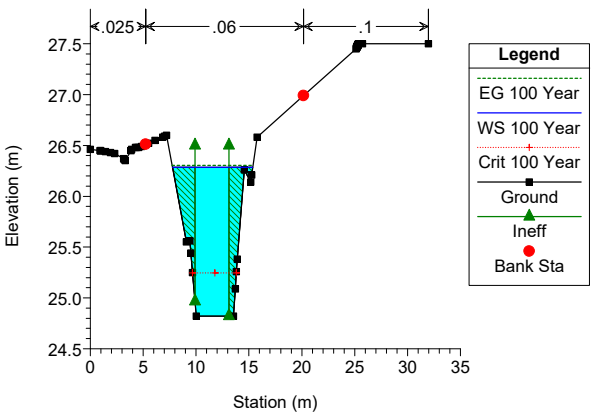
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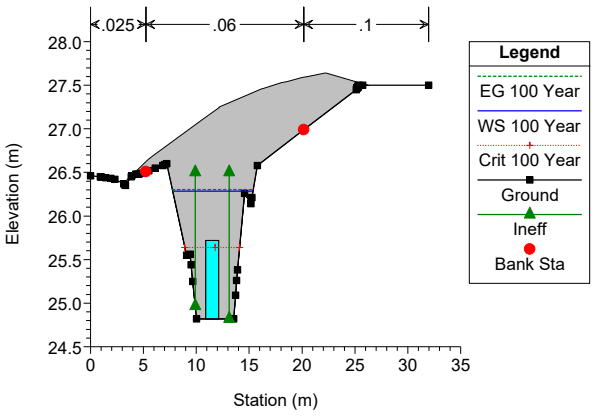
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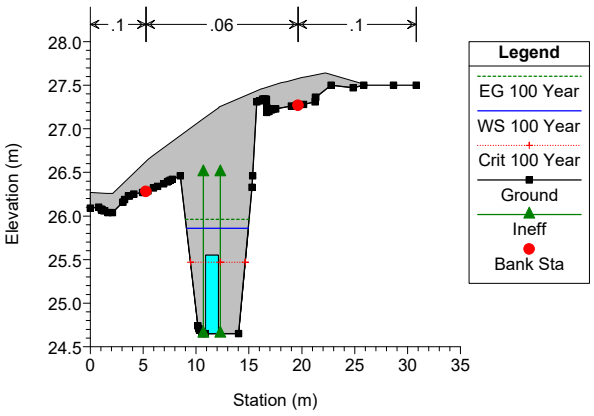
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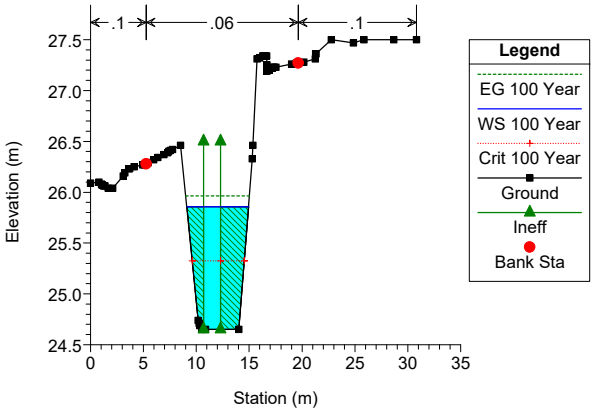
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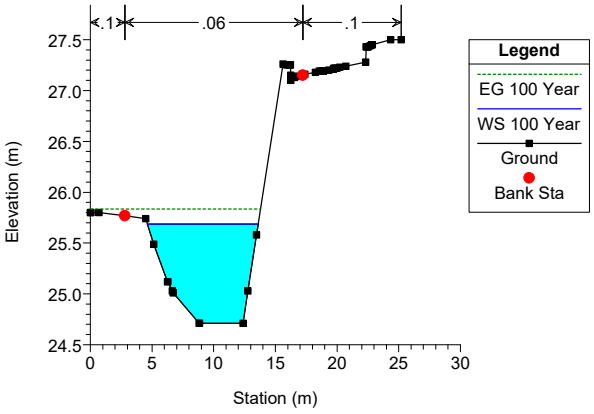
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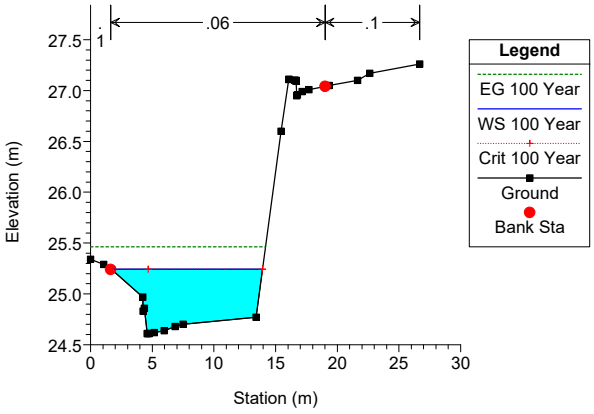
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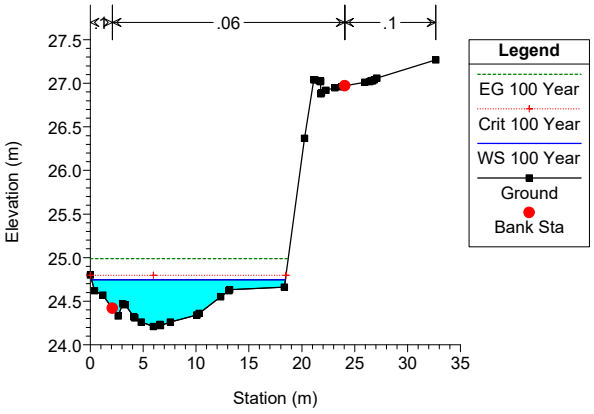
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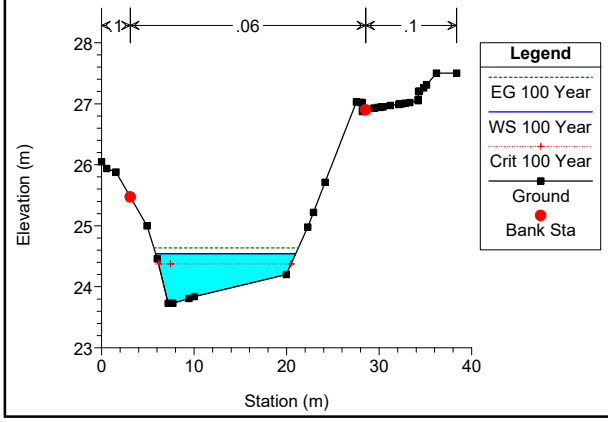
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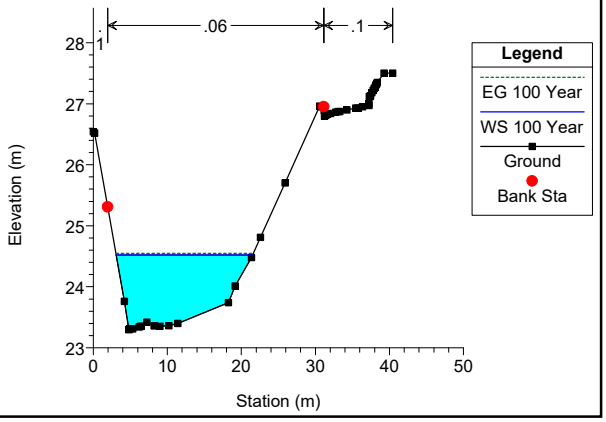
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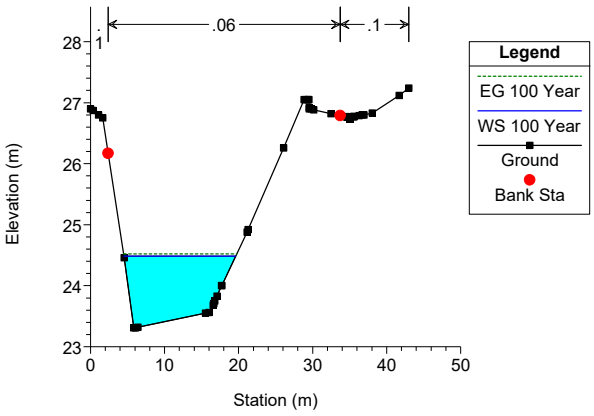
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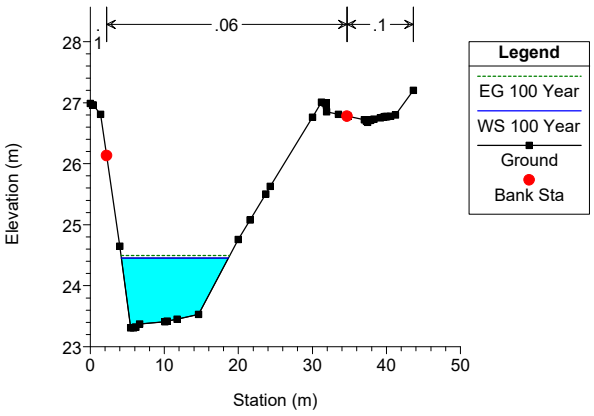
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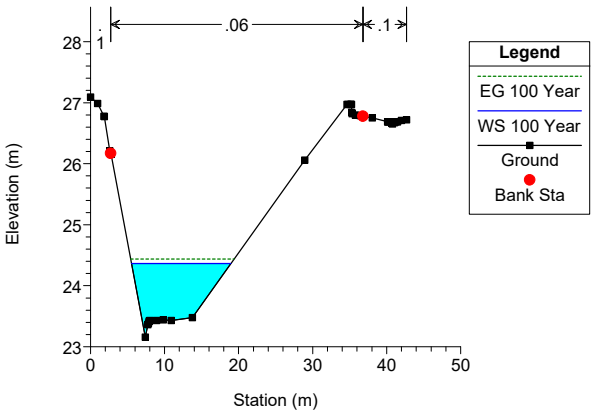
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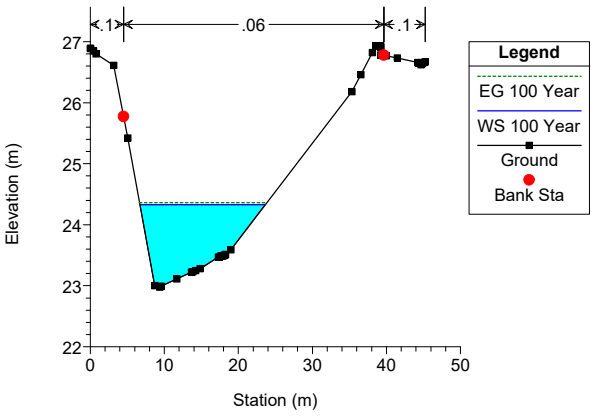
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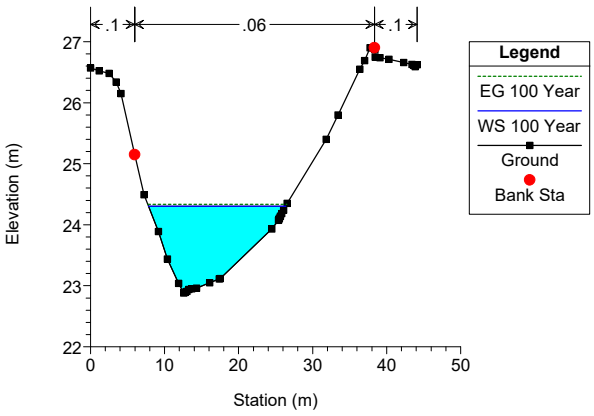
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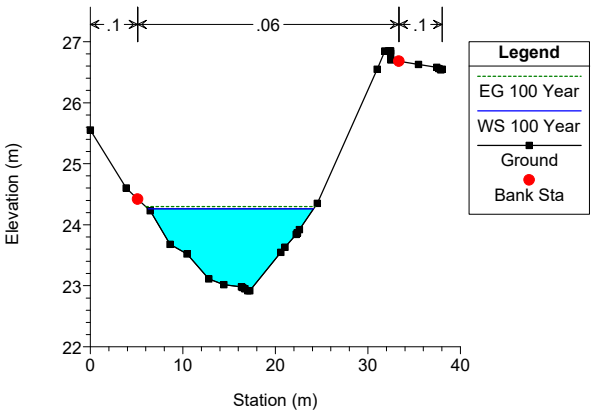
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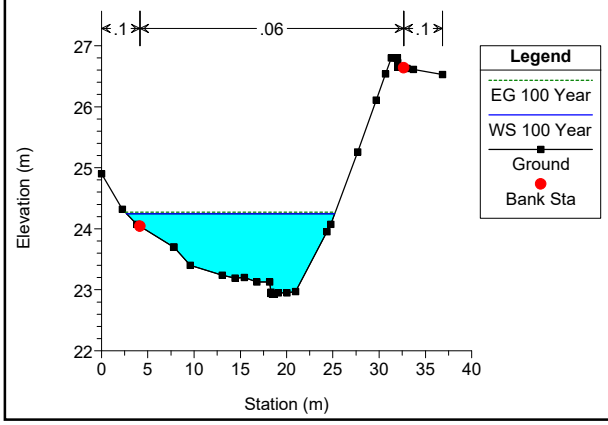
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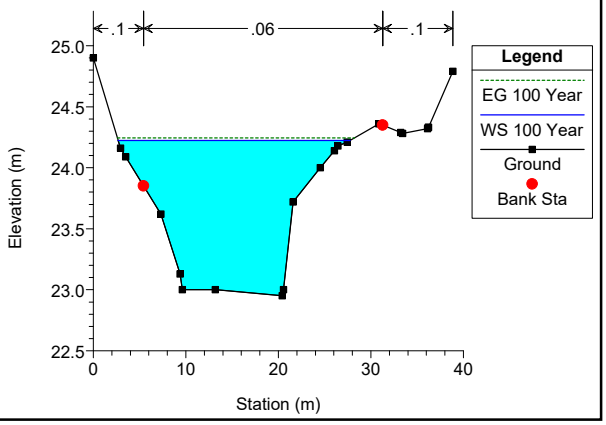
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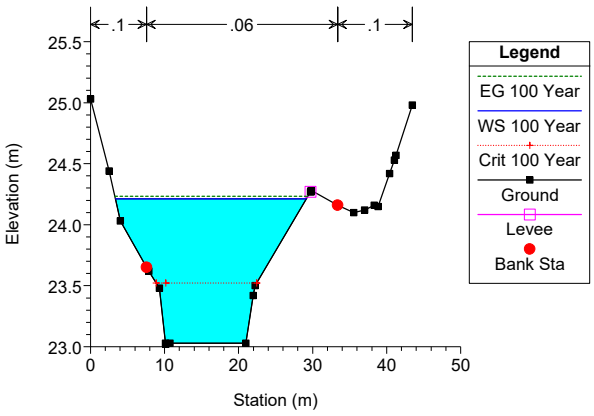
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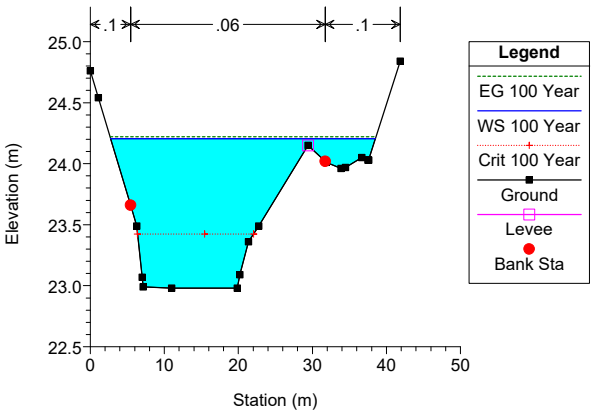
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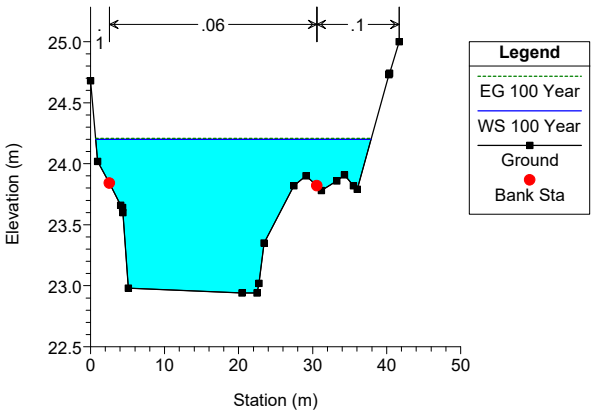
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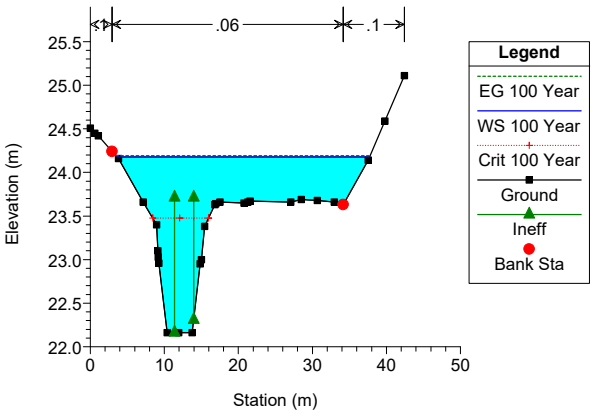
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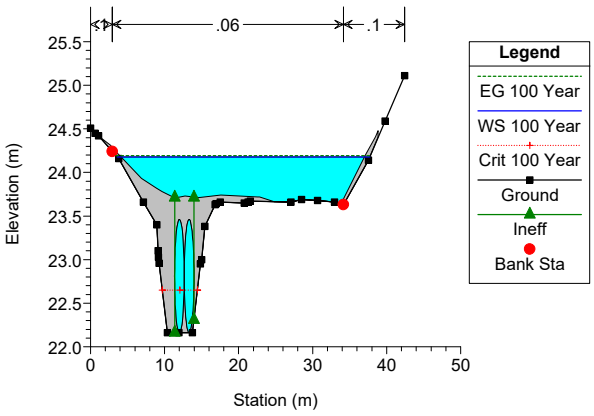
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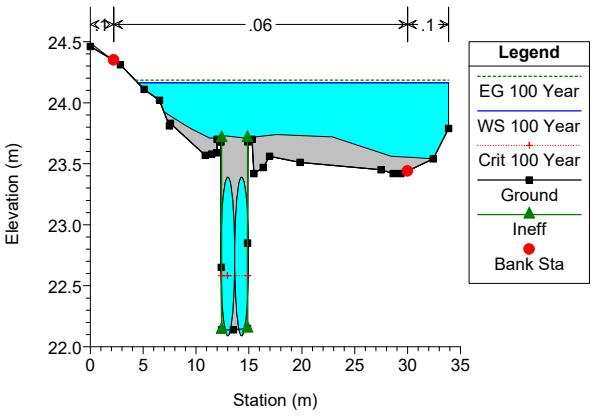
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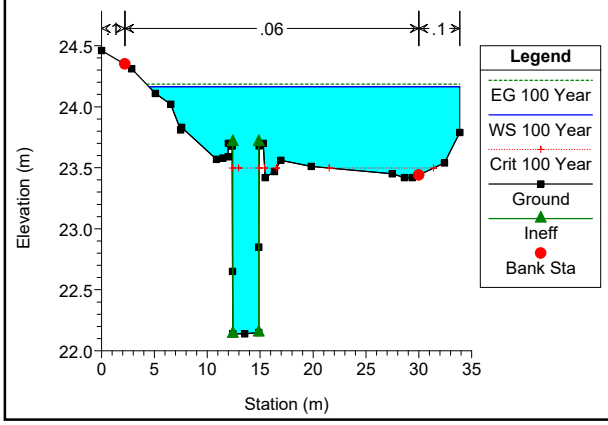
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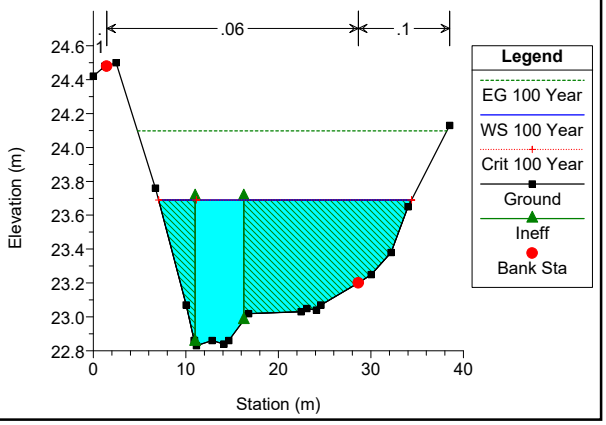
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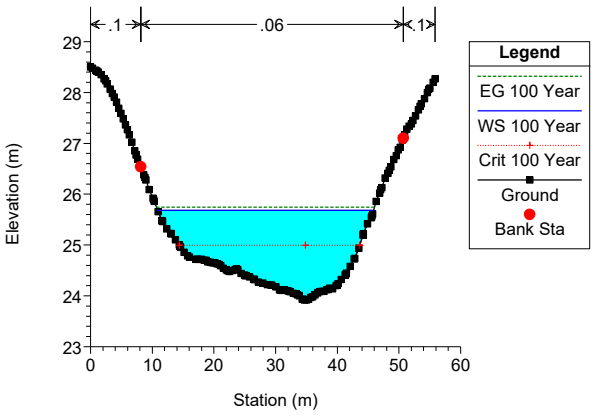
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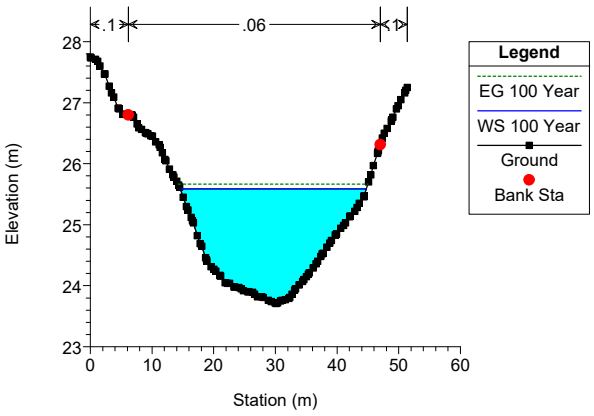
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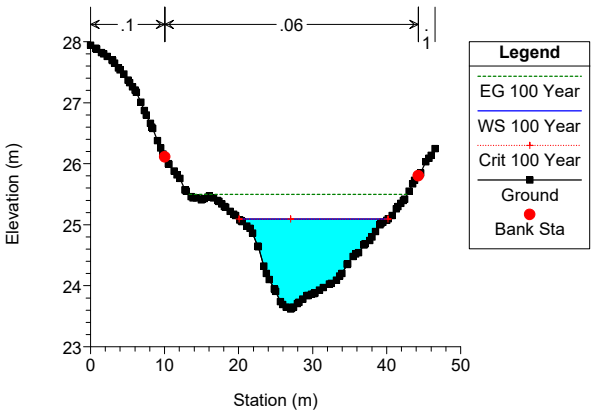
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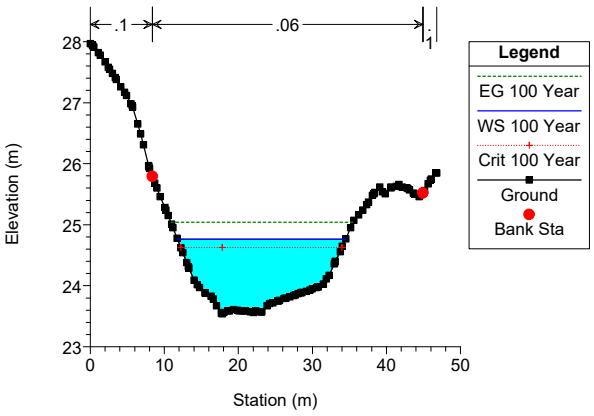
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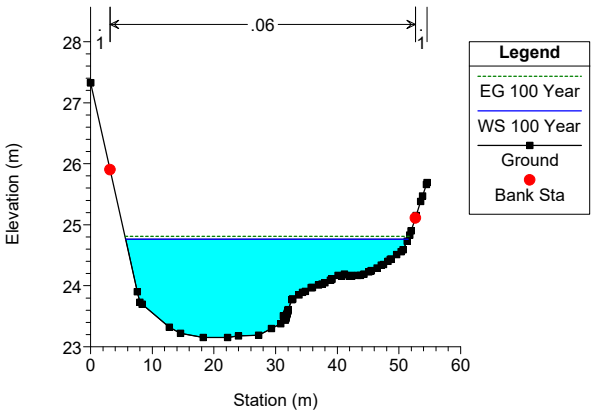
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



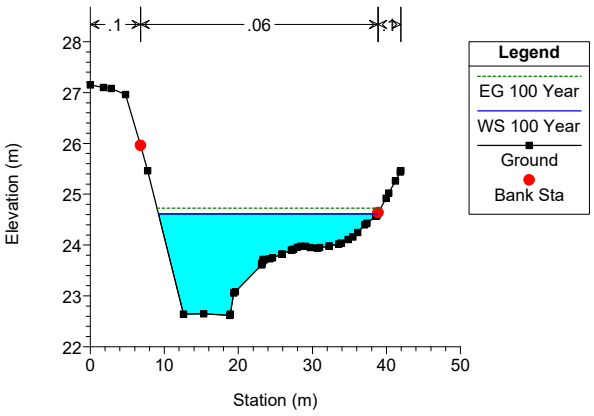
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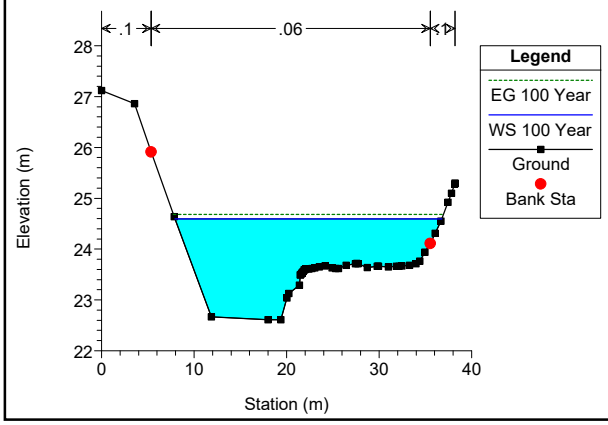
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



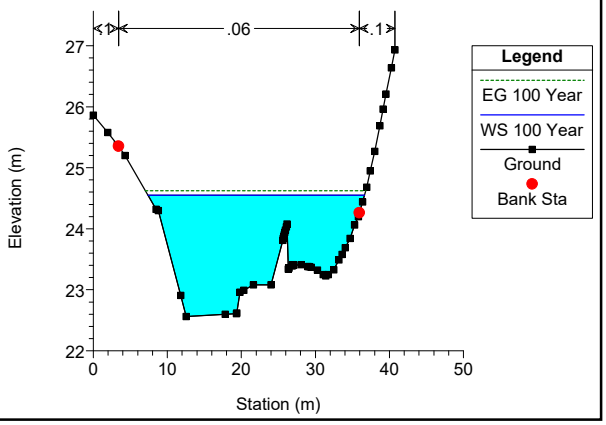
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



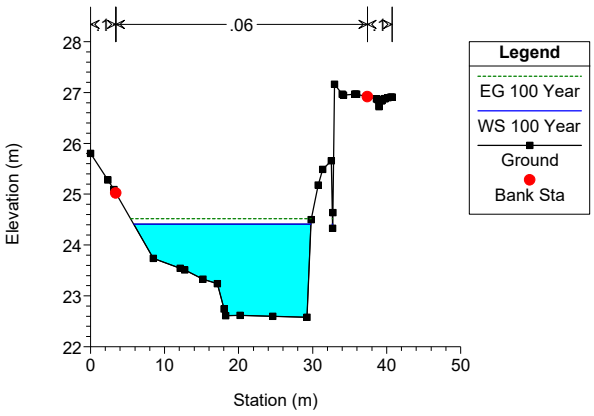
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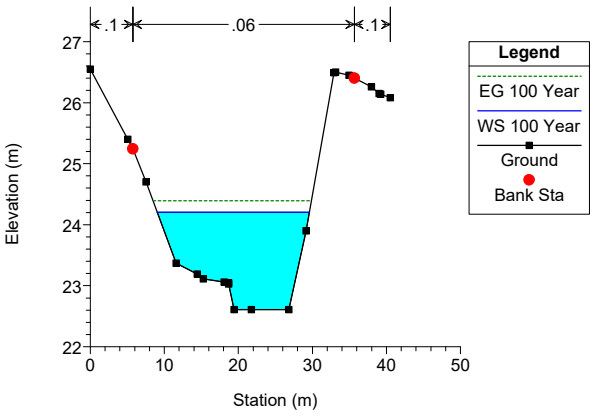
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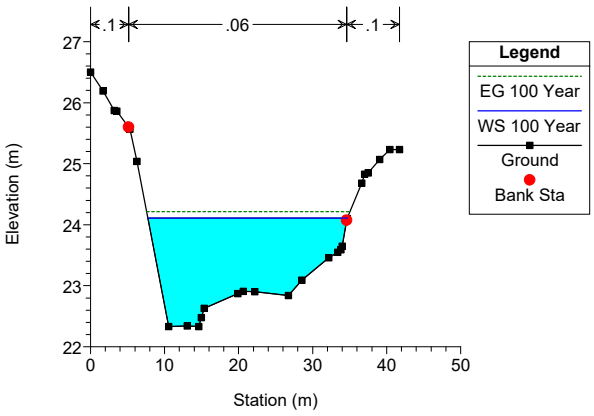
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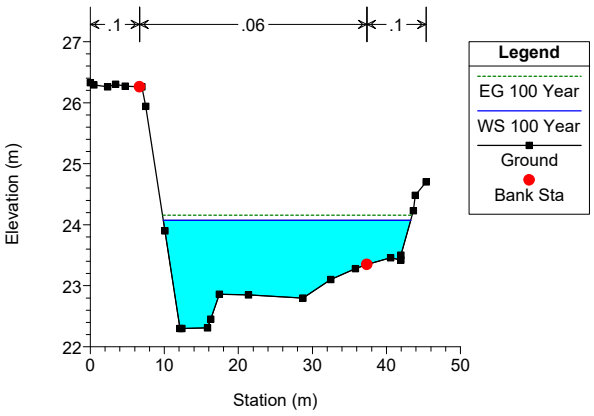
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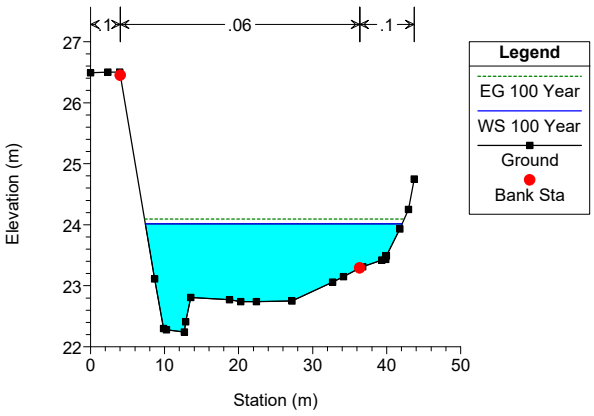
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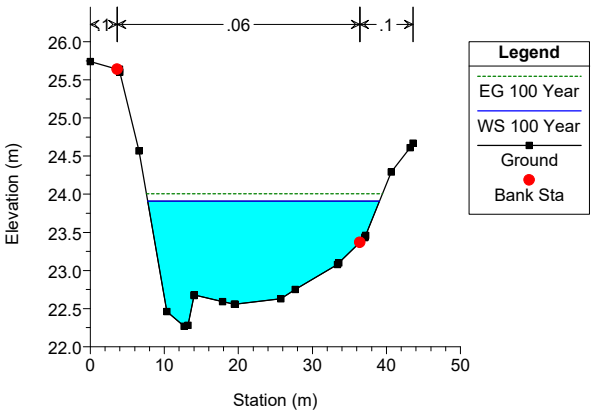
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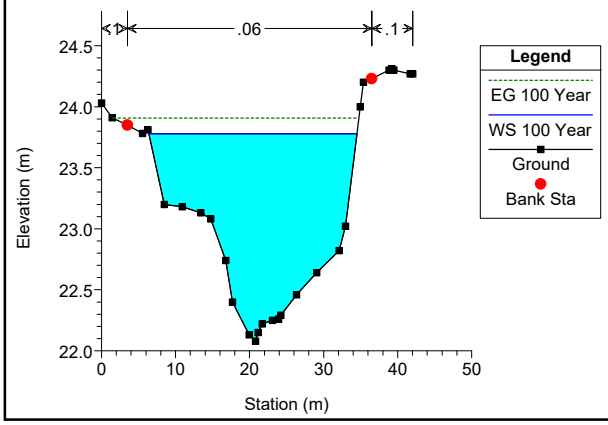
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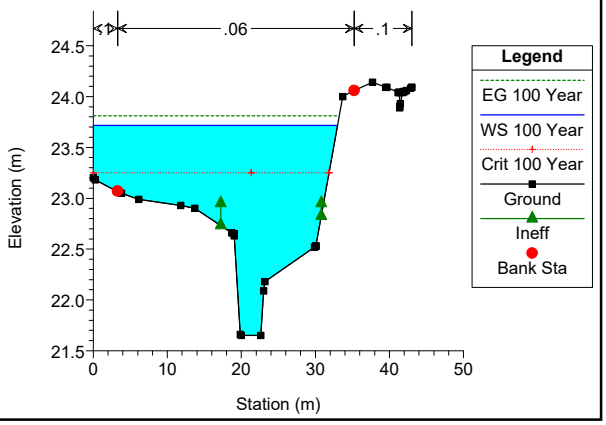
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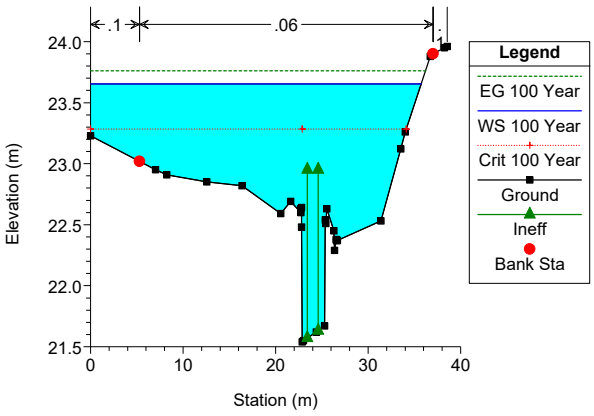
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



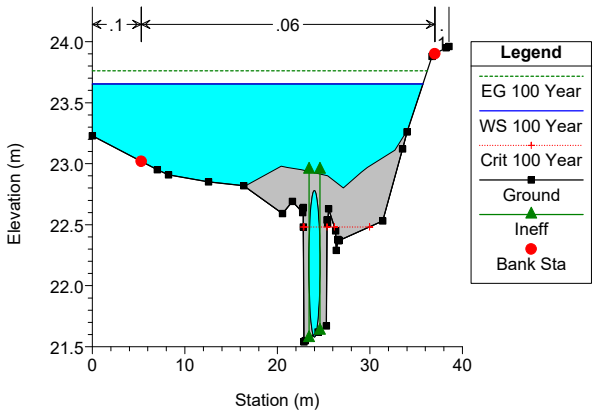
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



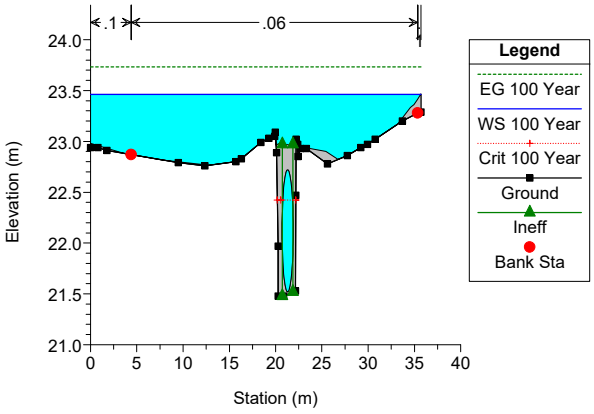
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



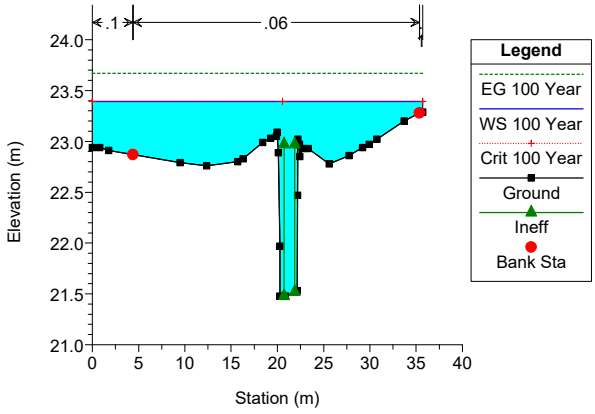
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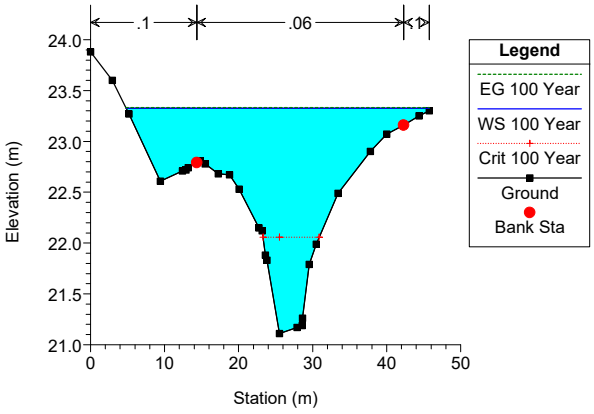
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



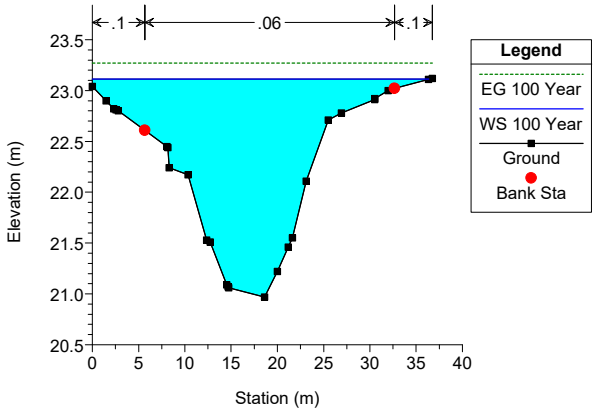
10022603_Proposed Plan: 10022603_Proposed_rev02 26/07/2018



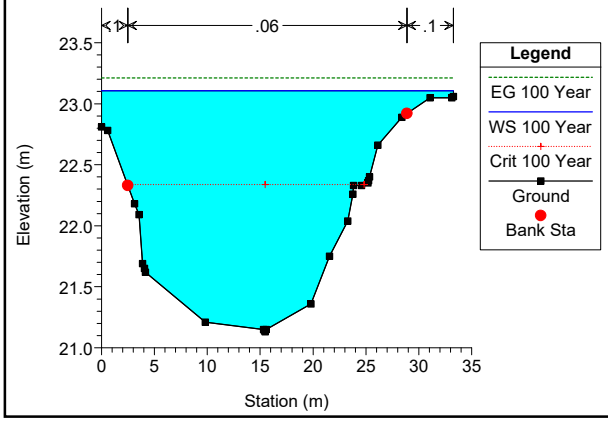
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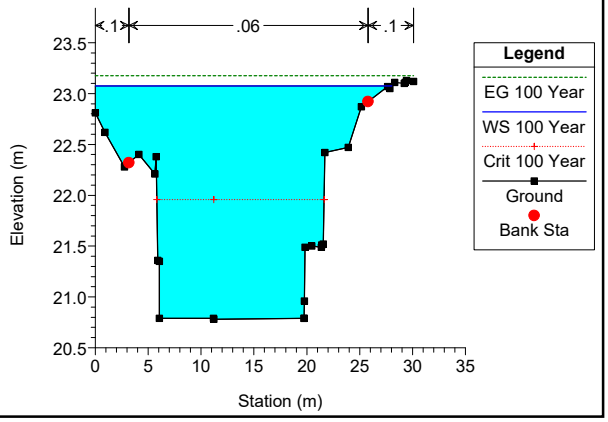
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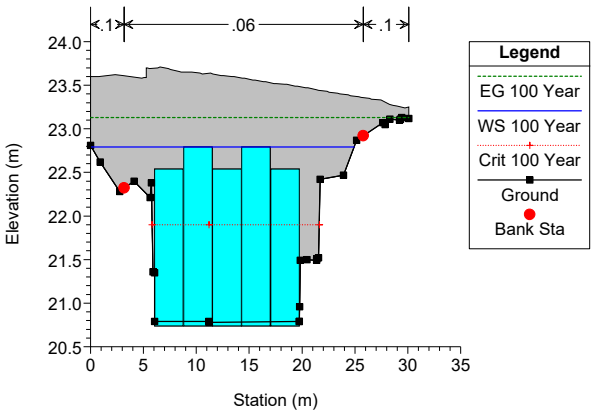
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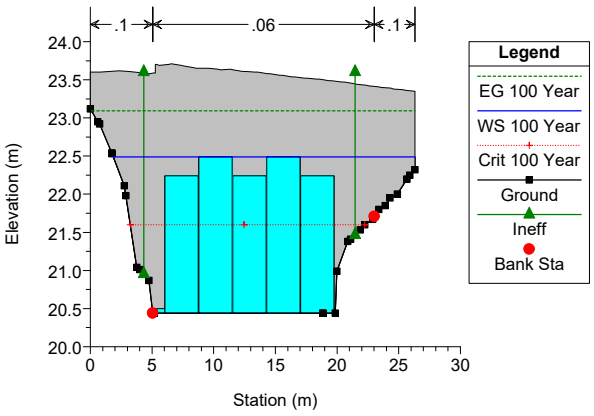
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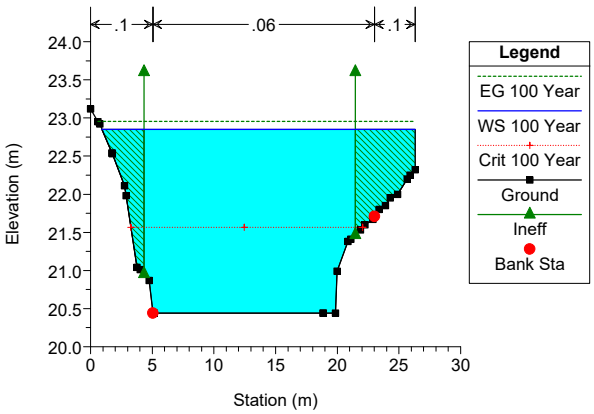
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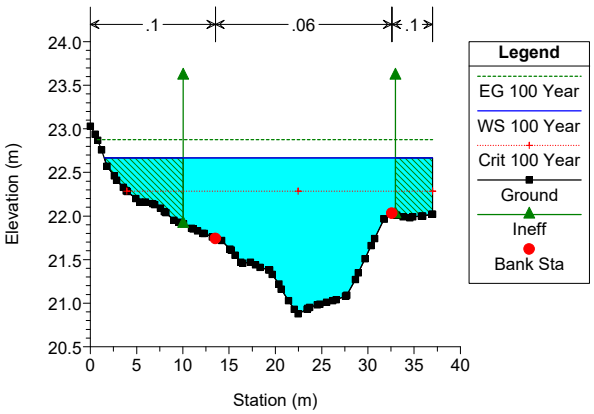
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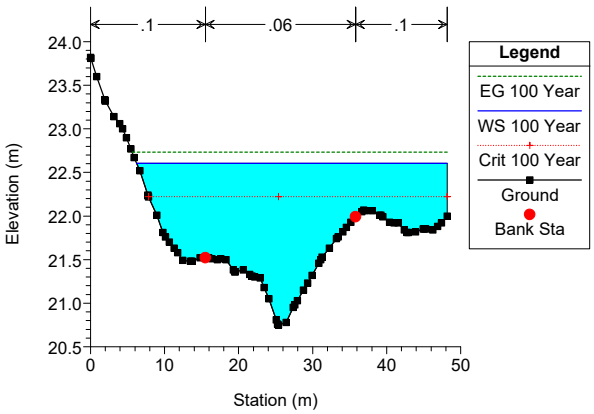
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RESULTS

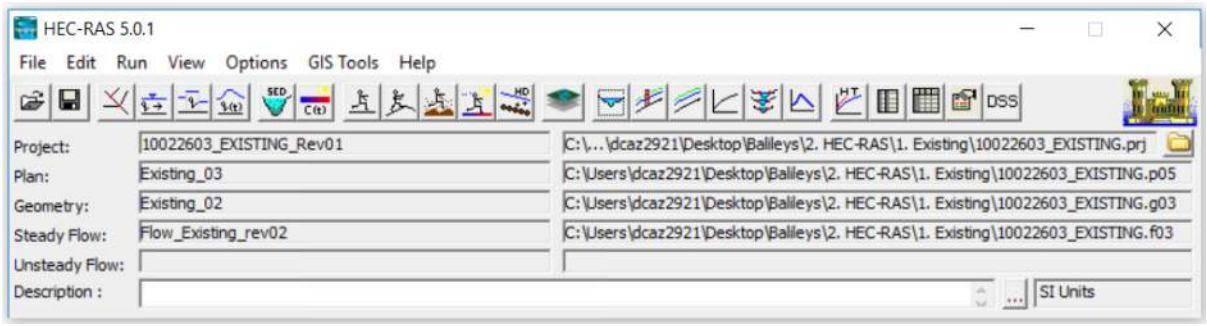
River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reserve Rd	79	344.25	2 Year	18.99	23.92	25.08	24.67	25.13	0.0049	0.91	20.84	30	0.35
Reserve Rd	79	344.25	10 Year	30.46	23.92	25.38	24.84	25.43	0.004179	1.01	30.06	32.7	0.34
Reserve Rd	79	344.25	100 Year	45.38	23.92	25.68	25	25.74	0.003838	1.13	40.28	35.01	0.34
Reserve Rd	79	344.25	200 Year	65.62	23.92	25.99	25.18	26.07	0.003845	1.28	51.33	36.87	0.35
Reserve Rd	79	325.65	2 Year	18.99	23.71	25		25.04	0.004203	0.95	20.06	24.28	0.33
Reserve Rd	79	325.65	10 Year	30.46	23.71	25.29		25.35	0.004428	1.1	27.64	27.65	0.35
Reserve Rd	79	325.65	100 Year	45.38	23.71	25.59		25.67	0.004465	1.25	36.28	30.16	0.36
Reserve Rd	79	325.65	200 Year	65.62	23.71	25.88		25.99	0.004857	1.44	45.59	32.63	0.39
Reserve Rd	79	312.07	2 Year	18.99	23.62	24.7	24.6	24.91	0.027799	2.03	9.35	14.74	0.81
Reserve Rd	79	312.07	10 Year	30.46	23.62	24.88	24.83	25.19	0.034826	2.5	12.17	16.6	0.93
Reserve Rd	79	312.07	100 Year	45.38	23.62	25.09	25.09	25.5	0.039204	2.82	16.1	20.09	1.01
Reserve Rd	79	312.07	200 Year	65.62	23.62	25.36	25.36	25.81	0.037362	2.98	22.02	24.42	1
Reserve Rd	79	298.73	2 Year	18.99	23.54	24.3	24.25	24.49	0.03372	1.93	9.83	19.47	0.87
Reserve Rd	79	298.73	10 Year	30.46	23.54	24.52		24.75	0.027755	2.13	14.29	21.07	0.83
Reserve Rd	79	298.73	100 Year	45.38	23.54	24.76	24.63	25.04	0.024001	2.32	19.57	22.73	0.8
Reserve Rd	79	298.73	200 Year	65.62	23.54	25.07	24.85	25.37	0.019882	2.45	26.78	24.81	0.75
Reserve Rd	79	274.1	2 Year	18.99	23.15	24.2		24.23	0.003906	0.78	24.41	37.59	0.31
Reserve Rd	79	274.1	10 Year	30.46	23.15	24.47		24.51	0.003457	0.86	35.44	42.82	0.3
Reserve Rd	79	274.1	100 Year	45.38	23.15	24.76		24.81	0.002958	0.94	48.47	45.79	0.29
Reserve Rd	79	274.1	200 Year	65.62	23.15	25.11		25.16	0.002515	1.02	64.63	47.75	0.28
Reserve Rd	79	256.8	2 Year	18.99	22.62	24.04		24.12	0.010177	1.24	15.36	23.75	0.49
Reserve Rd	79	256.8	10 Year	30.46	22.62	24.32		24.41	0.00875	1.36	22.42	26.86	0.47
Reserve Rd	79	256.8	100 Year	45.38	22.62	24.61		24.72	0.007763	1.48	30.7	29.6	0.46
Reserve Rd	79	256.8	200 Year	65.62	22.62	24.96		25.09	0.006347	1.6	41.29	31.47	0.44
Reserve Rd	79	251.32	2 Year	18.99	22.61	24.02		24.07	0.005602	0.99	19.08	26.13	0.37
Reserve Rd	79	251.32	10 Year	30.46	22.61	24.3		24.37	0.005009	1.15	26.62	27.51	0.37
Reserve Rd	79	251.32	100 Year	45.38	22.61	24.6		24.68	0.004749	1.31	34.9	28.86	0.37
Reserve Rd	79	251.32	200 Year	65.62	22.61	24.94		25.05	0.004486	1.47	45.16	30.25	0.38
Reserve Rd	79	238.8	2 Year	18.99	22.56	23.97		24.01	0.003619	0.88	21.69	25.33	0.3
Reserve Rd	79	238.8	10 Year	30.46	22.56	24.26		24.31	0.00385	1.05	29.08	27.06	0.32
Reserve Rd	79	238.8	100 Year	45.38	22.56	24.55		24.63	0.004003	1.22	37.38	29.25	0.34
Reserve Rd	79	238.8	200 Year	65.62	22.56	24.9		25	0.003985	1.38	48.04	31.61	0.35
Reserve Rd	79	218.14	2 Year	18.99	22.58	23.87		23.93	0.00491	1.02	18.63	21.68	0.35
Reserve Rd	79	218.14	10 Year	30.46	22.58	24.14		24.22	0.005479	1.24	24.49	22.79	0.38
Reserve Rd	79	218.14	100 Year	45.38	22.58	24.41		24.52	0.006082	1.47	30.92	23.97	0.41
Reserve Rd	79	218.14	200 Year	65.62	22.58	24.74		24.89	0.006542	1.67	39.2	25.74	0.43
Reserve Rd	79	203.75	2 Year	18.99	22.61	23.74		23.83	0.008769	1.31	14.5	18.4	0.47
Reserve Rd	79	203.75	10 Year	30.46	22.61	23.97		24.1	0.010228	1.62	18.84	19.49	0.52
Reserve Rd	79	203.75	100 Year	45.38	22.61	24.21		24.4	0.01169	1.93	23.52	20.54	0.58
Reserve Rd	79	203.75	200 Year	65.62	22.61	24.51		24.75	0.011974	2.19	29.95	21.91	0.6
Reserve Rd	79	184.97	2 Year	18.99	22.33	23.65		23.7	0.004737	0.96	19.84	25.53	0.35
Reserve Rd	79	184.97	10 Year	30.46	22.33	23.88		23.95	0.005367	1.19	25.69	26.22	0.38
Reserve Rd	79	184.97	100 Year	45.38	22.33	24.11		24.22	0.006018	1.42	31.89	26.96	0.42
Reserve Rd	79	184.97	200 Year	65.62	22.33	24.44		24.57	0.00576	1.61	40.87	28.59	0.42
Reserve Rd	79	175.9	2 Year	18.99	22.3	23.62		23.66	0.004221	0.9	21.8	31.78	0.33
Reserve Rd	79	175.9	10 Year	30.46	22.3	23.84		23.9	0.004566	1.1	29.06	32.59	0.35
Reserve Rd	79	175.9	100 Year	45.38	22.3	24.08		24.16	0.00496	1.31	36.77	33.43	0.38
Reserve Rd	79	175.9	200 Year	65.62	22.3	24.41		24.51	0.004584	1.47	48.07	34.39	0.38
Reserve Rd	79	163.26	2 Year	18.99	22.24	23.57		23.61	0.003924	0.86	22.52	32.25	0.31
Reserve Rd	79	163.26	10 Year	30.46	22.24	23.79		23.85	0.004309	1.06	29.8	33.49	0.34
Reserve Rd	79	163.26	100 Year	45.38	22.24	24.02		24.1	0.004725	1.27	37.62	34.71	0.37
Reserve Rd	79	163.26	200 Year	65.62	22.24	24.36		24.46	0.004267	1.41	49.69	36.18	0.37
Reserve Rd	79	146.22	2 Year	18.99	22.27	23.49		23.54	0.00426	0.9	21.25	28.85	0.33
Reserve Rd	79	146.22	10 Year	30.46	22.27	23.7		23.77	0.004935	1.12	27.39	30.09	0.37
Reserve Rd	79	146.22	100 Year	45.38	22.27	23.92		24.01	0.00565	1.36	33.93	31.36	0.4
Reserve Rd	79	146.22	200 Year	65.62	22.27	24.26		24.38	0.004961	1.5	45.19	33.42	0.39
Reserve Rd	79	133.24	2 Year	18.99	22.08	23.42		23.47	0.006062	1.03	18.51	26.06	0.39
Reserve Rd	79	133.24	10 Year	30.46	22.08	23.6		23.69	0.007508	1.3	23.44	27.11	0.45
Reserve Rd	79	133.24	100 Year	45.38	22.08	23.79		23.91	0.009238	1.59	28.54	28.43	0.51

Reserve Rd	79	133.24	200 Year	65.62	22.08	24.17		24.3	0.006968	1.62	41.32	35.31	0.46
Reserve Rd	79	122.13	2 Year	18.99	21.65	23.37	22.83	23.41	0.004014	0.86	22.66	32.15	0.32
Reserve Rd	79	122.13	10 Year	30.46	21.65	23.55	23.09	23.61	0.005138	1.11	28.39	32.59	0.37
Reserve Rd	79	122.13	100 Year	45.38	21.65	23.72	23.25	23.82	0.006445	1.38	34.1	33.02	0.42
Reserve Rd	79	122.13	200 Year	65.62	21.65	24.12	23.43	24.23	0.005	1.44	47.93	41.87	0.39
Reserve Rd	79	115.82	2 Year	18.99	21.54	23.34	22.98	23.38	0.005695	0.93	21.13	34.35	0.36
Reserve Rd	79	115.82	10 Year	30.46	21.54	23.5	23.13	23.57	0.007086	1.19	26.94	35.08	0.41
Reserve Rd	79	115.82	100 Year	45.38	21.54	23.67	23.29	23.77	0.008741	1.46	32.7	35.79	0.47
Reserve Rd	79	115.82	200 Year	65.62	21.54	24.09	23.45	24.19	0.005441	1.44	48.54	38.56	0.39
Reserve Rd	79	114.82		Culvert									
Reserve Rd	79	106.85	2 Year	18.99	21.48	23.18	23.13	23.3	0.034667	1.57	12.71	33.43	0.8
Reserve Rd	79	106.85	10 Year	30.46	21.48	23.39	23.25	23.52	0.021607	1.6	20.06	35.71	0.67
Reserve Rd	79	106.85	100 Year	45.38	21.48	23.55	23.39	23.72	0.021307	1.87	25.69	35.71	0.7
Reserve Rd	79	106.85	200 Year	65.62	21.48	24.04	23.55	24.16	0.008143	1.62	43.09	35.71	0.47
Reserve Rd	79	91.26	2 Year	21.79	21.11	22.58		22.81	0.027519	2.12	10.29	14.85	0.81
Reserve Rd	79	91.26	10 Year	35.63	21.11	22.9	22.82	23.12	0.026783	2.12	17.73	30.21	0.81
Reserve Rd	79	91.26	100 Year	52.69	21.11	23.26		23.44	0.014873	1.91	30.26	39.52	0.63
Reserve Rd	79	91.26	200 Year	84.37	21.11	23.93		24.06	0.005686	1.69	58.75	45.77	0.43
Reserve Rd	79	79.18	2 Year	25.11	20.97	22.39		22.56	0.015377	1.83	13.71	16.02	0.63
Reserve Rd	79	79.18	10 Year	37.79	20.97	22.66		22.87	0.016585	2.04	18.58	20.35	0.67
Reserve Rd	79	79.18	100 Year	55.8	20.97	23.1		23.28	0.01221	1.9	30.65	35.75	0.59
Reserve Rd	79	79.18	200 Year	92.82	20.97	23.83		23.99	0.005329	1.78	57.8	36.76	0.42
Reserve Rd	3	73.17	2 Year	25.11	21.13	22.39	21.91	22.47	0.006398	1.23	20.5	23.11	0.41
Reserve Rd	3	73.17	10 Year	37.79	21.13	22.68	22.1	22.78	0.006	1.39	27.41	25.34	0.42
Reserve Rd	3	73.17	100 Year	55.8	21.13	23.11	22.34	23.21	0.004783	1.45	39.63	33.26	0.39
Reserve Rd	3	73.17	200 Year	92.82	21.13	23.83		23.95	0.003228	1.57	63.81	33.26	0.34
Reserve Rd	3	65.65	2 Year	25.11	20.78	22.37	21.51	22.43	0.003376	1.05	23.86	18.95	0.29
Reserve Rd	3	65.65	10 Year	37.79	20.78	22.65	21.71	22.74	0.004554	1.28	29.98	23.75	0.35
Reserve Rd	3	65.65	100 Year	55.8	20.78	23.08	21.96	23.18	0.004173	1.42	40.76	28.04	0.35
Reserve Rd	3	65.65	200 Year	92.82	20.78	23.8	22.51	23.93	0.003378	1.61	62.49	30.1	0.33
Reserve Rd	3	63.15		Culvert									
Reserve Rd	3	30.52	2 Year	25.11	20.44	22.36	21.1	22.39	0.001109	0.82	31.37	24.16	0.19
Reserve Rd	3	30.52	10 Year	37.79	20.44	22.59	21.31	22.65	0.001703	1.09	35.26	24.71	0.24
Reserve Rd	3	30.52	100 Year	55.8	20.44	22.85	21.56	22.95	0.002489	1.43	39.77	25.4	0.3
Reserve Rd	3	30.52	200 Year	92.82	20.44	23.28	21.98	23.48	0.003934	2.01	47.07	26.32	0.39
Reserve Rd	3	15.92	2 Year	25.11	20.88	22.26	21.88	22.35	0.007594	1.37	19.31	32.79	0.46
Reserve Rd	3	15.92	10 Year	37.79	20.88	22.45	22.08	22.59	0.009071	1.7	23.64	34.35	0.51
Reserve Rd	3	15.92	100 Year	55.8	20.88	22.67	22.28	22.88	0.010769	2.08	28.59	35.49	0.58
Reserve Rd	3	15.92	200 Year	92.82	20.88	23.01	22.64	23.37	0.013598	2.72	36.43	36.87	0.67
Reserve Rd	3	3.34	2 Year	25.11	20.75	22.17	21.86	22.25	0.008314	1.32	23.32	40.06	0.47
Reserve Rd	3	3.34	10 Year	37.79	20.75	22.37	22.03	22.47	0.008301	1.53	31.33	40.93	0.48
Reserve Rd	3	3.34	100 Year	55.8	20.75	22.6	22.22	22.73	0.0083	1.75	41.06	41.94	0.5
Reserve Rd	3	3.34	200 Year	92.82	20.75	23	22.49	23.18	0.008305	2.11	58.07	43.86	0.52
Baileys Rd	42	337.91	2 Year	1.16	27.34	27.64	27.58	27.67	0.022442	0.71	1.62	10.61	0.58
Baileys Rd	42	337.91	10 Year	1.92	27.34	27.7	27.64	27.74	0.021698	0.81	2.37	12.45	0.59
Baileys Rd	42	337.91	100 Year	2.78	27.34	27.75	27.69	27.8	0.022902	0.94	2.96	13.01	0.63
Baileys Rd	42	337.91	200 Year	4.96	27.34	27.87	27.77	27.92	0.022131	1	4.98	19.53	0.63
Baileys Rd	42	314.57	2 Year	1.16	26.59	26.82	26.81	26.86	0.060654	0.95	1.22	10.92	0.91
Baileys Rd	42	314.57	10 Year	1.92	26.59	26.86	26.86	26.92	0.064431	1.12	1.71	12.41	0.97
Baileys Rd	42	314.57	100 Year	2.78	26.59	26.9	26.89	26.98	0.059489	1.24	2.25	13.39	0.96
Baileys Rd	42	314.57	200 Year	4.96	26.59	26.97	26.97	27.09	0.063823	1.52	3.27	15.06	1.04
Baileys Rd	42	311.79*	2 Year	1.16	26.41	26.62	26.62	26.68	0.07175	1.07	1.09	9.29	1
Baileys Rd	42	311.79*	10 Year	1.92	26.41	26.67	26.67	26.75	0.068284	1.22	1.57	10.58	1.01
Baileys Rd	42	311.79*	100 Year	2.78	26.41	26.72	26.72	26.81	0.062531	1.32	2.11	11.85	1
Baileys Rd	42	311.79*	200 Year	4.96	26.41	26.83	26.81	26.93	0.0472	1.4	3.53	14.58	0.91
Baileys Rd	42	309.01	2 Year	1.16	26.23	26.5	26.43	26.52	0.01876	0.67	1.73	10.84	0.54
Baileys Rd	42	309.01	10 Year	1.92	26.23	26.56	26.48	26.59	0.018194	0.77	2.48	12.27	0.55
Baileys Rd	42	309.01	100 Year	2.78	26.23	26.62	26.52	26.66	0.01749	0.85	3.26	13.49	0.55
Baileys Rd	42	309.01	200 Year	4.96	26.23	26.83		26.86	0.007713	0.78	6.35	16.23	0.4

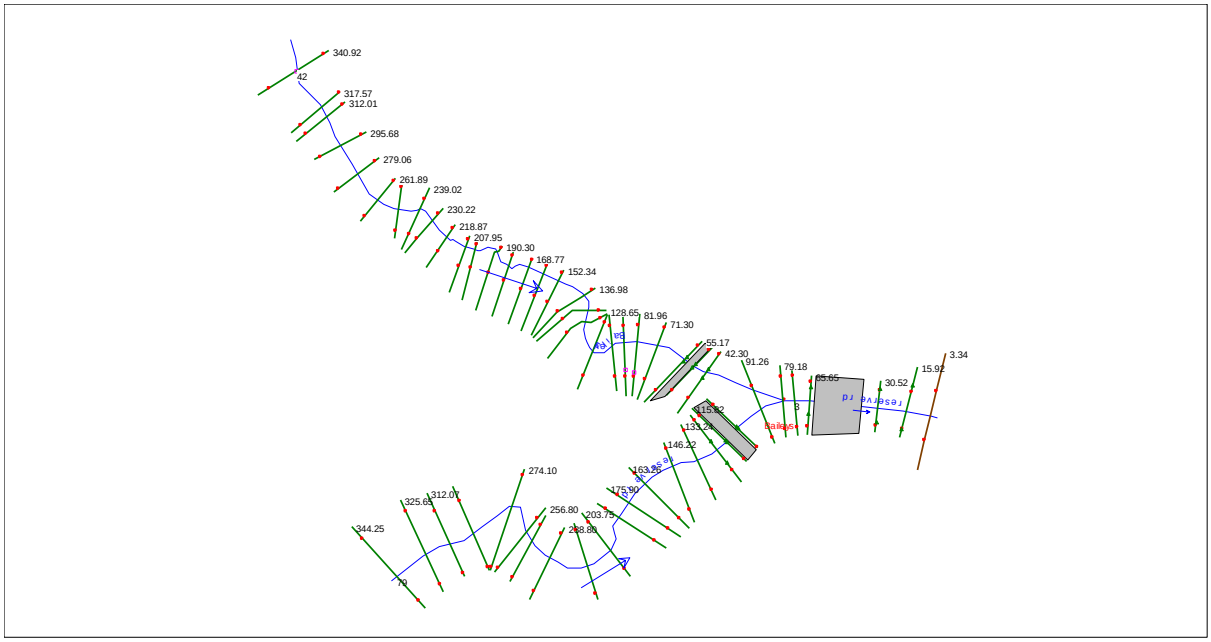
Baileys Rd	42	304.93*	2 Year	1.16	26.14	26.4		26.43	0.025217	0.78	1.49	9.29	0.62
Baileys Rd	42	304.93*	10 Year	1.92	26.14	26.47		26.51	0.023523	0.88	2.17	10.64	0.62
Baileys Rd	42	304.93*	100 Year	2.78	26.14	26.53		26.58	0.022721	0.97	2.86	11.84	0.63
Baileys Rd	42	304.93*	200 Year	4.96	26.14	26.81		26.83	0.006225	0.73	6.81	16.45	0.36
Baileys Rd	42	300.85*	2 Year	1.16	26.05	26.29		26.33	0.027373	0.82	1.4	8.54	0.65
Baileys Rd	42	300.85*	10 Year	1.92	26.05	26.36		26.4	0.02731	0.96	1.99	9.6	0.67
Baileys Rd	42	300.85*	100 Year	2.78	26.05	26.43		26.48	0.023224	1.01	2.74	10.79	0.64
Baileys Rd	42	300.85*	200 Year	4.96	26.05	26.79		26.81	0.004319	0.65	7.64	16.59	0.31
Baileys Rd	42	296.77*	2 Year	1.16	25.97	26.18		26.21	0.028901	0.83	1.39	8.63	0.66
Baileys Rd	42	296.77*	10 Year	1.92	25.97	26.24		26.29	0.02808	0.99	1.93	9.07	0.69
Baileys Rd	42	296.77*	100 Year	2.78	25.97	26.37		26.41	0.01385	0.87	3.21	10.84	0.51
Baileys Rd	42	296.77*	200 Year	4.96	25.97	26.78		26.79	0.00271	0.56	8.8	16.62	0.25
Baileys Rd	42	292.69	2 Year	1.16	25.88	26.12		26.14	0.012241	0.62	1.87	9.51	0.45
Baileys Rd	42	292.69	10 Year	1.92	25.88	26.14		26.18	0.023352	0.91	2.1	9.66	0.63
Baileys Rd	42	292.69	100 Year	2.78	25.88	26.34		26.37	0.006117	0.66	4.21	11.54	0.35
Baileys Rd	42	292.69	200 Year	4.96	25.88	26.77		26.78	0.001658	0.48	10.25	16.76	0.2
Baileys Rd	42	276.36	2 Year	1.16	25.53	25.81		25.84	0.028688	0.76	1.53	10.91	0.65
Baileys Rd	42	276.36	10 Year	1.92	25.53	25.95		25.97	0.008244	0.61	3.13	11.94	0.38
Baileys Rd	42	276.36	100 Year	2.78	25.53	26.32		26.33	0.000965	0.33	8.4	16.17	0.15
Baileys Rd	42	276.36	200 Year	4.96	25.53	26.77		26.77	0.000452	0.3	16.64	21.29	0.11
Baileys Rd	42	262.66	2 Year	1.16	25.25	25.61		25.63	0.009429	0.69	1.68	5.94	0.41
Baileys Rd	42	262.66	10 Year	1.92	25.25	25.89		25.91	0.002796	0.54	3.58	7.33	0.24
Baileys Rd	42	262.66	100 Year	2.78	25.25	26.31		26.32	0.000853	0.39	7.06	9.26	0.14
Baileys Rd	42	262.66	200 Year	4.96	25.25	26.75		26.76	0.000725	0.42	11.85	12.87	0.14
Baileys Rd	42	250.61	2 Year	1.16	24.99	25.58	25.2	25.59	0.001432	0.36	3.26	7.5	0.17
Baileys Rd	42	250.61	10 Year	1.92	24.99	25.88	25.28	25.89	0.000798	0.33	5.8	9.56	0.14
Baileys Rd	42	250.61	100 Year	2.78	24.99	26.31	25.34	26.31	0.000329	0.26	10.68	13.41	0.09
Baileys Rd	42	250.61	200 Year	4.96	24.99	26.75	25.49	26.75	0.000276	0.29	17.48	17.41	0.09
Baileys Rd	42	242.22	2 Year	1.16	24.82	25.56	25.06	25.58	0.001313	0.49	2.37	4.99	0.18
Baileys Rd	42	242.22	10 Year	1.92	24.82	25.86	25.15	25.88	0.001179	0.58	3.32	5.73	0.18
Baileys Rd	42	242.22	100 Year	2.78	24.82	26.29	25.25	26.3	0.000787	0.59	4.68	7.59	0.16
Baileys Rd	42	242.22	200 Year	4.96	24.82	26.74	25.45	26.75	0.00061	0.37	13.24	17.53	0.12
Baileys Rd	42	240.72		Culvert									
Baileys Rd	42	232.07	2 Year	1.16	24.65	25.47	25.03	25.51	0.003636	0.88	1.31	5.18	0.31
Baileys Rd	42	232.07	10 Year	1.92	24.65	25.66	25.18	25.73	0.005	1.19	1.62	5.5	0.38
Baileys Rd	42	232.07	100 Year	2.78	24.65	25.86	25.33	25.96	0.00581	1.44	1.93	5.84	0.42
Baileys Rd	42	232.07	200 Year	4.96	24.65	26.05	25.64	26.3	0.011182	2.21	2.25	6.92	0.6
Baileys Rd	42	222.42	2 Year	4.3	24.71	25.36		25.43	0.011746	1.11	3.86	7.67	0.5
Baileys Rd	42	222.42	10 Year	7.23	24.71	25.53		25.62	0.014192	1.4	5.17	8.36	0.57
Baileys Rd	42	222.42	100 Year	11.16	24.71	25.69		25.83	0.016988	1.7	6.56	8.99	0.64
Baileys Rd	42	222.42	200 Year	18.1	24.71	25.9		26.11	0.022215	2.06	9.06	13.88	0.74
Baileys Rd	42	209.15	2 Year	4.3	24.61	24.99	24.99	25.13	0.056399	1.63	2.64	9.66	1
Baileys Rd	42	209.15	10 Year	7.23	24.61	25.11	25.11	25.29	0.052845	1.88	3.85	10.89	1.01
Baileys Rd	42	209.15	100 Year	11.16	24.61	25.24	25.24	25.46	0.049342	2.08	5.36	12.32	1.01
Baileys Rd	42	209.15	200 Year	18.1	24.61	25.42	25.42	25.71	0.04233	2.39	7.74	14.13	0.98
Baileys Rd	42	201.68	2 Year	4.3	24.21	24.67	24.6	24.74	0.033306	1.13	3.94	18.1	0.76
Baileys Rd	42	201.68	10 Year	7.23	24.21	24.74	24.71	24.84	0.04172	1.48	5.07	18.3	0.88
Baileys Rd	42	201.68	100 Year	11.16	24.21	24.75	24.8	24.99	0.087536	2.2	5.28	18.34	1.28
Baileys Rd	42	201.68	200 Year	18.1	24.21	24.83	24.93	25.22	0.104503	2.8	6.75	18.54	1.46
Baileys Rd	42	191.59	2 Year	4.3	23.73	24.18	24.18	24.29	0.059888	1.49	2.88	12.9	1.01
Baileys Rd	42	191.59	10 Year	7.23	23.73	24.3	24.28	24.43	0.041699	1.59	4.54	13.99	0.89
Baileys Rd	42	191.59	100 Year	11.16	23.73	24.54	24.38	24.64	0.016508	1.39	8.04	15.13	0.61
Baileys Rd	42	191.59	200 Year	18.1	23.73	24.79	24.53	24.9	0.013112	1.52	11.91	16.36	0.57
Baileys Rd	42	175.92	2 Year	4.3	23.3	24.08	23.67	24.09	0.001888	0.49	8.84	15.77	0.21

Baileys Rd	42	175.92	10 Year	7.23	23.3	24.29		24.31	0.001967	0.59	12.33	17.06	0.22
Baileys Rd	42	175.92	100 Year	11.16	23.3	24.52		24.55	0.002002	0.68	16.45	18.43	0.23
Baileys Rd	42	175.92	200 Year	18.1	23.3	24.76		24.8	0.002534	0.86	21.05	19.68	0.27
Baileys Rd	42	166.66	2 Year	4.3	23.31	24.05		24.07	0.00312	0.61	7.04	12.89	0.26
Baileys Rd	42	166.66	10 Year	7.23	23.31	24.26		24.28	0.003234	0.74	9.83	13.94	0.28
Baileys Rd	42	166.66	100 Year	11.16	23.31	24.49		24.52	0.003286	0.85	13.14	15.09	0.29
Baileys Rd	42	166.66	200 Year	18.1	23.31	24.71		24.77	0.004337	1.09	16.66	16.26	0.34
Baileys Rd	42	160.06	2 Year	4.3	23.31	24.02		24.04	0.004138	0.68	6.3	12.09	0.3
Baileys Rd	42	160.06	10 Year	7.23	23.31	24.23		24.26	0.004181	0.81	8.91	13.22	0.32
Baileys Rd	42	160.06	100 Year	11.16	23.31	24.45		24.5	0.004146	0.93	12.04	14.46	0.32
Baileys Rd	42	160.06	200 Year	18.1	23.31	24.66		24.74	0.005559	1.19	15.22	15.62	0.38
Baileys Rd	42	150.26	2 Year	4.3	23.16	23.92		23.97	0.013965	1.05	4.08	10.08	0.53
Baileys Rd	42	150.26	10 Year	7.23	23.16	24.13		24.19	0.010694	1.13	6.4	11.67	0.49
Baileys Rd	42	150.26	100 Year	11.16	23.16	24.36		24.44	0.008759	1.2	9.34	13.41	0.46
Baileys Rd	42	150.26	200 Year	18.1	23.16	24.53		24.65	0.012308	1.55	11.68	14.65	0.55
Baileys Rd	42	136.27	2 Year	4.3	22.98	23.86		23.88	0.003005	0.6	7.2	13.33	0.26
Baileys Rd	42	136.27	10 Year	7.23	22.98	24.09		24.11	0.002998	0.7	10.34	15.06	0.27
Baileys Rd	42	136.27	100 Year	11.16	22.98	24.33		24.36	0.002925	0.79	14.2	16.94	0.27
Baileys Rd	42	136.27	200 Year	18.1	22.98	24.47		24.53	0.004849	1.08	16.74	18.07	0.36
Baileys Rd	42	127.75	2 Year	4.69	22.88	23.84		23.86	0.002626	0.58	8.13	14.46	0.25
Baileys Rd	42	127.75	10 Year	7.92	22.88	24.06		24.09	0.002799	0.68	11.59	16.73	0.26
Baileys Rd	42	127.75	100 Year	12.22	22.88	24.3		24.33	0.002699	0.77	15.85	18.55	0.27
Baileys Rd	42	127.75	200 Year	19.69	22.88	24.43		24.49	0.004671	1.08	18.29	19.57	0.36
Baileys Rd	42	115.98	2 Year	4.69	22.92	23.8		23.82	0.003918	0.66	7.08	13.84	0.3
Baileys Rd	42	115.98	10 Year	7.92	22.92	24.02		24.05	0.003772	0.77	10.32	15.72	0.3
Baileys Rd	42	115.98	100 Year	12.22	22.92	24.26		24.3	0.003522	0.85	14.4	17.88	0.3
Baileys Rd	42	115.98	200 Year	19.69	22.92	24.35		24.42	0.006977	1.23	15.96	18.86	0.43
Baileys Rd	42	107.75	2 Year	4.69	22.93	23.78		23.79	0.00275	0.55	8.52	16.79	0.25
Baileys Rd	42	107.75	10 Year	7.92	22.93	24		24.02	0.002671	0.63	12.6	19.94	0.25
Baileys Rd	42	107.75	100 Year	12.22	22.93	24.25		24.27	0.002181	0.69	17.92	22.51	0.24
Baileys Rd	42	107.75	200 Year	19.69	22.93	24.32		24.37	0.004371	1.02	19.52	23.12	0.34
Baileys Rd	42	95.16	2 Year	4.69	22.95	23.75		23.76	0.001559	0.48	9.87	15.74	0.19
Baileys Rd	42	95.16	10 Year	7.92	22.95	23.97		23.99	0.001879	0.58	13.77	19.82	0.22
Baileys Rd	42	95.16	100 Year	12.22	22.95	24.22		24.24	0.001933	0.65	19.34	25.07	0.22
Baileys Rd	42	95.16	200 Year	19.69	22.95	24.26		24.31	0.00449	0.99	20.38	26.15	0.34
Baileys Rd	42	88.63	2 Year	4.69	23.02	23.74	23.29	23.75	0.002093	0.51	9.32	17.83	0.22
Baileys Rd	42	88.63	10 Year	7.92	23.02	23.96	23.4	23.98	0.00211	0.59	13.68	22.01	0.23
Baileys Rd	42	88.63	100 Year	12.22	23.02	24.21	23.52	24.23	0.001915	0.65	19.74	25.79	0.23
Baileys Rd	42	88.63	200 Year	19.69	23.02	24.23	23.71	24.28	0.004614	1.02	20.3	26.08	0.35
Baileys Rd	42	81.96	2 Year	4.69	22.98	23.73	23.22	23.74	0.001192	0.4	11.69	20.14	0.17
Baileys Rd	42	81.96	10 Year	7.92	22.98	23.95	23.32	23.96	0.001292	0.49	16.46	23.44	0.18
Baileys Rd	42	81.96	100 Year	12.22	22.98	24.21	23.42	24.22	0.001287	0.53	24.41	35.77	0.18
Baileys Rd	42	81.96	200 Year	19.69	22.98	24.22	23.59	24.25	0.003168	0.85	24.87	35.9	0.29
Baileys Rd	42	71.3	2 Year	4.69	22.94	23.73		23.73	0.000659	0.32	14.88	23.13	0.13
Baileys Rd	42	71.3	10 Year	7.92	22.94	23.94		23.95	0.000823	0.38	21.16	35.09	0.14
Baileys Rd	42	71.3	100 Year	12.22	22.94	24.2		24.21	0.000692	0.43	30.42	37.19	0.14
Baileys Rd	42	71.3	200 Year	19.69	22.94	24.2		24.23	0.001779	0.69	30.51	37.21	0.22
Baileys Rd	42	55.17	2 Year	4.69	22.16	23.62	22.86	23.7	0.003409	1.24	3.79	9.42	0.33
Baileys Rd	42	55.17	10 Year	7.92	22.16	23.92	23.14	23.93	0.00221	0.51	15.8	30.65	0.22
Baileys Rd	42	55.17	100 Year	12.22	22.16	24.18	23.48	24.19	0.001454	0.52	24.26	34.14	0.19
Baileys Rd	42	55.17	200 Year	19.69	22.16	24.14	23.73	24.18	0.00439	0.88	23.03	33.64	0.33
Baileys Rd	42	53.65		Culvert									
Baileys Rd	42	49.39	2 Year	4.69	22.14	23.51	22.86	23.61	0.00462	1.39	3.37	15.05	0.38
Baileys Rd	42	49.39	10 Year	7.92	22.14	23.7	23.16	23.91	0.008516	2.06	3.84	23.97	0.53
Baileys Rd	42	49.39	100 Year	12.22	22.14	24.17	23.5	24.18	0.002648	0.63	20.48	29.39	0.24
Baileys Rd	42	49.39	200 Year	19.69	22.14	24.07	23.79	24.14	0.010293	1.17	17.81	28.18	0.46
Baileys Rd	42	42.3	2 Year	4.69	22.83	23.3	23.3	23.52	0.045931	2.05	2.29	22.03	0.99
Baileys Rd	42	42.3	10 Year	7.92	22.83	23.48	23.48	23.79	0.042171	2.46	3.22	24.81	1.01
Baileys Rd	42	42.3	100 Year	12.22	22.83	23.69	23.69	24.1	0.03769	2.83	4.32	27.32	1
Baileys Rd	42	42.3	200 Year	19.69	22.83	24.06	23.71	24.09	0.002689	0.82	26.69	32.9	0.27

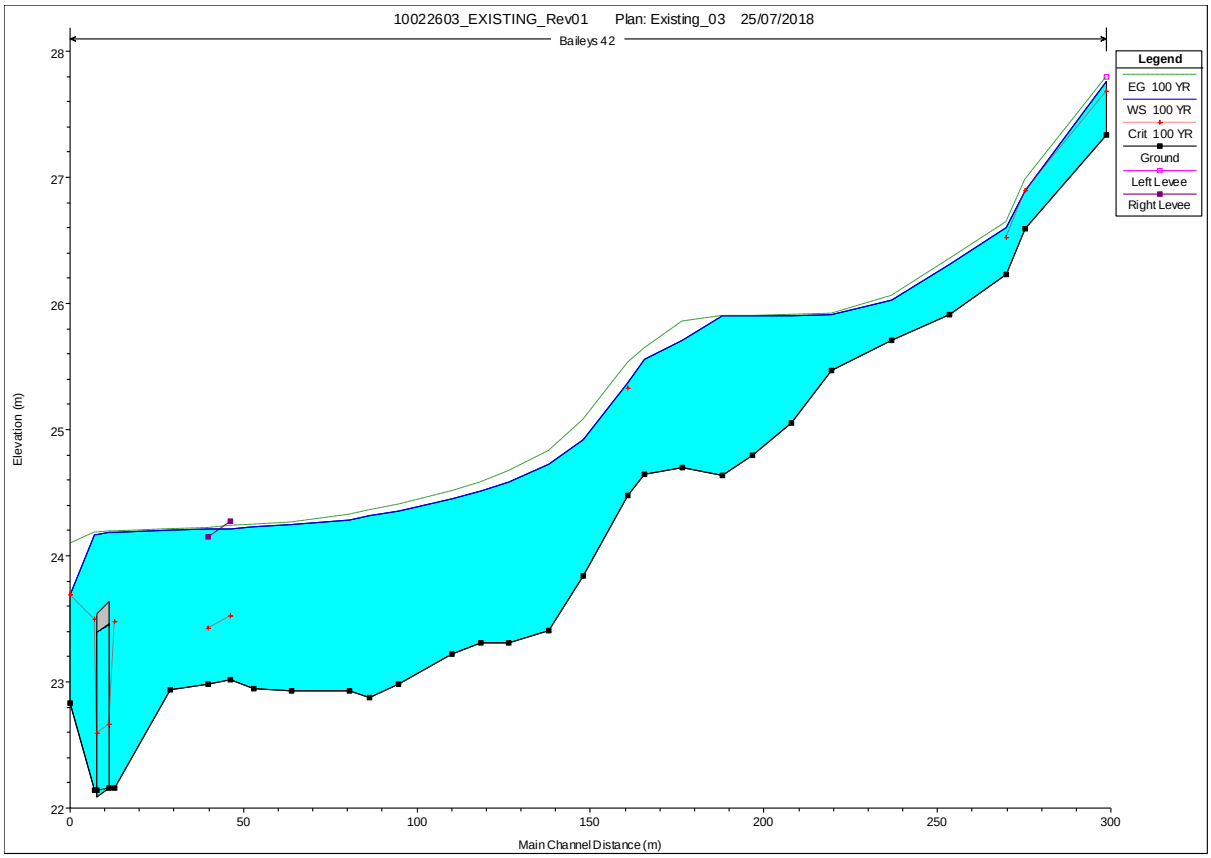
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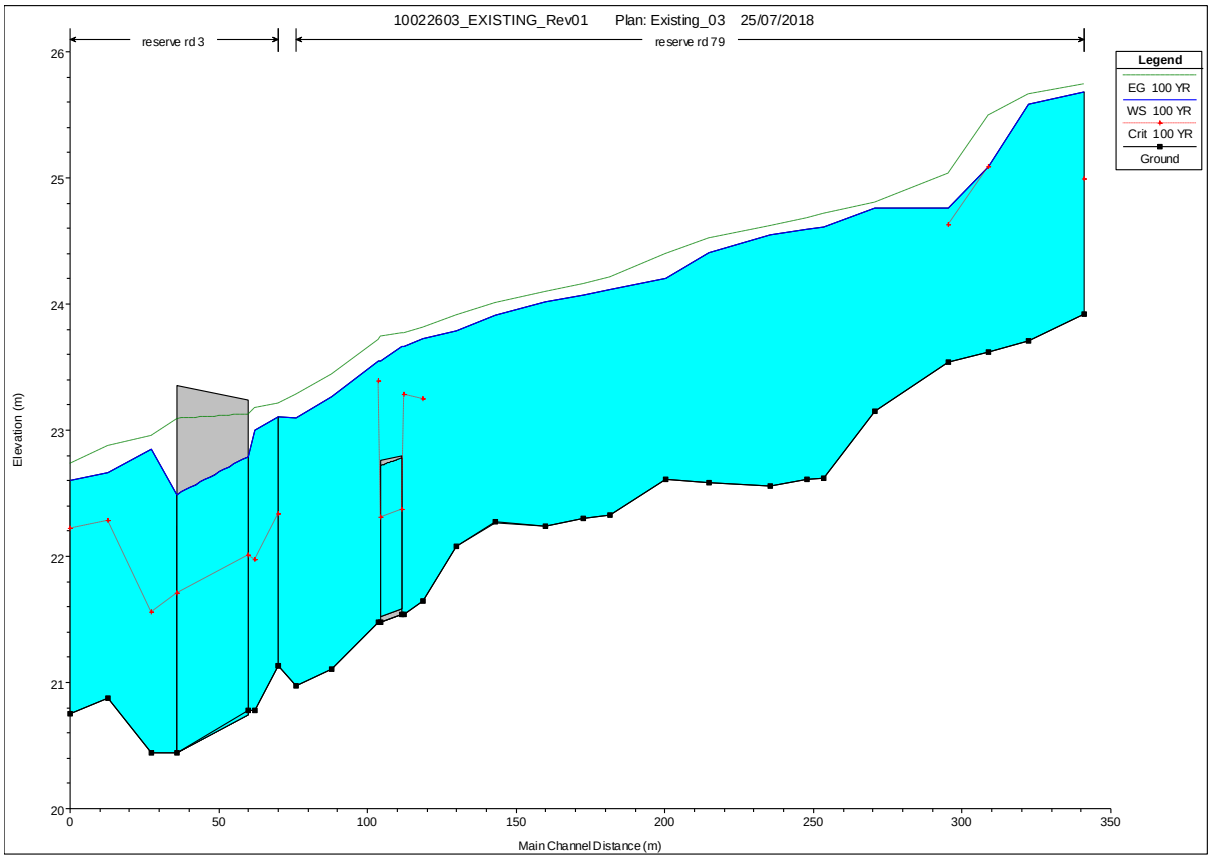


PLAN VIEW



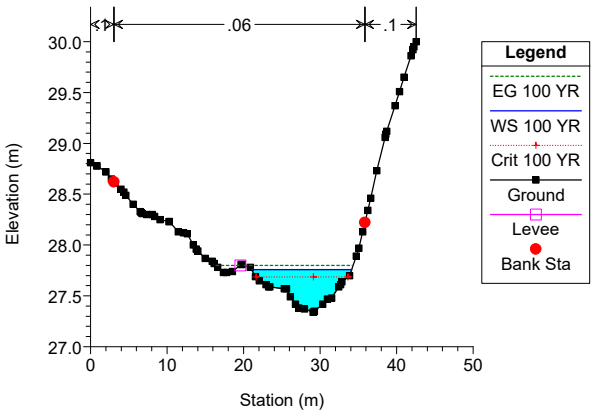
LONG SECTIONS



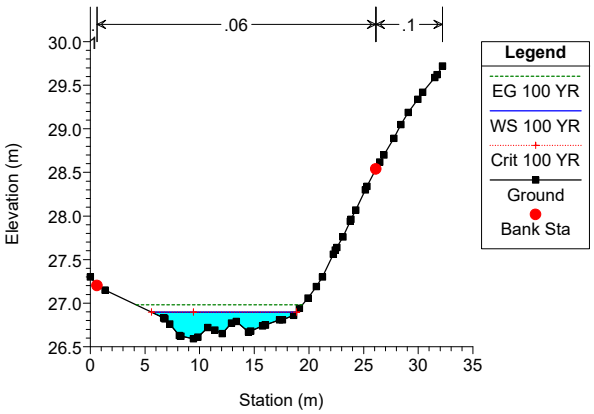


CROSS SECTIONS

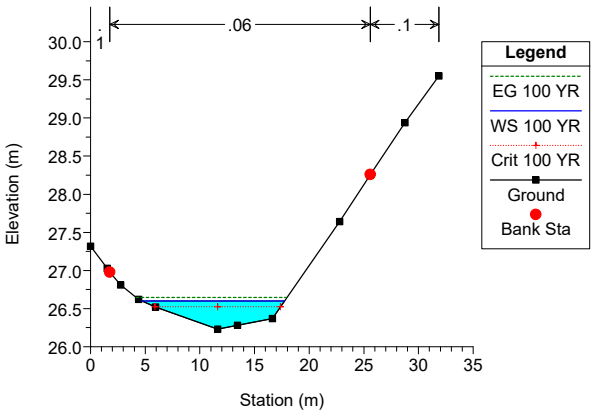
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



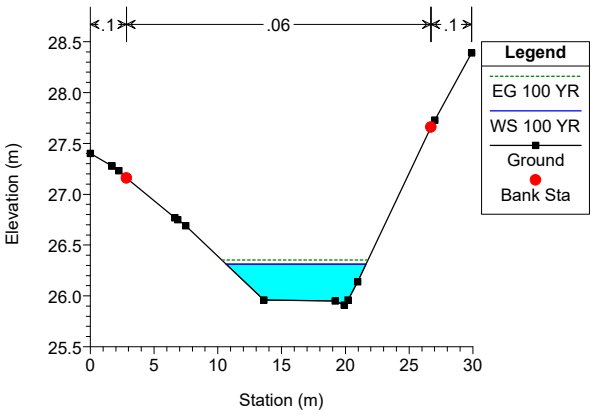
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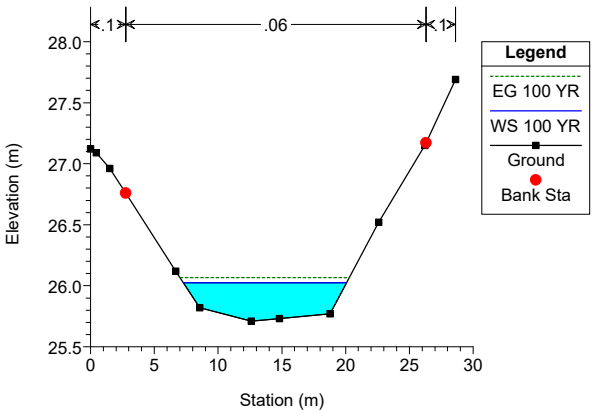
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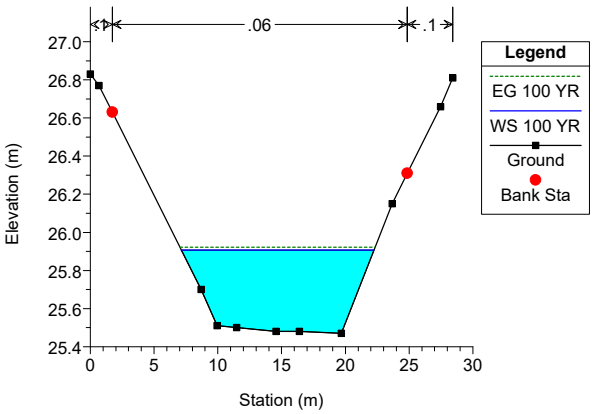
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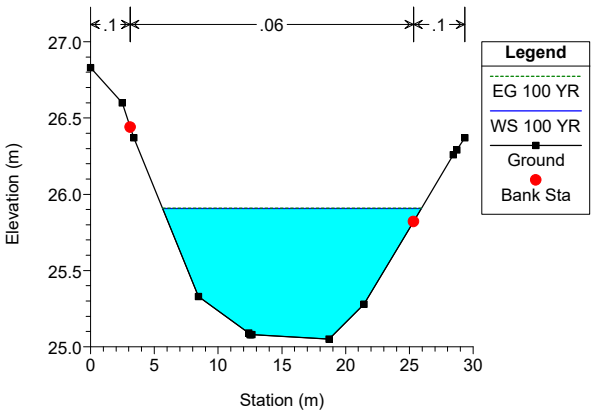
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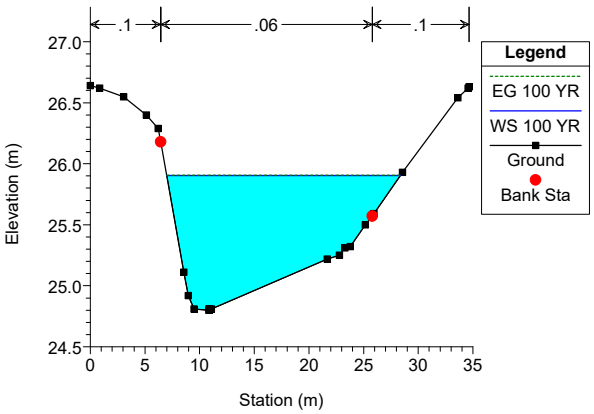
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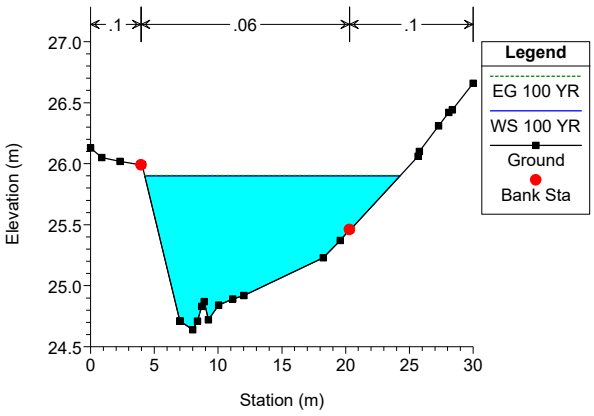
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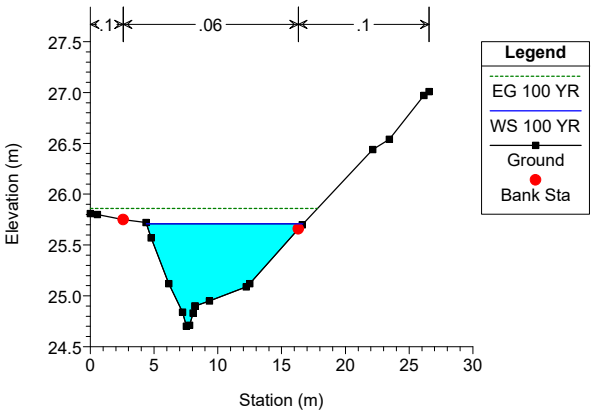
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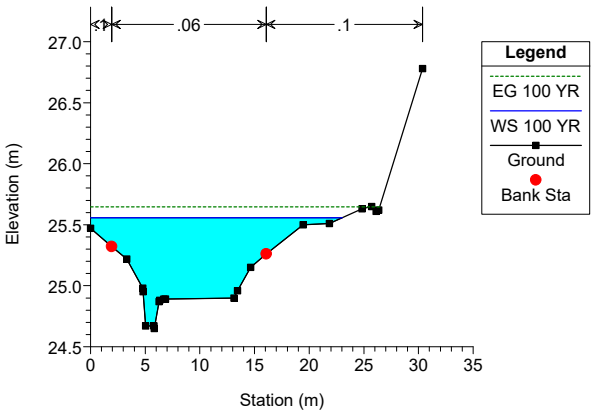
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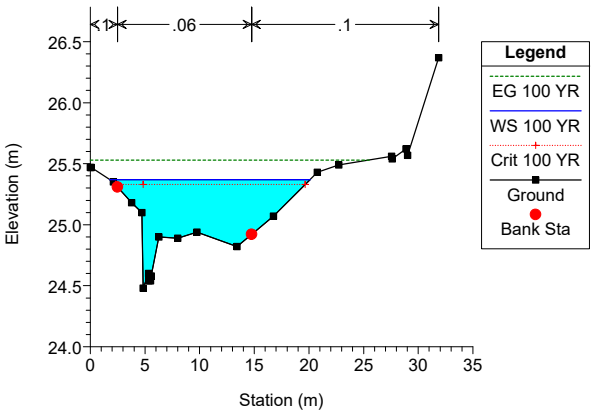
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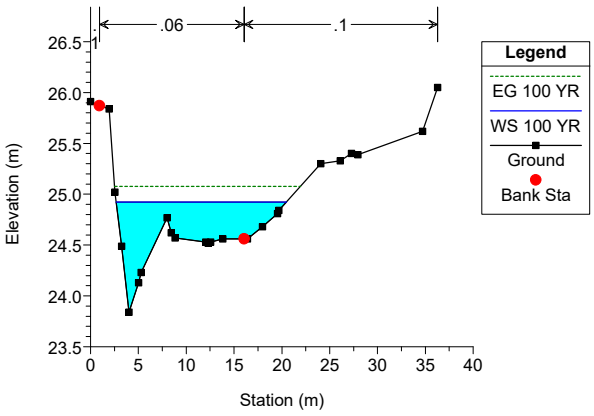
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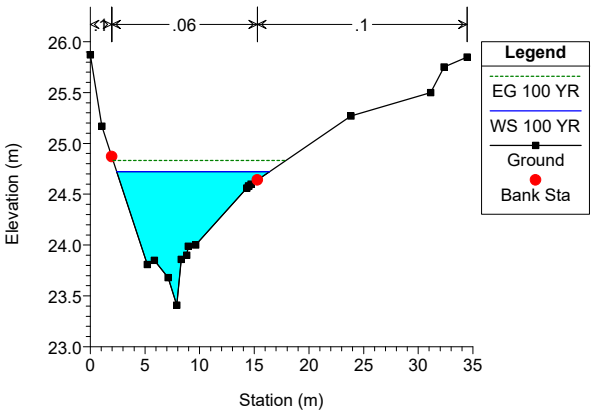
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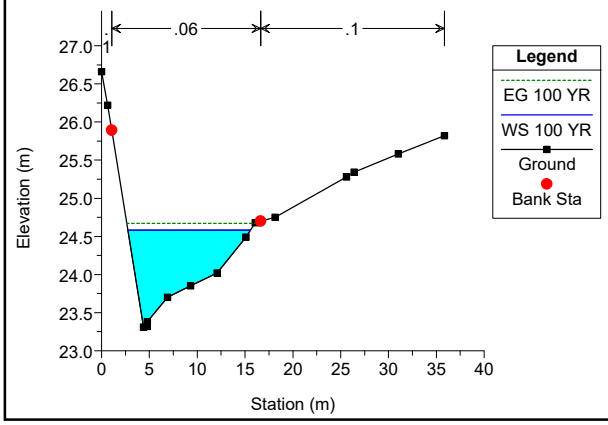
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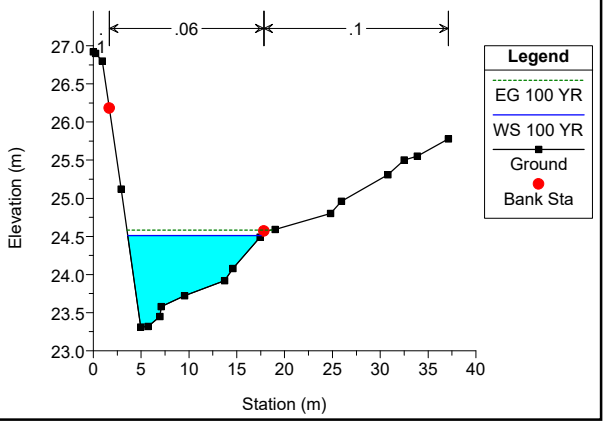
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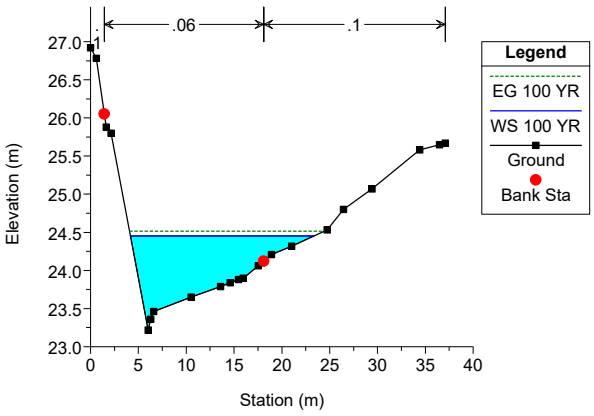
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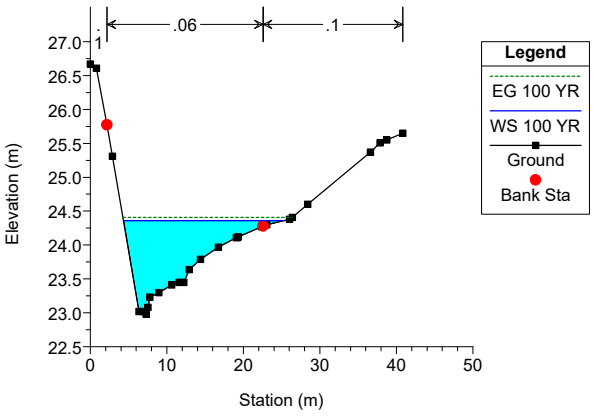
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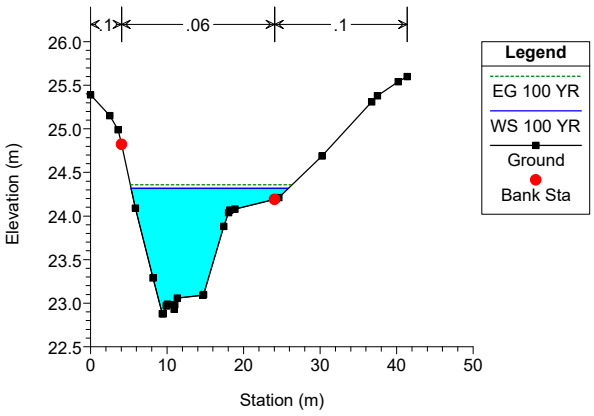
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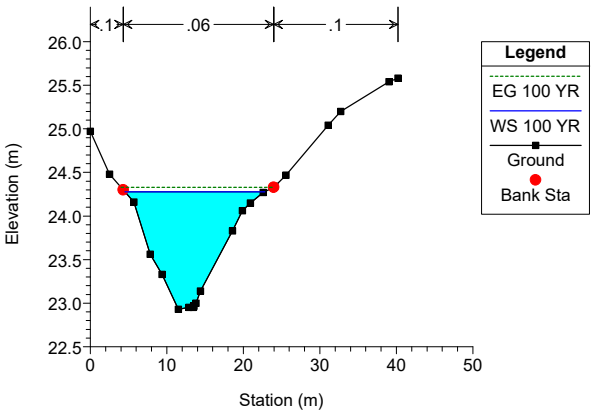
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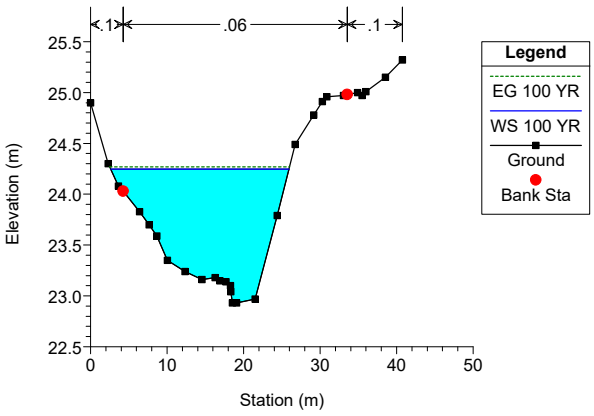
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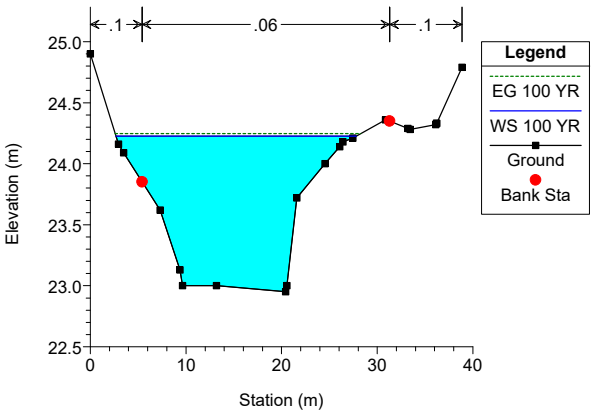
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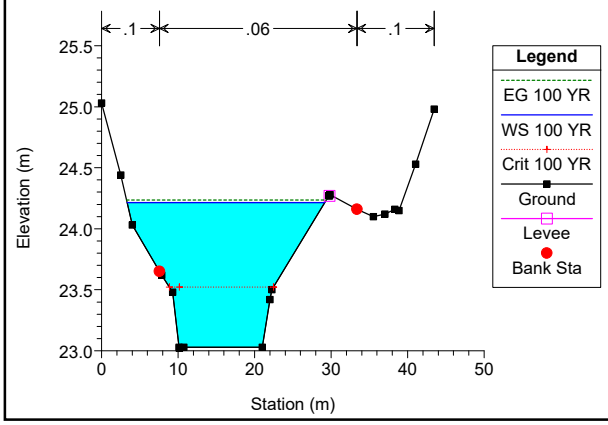
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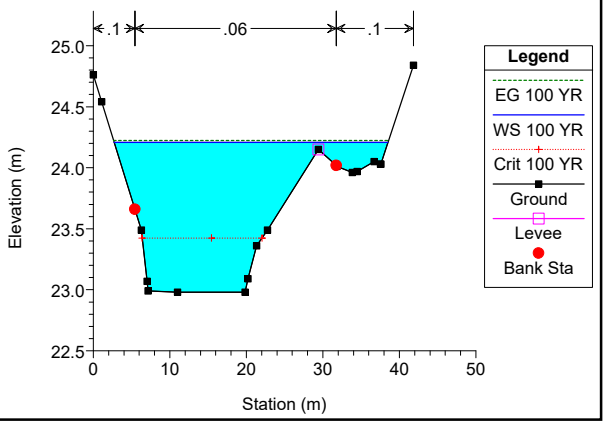
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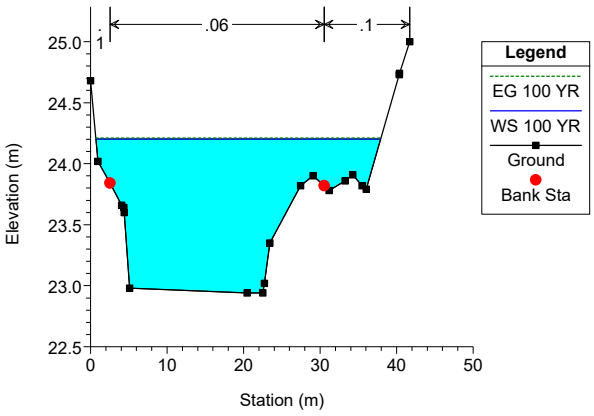
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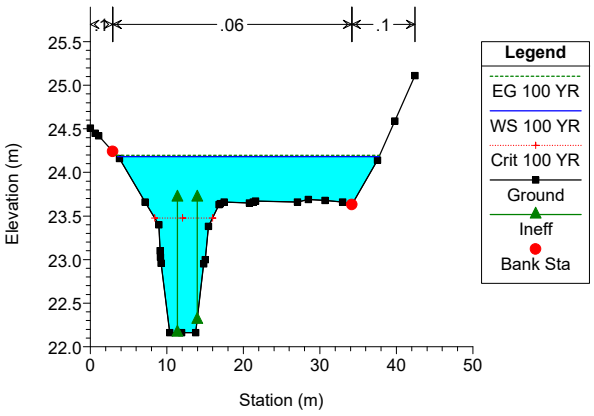
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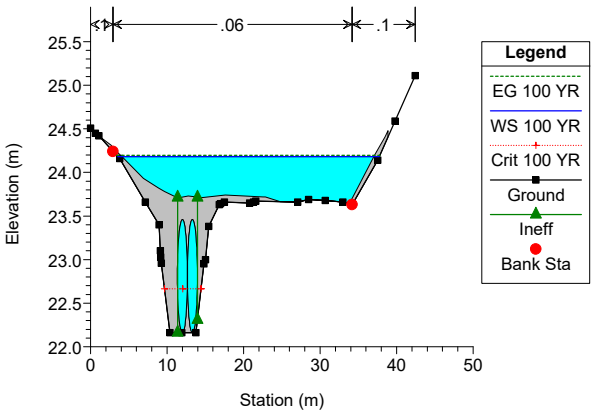
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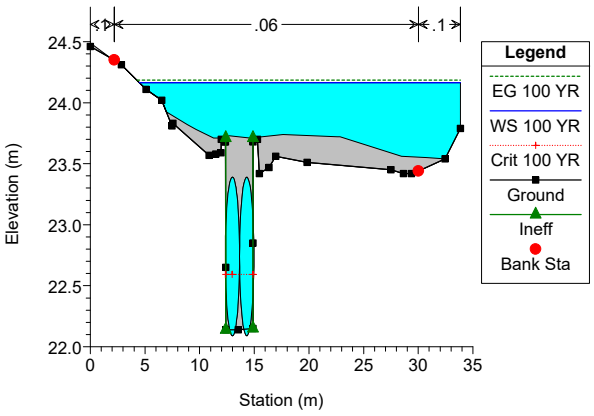
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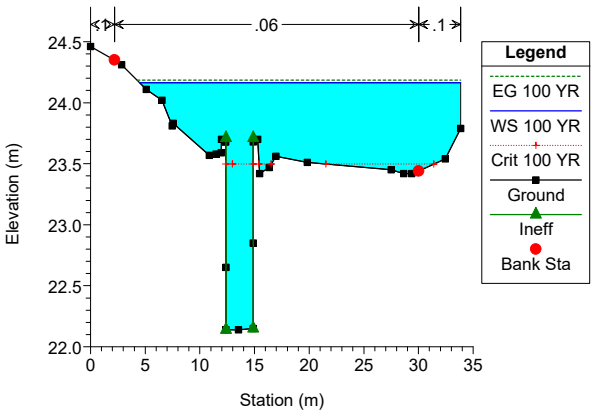
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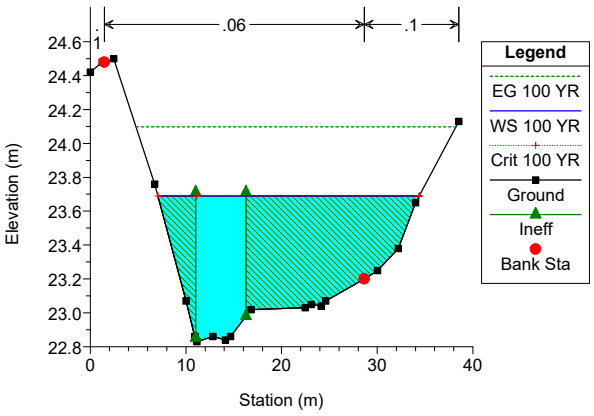
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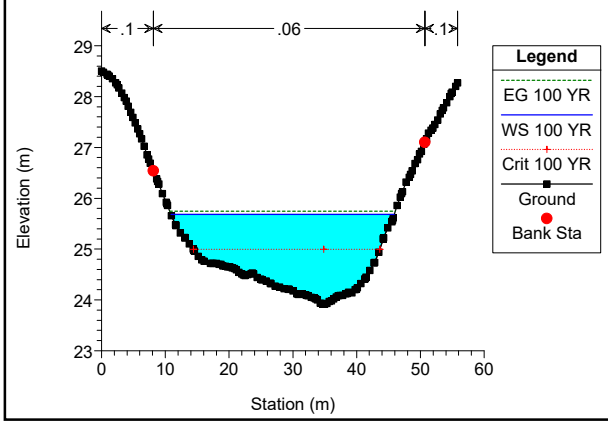
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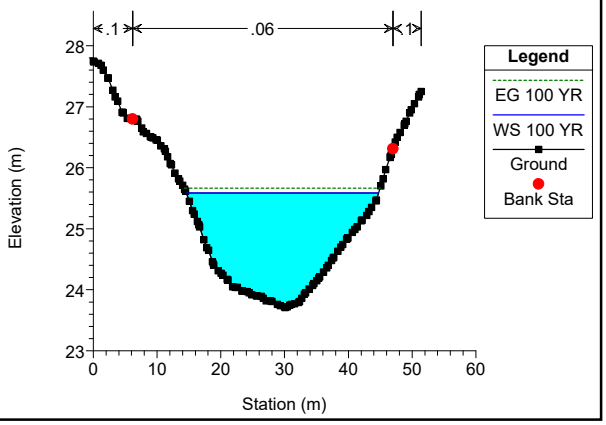
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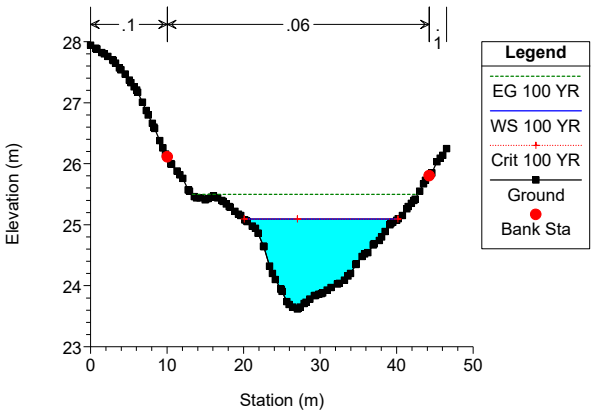
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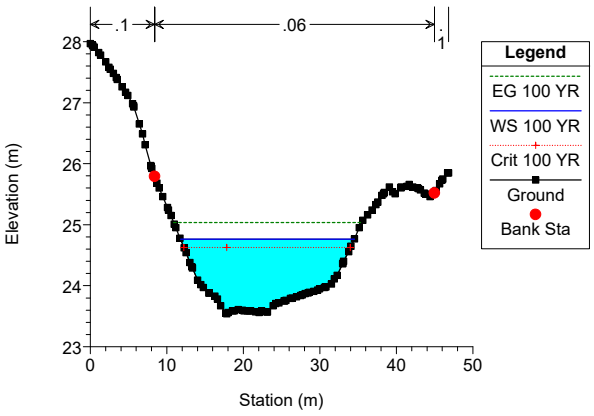
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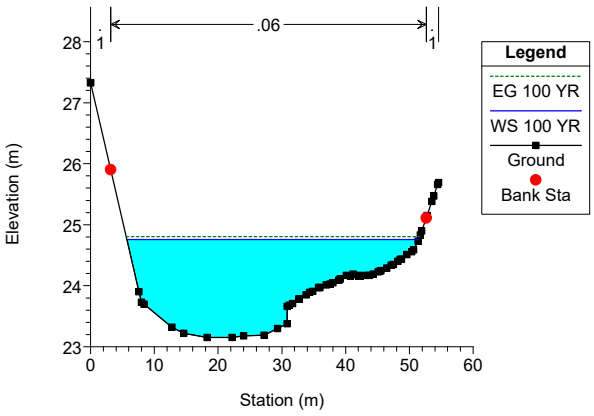
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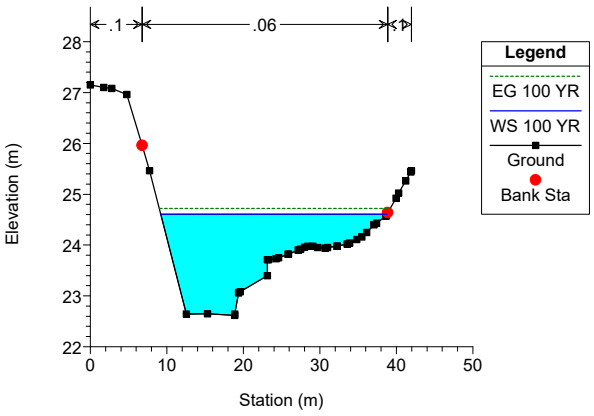
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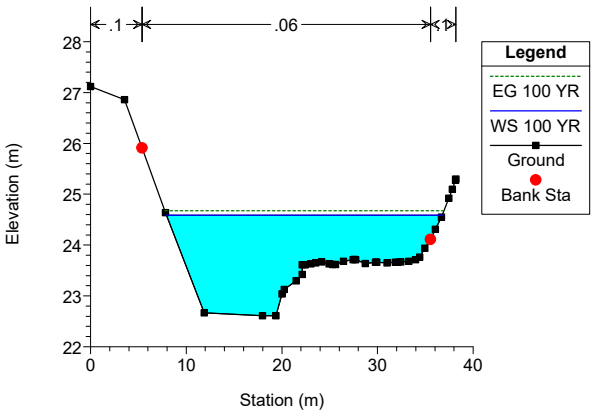
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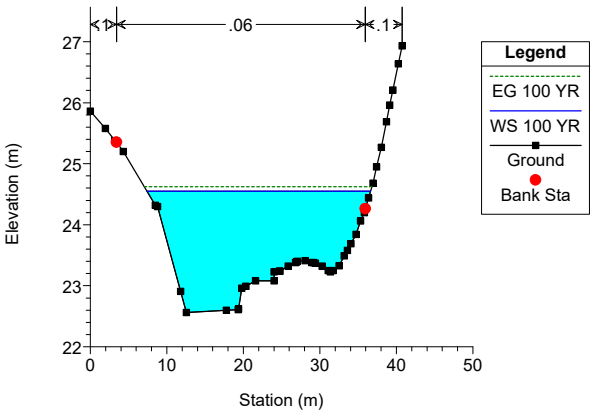
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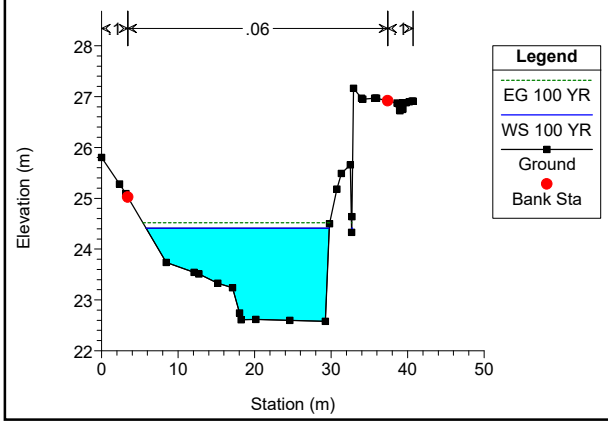
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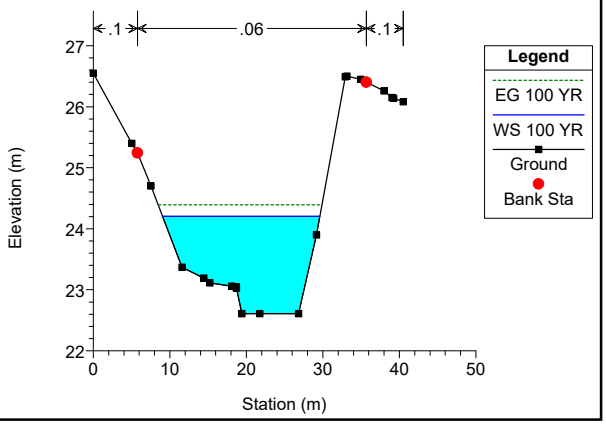
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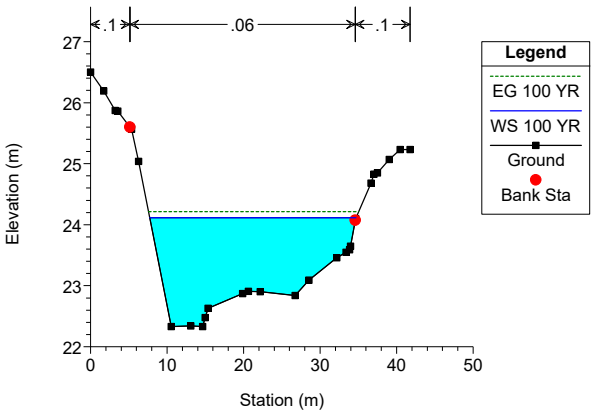
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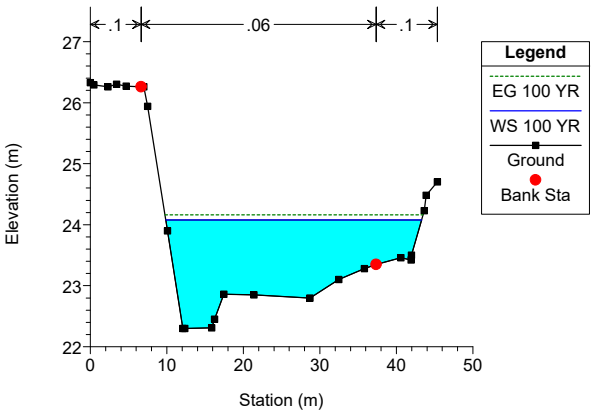
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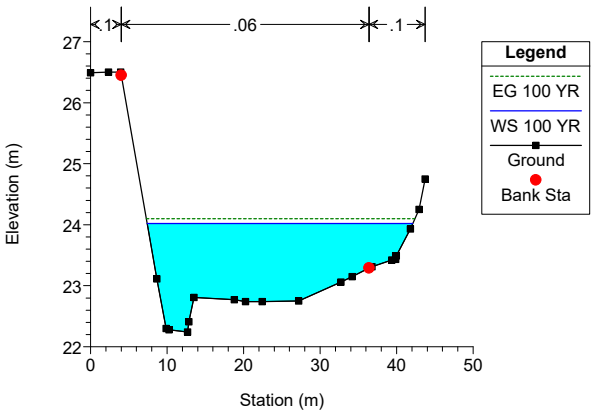
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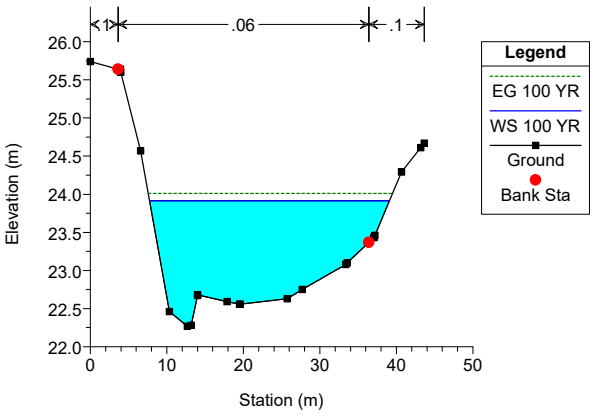
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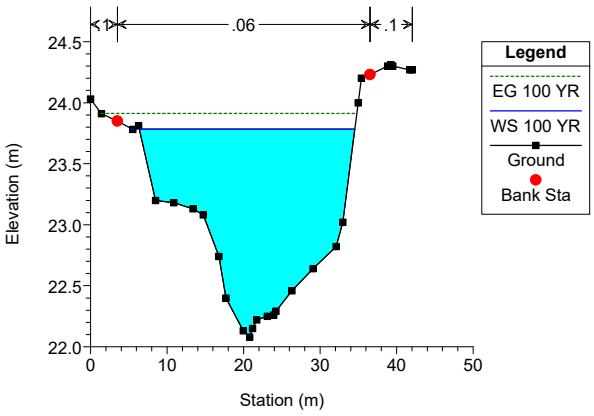
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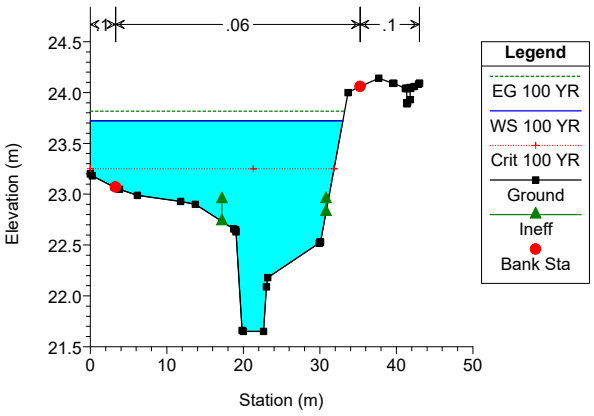
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



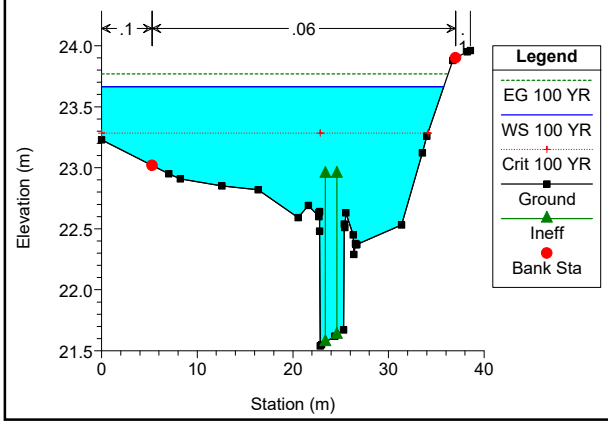
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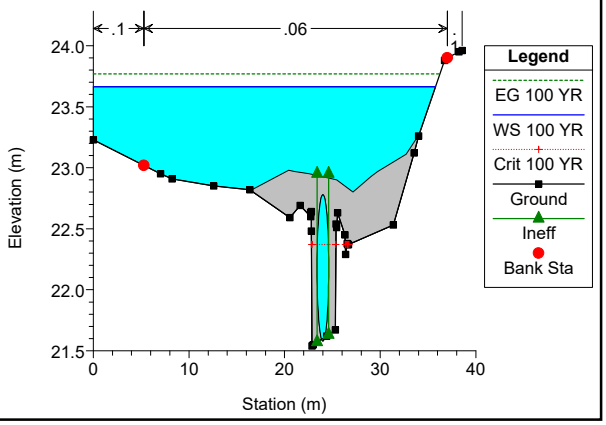
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



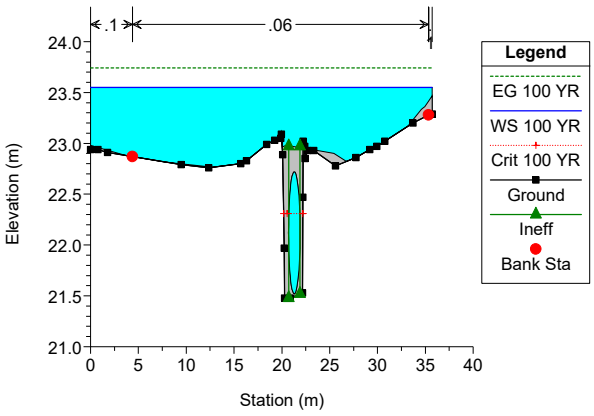
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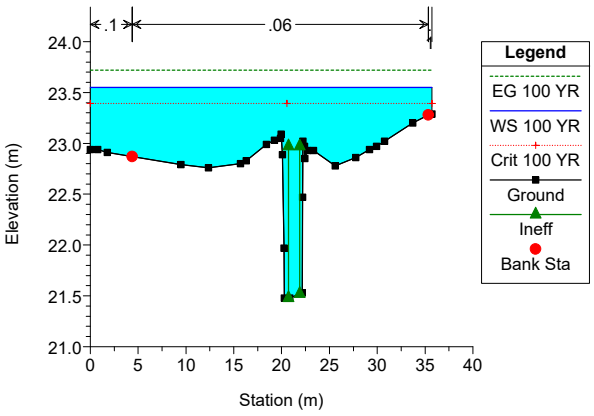
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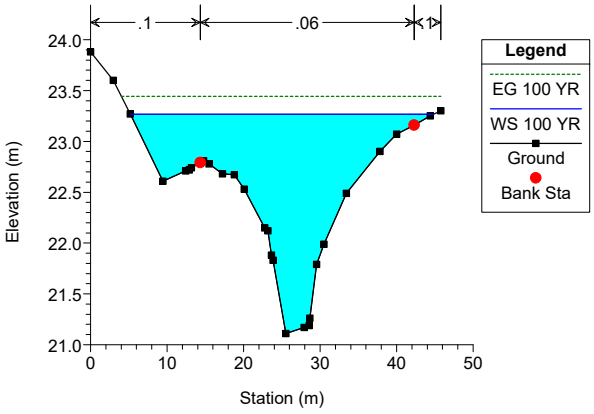
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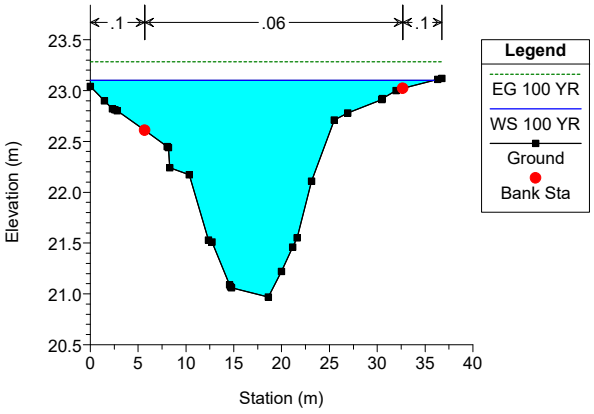
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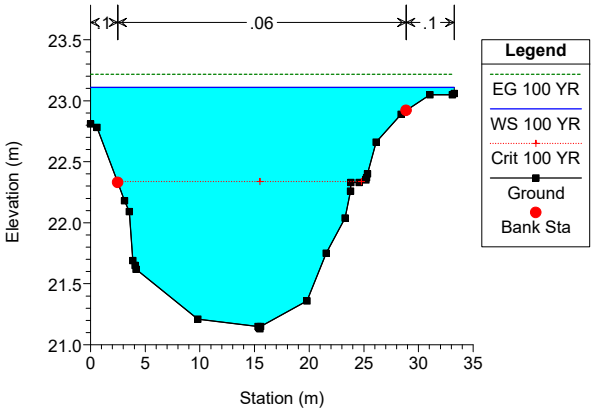
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



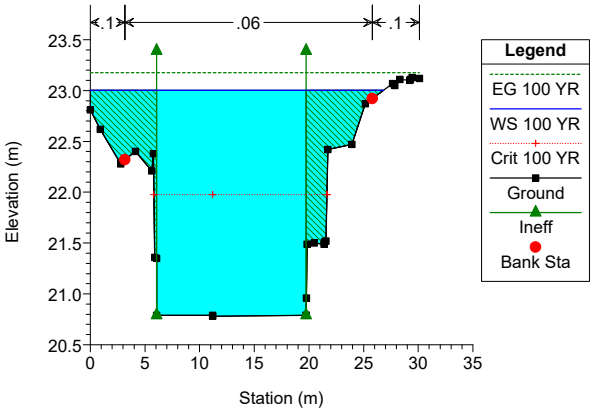
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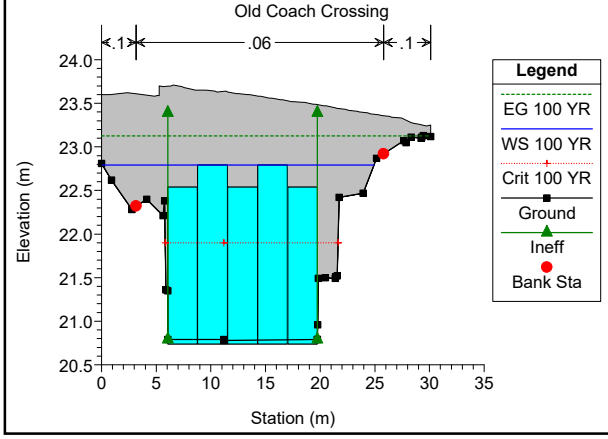


10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



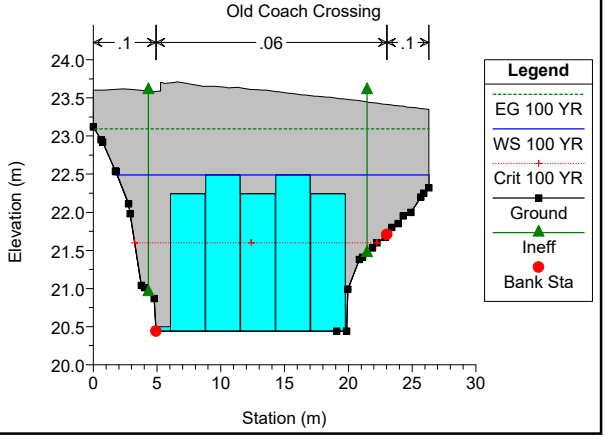
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018

Old Coach Crossing

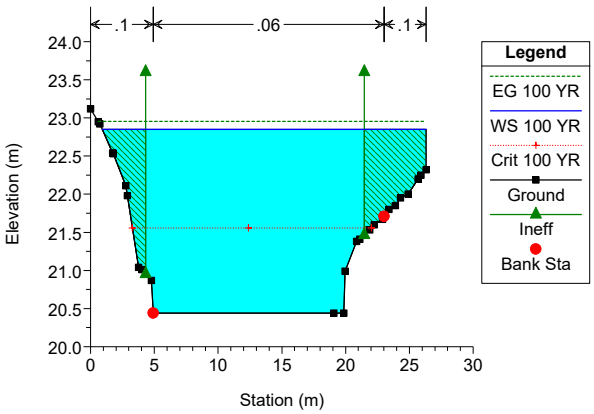


10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018

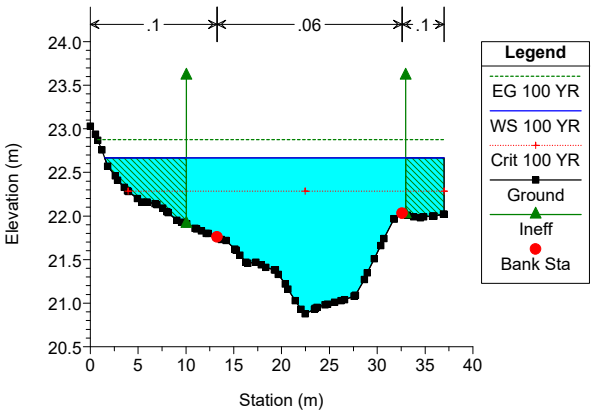
Old Coach Crossing



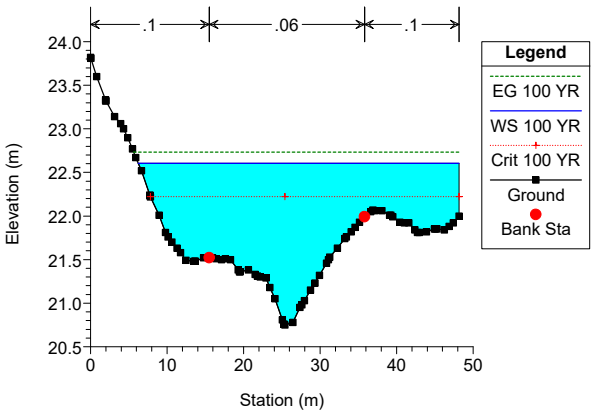
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



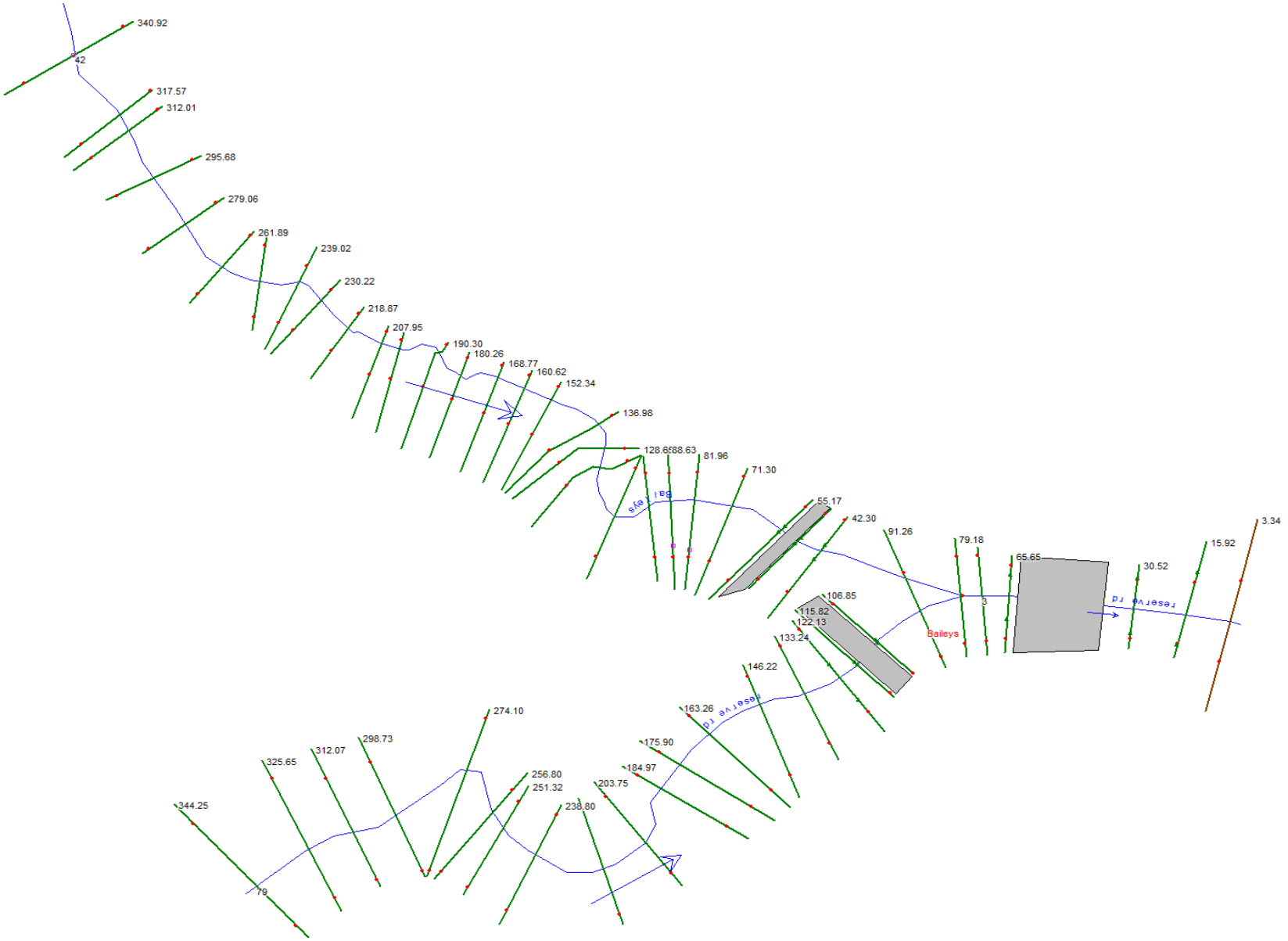
RESULTS

River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
reserve rd	79	344.25	2 YR	18.99	23.92	25.08	24.68	25.13	0.004906	0.91	20.83	30	0.35
reserve rd	79	344.25	10 YR	30.46	23.92	25.38	24.84	25.43	0.004174	1.01	30.07	32.7	0.34
reserve rd	79	344.25	100 YR	45.38	23.92	25.68	24.99	25.74	0.003837	1.13	40.29	35.02	0.34
reserve rd	79	344.25	200 YR	65.62	23.92	25.99	25.17	26.07	0.003844	1.28	51.34	36.87	0.35
reserve rd	79	325.65	2 YR	18.99	23.71	25		25.04	0.004209	0.95	20.05	24.28	0.33
reserve rd	79	325.65	10 YR	30.46	23.71	25.29		25.35	0.004422	1.1	27.65	27.65	0.35
reserve rd	79	325.65	100 YR	45.38	23.71	25.59		25.67	0.004463	1.25	36.29	30.16	0.36
reserve rd	79	325.65	200 YR	65.62	23.71	25.88		25.99	0.004856	1.44	45.59	32.63	0.39
reserve rd	79	312.07	2 YR	18.99	23.62	24.69	24.59	24.91	0.028176	2.04	9.3	14.68	0.82
reserve rd	79	312.07	10 YR	30.46	23.62	24.87	24.83	25.19	0.034901	2.5	12.16	16.6	0.93
reserve rd	79	312.07	100 YR	45.38	23.62	25.09	25.09	25.5	0.03932	2.82	16.08	20.08	1.01
reserve rd	79	312.07	200 YR	65.62	23.62	25.36	25.36	25.81	0.037435	2.98	22.01	24.41	1
reserve rd	79	298.73	2 YR	18.99	23.54	24.31		24.5	0.032236	1.9	9.97	19.53	0.85
reserve rd	79	298.73	10 YR	30.46	23.54	24.53		24.76	0.027444	2.12	14.35	21.09	0.82
reserve rd	79	298.73	100 YR	45.38	23.54	24.76	24.63	25.04	0.024065	2.32	19.55	22.72	0.8
reserve rd	79	298.73	200 YR	65.62	23.54	25.07	24.85	25.37	0.02001	2.46	26.73	24.8	0.76
reserve rd	79	274.1	2 YR	18.99	23.15	24.19		24.22	0.004233	0.8	23.83	37.43	0.32
reserve rd	79	274.1	10 YR	30.46	23.15	24.47		24.5	0.003662	0.87	34.85	42.71	0.31
reserve rd	79	274.1	100 YR	45.38	23.15	24.76		24.8	0.003094	0.95	47.88	45.75	0.3
reserve rd	79	274.1	200 YR	65.62	23.15	25.1		25.16	0.002599	1.02	64.07	47.72	0.28
reserve rd	79	256.8	2 YR	18.99	22.62	24.04		24.11	0.009782	1.22	15.58	23.65	0.48
reserve rd	79	256.8	10 YR	30.46	22.62	24.31		24.41	0.008573	1.35	22.63	26.81	0.47
reserve rd	79	256.8	100 YR	45.38	22.62	24.61		24.72	0.00767	1.47	30.91	29.57	0.46
reserve rd	79	256.8	200 YR	65.62	22.62	24.96		25.08	0.006285	1.59	41.54	31.45	0.43
reserve rd	79	251.32	2 YR	18.99	22.61	24.01		24.07	0.00566	1	19.03	26.09	0.37
reserve rd	79	251.32	10 YR	30.46	22.61	24.3		24.36	0.005055	1.15	26.56	27.48	0.37
reserve rd	79	251.32	100 YR	45.38	22.61	24.59		24.68	0.004779	1.31	34.85	28.83	0.37
reserve rd	79	251.32	200 YR	65.62	22.61	24.94		25.05	0.004494	1.47	45.16	30.23	0.38
reserve rd	79	238.8	2 YR	18.99	22.56	23.97		24.01	0.003219	0.85	22.35	25.57	0.29
reserve rd	79	238.8	10 YR	30.46	22.56	24.25		24.31	0.003452	1.02	29.75	27.05	0.31
reserve rd	79	238.8	100 YR	45.38	22.56	24.55		24.62	0.003655	1.2	38.04	29.23	0.33
reserve rd	79	238.8	200 YR	65.62	22.56	24.9		24.99	0.003683	1.36	48.75	31.61	0.34
reserve rd	79	218.14	2 YR	18.99	22.58	23.87		23.93	0.004893	1.02	18.65	21.68	0.35
reserve rd	79	218.14	10 YR	30.46	22.58	24.14		24.22	0.005469	1.24	24.51	22.79	0.38
reserve rd	79	218.14	100 YR	45.38	22.58	24.41		24.52	0.006084	1.47	30.92	23.97	0.41
reserve rd	79	218.14	200 YR	65.62	22.58	24.75		24.89	0.00653	1.67	39.22	25.75	0.43
reserve rd	79	203.75	2 YR	18.99	22.61	23.74		23.83	0.008712	1.31	14.53	18.41	0.47
reserve rd	79	203.75	10 YR	30.46	22.61	23.97		24.11	0.010193	1.61	18.87	19.49	0.52
reserve rd	79	203.75	100 YR	45.38	22.61	24.21		24.39	0.011698	1.93	23.51	20.54	0.58
reserve rd	79	203.75	200 YR	65.62	22.61	24.51		24.75	0.011924	2.19	29.99	21.92	0.6
reserve rd	79	184.97	2 YR	18.99	22.33	23.66		23.7	0.004684	0.95	19.91	25.54	0.34
reserve rd	79	184.97	10 YR	30.46	22.33	23.88		23.95	0.005337	1.18	25.74	26.22	0.38
reserve rd	79	184.97	100 YR	45.38	22.33	24.11		24.22	0.006025	1.42	31.88	26.95	0.42
reserve rd	79	184.97	200 YR	65.62	22.33	24.44		24.57	0.005728	1.61	40.94	28.6	0.42
reserve rd	79	175.9	2 YR	18.99	22.3	23.62		23.66	0.00416	0.9	21.9	31.8	0.32
reserve rd	79	175.9	10 YR	30.46	22.3	23.84		23.9	0.004536	1.1	29.12	32.6	0.35
reserve rd	79	175.9	100 YR	45.38	22.3	24.08		24.16	0.004965	1.31	36.75	33.42	0.38
reserve rd	79	175.9	200 YR	65.62	22.3	24.41		24.52	0.004556	1.46	48.16	34.39	0.38
reserve rd	79	163.26	2 YR	18.99	22.24	23.57		23.61	0.003854	0.86	22.65	32.28	0.31
reserve rd	79	163.26	10 YR	30.46	22.24	23.79		23.85	0.004273	1.06	29.88	33.5	0.34
reserve rd	79	163.26	100 YR	45.38	22.24	24.02		24.1	0.004731	1.27	37.6	34.71	0.37
reserve rd	79	163.26	200 YR	65.62	22.24	24.36		24.46	0.004235	1.41	49.81	36.19	0.36
reserve rd	79	146.22	2 YR	18.99	22.27	23.5		23.54	0.004153	0.89	21.42	28.89	0.32
reserve rd	79	146.22	10 YR	30.46	22.27	23.71		23.77	0.004878	1.12	27.49	30.11	0.37
reserve rd	79	146.22	100 YR	45.38	22.27	23.92		24.01	0.005662	1.36	33.91	31.35	0.41
reserve rd	79	146.22	200 YR	65.62	22.27	24.27		24.38	0.004913	1.5	45.34	33.45	0.39
reserve rd	79	133.24	2 YR	18.99	22.08	23.42		23.48	0.00584	1.01	18.73	26.11	0.38
reserve rd	79	133.24	10 YR	30.46	22.08	23.61		23.69	0.007373	1.29	23.58	27.14	0.44
reserve rd	79	133.24	100 YR	45.38	22.08	23.78		23.91	0.009243	1.59	28.51	28.37	0.51
reserve rd	79	133.24	200 YR	65.62	22.08	24.17		24.3	0.006862	1.61	41.53	35.32	0.45

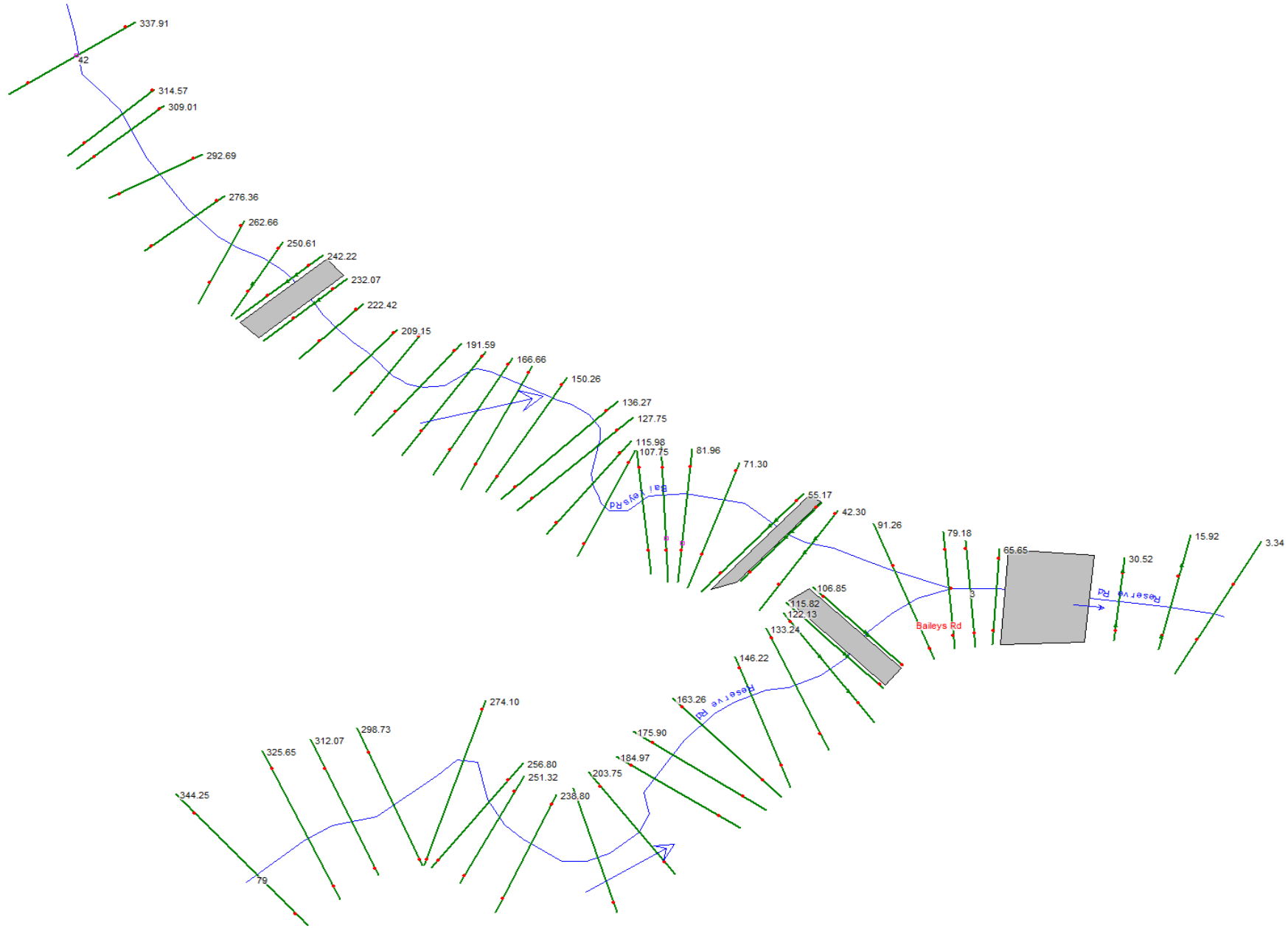
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reserve rd	79	122.13	100 YR	45.38	21.65	23.72	23.25	23.82	0.006468	1.38	34.06	33.01	0.42
reserve rd	79	122.13	200 YR	65.62	21.65	24.13	23.43	24.23	0.004916	1.43	48.24	42.34	0.39
reserve rd	79	115.82	2 YR	18.99	21.54	23.35	22.98	23.39	0.005354	0.92	21.57	34.41	0.35
reserve rd	79	115.82	10 YR	30.46	21.54	23.51	23.13	23.58	0.006868	1.18	27.22	35.12	0.41
reserve rd	79	115.82	100 YR	45.38	21.54	23.66	23.29	23.77	0.008785	1.47	32.65	35.79	0.47
reserve rd	79	115.82	200 YR	65.62	21.54	24.1	23.45	24.2	0.00534	1.43	48.83	38.56	0.39
reserve rd	79	114.82		Culvert									
reserve rd	79	106.85	2 YR	18.99	21.48	23.18	23.13	23.3	0.034484	1.57	12.74	33.44	0.79
reserve rd	79	106.85	10 YR	30.46	21.48	23.39	23.25	23.52	0.021525	1.6	20.08	35.71	0.67
reserve rd	79	106.85	100 YR	45.38	21.48	23.55	23.39	23.72	0.021321	1.87	25.69	35.71	0.7
reserve rd	79	106.85	200 YR	65.62	21.48	24.04	23.55	24.16	0.008159	1.62	43.07	35.71	0.47
reserve rd	79	91.26	2 YR	21.79	21.11	22.58		22.81	0.027712	2.13	10.25	14.81	0.82
reserve rd	79	91.26	10 YR	35.63	21.11	22.9	22.83	23.12	0.026972	2.13	17.68	30.18	0.81
reserve rd	79	91.26	100 YR	52.69	21.11	23.27		23.44	0.014757	1.91	30.35	39.59	0.63
reserve rd	79	91.26	200 YR	84.37	21.11	23.92		24.06	0.005699	1.69	58.7	45.77	0.43
reserve rd	79	79.18	2 YR	25.11	20.97	22.38		22.55	0.015873	1.85	13.56	15.98	0.64
reserve rd	79	79.18	10 YR	37.79	20.97	22.65		22.87	0.016886	2.05	18.47	20.24	0.67
reserve rd	79	79.18	100 YR	55.8	20.97	23.1		23.28	0.012016	1.89	30.83	35.95	0.58
reserve rd	79	79.18	200 YR	92.82	20.97	23.83		23.99	0.005341	1.79	57.76	36.76	0.42
reserve rd	3	73.17	2 YR	25.11	21.13	22.39	21.91	22.46	0.006622	1.24	20.27	23.04	0.42
reserve rd	3	73.17	10 YR	37.79	21.13	22.68	22.1	22.77	0.006077	1.4	27.27	25.26	0.42
reserve rd	3	73.17	100 YR	55.8	21.13	23.11	22.34	23.22	0.004729	1.45	39.79	33.26	0.38
reserve rd	3	73.17	200 YR	92.82	21.13	23.83		23.95	0.003234	1.57	63.77	33.26	0.34
reserve rd	3	65.65	2 YR	25.11	20.78	22.36	21.49	22.43	0.002673	1.17	21.53	18.6	0.3
reserve rd	3	65.65	10 YR	37.79	20.78	22.62	21.71	22.74	0.003629	1.5	25.11	23.51	0.35
reserve rd	3	65.65	100 YR	55.8	20.78	23	21.98	23.18	0.004226	1.84	30.31	26.82	0.39
reserve rd	3	65.65	200 YR	92.82	20.78	23.8	22.46	23.93	0.003384	1.62	62.45	30.1	0.33
reserve rd	3	63.15		Culvert									
reserve rd	3	30.52	2 YR	25.11	20.44	22.36	21.1	22.39	0.0011	0.81	31.39	24.15	0.19
reserve rd	3	30.52	10 YR	37.79	20.44	22.59	21.31	22.65	0.00169	1.09	35.28	24.7	0.24
reserve rd	3	30.52	100 YR	55.8	20.44	22.85	21.56	22.95	0.002473	1.43	39.79	25.4	0.3
reserve rd	3	30.52	200 YR	92.82	20.44	23.28	21.98	23.48	0.003912	2.01	47.07	26.32	0.39
reserve rd	3	15.92	2 YR	25.11	20.88	22.26	21.88	22.35	0.007578	1.37	19.32	32.8	0.45
reserve rd	3	15.92	10 YR	37.79	20.88	22.45	22.08	22.59	0.009033	1.69	23.65	34.35	0.51
reserve rd	3	15.92	100 YR	55.8	20.88	22.67	22.28	22.88	0.010705	2.07	28.6	35.49	0.57
reserve rd	3	15.92	200 YR	92.82	20.88	23.01	22.64	23.37	0.013483	2.71	36.46	36.88	0.67
reserve rd	3	3.34	2 YR	25.11	20.75	22.17	21.86	22.25	0.008314	1.32	23.32	40.06	0.47
reserve rd	3	3.34	10 YR	37.79	20.75	22.37	22.03	22.47	0.008301	1.53	31.33	40.93	0.48
reserve rd	3	3.34	100 YR	55.8	20.75	22.6	22.22	22.73	0.0083	1.75	41.06	41.94	0.5
reserve rd	3	3.34	200 YR	92.82	20.75	23	22.49	23.18	0.008305	2.11	58.07	43.86	0.52
Baileys	42	340.92	2 YR	1.16	27.34	27.64	27.58	27.67	0.022066	0.71	1.63	10.65	0.58
Baileys	42	340.92	10 YR	1.92	27.34	27.71	27.64	27.74	0.02153	0.81	2.37	12.46	0.59
Baileys	42	340.92	100 YR	2.78	27.34	27.75	27.69	27.8	0.023671	0.95	2.93	12.98	0.64
Baileys	42	340.92	200 YR	4.96	27.34	27.86	27.77	27.92	0.022769	1.01	4.93	19.44	0.64
Baileys	42	317.57	2 YR	1.16	26.59	26.82	26.81	26.86	0.060713	0.95	1.22	10.92	0.91
Baileys	42	317.57	10 YR	1.92	26.59	26.86	26.86	26.92	0.06447	1.12	1.71	12.41	0.97
Baileys	42	317.57	100 YR	2.78	26.59	26.91	26.89	26.98	0.055742	1.21	2.3	13.48	0.93
Baileys	42	317.57	200 YR	4.96	26.59	26.98	26.97	27.09	0.059361	1.48	3.35	15.19	1.01
Baileys	42	314.79*	2 YR	1.16	26.41	26.62	26.62	26.68	0.07175	1.07	1.09	9.29	1
Baileys	42	314.79*	10 YR	1.92	26.41	26.67	26.67	26.75	0.066067	1.21	1.59	10.63	1
Baileys	42	314.79*	100 YR	2.78	26.41	26.72	26.72	26.81	0.064469	1.33	2.09	11.8	1.01
Baileys	42	314.79*	200 YR	4.96	26.41	26.81	26.81	26.93	0.058843	1.52	3.26	14.13	1.01
Baileys	42	312.01	2 YR	1.16	26.23	26.51	26.43	26.53	0.015617	0.63	1.84	11.1	0.49
Baileys	42	312.01	10 YR	1.92	26.23	26.57	26.48	26.6	0.016087	0.74	2.59	12.45	0.52
Baileys	42	312.01	100 YR	2.78	26.23	26.63	26.52	26.67	0.015665	0.82	3.38	13.61	0.53
Baileys	42	312.01	200 YR	4.96	26.23	26.75	26.62	26.8	0.014949	0.98	5.07	15.19	0.54
Baileys	42	307.93*	2 YR	1.16	26.15	26.43		26.45	0.020737	0.7	1.65	10.46	0.56
Baileys	42	307.93*	10 YR	1.92	26.15	26.5		26.53	0.018909	0.8	2.4	11.66	0.56
Baileys	42	307.93*	100 YR	2.78	26.15	26.56		26.6	0.018316	0.89	3.13	12.66	0.57

Baileys	42	307.93*	200 YR	4.96	26.15	26.68		26.73	0.017691	1.05	4.73	14.51	0.59
Baileys	42	303.85*	2 YR	1.16	26.07	26.34		26.37	0.021741	0.74	1.56	9.46	0.58
Baileys	42	303.85*	10 YR	1.92	26.07	26.41		26.45	0.022375	0.87	2.21	10.74	0.61
Baileys	42	303.85*	100 YR	2.78	26.07	26.47		26.52	0.021576	0.96	2.9	11.8	0.62
Baileys	42	303.85*	200 YR	4.96	26.07	26.59		26.65	0.020436	1.12	4.41	13.54	0.63
Baileys	42	299.76*	2 YR	1.16	25.99	26.24		26.27	0.024838	0.79	1.47	8.89	0.62
Baileys	42	299.76*	10 YR	1.92	25.99	26.31		26.35	0.023102	0.9	2.13	9.96	0.62
Baileys	42	299.76*	100 YR	2.78	25.99	26.38		26.43	0.021524	0.99	2.82	10.97	0.62
Baileys	42	299.76*	200 YR	4.96	25.99	26.5		26.57	0.021917	1.18	4.21	12.7	0.65
Baileys	42	295.68	2 YR	1.16	25.91	26.15		26.18	0.021936	0.76	1.53	8.98	0.59
Baileys	42	295.68	10 YR	1.92	25.91	26.24		26.27	0.01549	0.8	2.41	10.1	0.52
Baileys	42	295.68	100 YR	2.78	25.91	26.31		26.35	0.014687	0.88	3.17	10.98	0.52
Baileys	42	295.68	200 YR	4.96	25.91	26.42		26.48	0.018667	1.14	4.36	12.23	0.61
Baileys	42	279.06	2 YR	1.16	25.71	25.97	25.85	25.98	0.007483	0.49	2.38	12.13	0.35
Baileys	42	279.06	10 YR	1.92	25.71	25.98		26.01	0.016091	0.74	2.58	12.32	0.52
Baileys	42	279.06	100 YR	2.78	25.71	26.02		26.07	0.019107	0.89	3.11	12.8	0.58
Baileys	42	279.06	200 YR	4.96	25.71	26.21		26.25	0.010036	0.87	5.67	14.89	0.45
Baileys	42	261.89	2 YR	1.16	25.47	25.59	25.59	25.65	0.099323	1.1	1.05	10.93	1.13
Baileys	42	261.89	10 YR	1.92	25.47	25.73		25.75	0.014095	0.71	2.72	12.71	0.49
Baileys	42	261.89	100 YR	2.78	25.47	25.91		25.92	0.004273	0.53	5.21	15.11	0.29
Baileys	42	261.89	200 YR	4.96	25.47	26.15		26.16	0.002608	0.54	9.24	18.33	0.24
Baileys	42	250.27	2 YR	1.16	25.05	25.56	25.2	25.56	0.000505	0.19	5.99	16.12	0.1
Baileys	42	250.27	10 YR	1.92	25.05	25.73		25.73	0.000436	0.22	8.9	18.16	0.1
Baileys	42	250.27	100 YR	2.78	25.05	25.91		25.91	0.000351	0.23	12.28	20.27	0.09
Baileys	42	250.27	200 YR	4.96	25.05	26.15		26.15	0.000392	0.29	17.5	23.15	0.1
Baileys	42	239.02	2 YR	1.16	24.8	25.56		25.56	0.00018	0.14	8.57	18.02	0.06
Baileys	42	239.02	10 YR	1.92	24.8	25.73		25.73	0.000182	0.16	11.76	19.67	0.07
Baileys	42	239.02	100 YR	2.78	24.8	25.9		25.91	0.00017	0.18	15.39	21.38	0.07
Baileys	42	239.02	200 YR	4.96	24.8	26.14		26.15	0.000226	0.25	20.81	23.82	0.08
Baileys	42	230.22	2 YR	1.16	24.64	25.56		25.56	0.000176	0.14	8.14	16.18	0.06
Baileys	42	230.22	10 YR	1.92	24.64	25.73		25.73	0.000194	0.18	11.04	18.06	0.07
Baileys	42	230.22	100 YR	2.78	24.64	25.9		25.9	0.000191	0.2	14.4	20.03	0.07
Baileys	42	230.22	200 YR	4.96	24.64	26.14		26.14	0.000257	0.27	19.9	26.06	0.08
Baileys	42	218.87	2 YR	4.3	24.7	25.46		25.53	0.017514	1.15	3.75	9.8	0.59
Baileys	42	218.87	10 YR	7.23	24.7	25.59		25.69	0.021358	1.43	5.06	11.08	0.67
Baileys	42	218.87	100 YR	11.16	24.7	25.71		25.86	0.024698	1.72	6.49	12.28	0.75
Baileys	42	218.87	200 YR	18.1	24.7	25.87	25.81	26.09	0.028735	2.06	9.12	17.91	0.83
Baileys	42	207.95	2 YR	4.3	24.65	25.31		25.36	0.013167	0.91	4.73	14.81	0.5
Baileys	42	207.95	10 YR	7.23	24.65	25.43		25.5	0.013381	1.12	6.68	18	0.53
Baileys	42	207.95	100 YR	11.16	24.65	25.56		25.65	0.013548	1.33	9.24	23.04	0.56
Baileys	42	207.95	200 YR	18.1	24.65	25.75		25.86	0.012071	1.52	14.22	26.82	0.55
Baileys	42	202.89	2 YR	4.3	24.48	25.21		25.27	0.022482	1.13	4.13	14.74	0.64
Baileys	42	202.89	10 YR	7.23	24.48	25.3		25.4	0.028051	1.43	5.59	16.7	0.73
Baileys	42	202.89	100 YR	11.16	24.48	25.37	25.33	25.53	0.037249	1.84	6.85	18.35	0.87
Baileys	42	202.89	200 YR	18.1	24.48	25.49	25.47	25.74	0.04405	2.33	9.23	22.66	0.98
Baileys	42	190.3	2 YR	4.3	23.84	24.68	24.68	24.8	0.068001	1.55	2.86	14.26	1.06
Baileys	42	190.3	10 YR	7.23	23.84	24.79	24.78	24.93	0.05192	1.7	4.52	16.4	0.97
Baileys	42	190.3	100 YR	11.16	23.84	24.92		25.08	0.03608	1.79	6.82	17.79	0.86
Baileys	42	190.3	200 YR	18.1	23.84	25.11		25.3	0.027673	1.96	10.4	19.8	0.79

Baileys	42	180.26	2 YR	4.3	23.41	24.37	24.21	24.44	0.017559	1.16	3.69	9.26	0.59
Baileys	42	180.26	10 YR	7.23	23.41	24.54		24.63	0.017453	1.33	5.45	11.21	0.61
Baileys	42	180.26	100 YR	11.16	23.41	24.72		24.83	0.016065	1.46	7.7	14	0.6
Baileys	42	180.26	200 YR	18.1	23.41	24.94		25.08	0.015244	1.71	11.07	17.56	0.62
Baileys	42	168.77	2 YR	4.3	23.31	24.23		24.27	0.011105	0.98	4.4	10.21	0.48
Baileys	42	168.77	10 YR	7.23	23.31	24.4		24.46	0.011478	1.16	6.24	11.51	0.5
Baileys	42	168.77	100 YR	11.16	23.31	24.58		24.67	0.011225	1.31	8.53	12.84	0.51
Baileys	42	168.77	200 YR	18.1	23.31	24.78		24.91	0.013387	1.61	11.34	16.12	0.58
Baileys	42	160.62	2 YR	4.3	23.31	24.15		24.19	0.008943	0.89	4.85	11.08	0.43
Baileys	42	160.62	10 YR	7.23	23.31	24.32		24.38	0.009491	1.06	6.82	12.43	0.46
Baileys	42	160.62	100 YR	11.16	23.31	24.51		24.58	0.009196	1.19	9.36	13.95	0.46
Baileys	42	160.62	200 YR	18.1	23.31	24.7		24.81	0.011051	1.5	12.29	18.56	0.53
Baileys	42	152.34	2 YR	4.3	23.22	24.05		24.1	0.013477	0.95	4.51	12.71	0.51
Baileys	42	152.34	10 YR	7.23	23.22	24.24		24.3	0.009516	1.03	7.1	15.06	0.46
Baileys	42	152.34	100 YR	11.16	23.22	24.45		24.51	0.007278	1.11	10.68	19.17	0.42
Baileys	42	152.34	200 YR	18.1	23.22	24.63		24.72	0.008915	1.4	14.29	21.44	0.48
Baileys	42	136.98	2 YR	4.3	22.98	23.88		23.92	0.010032	0.94	4.58	10.49	0.45
Baileys	42	136.98	10 YR	7.23	22.98	24.11		24.15	0.008746	0.98	7.36	14.27	0.44
Baileys	42	136.98	100 YR	11.16	22.98	24.36		24.41	0.006302	0.96	11.71	20.89	0.38
Baileys	42	136.98	200 YR	18.1	22.98	24.51		24.59	0.008029	1.24	15.15	23.37	0.45
Baileys	42	128.65	2 YR	4.69	22.88	23.85		23.87	0.00339	0.7	6.74	10.76	0.28
Baileys	42	128.65	10 YR	7.92	22.88	24.07		24.1	0.00402	0.86	9.23	12.26	0.32
Baileys	42	128.65	100 YR	12.22	22.88	24.32		24.36	0.004719	0.91	13.62	20.57	0.34
Baileys	42	128.65	200 YR	19.69	22.88	24.45		24.53	0.006987	1.22	16.52	22.48	0.43
Baileys	42	122.71	2 YR	4.69	22.93	23.82		23.85	0.005401	0.78	6	11.6	0.35
Baileys	42	122.71	10 YR	7.92	22.93	24.03		24.08	0.005442	0.91	8.74	13.6	0.36
Baileys	42	122.71	100 YR	12.22	22.93	24.28		24.33	0.005751	0.97	12.55	18.3	0.38
Baileys	42	122.71	200 YR	19.69	22.93	24.38		24.48	0.009999	1.35	14.61	21.09	0.5
Baileys	42	106.21	2 YR	4.69	22.93	23.77		23.79	0.002376	0.52	9.02	17.4	0.23
Baileys	42	106.21	10 YR	7.92	22.93	23.99		24.01	0.002351	0.6	13.22	20.46	0.24
Baileys	42	106.21	100 YR	12.22	22.93	24.25		24.27	0.001946	0.66	18.77	23.32	0.23
Baileys	42	106.21	200 YR	19.69	22.93	24.32		24.37	0.003928	0.98	20.42	23.94	0.33
Baileys	42	95.16	2 YR	4.69	22.95	23.75		23.76	0.001559	0.48	9.87	15.74	0.19
Baileys	42	95.16	10 YR	7.92	22.95	23.97		23.99	0.001879	0.58	13.77	19.82	0.22
Baileys	42	95.16	100 YR	12.22	22.95	24.23		24.25	0.00192	0.64	19.4	25.13	0.22
Baileys	42	95.16	200 YR	19.69	22.95	24.27		24.32	0.004415	0.98	20.54	26.32	0.34
Baileys	42	88.63	2 YR	4.69	23.02	23.74	23.29	23.75	0.002093	0.51	9.32	17.83	0.22
Baileys	42	88.63	10 YR	7.92	23.02	23.96	23.4	23.98	0.00211	0.59	13.68	22.01	0.23
Baileys	42	88.63	100 YR	12.22	23.02	24.21	23.52	24.23	0.001898	0.65	19.81	25.83	0.22
Baileys	42	88.63	200 YR	19.69	23.02	24.24	23.71	24.29	0.004508	1.01	20.48	26.17	0.35
Baileys	42	81.96	2 YR	4.69	22.98	23.73	23.22	23.74	0.001192	0.4	11.69	20.14	0.17
Baileys	42	81.96	10 YR	7.92	22.98	23.95	23.32	23.96	0.001292	0.49	16.46	23.44	0.18
Baileys	42	81.96	100 YR	12.22	22.98	24.21	23.42	24.22	0.001273	0.53	24.51	35.78	0.18
Baileys	42	81.96	200 YR	19.69	22.98	24.23	23.59	24.26	0.003075	0.84	25.13	35.96	0.29
Baileys	42	71.3	2 YR	4.69	22.94	23.73		23.73	0.000659	0.32	14.88	23.13	0.13
Baileys	42	71.3	10 YR	7.92	22.94	23.94		23.95	0.000823	0.38	21.16	35.09	0.14
Baileys	42	71.3	100 YR	12.22	22.94	24.2		24.21	0.000685	0.43	30.52	37.21	0.14
Baileys	42	71.3	200 YR	19.69	22.94	24.21		24.23	0.001729	0.69	30.81	37.26	0.22
Baileys	42	55.17	2 YR	4.69	22.16	23.62	22.86	23.7	0.003409	1.24	3.79	9.42	0.33
Baileys	42	55.17	10 YR	7.92	22.16	23.92	23.14	23.93	0.00221	0.51	15.8	30.65	0.22
Baileys	42	55.17	100 YR	12.22	22.16	24.18	23.48	24.2	0.001437	0.52	24.36	34.19	0.19
Baileys	42	55.17	200 YR	19.69	22.16	24.15	23.73	24.19	0.004202	0.87	23.37	33.75	0.32
Baileys	42	53.65		Culvert									
Baileys	42	49.39	2 YR	4.69	22.14	23.51	22.86	23.61	0.00462	1.39	3.37	15.05	0.38
Baileys	42	49.39	10 YR	7.92	22.14	23.7	23.16	23.91	0.008516	2.06	3.84	23.97	0.53
Baileys	42	49.39	100 YR	12.22	22.14	24.17	23.5	24.18	0.002648	0.63	20.48	29.39	0.24
Baileys	42	49.39	200 YR	19.69	22.14	24.07	23.79	24.14	0.010329	1.17	17.79	28.17	0.46
Baileys	42	42.3	2 YR	4.69	22.83	23.3	23.3	23.52	0.045931	2.05	2.29	22.03	0.99
Baileys	42	42.3	10 YR	7.92	22.83	23.48	23.48	23.79	0.042171	2.46	3.22	24.81	1.01
Baileys	42	42.3	100 YR	12.22	22.83	23.69	23.69	24.1	0.03769	2.83	4.32	27.32	1
Baileys	42	42.3	200 YR	19.69	22.83	24.06	23.71	24.09	0.002696	0.82	26.66	32.89	0.27



EXISTING CASE GEOMETRIC VIEW OF MODEL



DEVELOPED CASE GEOMETRIC VIEW OF MODEL

ATTACHMENT 12

Sewer Network Capacity Assessment, prepared by Arcadis



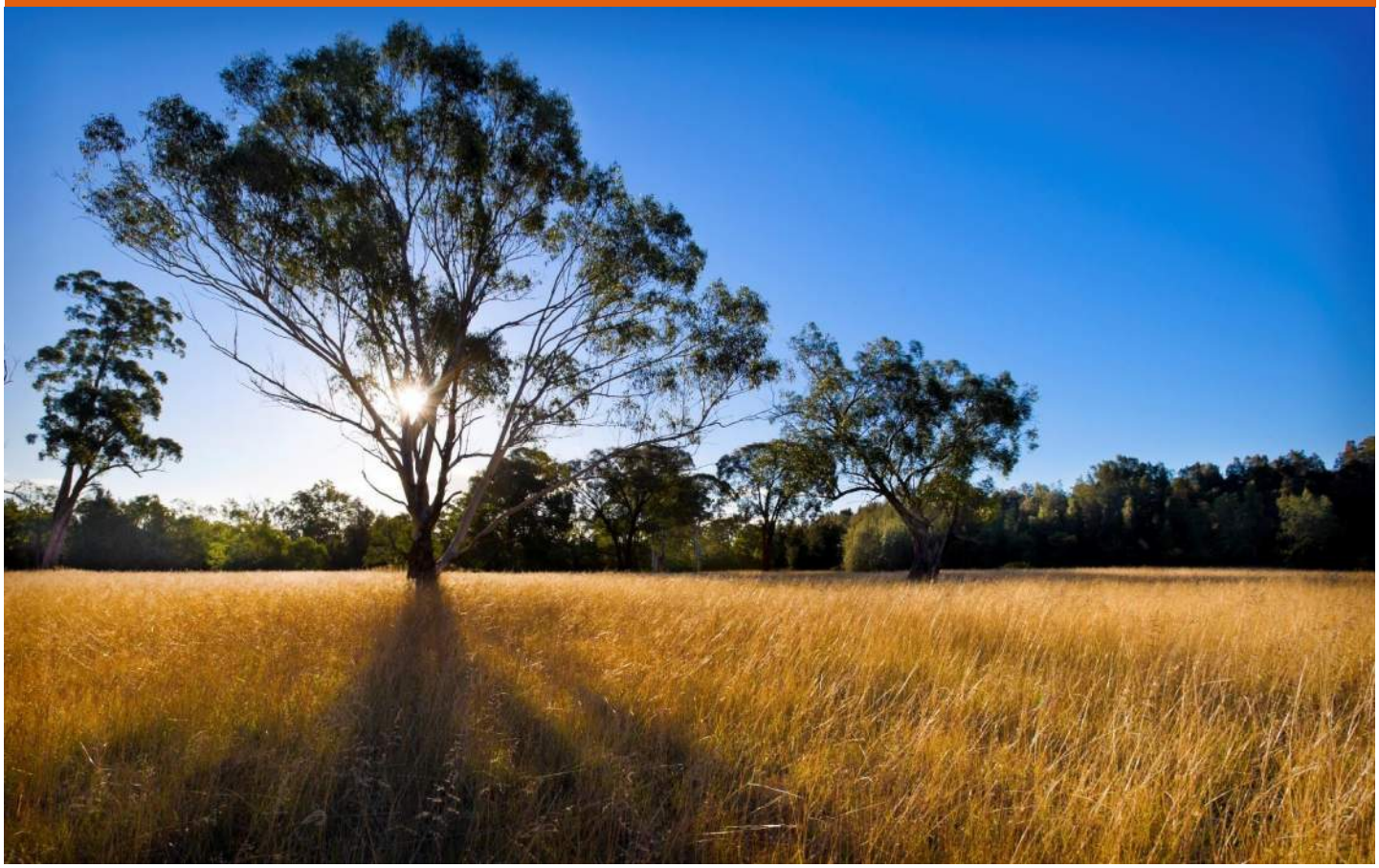
UPS
URBAN PLANNING SERVICES PTY LTD

ARCADIS Design & Consultancy for natural and built assets

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SEWER NETWORK CAPACITY ASSESSMENT

26 JULY 2018



Incorporating Hyder

SANDSON PTY LTD
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SEWER NETWORK CAPACITY ASSESSMENT

Author	Oliver Purton	
Checker	Ashley Shepherd	
Approver	James Stockwell RPEQ20152	
Report No	F0003-10021414-AAR	
Date	26/07/2018	
Revision Text	02	

This report has been prepared for Sandson Pty Ltd in accordance with the terms and conditions of appointment for 202 Baileys Mountain Road, Upper Coomera dated June 2018. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/07/2018	Draft Issue	OP	JS
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1 EXECUTIVE SUMMARY

Arcadis have been engaged by Sandson Pty Ltd to undertake a Sewer Network Capacity Assessment (SNCA) for a development application. The proposed development site is located over the following allotment in Upper Coomera, QLD.

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

With the use of the software InfoSWMM, a hydraulic assessment of the proposed development's impact on the surrounding wastewater network has been undertaken. One connection is proposed to Gold Coast Water's (GCW) wastewater network, located south-east of the development site in Old Coach Road:

- S111-03013M - 1050mm diameter manhole

The following SNCA compares the existing local gravity sewer network performance under the 'existing' and 'developed' network demand for the relevant planning horizons against GCW's Desired Standard of Service (DSS) as specified by the South-East Queensland Design and Construction Code for Water Supply and Sewerage (SEQ WS&S D&C Code). The purpose of this assessment is to determine whether there is sufficient capacity in the local network to service the proposed development or whether the proposed development triggers the requirement for a wastewater infrastructure upgrade within the Pump Station (SPS) PA1 sub-catchment.

The following assessment has concluded that the existing gravity sewerage pipe and manhole network satisfies the minimum 1m manhole freeboard DSS for the majority of the assessed line in both the existing and developed loading scenarios up to SPS PA1. It is established in this report that the proposed development does not cause any additional non-compliances within the assessed gravity line.

An assessment of SPS PA1 was undertaken, with the following conclusions:

- **Pump Capacity –** Adequate for all planning horizons.
- **Operational Storage –** Adequate for all planning horizons.
- **Emergency Storage –** Adequate until the 2036 horizon. Non-compliances are encountered in the 2066 planning horizon. The 2066 existing scenario has a deficiency of 19.25m^3 and the 2066 developed scenario has a deficiency of 23.94m^3. The development only constitutes an additional 4.69m^3 emergency storage.
- **Rising Main Velocity –** Rising main assessment was not undertaken as no pump capacity augmentations were proposed.

The development in isolation has negligible impacts in context of the wider catchment and inherent shortcomings of SPS PA1. The proposed loadings for the subject site do not trigger an isolated or new upgrade, not already needed to service the existing catchment projections.

It is suggested that GCW review the upgrade strategy for SPS PA1 to ensure that adequate future proofing is undertaken to mitigate the non-compliances caused by the current approved developments, the proposed development and future foreseeable developments. This could equate to a more equitable economic solution for GCW and developers.

2 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The subject site is located at 202 Baileys Mountain Road, Upper Coomera, South-East Queensland, Australia on the following allotment:

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

The total area of the site is 30,870m².

2.2 LAND USAGE

In its current state the subject site described as 202 Baileys Mountain Road is occupied by a single residential dwelling and sheds.

A site locality plan is located below in Figure 2-1.



Figure 2-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

2.3 EXISTING TOPOGRAPHY

The site topography consists of moderately grading slopes (averaging <4%) with the site generally grading south-east towards both Baileys Mountain Road and Reserve Road. An existing topographic survey can be found in Appendix A.

The highest point of the site is at approximately RL39.0m AHD at the far north-west corner of the site on the northern boundary. The lowest point is approximately RL21.0m AHD located in the south-eastern corner of the site.

3 PROPOSED DEVELOPMENT

It is proposed to deliver an aged care facility with the following features;

- Aged Care Suites;
- Retirement Apartments
- Residents Amenities (Café, Kitchens, Library, Treatment Rooms, etc);
- Staff Facilities; and
- Carparking.

The existing dwelling on the site will be repurposed as a staff training facility.

A master plan of the proposed development has been provided in Figure 3-1 below.

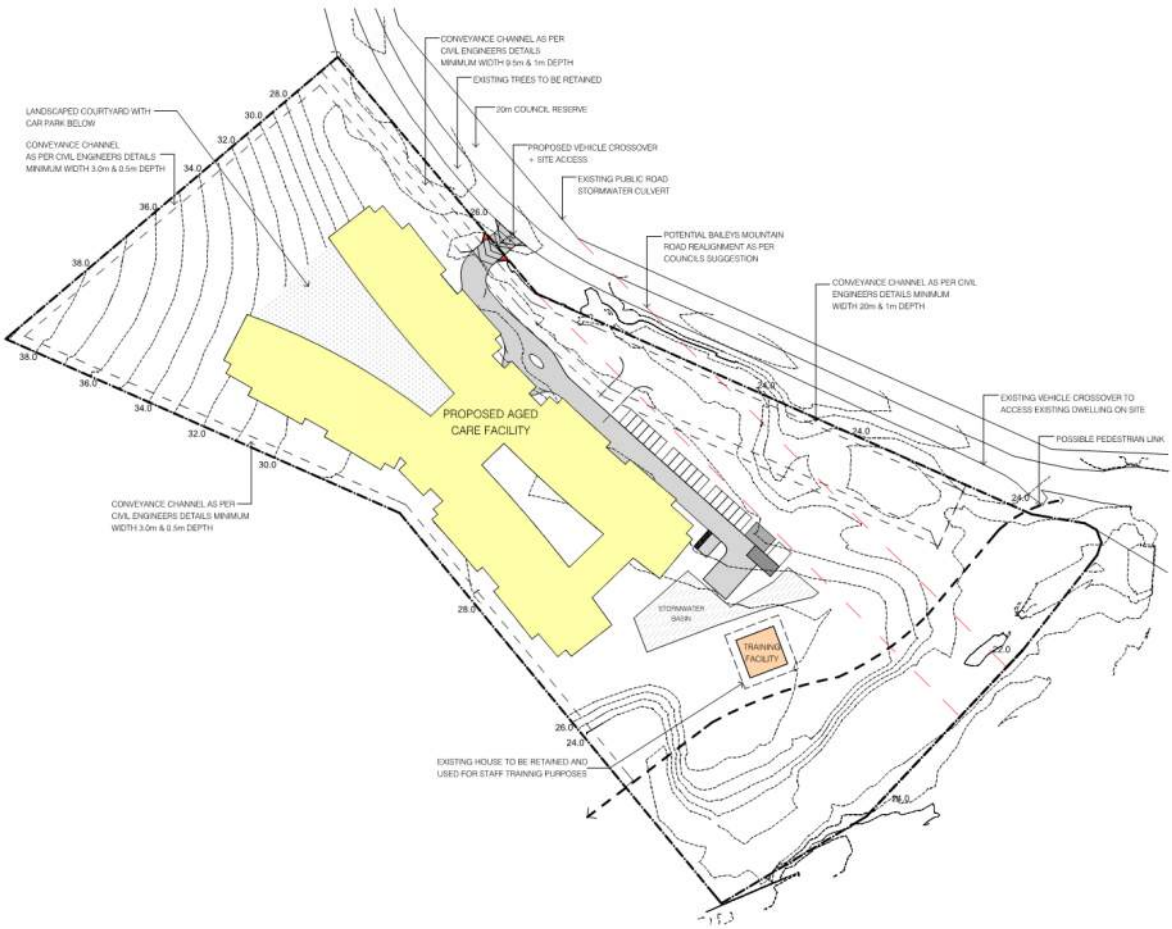


Figure 3-1 Development Master Plan (Courtesyof BDA)

3.1 PROPOSED DEVELOPMENT NETWORK LOADING

For the purposes of this report, the development has been assessed under two loading cases to better determine the anticipated impact to be had on the surrounding network. These cases are as follows:

- **Existing Case** - A demand assigned to the site via the infrastructure Demand Model (IDM) 2013 provided by GCW with additional loads included of other proposed developments (refer to section 5 for further details) as instructed by GCW.
- **Developed Case** - The calculated demand for the property based on proposed architect plans and conversion rates from the Gold Coast Planning Scheme with additional loads included of other proposed developments (refer to section 5 for further details) as instructed by GCW.

Table 3-1 shows the calculated Equivalent Tenements as per 'Table A2 – Typical Water and Wastewater Supply Demand Generation Rates for Development Types (Gold Coast Area) of the SEQ Water Supply and Sewerage Design and Construction Code, Appendix A1 – City of Gold Coast.

Table 3-1 Proposed Development Loadings

Category	No. Units	Conversion Rate	Proposed ET Loading	Proposed EP Loading
Nursing Home	**144 beds**	0.26ET/bed	37.44	102.2
1 Bedroom apartment/studio	**2**	0.47ET/dwelling	0.94	2.57
2 Bedroom apartment/studio	**6**	0.63ET/dwelling	3.78	10.3
Medical Treatment room	**4**	0.3ET/room	1.2	3.28
Retail/office/cafe	**910m^2**	0.6ET/100m^2	5.46	14.91
		Total:	**48.82**	**134**

*2.73EP/ET – SEQ WS&S D&C Code CoGC EP/ET Conversion

**Repurposed training facility is included in retail/office/café category

4 MODELLING ASSUMPTIONS

The sewer network surrounding the proposed development site was modelled using the wastewater model 'PI_LGIP_15June2018' for the Pimpama Catchment using the InfoSWMM program. The required modelling files were supplied by CoGC in June 2018. The demand due to the proposed development has been applied in the relevant planning horizons. This analysis was undertaken adopting the following assumptions and design criteria (Note: All design criteria are in accordance with Table 10 – Sewerage Network Design Criteria (Gold Coast) of the SEQ D & C Code and GCW DSS):

- The extent of the network studied is to the downstream pump station PA1;
- Average Dry Weather Flow (ADWF) = 210 L/EP/d;
    - Peak Dry Weather Flow (PDWF) = C2 x ADWF
        - C2= 4.7 x EP-0.105
- Peak Wet Weather Flow (PWWF) = 5 × ADWF;
- EP/ET Conversion = 2.73;
- Manning's flow equation is used to calculate flows;
- Manning's roughness coefficient is taken as 0.013;
- Maximum velocity for Rising Main = 3m/s;
- Depth of flow @ PWWF – Existing system = Up to 1.0m below MH cover level and no spillage through overflow structures (as confirmed by Council Officers);
- Depth of flow @ PWWF – Proposed sewers = Max flow depth shall not exceed ¾ pipe internal diameter;
    - Emergency Storage: 4 Hours @ ADWF
    - Single Pump Capacity (Duty & Assist): Q = C1 x ADWF
        - where C1 = 15 x EP^-0.1587 (but must range between 3.5 – 5)
    - Operational Storage: Ops Storage = 0.9 x Q/N (See N below)
        - N = 12 (Motors <100Kw)
        - N = 8 (Motors 100-200Kw)
        - N = 5 (Motors >200Kw)
- The development is serviced from connection point S111-03013M located on the engineering drawings in Appendix A;
- GCW advised that there were 1 other above planning-scheme-density sites be included as part of the assessment. More details regarding these additional loads can be found in Section 5.
- GCW advised that this site is not currently connected to the municipal wastewater network. It is also not planned to be a part of the network under council's planning scheme and as such has no planned service load for the network over the planning horizons.
- The SPS PA1 upstream catchment was extracted from the overall Pimpama model to minimise model run time. A dummy outfall from SPS PA1 with an outfall pipe diameter of 2000mm was applied to simulate free flow conditions in order to assess the capacity of the local gravity network.
- Note: GCW advised that using the LGIP report values is acceptable for emergency storage.
- An LGIP upgrade of an additional 236.9m^3 of emergency storage volume was proposed for SPS PA1 in the 2016 planning horizon. Therefore, it has been assumed in this assessment that this upgrade has been undertaken.

5 MODELLING METHODOLOGY

The InfoSWMM model 'PI_LGIP_15June2018' was first run by applying the existing loads of the CoGC Infrastructure Demand Model (IDM) at the specified junction points to provide a baseline to compare the impacts of the proposed development to. The impact on the existing network was assessed by verifying and comparing the flow velocities and depth of flow of the developed network against the existing network. One reach of pipe was assessed, from the proposed connection point down to the respective downstream pump station. The reach of pipe assessed is included in the engineering drawings in Appendix A, along with labelled pipes and junctions.

Discussions with Council officers identified that there is currently one other approved surrounding development within the SPS PA1 catchment. The respective location of its connection and load can be found in Table 5-1.

Table 5-1 Surrounding Approved Developments Included in Modelling

Connection Manhole	2016 Horizon EP	2021 Horizon EP	2026 Horizon EP	2031 Horizon EP	2036 Horizon EP	2066 Horizon EP
S111-00177M	212.27	212.27	212.27	212.27	212.27	212.27
TOTAL	**212.27**	**212.27**	**212.27**	**212.27**	**212.27**	**212.27**

5.1 DEPTH OF FLOW

The depth of flow was assessed for all pipes included in the assessment for all horizons in the existing and developed scenarios. In the developed scenario the additional loads were applied to the specified connection point and the models were then compared to the results obtained in the existing scenario and GCW DSS. The maximum depth of flow was assessed over a 24-hour period against the maximum depths for pipes in the existing and developed scenarios.

5.2 PUMP CAPACITY

The pump capacity was assessed for all assessed planning horizons in the existing and developed scenarios. The pump capacity is obtained from the relevant LGIP catchment report. The pump capacity is then assessed against the PWWF generated by the assessed pump station's local catchment (Local EP) and all upstream catchments (Cumulative EP) feeding into the assessed local-catchment.

5.3 OPERATIONAL WET WELL VOLUME

The operational wet well volume was assessed for all relevant planning horizons in the existing and developed scenarios. Existing operational wet well volume is determined through the relevant LGIP catchment report. The required operational well volume is calculated by obtaining the ADWF (L/s) and Multiplying it by Variable C1 then dividing it by average starts per hours (N value is provided by GCW otherwise adopted the highest value, N = 12, for a more conservative assessment) and multiplying it by 0.9. This is the then compared to the calculated existing operational wet well volume.

5.4 EMERGENCY STORAGE

The emergency storage was assessed for all planning horizons in the existing and developed scenarios. Emergency storage is calculated by assessing the volume of wastewater generated over four hours at ADWF. This volume is calculated from local catchment EP load for both existing and developed scenarios.

5.5 RISING MAIN ASSESSMENT

A rising main assessment will be undertaken if an augmentation to pump capacity is proposed. If the pump receives an augmentation, an assessment will be undertaken to determine the effect the upgrade will have on rising main velocity. A comparison between the existing and developed scenarios will be undertaken and measured against the GCW DSS.

6 RESULTS AND DISCUSSION

6.1 GRAVITY LINE ASSESSMENT

6.1.1 EXISTING SYSTEM PERFORMANCE

One reach of pipe has been assessed, being the existing sewer line located west of the proposed development. This line connects to pump station PA1 located approximately 2,300m east of the proposed development within Upper Coomera. The demands have been assigned as per the IDM 2013. The sewer reach is described as:

- From the existing sewer manhole S111-03013M, it travels east along Reserve Road, north-east across Yaun Creek, east through Clydesdale Drive, north-east along Hanoverian Way, then crosses through Abraham Road, then follows Yaun Creek until it turns south into pump station PA1.

The alignment can also be seen in the engineering drawings included in Appendix A, which specify both the assessed alignments and the pipes and manholes included in the assessment. The tabulated results attached in Appendix B show the detailed outputs of each manhole assessed. Longitudinal sections showing the depth of flow and hydraulic grade line have also been included in Appendix C.

The junction results for the assessed line indicate that in the existing load case, there is sufficient freeboard in the majority of the assessed manholes (i.e. 1m minimum freeboard). Manholes 'S111-00462M', 'S111-01283M' and 'S111-01281M' have less than the 1m minimum freeboard requirement. Manholes 'S111-01283M' and 'S111-01281M' were constructed with only 0.95m depth, therefore by default will not achieve the 1m minimum freeboard. Manhole 'S111-00462M' has a freeboard of 0.986m, which is only 0.014m under the required 1m minimum. These three manholes will be shown on the engineering drawings. There are no instances of manholes surcharging which is in accordance with GCW DSS for existing infrastructure for all horizons.

The above existing results are noted as a baseline reference for comparison once the developed loadings are applied to the network.

6.1.2 DEVELOPED SYSTEM PERFORMANCE

In the developed scenario, the same line of pipes have been assessed; inclusive of each of the connection points to the corresponding downstream pump station. Loads have been assigned as per the proposed loads of the development. The tabulated results are included for the relevant planning horizons for this assessed length. This alignment can also be seen in the engineering drawings included in Appendix A, which specify both the assessed alignment and the pipes and manholes included in the assessment. The tabulated results attached in Appendix D show the detailed outputs of each pipe and manhole assessed. Longitudinal sections showing the depth of flow have also been included in Appendix E.

The results demonstrate that upon inclusion of the proposed development loads, the majority of the assessed gravity reach does meet the SEQ DSS. However, the same three manholes ('S111-00462M', 'S111-01283M' and 'S111-01281M') from the existing case do not have sufficient freeboard in the developed case. In the developed scenario, manhole 'S111-00462M' has a freeboard of 0.912m, which is 0.088m under the required 1m minimum. It must be noted that the proposed development does not cause any additional non-compliances. In no circumstance do any of the manholes surcharge during the PWWF for all horizons.

This is deemed acceptable in context of the existing constraints.

6.2 PUMP STATION ASSESSMENT

6.2.1 PUMP STATION PA1

In addition to assessing the adequacy of downstream pipe infrastructure, the required operating wet well volume, pump capacity, rising main and emergency storage volume of SPS PA1 has also been assessed. The local EPs have been determined from the sewerage catchment which is serviced by the pump station. These loads have been determined from the IDM 2013 and surrounding approved developments supplied.

6.2.1.1 PUMP CAPACITY ASSESSMENT

Table 6-1 below encompasses all the information relevant to the pump capacity of SPS PA1.

Table 6-1 Pump Capacity Assessment

SPS PA1	Cumulative EP	PWWF (L/s)	Pump Capacity (L/s)
2066 Existing	17025	206.90	256.2
2066 Developed	17159	208.53	256.2

As seen in Table 6-1, in the 2066 horizon for both the existing and developed scenarios there is sufficient capacity. As no upgrades are proposed in earlier horizons, it is deemed that they will also be satisfied as loading is generally smaller than this planning horizon.

Existing pump capacity was obtained from the Water and Supply and Sewerage Infrastructure Plan 2014: Pimpama Sewerage Catchment (Pimpama District) Hydraulic Modelling Report 2014 (August 2014), Appendix C – Pump Capacity. The report value is adequate for the rising main pump capacity, as it is a direct rising main and there are no other sites injecting into the rising main system.

6.2.1.2 OPERATIONAL WET WELL ASSESSMENT

Table 6-2 below encompasses all the information relevant to the operational wet well volume of SPS PA1

Table 6-2 Operational Wet Well Volume

SPS PA1	Existing Op. Storage Volume (m^3)	Required Volume (m^3)
2066 Existing	11.8	10.86
2066 Developed		10.95

The available storage is compliant for the 2066 planning horizon for both the existing and developed scenarios. As no upgrades are proposed in earlier horizons, it is deemed that they will also be satisfied as loading is generally smaller than this planning horizon.

Existing operational Wet Well Volume was obtained from the Water and Supply and Sewerage Infrastructure Plan 2014: Pimpama Sewerage Catchment (Pimpama District) Hydraulic Modelling Report 2014 (August 2014), Appendix B – Pump Station Operational Storage Volume Assessment.

6.2.1.3 EMERGENCY STORAGE VOLUME ASSESSMENT

Table 6-3 below encompasses all the information relevant to the Emergency Storage Volume of the local SPS PA1 catchment. An LGIP upgrade of an additional 236.9m³ of emergency storage volume was proposed for SPS PA1 in the 2016 planning horizon. Therefore, it has been assumed in this assessment that this upgrade has been undertaken.

Table 6-3 Emergency Storage Volume

SPS PA1	Local EP	Existing System Volume (m³)	Required Volume (m³)
2066 Existing	15142	510.7	529.95 (-19.25)
2066 Developed	15276		534.64 (-23.94)
2036 Existing	11112	510.7	388.91
2036 Developed	11246		393.60

The network is adequate up and including the 2036 horizon, however non-compliances are observed in both the existing and developed case scenarios in the 2066 horizon, as seen in Table 6-3 above. The LGIP upgrade allows the network to function to acceptable storage requirements until the 2036 horizon. The 2066 existing scenario has a deficiency of 19.25m³ and the 2066 developed scenario has a deficiency of 23.94m³. The development only constitutes an additional 4.69m³ emergency storage. This is considered to be a minor amount in context of that available in the system (0.92%).

It is suggested that Council consider upgrades to the emergency storage of the SPS PA1 catchment to incorporate the extra emergency storage required by the surrounding approved developments in the 2066 horizon, future foreseeable developments and the proposed development.

Emergency storage volume was obtained from the Water and Supply and Sewerage Infrastructure Plan 2014: Pimpama Sewerage Catchment (Pimpama District) Hydraulic Modelling Report 2014 (August 2014), Appendix D –Emergency Storage Assessment.

7 CONCLUSION

This assessment has concluded that the existing gravity sewerage pipe and manhole network satisfies the minimum 1m manhole freeboard DSS for the majority of the assessed line in both the existing and developed loading scenarios up to SPS PA1. It is established in this report that the proposed development does not cause any additional non-compliances within the assessed gravity line.

An assessment of SPS PA1 was undertaken, with the following conclusions:

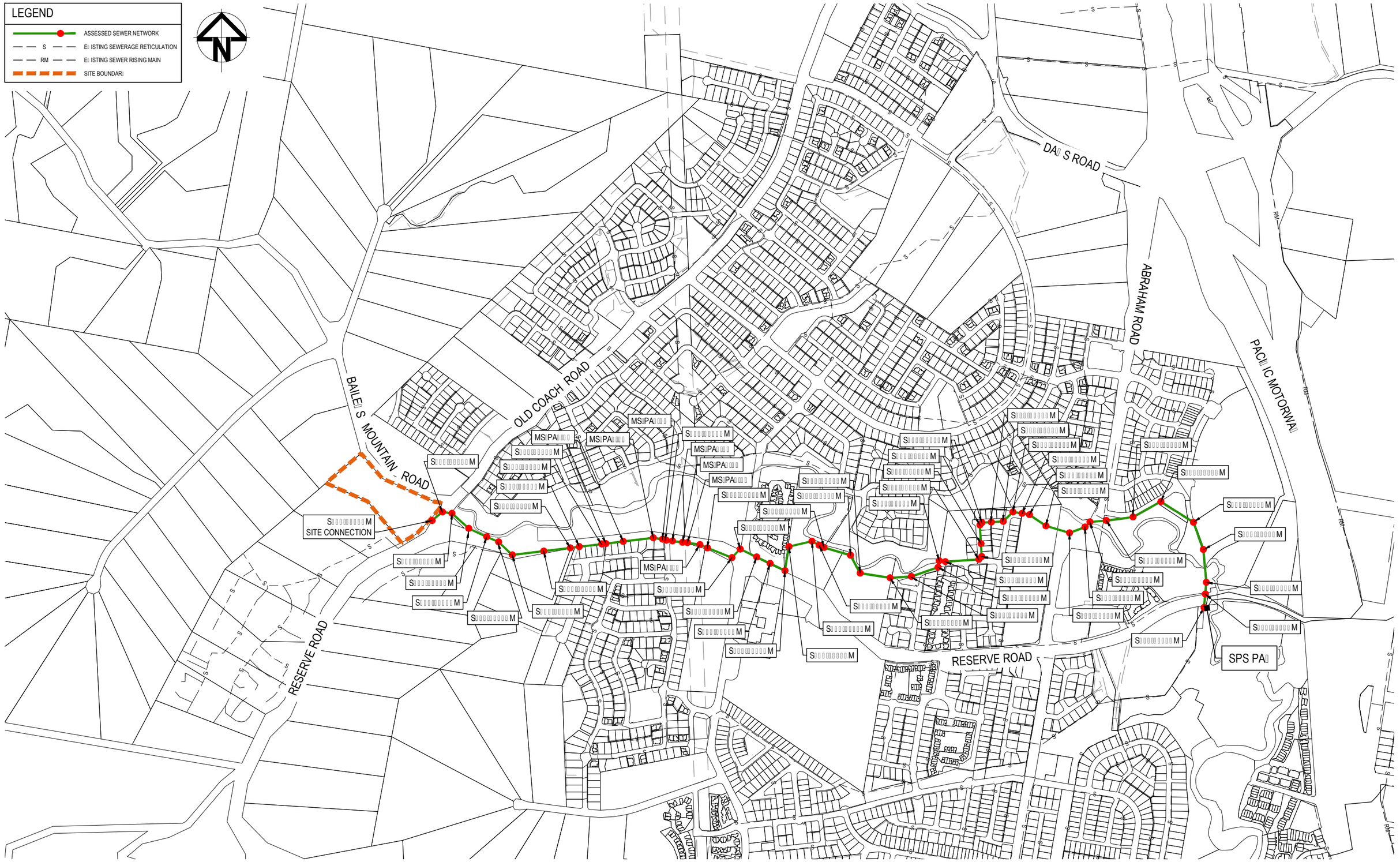
- **Pump Capacity –** Adequate for all planning horizons.
- **Operational Storage –** Adequate for all planning horizons.
- **Emergency Storage –** Adequate until the 2036 horizon. Non-compliances are encountered in the 2066 planning horizon. The 2066 existing scenario has a deficiency of 19.25m³ and the 2066 developed scenario has a deficiency of 23.94m³. The development only constitutes an additional 4.69m³ emergency storage.
- **Rising Main Velocity –** Rising main assessment was not undertaken as no pump capacity augmentations were proposed.

The development in isolation has negligible impacts in context of the wider catchment and inherent shortcomings of SPS PA1. The proposed loadings for the subject site do not trigger an isolated or new upgrade, not already needed to service the exiting catchment projections.

It is suggested that GCW review the upgrade strategy for PS PA1 to ensure that adequate future proofing is undertaken to mitigate the non-compliances caused by the current approved developments, the proposed development and future foreseeable developments. This could equate to a more equitable economic solution for GCW and developers.

APPENDIX A

ENGINEERING DRAWINGS



00	ORIGINAL ISSUE	NJ	AS			00.00.00
Issue	Description	By	Chkd	RPEQ		Date

Scale

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Surveyor

SCHLENCKER SURVEYING

Architect

BDA ARCHITECTURE

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Client

SANDSON PTY LTD

Status

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved		RPEQ No.	
Scale	00000	Original Size	
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		No. AHE0	
Original Size	A0	Designed	
		O. PURTON	
Horizontal Datum	AHD	Project Manager	
		J. STOCKWELL	
Grid		© Copyright reserved	

Project

000 BAILEYS MOUNTAIN ROAD
UPPER COOMERA

Title

SEWER NETWORK CAPACITY
PLAN

ARCADIS
Arcadis Australia Pacific Pty Limited
P O Box, 1653
South Port QLD 4215
ABN 76 104 485 289
Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
0000arcadis0com

Drawing No.	Project No.	Issue
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APPENDIX B

EXISTING SCENARIO RESULTS TABLES

Long Section 1 Results - Existing Scenario

Year Model **2066**
Time Setting Base
Domain Map

Standard Run - Node Results

Allowable Depths in Accordance with GCCC Guidelines

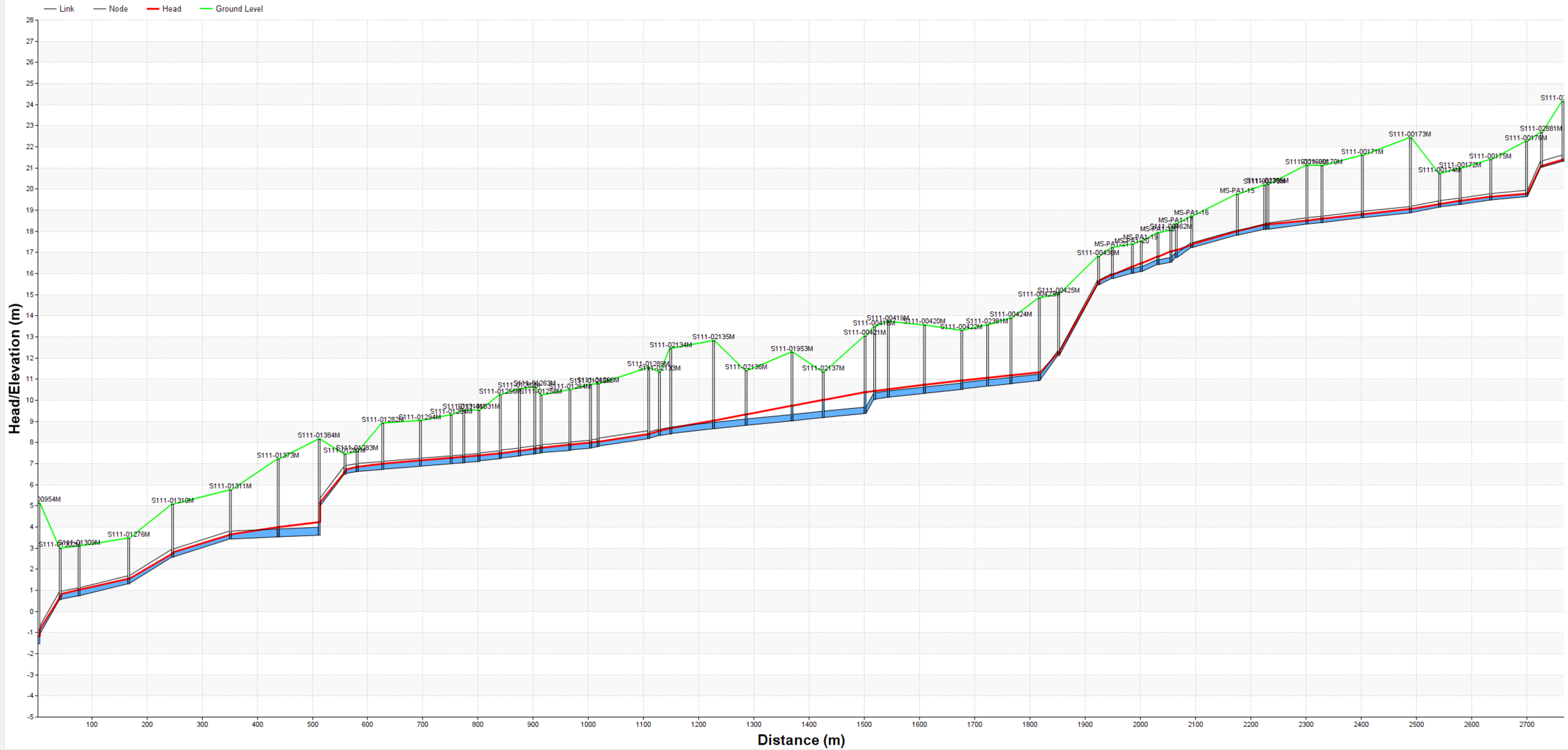
Depth Below MH 1

Junction ID	Manhole Depth (m)	Max. Depth (m)	Freeboard (m)	Head (m)	Lateral Inflow (L/s)	Total Inflow (L/s)	MH Depth Comment
S111-02881M	1.64	0.043	1.597	21.083	0	10.109	
S111-00176M	2.61	0.14	2.47	19.78	0	20.47	
S111-00175M	1.91	0.162	1.748	19.642	11.975	32.444	
S111-00172M	1.7	0.182	1.518	19.452	0	32.444	
S111-00174M	1.59	0.148	1.442	19.288	0	32.444	
S111-00173M	3.55	0.192	3.358	19.062	0	32.444	
S111-00171M	2.95	0.172	2.778	18.812	0	32.444	
S111-00170M	2.69	0.191	2.499	18.601	0	32.444	
S111-00169M	2.78	0.17	2.61	18.51	1.581	34.025	
S111-02389M	2.115	0.235	1.88	18.335	0	35.549	
S111-00179M	2.09	0.233	1.857	18.323	0.042	36.118	
MS-PA1-15	1.93	0.196	1.734	18.016	0.125	36.242	
MS-PA1-16	1.48	0.138	1.342	17.357	0	36.242	
MS-PA1-17	1.59	0.356	1.234	17.116	0.042	36.284	
S111-00462M	1.51	0.524	0.986	17.054	0	44.772	FAIL
MS-PA1-18	1.49	0.382	1.108	16.812	0	44.772	
MS-PA1-19	1.43	0.396	1.034	16.496	0	44.772	
MS-PA1-20	1.37	0.323	1.047	16.333	0	44.772	
MS-PA1-21	1.46	0.18	1.28	15.95	0	44.772	
S111-00438M	1.33	0.113	1.217	15.583	2.193	46.965	
S111-00425M	2.91	0.122	2.788	12.242	0	46.965	
S111-00423M	3.9	0.394	3.506	11.324	1.59	48.555	
S111-00424M	3.1	0.404	2.696	11.184	0	48.555	
S111-02381M	2.89	0.398	2.492	11.068	0.917	49.472	
S111-00422M	2.79	0.426	2.364	10.936	0.711	50.183	
S111-00420M	3.23	0.419	2.811	10.739	0	53.187	
S111-00419M	3.58	0.385	3.195	10.525	0	53.187	
S111-00418M	3.44	0.404	3.036	10.444	0.616	53.804	
S111-00421M	3.66	1.015	2.645	10.385	0	64.603	
S111-02137M	2.15	0.93	1.22	10.02	0	64.603	
S111-01953M	3.25	0.727	2.523	9.747	1.006	65.609	
S111-02136M	2.58	0.524	2.056	9.334	0	65.609	
S111-02135M	4.16	0.39	3.77	9.04	0	66.328	
S111-02134M	4.04	0.276	3.764	8.686	0.042	66.369	
S111-02133M	3	0.23	2.77	8.56	0	66.369	
S111-01289M	3.35	0.225	3.125	8.405	0	66.494	
S111-01266M	2.97	0.24	2.73	8.04	0.042	67.159	
S111-01265M	3.01	0.269	2.741	7.999	0	67.159	
S111-01264M	2.87	0.282	2.588	7.902	0.166	67.325	
S111-01258M	2.74	0.251	2.489	7.751	0	67.325	
S111-01263M	3.16	0.249	2.911	7.709	0	67.325	
S111-01262M	3.17	0.25	2.92	7.61	0	67.658	
S111-01256M	3.02	0.261	2.759	7.491	0.083	67.741	
S111-01331M	2.42	0.292	2.128	7.392	0.042	67.99	
S111-01314M	2.48	0.29	2.19	7.33	0	68.447	
S111-01284M	2.31	0.288	2.022	7.278	0	68.447	
S111-01294M	2.16	0.287	1.873	7.157	0.139	68.586	
S111-01282M	2.19	0.282	1.908	7.002	0	68.586	
S111-01283M	0.95	0.229	0.721	6.849	0	68.586	FAIL
S111-01281M	0.95	0.122	0.828	6.612	0	68.586	FAIL
S111-01384M	4.54	0.623	3.917	4.233	0	94.103	
S111-01373M	3.68	0.468	3.212	3.998	0	94.103	
S111-01311M	2.31	0.216	2.094	3.646	0.125	94.228	
S111-01310M	2.5	0.173	2.327	2.743	0	94.228	
S111-01276M	2.15	0.248	1.902	1.558	0	104.84	
S111-01309M	2.35	0.297	2.053	1.037	0	104.84	
S111-01302M	2.44	0.15	2.29	0.7	0	112.337	
S111-00954M	6.65	0.361	6.289	-1.169	0	207.014	
S111-03013M	2.84	0.081	2.759	21.391	0	10.109	

APPENDIX C

EXISTING SCENARIO LONGITUDINAL SECTIONS

HGL Profile with Maximum Data of Links S111-01302MI1,S111-01309MI1,...,S111-03013ML1



APPENDIX D

DEVELOPED SCENARIO RESULTS TABLE

Long Section 1 Results - Developed Scenario

Year Model **2066**
Time Setting Base
Domain Map

Standard Run - Node Results

Allowable Depths in Accordance with GCCC Guidelines

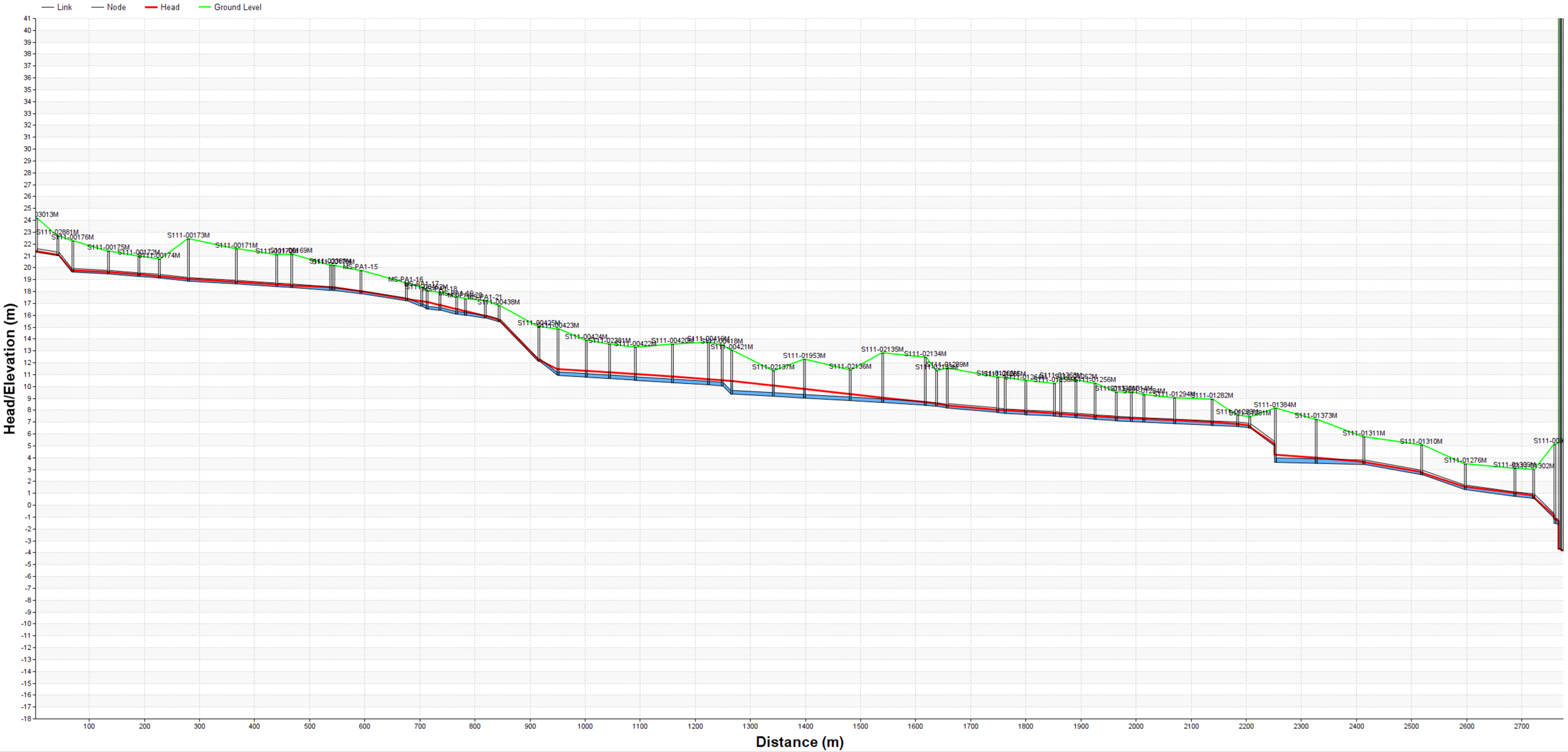
Depth Below MH 1

Junction ID	Manhole Depth (m)	Max. Depth (m)	Freeboard (m)	Head (m)	Lateral Inflow (L/s)	Total Inflow (L/s)	MH Depth Comment
S111-03013M	2.84	0.088	2.752	21.398	1.58	11.689	
S111-02881M	1.64	0.046	1.594	21.086	0	11.689	
S111-00176M	2.61	0.146	2.464	19.786	0	22.05	
S111-00175M	1.91	0.167	1.743	19.647	11.975	34.024	
S111-00172M	1.7	0.187	1.513	19.457	0	34.024	
S111-00174M	1.59	0.153	1.437	19.293	0	34.024	
S111-00173M	3.55	0.198	3.352	19.068	0	34.024	
S111-00171M	2.95	0.177	2.773	18.817	0	34.024	
S111-00170M	2.69	0.196	2.494	18.606	0	34.024	
S111-00169M	2.78	0.175	2.605	18.515	1.581	35.605	
S111-02389M	2.115	0.269	1.846	18.369	0	37.129	
S111-00179M	2.09	0.269	1.821	18.359	0.042	37.698	
MS-PA1-15	1.93	0.212	1.718	18.032	0.125	37.822	
MS-PA1-16	1.48	0.155	1.325	17.385	0	37.822	
MS-PA1-17	1.59	0.436	1.154	17.196	0.042	37.864	
S111-00462M	1.51	0.598	0.912	17.128	0	46.352	FAIL
MS-PA1-18	1.49	0.439	1.051	16.869	0	46.352	
MS-PA1-19	1.43	0.43	1	16.53	0	46.352	
MS-PA1-20	1.37	0.345	1.025	16.355	0	46.352	
MS-PA1-21	1.46	0.187	1.273	15.957	0	46.352	
S111-00438M	1.33	0.116	1.214	15.586	2.193	48.545	
S111-00425M	2.91	0.124	2.786	12.244	0	48.545	
S111-00423M	3.9	0.54	3.36	11.47	1.59	50.135	
S111-00424M	3.1	0.54	2.56	11.32	0	50.135	
S111-02381M	2.89	0.527	2.363	11.197	0.917	51.052	
S111-00422M	2.79	0.546	2.244	11.056	0.711	51.854	
S111-00420M	3.23	0.527	2.703	10.847	0	54.969	
S111-00419M	3.58	0.48	3.1	10.62	0	55.148	
S111-00418M	3.44	0.493	2.947	10.533	0.616	55.839	
S111-00421M	3.66	1.101	2.559	10.471	0	66.183	
S111-02137M	2.15	0.908	1.242	10.088	0	66.183	
S111-01953M	3.25	0.781	2.469	9.801	1.006	67.189	
S111-02136M	2.58	0.558	2.022	9.368	0	67.189	
S111-02135M	4.16	0.41	3.75	9.06	0	67.907	
S111-02134M	4.04	0.282	3.758	8.692	0.042	67.949	
S111-02133M	3	0.234	2.766	8.564	0	67.949	
S111-01289M	3.35	0.228	3.122	8.408	0	68.074	
S111-01266M	2.97	0.245	2.725	8.045	0.042	68.739	
S111-01265M	3.01	0.274	2.736	8.004	0	68.739	
S111-01264M	2.87	0.286	2.584	7.906	0.166	68.905	
S111-01258M	2.74	0.255	2.485	7.755	0	68.905	
S111-01263M	3.16	0.253	2.907	7.713	0	68.905	
S111-01262M	3.17	0.254	2.916	7.614	0	69.237	
S111-01256M	3.02	0.266	2.754	7.496	0.083	69.321	
S111-01331M	2.42	0.297	2.123	7.397	0.042	69.57	
S111-01314M	2.48	0.296	2.184	7.336	0	70.027	
S111-01284M	2.31	0.293	2.017	7.283	0	70.027	
S111-01294M	2.16	0.292	1.868	7.162	0.139	70.166	
S111-01282M	2.19	0.286	1.904	7.006	0	70.166	
S111-01283M	0.95	0.233	0.717	6.853	0	70.166	FAIL
S111-01281M	0.95	0.124	0.826	6.614	0	70.166	FAIL
S111-01384M	4.54	0.642	3.898	4.252	0	95.683	
S111-01373M	3.68	0.479	3.201	4.009	0	95.683	
S111-01311M	2.31	0.218	2.092	3.648	0.125	95.808	
S111-01310M	2.5	0.175	2.325	2.745	0	95.808	
S111-01276M	2.15	0.251	1.899	1.561	0	106.42	
S111-01309M	2.35	0.301	2.049	1.041	0	106.42	
S111-01302M	2.44	0.151	2.289	0.701	0	113.917	
S111-00954M	6.65	0.363	6.287	-1.167	0	208.594	

APPENDIX E

DEVELOPED SCENARIO LONGITUDINAL SECTIONS

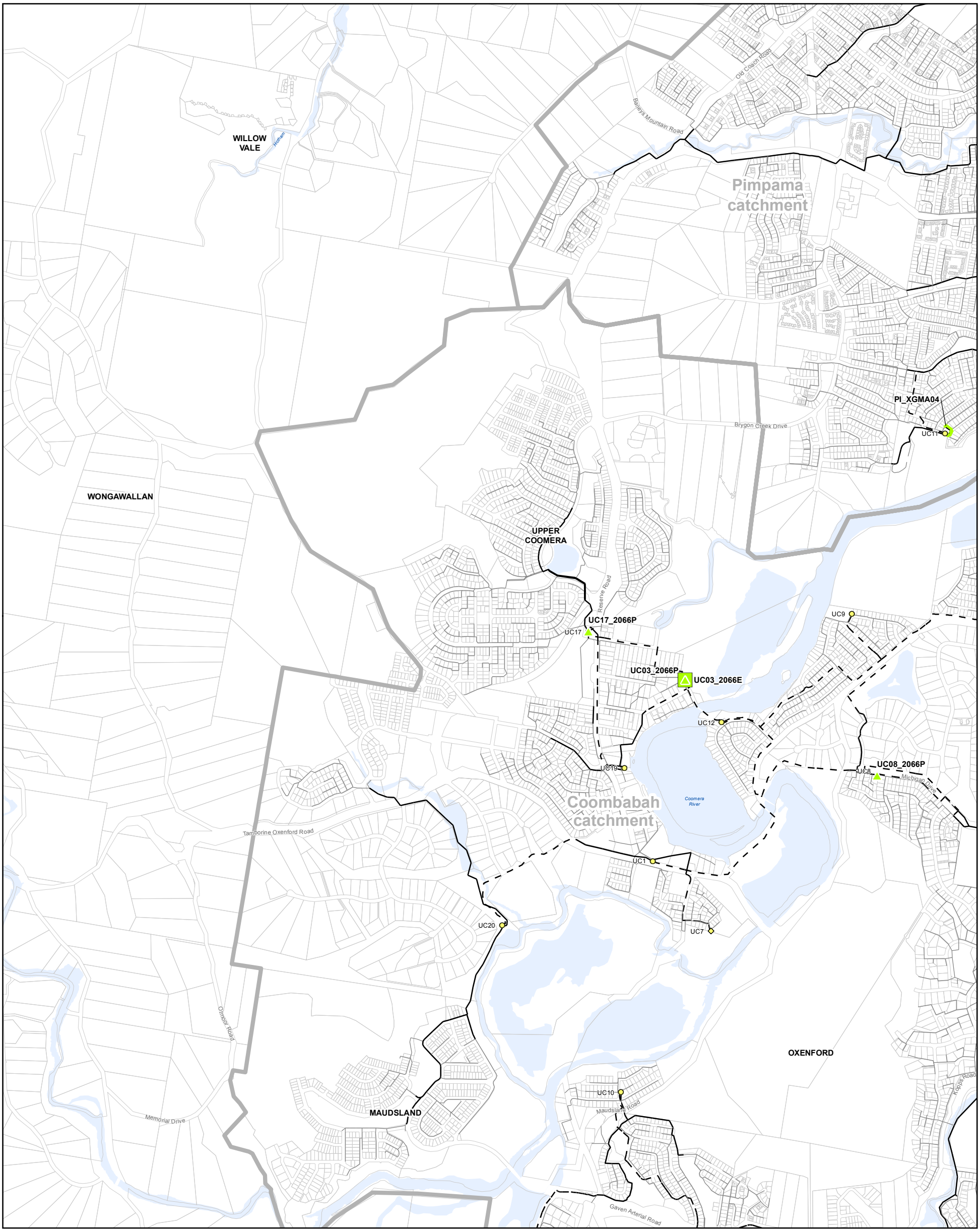
HGL Profile with Maximum Data of Links S111-03013ML1,S111-02881ML1,...,CDT-201



APPENDIX F

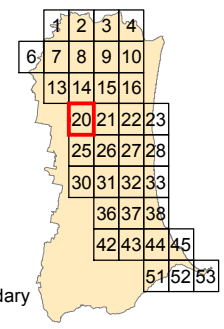
INFRASTRUCTURE MAP

Local Government Infrastructure Plan Map - Plan for trunk sewerage infrastructure (sewage collection and treatment) - map 20



	Sewer gravity main	Sewer rising main	Pump station total power	Pump station operational capacity	Pump station emergency capacity	Sewerage treatment plant
Existing infrastructure						
Trunk						
Non-Trunk						
New/augmented trunk infrastructure						
2021						
2026						
2031						
2036						
Ultimate						

- Sewerage service catchment
- Land affected by other development legislation, refer to Context map and Part 10 of the City Plan
- Cadastre boundary
- Local government area boundary
- Waterway or waterbody



City Plan

Disclaimer:
© City of Gold Coast, Queensland 2017 or © State of Queensland 2017. No warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Map Version 3.00
18 Jul 2017

Data Sources:
Sewer infrastructure - CoGC
Waterways - CoGC
Cadastre (February 2016) - State

Projection:
MGA94
Zone 56

0 150 300 600 m

Approx Scale @ A3 1:20,000

CITY OF GOLDCOAST.

LGIP-PFTI-SEW-SCT-20 (40k ref: 5)

ATTACHMENT 13

Water Network Capacity Assessment, prepared by Arcadis



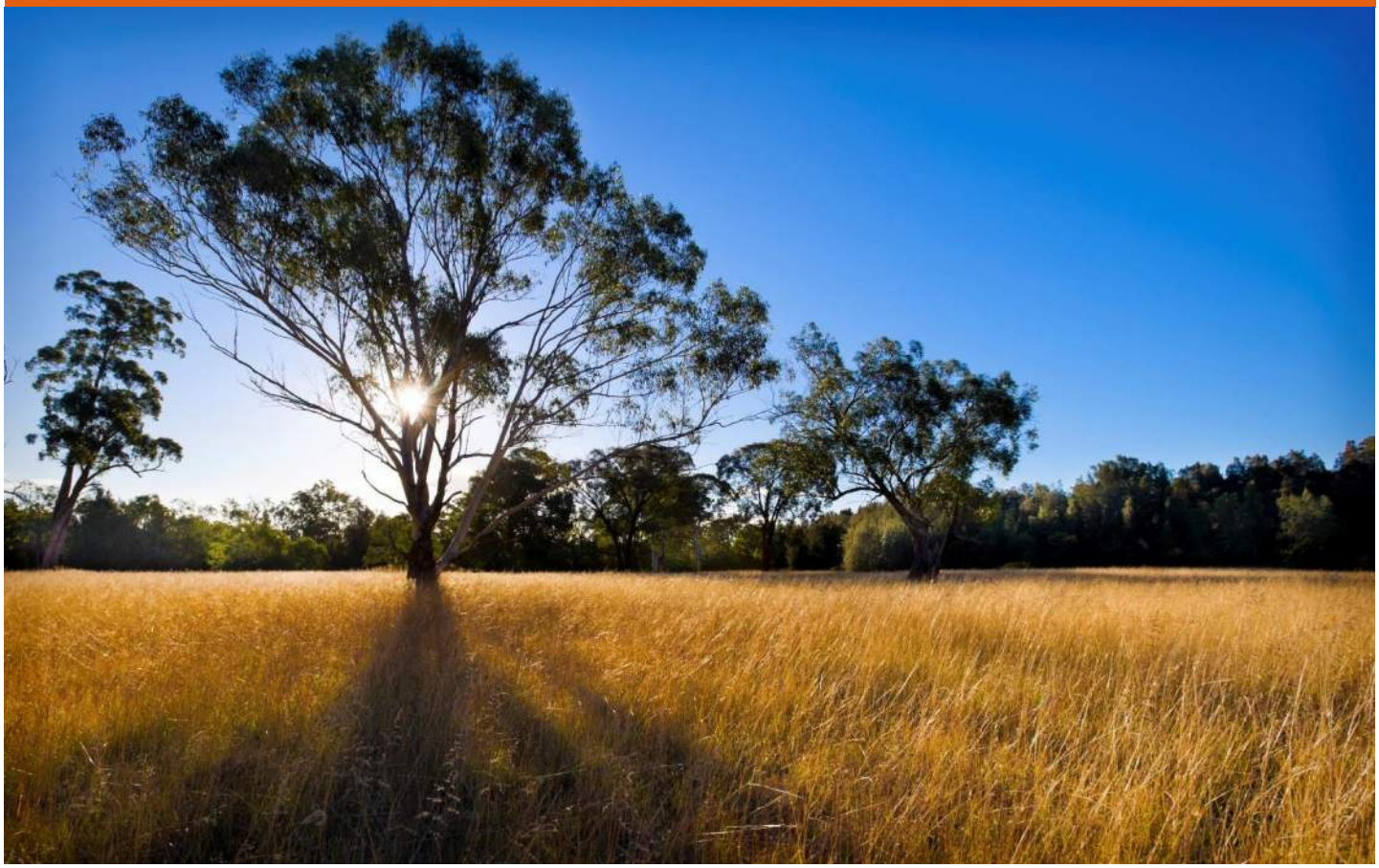
URBAN PLANNING SERVICES

ARCADIS Design & Consultancy for natural and built assets

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

WATER NETWORK CAPACITY ASSESSMENT

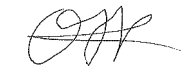
26 JULY 2018



Incorporating Hyder

SANDSON PTY LTD
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

WATER NETWORK CAPACITY ASSESSMENT

Author	Oliver Purton	
Checker	Ashley Shepherd	
Approver	James Stockwell	
Report No	F0004-10022603-AAR	
Date	26/07/2018	
Revision Text	02	

This report has been prepared for Sandson Pty Ltd in accordance with the terms and conditions of appointment for 202 Baileys Mountain Road dated June 2018. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/07/2018	Draft Issue	OP	JS
02	26/07/2018	Issued for Approval	OP	JS

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GCW CORRESPONDENCE & ADDITIONAL LOADS OF OTHER OVER-PLANNING-SCHEME DENSITY SITES AND LOADS TO BE REMOVED

APPENDIX C

2015 CITY PLAN PRIORITY INFRASTRUCTURE PLAN FOR WATER

1 EXECUTIVE SUMMARY

Arcadis have been engaged by Sandson Pty Ltd to undertake a Water Network Capacity Assessment (WNCA) for a development application. The proposed development site is located over the following allotment in Upper Coomera, QLD.

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

With the use of the software InfoWater, a hydraulic assessment of the proposed development's impact on the surrounding water network has been undertaken. Calculations based on the Equivalent Persons (EP's) illustrate an increased loading in excess of CoGC's planned demand for the site relating to potable water services.

The proposed connection to Gold Coast Water's (GCW) water network will generally be from the DN300 main that is aligned along the north-western verge of Old Coach Road, south of the proposed development.

The assessment resulted in the following conclusions:

- **Standard Flow Pressure –** There are some pressure non-compliances across all planning horizons for both existing and developed scenarios. The proposed development does not cause any additional pressure non-compliances within the network. The existing non-compliances are relatively minor for most of the planning horizons. The addition of the proposed development causes a negligible impact on these non-compliances.
- **Standard Flow Velocity –** Adequate for all planning horizons and scenarios.
- **Fire Flow –** Adequate for all planning horizons and scenarios.

As seen in the results, the proposed development has little impact on the water network.

No network augmentation recommendations have been put forward to solve the non-compliances as the development does not create any additional non-compliances.

GCW advised the removal of the trunk potable water main within Baileys Mountain Road from the model, refer to section 4 for details.

2 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The subject site is located at 202 Baileys Mountain Road, Upper Coomera, South-East Queensland, Australia on the following allotment:

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

The total area of the site is 30,870m².

2.2 LAND USAGE

In its current state the subject site described as 202 Baileys Mountain Road is occupied by a single residential dwelling and sheds.

A site locality plan is located below in Figure 2-1.



Figure 2-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

2.3 EXISTING TOPOGRAPHY

The site topography consists of moderately grading slopes (averaging <4%) with the site generally grading south-east towards both Baileys Mountain Road and Reserve Road. An existing topographic survey can be found in Appendix A.

The highest point of the site is at approximately RL39.0m AHD at the far north-west corner of the site on the northern boundary. The lowest point is approximately RL21.0m AHD located in the south-eastern corner of the site.

3 PROPOSED DEVELOPMENT

It is proposed to deliver an aged care facility with the following features;

- Aged Care Suites;
- Retirement Apartments
- Residents Amenities (Café, Kitchens, Library, Treatment Rooms, etc);
- Staff Facilities; and
- Carparking.

The existing dwelling on the site will be repurposed as a staff training facility.

A master plan of the proposed development has been provided in Figure 3-1 below.

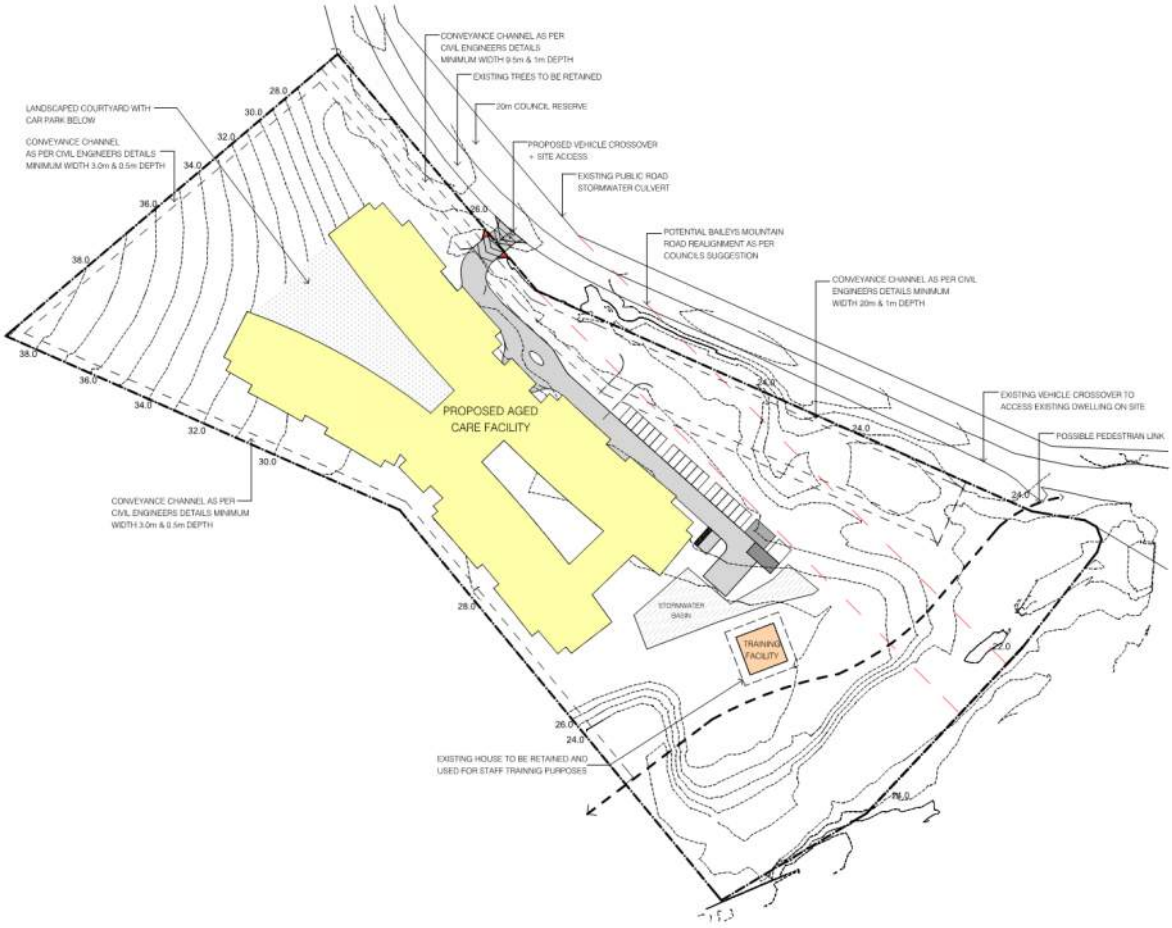


Figure 3-1 Development Master Plan (Courtesyof BDA)

3.1 PROPOSED DEVELOPMENT LOADING

For the purposes of this report, the development has been assessed under two loading cases to better determine the anticipated impact to be had on the surrounding network as a result of the development. These cases are as follows:

- **Existing Case** – A demand assigned to the site via the infrastructure Demand Model (IDM) 2013 provided by GCW with additional loads included of other proposed developments (refer to section 5 for further details) as instructed by GCW. The 2016, 2021, 2026, 2031, 2036 and 2066 planning horizons were assessed.
- **Developed Case** – The calculated demand for the property based on proposed architect plans and conversion rates from the Gold Coast Planning Scheme with additional loads included of other proposed developments (refer to section 4 for further details) as instructed by GCW. The 2016, 2021, 2026, 2031, 2036 and 2066 planning horizons were assessed.

Table 3-1 below shows the calculated ET as per 'Table A2 – Typical Water and Wastewater Supply Demand Generation Rates for Development Types (Gold Coast Area) of the SEQ Water Supply and Sewerage Design and Construction Code, Appendix A1 – City of Gold Coast.

Table 3-1 Proposed Development Loadings

Category	No. Units	Conversion Rate	Proposed ET Loading	Proposed EP Loading
Nursing Home	**144 beds**	0.26ET/bed	37.44	102.2
1 Bedroom apartment/studio	**2**	0.47ET/dwelling	0.94	2.57
2 Bedroom apartment/studio	**6**	0.63ET/dwelling	3.78	10.3
Medical Treatment room	**4**	0.3ET/room	1.2	3.28
Retail/office/cafe	**910m^2**	0.6ET/100m^2	5.46	14.91
		Total:	**48.82**	**134**

*2.73EP/ET – SEQ WS&S D&C Code CoGC EP/ET Conversion

**Repurposed training facility is included in retail/office/café category

4 MODELLING ASSUMPTIONS

The potable water supply network surrounding the proposed development site was modelled using the Northern Region InfoWater model “Northern Potable Multi-Use Updated v51” supplied by CoGC in August 2017. The development demand has been applied in the 2016, 2021, 2026, 2031, 2036 and the 2066 horizons (2066 corresponding to Planning Scheme Demand). 2016 is taken as being the current year for modelling purposes. The analysis was undertaken considering the following assumptions and design criteria (Note: All design criteria are in accordance with Table 4.1 – Water Network Design Criteria (Gold Coast) of the SEQ D & C Code):

- The site is located within the Coomera/Pimpama LLZ;
- 3-day standard flow simulation under Maximum Day (MD) condition with a minimum design pressure of 22m and a maximum design pressure of 80m.
- 3-day standard flow simulation under Maximum Day (MD) condition with a maximum design velocity of 2.5m/s.
- 1-day fire flow simulation under Maximum Day (MD) condition with a minimum design pressure of 12m. Further explanation regarding the fire flow is found in Section 5.3 of this report
- The development can be serviced from a single connection point (W18-04716N) with DN300 inlet pipe (CP_16128_PIPE), as shown in Appendix A.
- Demand has been applied using the Residential Multi Family (RMF_1).
- GCW advised that there was one other above planning-scheme-density site to be included as part of the assessment. More details regarding this additional load can be found in Appendix B.
- GCW advised that 1 node services the current site. The loads from this node will be removed in the Developed Scenarios. More details regarding the loads to be removed can be found in Table 5-1 below.
- GCW advised that pipe ‘FPI_25067_PIPE_LGIP’ within Baileys Mountain Road has not been constructed, and to deactivate the pipe in the model. This pipe is visible on the Gold Coast City Plan 2015 ‘Plan for Trunk Water Supply Infrastructure Map - 20’. Refer to Appendix B for correspondence with GCW.

5 MODELLING METHODOLOGY

The proposed development was incorporated into the InfoWater model by applying the anticipated loads at the specified connection point of the model, along with the inclusion of other over planning-scheme-density sites. The impact on the existing water supply network was assessed by verifying and comparing the standard flow pressure, fire flow pressure and pipe velocity against SEQ's DSS in the vicinity of the development site.

The vicinity around the proposed development site which has been assessed (assessment domain) is shown in Appendix A. A summary table is included below which specifies the applied loadings in each of the modelled scenarios as a result of the development.

Table 5-1 Load Application Table at Connection Junction W18-04716N

Planning Horizon	Loads to be Removed (EP)	Proposed Development Load (EP)
2016	3.42	134
2021	3.42	134
2026	3.42	134
2031	3.42	134
2036	3.42	134
2066	11.94	134

5.1 STANDARD FLOW PRESSURE

The standard flow scenario was assessed for all planning scheme horizons (2016, 2021, 2026, 2031, 2036 and PSD (2066)) in the existing and developed scenarios. In the developed scenarios the development loads were applied to the specified connection point and the results were then compared to the results modelled in the existing scenario. The minimum and maximum pressures in the previously specified vicinity to the proposed development were assessed over a 72-hour period using a steady state simulation.

5.2 PIPE VELOCITY

The standard flow scenario was assessed for all planning scheme horizons (2016, 2021, 2026, 2031, 2036 and PSD (2066)) in both the existing and developed scenario to determine pipe velocities. In the developed scenario the additional loads were applied to the specified connection point and the results were then compared to the results modelled in the existing scenario. The minimum and maximum velocities in the previously specified vicinity to the proposed development were assessed over a 72-hour period using a steady state simulation.

5.3 FIRE FLOW VELOCITY

The fire flow scenario was modelled using a fire flow simulation of 1 day by applying 7.5L/s fire flow demand for residential uses at the proposed connection point over a period of 4 hours. The development site is zoned as 'rural residential' in the City Plan 2015. Therefore, the fire flow demand for the lot from the city's water main should be 7.5L/s. A duration of 4 hours is adopted to ensure the peak in the system is adequately captured when modelling. It is noted that site will likely only be approved for 7.5/s for 2 hours unless another flow and duration is approved by GCW. The minimum fire flow pressures in the specified vicinity of the site were then assessed against the SEQ's DSS.

5.4 CoGC WATER SUPPLY PRIORITY INFRASTRUCTURE PLAN

Plan for Trunk Water Supply Infrastructure - Map 20 (Appendix C) indicates that there is a planned potable water main upgrade in both the 2021 & Ultimate horizon along Baileys Mountain Road and Reserve Road respectively, adjacent to the site.

Discussions with GCW concluded that the 2021 planned trunk potable water main upgrade within Baileys Mountain Road should be deactivated within the model. Refer to Appendix B for correspondence with GCW.

6 RESULTS AND DISCUSSION

6.1 EXISTING SYSTEM PERFORMANCE

6.1.1 STANDARD FLOW PRESSURES

The InfoWater simulation results are displayed in Table 6-1. The minimum and maximum pressures within the modelled domain are presented.

Table 6-1 Existing Standard Flow Pressures within Modelled Domain

Planning Horizon	W18-04716N		Min Pressure within Domain Pressure (m): Node	Max Pressure within Domain Pressure (m): Node	Number of Min Pressure Non-Compliances	Number of Max Pressure Non-Compliances
	Min Pressure (m):	Max Pressure (m):				
2016	59.8	65.6	19.7 (RW181332ME_3_HP)	82.4 (CP11842)	8	78
2021	58.3	65.6	18.9 (W18-01681H)	82.4 (CP11842)	12	78
2026	58.5	65.6	19.2 (W18-01681H)	82.4 (CP11842)	10	78
2031	57.9	65.6	23.3 (RW181332ME_3_HP)	81.0 (CP10630)	0	20
2036	56.1	65.6	22.1 (W18-01330H)	82.4 (CP11842)	0	78
2066	45.3	55.5	15.0 (W18-03953N)	76.0 (1380480)	24	0

The above existing scenario results indicate the minimum and maximum pressures within the modelled domain. There are both minimum and maximum pressure non-compliances throughout all planning horizons. These results will be the basis of which the developed scenario is assessed against.

The engineering drawings included within Appendix A illustrate the location of these nodes.

6.1.2 STANDARD FLOW VELOCITIES

The InfoWater simulation results are displayed in Table 6-2. The maximum velocities within the modelled domain and the connecting pipe are presented below.

Table 6-2 Existing Standard Flow Velocities within the Modelled Domain

Planning Horizon	CP_16128_PIPE	Max Velocity within Domain Velocity (m/s): Node	DSS Compliant (YES/NO)	Number of Max Velocity Non-Compliances
	Max Velocity: (m/s)			
2016	0.42	1.76 (CP_16936_PIPE)	YES	0
2021	0.41	1.76 (CP_16936_PIPE)	YES	0
2026	0.42	1.76 (CP_16936_PIPE)	YES	0
2031	0.41	2.38 (CP_16936_PIPE)	YES	0
2036	0.41	1.76 (CP_16936_PIPE)	YES	0
2066	0.72	2.47 (CP_16936_PIPE)	YES	0

The above existing scenario results indicate maximum velocities within the modelled domain comply with SEQ code for all planning horizons. These results will be the basis of which the developed scenario is assessed against.

6.1.3 FIRE FLOW PRESSURE/ VELOCITY

The existing scenario fire flow simulations were run at the proposed development connection with a fire flow demand of 7.5L/s. The fire flow pressure and pipe velocity results are presented in Table 6-3 below.

Table 6-3 Existing Fire Flow Pressure & Velocity within Modelled Domain

Planning Horizon	Fire Flow Demand (L/s)	Min Residual Pressure (m)	Max Velocity within Domain Velocity (m/s): Pipe	DSS Compliant (YES/NO)	Number of Max Velocity Non-Compliances
2016	7.5	19.7	1.76 (CP_16936_PIPE)	YES	0
2021	7.5	19.7	1.76 (CP_16936_PIPE)	YES	0
2026	7.5	18.6	1.76 (CP_16936_PIPE)	YES	0
2031	7.5	23.3	2.38 (CP_16936_PIPE)	YES	0
2036	7.5	22.0	1.76 (CP_16936_PIPE)	YES	0
2066	7.5	14.0	2.43 (CP_16940_PIPE)	YES	0

The fire flow simulations show the DSS of a minimum of 12m pressure is achieved within the domain for the assessed planning horizons with the specified fire loading. These results will be the basis of which the developed scenario is assessed against.

The above existing fire flow scenario results indicate maximum velocities within the modelled domain comply with SEQ code for all planning horizons.

6.2 DEVELOPED SYSTEM PERFORMANCE

6.2.1 STANDARD FLOW PRESSURE

The InfoWater simulation results displayed in Table 6-4 are the minimum and maximum pressures within the developed modelled domain.

Table 6-4 Developed Standard Flow Pressures within the Modelled Domain

Planning Horizon	W18-04716N		Min Pressure within Domain Pressure (m): (Δ Pressure ±) Node	Max Pressure within Domain Pressure (m): (Δ Pressure ±) Node	Number of Min Pressure Non-Compliances (±)	Number of Max Pressure Non-Compliances (±)
	Min Pressure (m): (Δ Pressure ±)	Max Pressure (m): (Δ Pressure ±)				
2016	59.7 (-0.1)	65.6 (0)	19.7 (0) (RW181332ME_3_HP)	82.4 (0) (CP11842)	8 (0)	78 (0)
2021	59.1 (+0.8)	65.6 (0)	19.7 (+0.8) (RW181332ME_3_HP)	82.4 (0) (CP11842)	8 (-4)	78 (0)
2026	58.4 (-0.1)	65.6 (0)	19.2 (0) (W18-01681H)	82.4 (0) (CP11842)	10 (0)	78 (0)
2031	57.4 (-0.5)	65.6 (0)	23.3 (0) (RW182402NE)	81.0 (0) (CP10630)	0 (0)	20 (0)
2036	55.9 (-0.2)	65.6 (0)	22.0 (-0.1) (W18-01330H)	82.4 (0) (CP11842)	0 (0)	78 (0)
2066	45.2 (-0.1)	55.5 (0)	14.9 (-0.1) (W18-03953N)	76.0 (0) (1380480)	24 (0)	0 (0)

The above developed scenario results indicate the minimum and maximum pressures within the modelled domain do not meet SEQ's DSS for the assessed planning horizons.

The proposed development does not cause any additional pressure non-compliances within the network.

The largest increase in pressure of +0.8m, occurs in the 2021 planning horizon at both 'W18-04716N' and 'RM181332ME_3_HP'. Whilst the largest decrease in pressure of -0.5m, occurs in the 2031 planning horizon at 'W18-04716N'. These are considered to be negligible changes.

The engineering drawings included within Appendix A illustrate the location of these structures.

6.2.2 STANDARD FLOW VELOCITIES

The InfoWater simulation results are displayed in Table 6-. The maximum velocities within the modelled domain and the connecting pipe are presented below.

Table 6-5 Developed Standard Flow Velocities within the Modelled Domain

Planning Horizon	CP_16128_PIPE Max Velocity: (m/s) (Δ Velocity ±)	Max Velocity within Domain Velocity (m/s): Node (Δ Velocity ±)	DSS Compliant (YES/NO)	Number of Max Velocity Non-Compliances (±)
2016	0.43 (+0.01)	1.76 (0) (CP_16936_PIPE)	YES	0
2021	0.42 (+0.01)	1.76 (0) (CP_16936_PIPE)	YES	0
2026	0.47 (+0.05)	1.76 (0) (CP_16936_PIPE)	YES	0
2031	0.46 (+0.05)	2.38 (0) (CP_16936_PIPE)	YES	0
2036	0.47 (+0.06)	1.76 (0) (CP_16936_PIPE)	YES	0
2066	0.72 (0)	2.47 (0) (CP_16936_PIPE)	YES	0

The above developed scenario results indicate maximum velocities within the modelled domain comply with SEQ code for all planning horizons.

The largest change in max velocity of +0.06m/s, was observed in the 2036 planning horizon. This is considered to be negligible.

6.2.3 FIRE FLOW PRESSURE/ VELOCITY

A summary of the junction fire flow assessment is presented below in Table 6- specifying whether the assessed network domain functions within SEQ's velocity and pressure DSS and highlighting any issues present.

Table 6-6 Developed Fire Flow Pressures & Velocities within the Modelled Domain

Planning Horizon	Fire Flow Demand (L/s)	Min Residual Pressure (m) (Δ Pressure ±)	Max Velocity within Domain Velocity (m/s): (Δ Velocity ±) Pipe	DSS Compliant (YES/NO)	Number of Max Velocity Non-Compliances (±)
2016	7.5	19.7 (0)	1.76 (0) (CP_16936_PIPE)	YES	0
2021	7.5	19.7 (0)	1.76 (0) (CP_16936_PIPE)	YES	0
2026	7.5	18.5 (-0.1)	1.76 (0) (CP_16936_PIPE)	YES	0
2031	7.5	23.3 (0)	2.38 (0) (CP_16936_PIPE)	YES	0
2036	7.5	21.9 (-0.1)	1.76 (0) (CP_16936_PIPE)	YES	0
2066	7.5	13.9 (-0.1)	2.43 (0) (CP_16940_PIPE)	YES	0

The fire flow simulations show the DSS of a minimum of 12m pressure is achieved within the domain for the assessed planning horizons with the specified fire loading.

The above developed fire flow scenario results indicate maximum velocities within the modelled domain comply with SEQ code for all planning horizons.

A minimal decrease in pressure of -0.1m, was observed in the 2026, 2036 and 2066 planning horizons. This is considered negligible.

7 CONCLUSION

This Water Network Capacity Assessment shows that the proposed development does not cause any additional DSS non-compliances within the network.

The assessment resulted in the following conclusions:

- **Standard Flow Pressure –** There are some pressure non-compliances across all planning horizons for both existing and developed scenarios. The proposed development does not cause any additional pressure non-compliances within the network. The existing non-compliances are relatively minor for most of the planning horizons. The addition of the proposed development causes a negligible impact on these non-compliances.
- **Standard Flow Velocity –** Adequate for all planning horizons and scenarios.
- **Fire Flow –** Adequate for all planning horizons and scenarios.

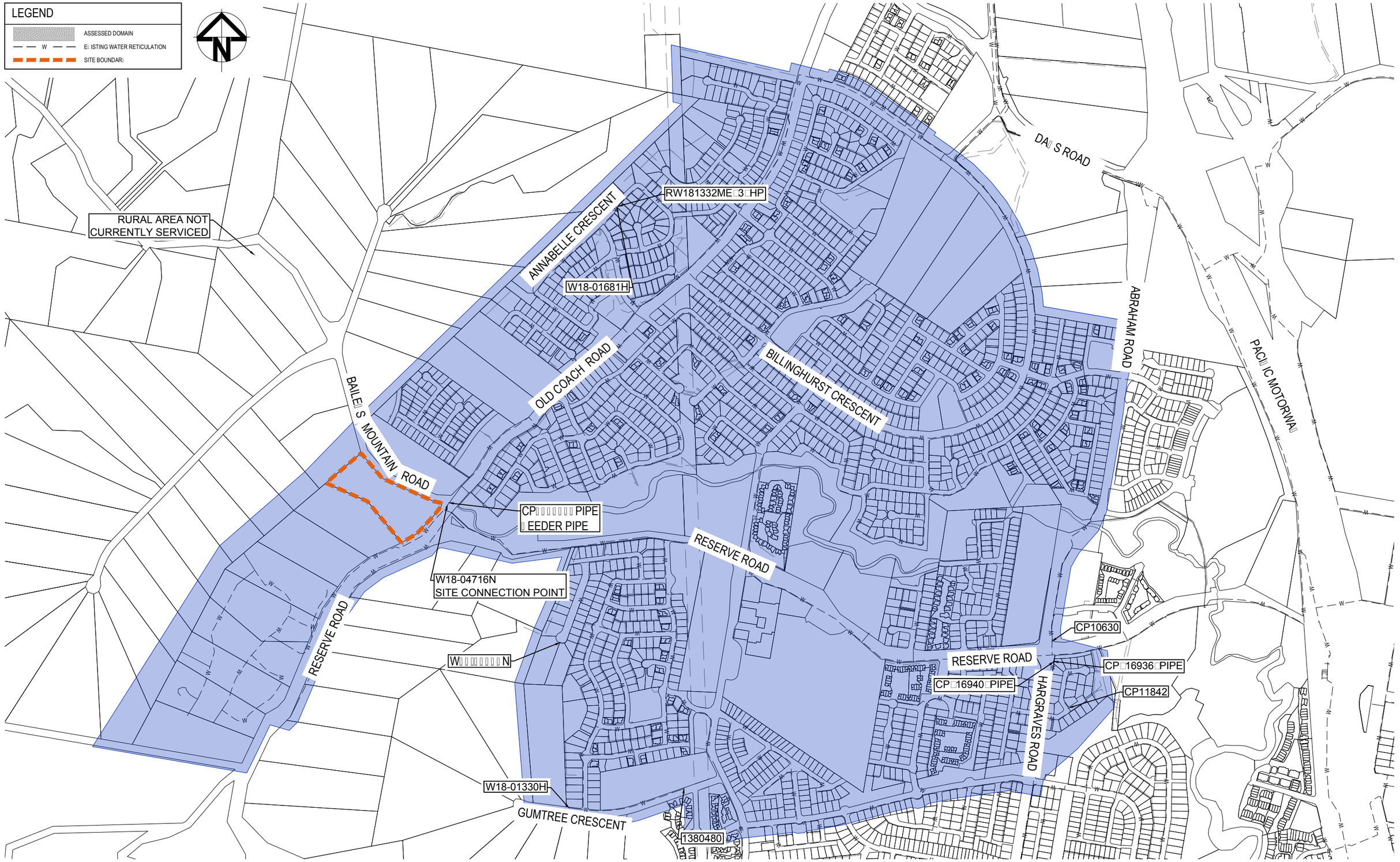
As seen in the results, the proposed development has little impact on the water network.

No network augmentation recommendations have been put forward to solve the non-compliances as the development does not create any additional non-compliances.

GCW advised the removal of the trunk potable water main within Baileys Mountain Road, refer to section 4 for details.

APPENDIX A

ENGINEERING DRAWINGS



	ORIGINAL ISSUE	N	AS			
	D r i n	B	C d	RPE	D	

S

S r r SCHLENCKER SURV ING

Ar BDA ARCHITECTURE

D d W N

C SANDSON PT LTD

S PRELIMINAR
NOT TO BE USED OR CONSTRUCTION

A d R.P.E N

S		Or S	
		Dr N. AHE	
Or S	A	D d O. PURTON	
Hr D	AHD	Pr M J. STOCKWELL	
Grd		© C r d	

Pr BAILE S MOUNTAIN ROAD UPPER COOMERA

T WATER IN RASTRUCTURE PLAN

ARCADIS
Arcadi Au tralia Paci ic Pt Limited
P O Box, 1653
Sout ort QLD 4215
ABN 76 104 485 289
Tel No 61 7 5532 3933
Fax No 61 7 5591 4778
arcadi com

Dr N. Pr N. I

DA — —

E:\CAD\C\C\C\C\ d\W N\ ri.dl

/Ju/ AM

APPENDIX B

GCW CORRESPONDENCE & ADDITIONAL LOADS OF OTHER OVER-PLANNING-SCHEME DENSITY SITES AND LOADS TO BE REMOVED

Purton, Oliver

From: SAHA Uttam <USAHA@goldcoast.qld.gov.au>
Sent: Thursday, 14 June 2018 12:50 PM
To: Purton, Oliver
Cc: JAHAN Syeda
Subject: RE: Site Information Request: 202 Baileys Mountain Road, Upper Coomera

Hi Oliver,

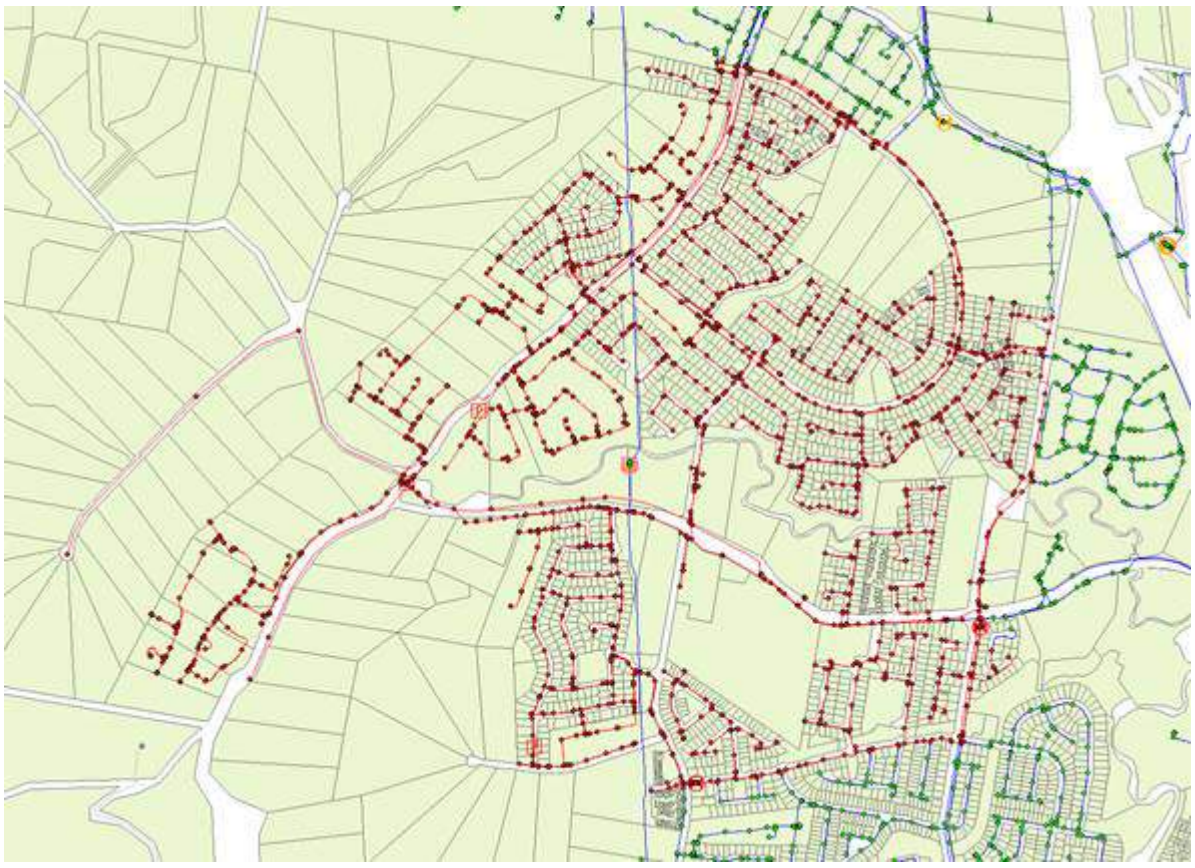
Yes, the domain is acceptable. The pipe 'FPI_25067_PIPE_LGIP' was not built. Please deactivate the pipe in modelling.

Regards Uttam

From: Purton, Oliver [mailto:Oliver.Purton@arcadis.com]
Sent: Wednesday, 13 June 2018 11:30 AM
To: SAHA Uttam
Cc: JAHAN Syeda
Subject: RE: Site Information Request: 202 Baileys Mountain Road, Upper Coomera

Hi Uttam & Roshni,

Is the below domain acceptable for the proposed development?



Also has the DN200 pipe 'FPI_25067_PIPE_LGIP' running north-west along Baileys Mountain Road been constructed?
It was not visible on our survey nor the ArcGIS infrastructure mapping, however the model says it was installed in 2016.

Thanks in advance.

Regards,

Oliver Purton
Civil Engineer – Urban Development & Regeneration
B.Eng (Civil) | Oliver.Purton@arcadis.com
Arcadis | Level 7, Premion Place, Cnr Queen & High Streets, Southport | QLD 4215 | Australia
T. + 617 5503 4806
www.arcadis.com

Be green, leave it on the screen.

Registered office: Level 5, 141 Walker Street, Sydney NSW 2060, Australia ABN 76 104 485 289

From: SAHA Uttam <USAHA@goldcoast.qld.gov.au>
Sent: Wednesday, 6 June 2018 9:28 AM
To: Purton, Oliver <Oliver.Purton@arcadis.com>
Cc: JAHAN Syeda <SJAHAN@goldcoast.qld.gov.au>
Subject: RE: Site Information Request: 202 Baileys Mountain Road, Upper Coomera

Hi Oliver,

Please find the relevant info for the following development lot:

o The lot is within 7.5 L/s fire flow demand map. The development lot is zoned as “rural residential” in the City Plan 2015. Therefore, the fire flow demand for the lot from city’s water main should be 7.5 l/s.

o Table 1 refers to LGIP demand for the development lot.

o Refer to Table 2 below for relevant info of neighbouring development.

Table 1: LGIP Demand for the subject lot

Lot Address	LotPlan	2016-2036 Res_EP (RSF)	2066 Res_EP (RSF)	2016-2066 Non_Res_EP	Connection Poir
202 Baileys Mountain Rd, Upper Coomera	58SP191940	3.42	11.94	0	W18-04716N

Table 2: Neighbouring developments

Name of the development	Lot Plan	Lot address	Water connection point	Demand pattern
155 Baileys Mountain Rd, Upper Coomera	217RP151152	155 Baileys Mountain Rd, Upper Coomera	W18-00883N	RSF_1:41 EP
			W18-00793H	RSF_1: 174 EP

Regards Uttam

From: Purton, Oliver [mailto:Oliver.Purton@arcadis.com]
Sent: Tuesday, 5 June 2018 9:34 AM
To: JAHAN Syeda
Cc: SAHA Uttam
Subject: Site Information Request: 202 Baileys Mountain Road, Upper Coomera

Hi Roshni,

We have a client who is interested in a site in Upper Coomera. May I request the following information pertaining to the sites mentioned below (Highlighted blue):

- 202 Baileys Mountain Road, Upper Coomera (Lot 58, SP191940).



The proposed development will see the construction of an aged care facility. We would like to confirm any considerations to take into account for the site during the modelling? Loads to be removed from the model? Loads to be added to the model?

I would also like to confirm the fire flow loading of 7.5l/s for 2 hours as it is zoned as Rural residential?

Thanks in advance,

Regards,

Oliver Purton
Civil Engineer – Urban Development & Regeneration
B.Eng (Civil) | Oliver.Purton@arcadis.com
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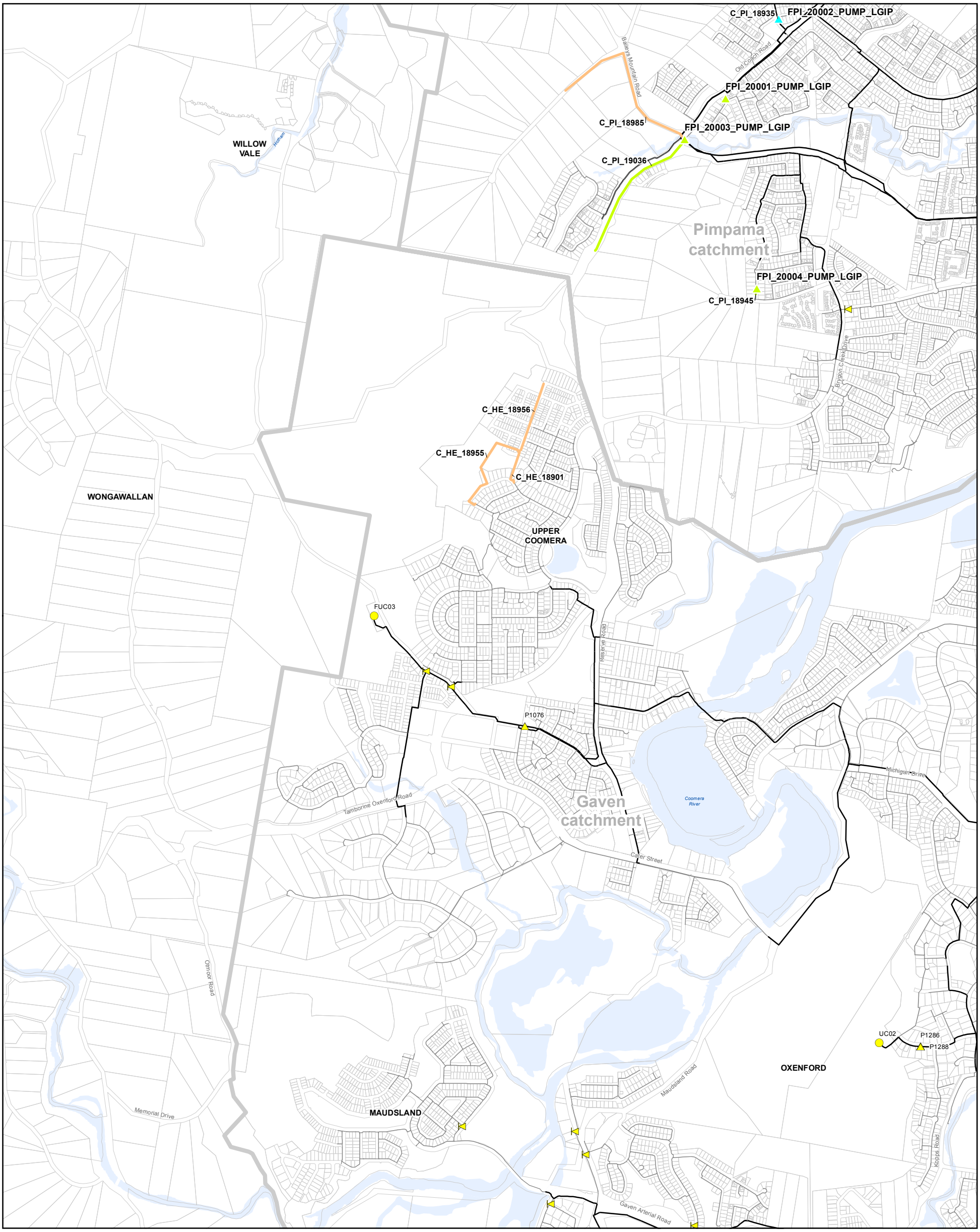
ARCADIS Design & Consultancy for natural and built assets

Be green, leave it on the screen.

APPENDIX C

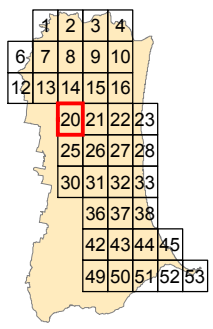
2015 CITY PLAN PRIORITY INFRASTRUCTURE PLAN FOR WATER

Local Government Infrastructure Plan Map - Plan for trunk water supply infrastructure - map 20



	Water main	Water pump station	Water reservoir	Water valve
Existing infrastructure				
Trunk				
Non-trunk				
New / augmented trunk infrastructure				
2021				
2026				
2031				
2036				
Ultimate				

- Existing SEQ Water pump station
- Existing SEQ Water reservoir
- Water supply service catchment
- Land affected by other development legislation, refer to Context map and Part 10 of the City Plan
- Cadastre boundary
- Local government area boundary
- Waterway or waterbody



City Plan

Disclaimer:
© City of Gold Coast, Queensland 2017 or
© State of Queensland 2017. No warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Map Version 3.00
18 Jul 2017

Data Sources:
Water supply infrastructure - CoGC
Waterways - CoGC
Cadastre (February 2016) - State

Projection:
MGA94
Zone 56

0 150 300 600 m

Approx Scale @ A3 1:20,000

CITY OF GOLDCOAST.

LGIP-PFTI-WAT-20 (40k ref: 5)

ATTACHMENT 14

Economic Need Assessment, prepared by Macro Plan Dimasi



URBAN PLANNING SERVICES

202 Baileys Mountain Road, Upper Coomera

Economic Needs Assessment

July 2018



MacroPlanDimasi

MacroPlan Dimasi

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Level 15
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Brisbane QLD 4000
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Broadbeach QLD 4218
(07) 3221 8166

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Level 1
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Perth WA 6000
(08) 9225 7200

Prepared for: Sandson Pty Ltd

MacroPlan Dimasi staff responsible for this report:

Daniel Parker, General Manager – Gold Coast

Reanne Plummer, Analyst - Economics

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Introduction

MacroPlan Dimasi has been engaged by Sandson Pty Ltd to prepare an economic needs assessment for a proposed Residential Aged Care Facility (RACF) at 202 Baileys Mountain Road, Upper Coomera. The proposed facility is to accommodate 158 beds which will include relocating/redeveloping an existing 48 bed RACF, specifically the Paradise Lakes Care Centre at 360 Oxley Drive, Runaway Bay.

The proposed residential care facility comprises a total of 158 beds including 130 high care units comprising 144 beds (including dementia care) and 8 low care units comprising 14 beds. The facility is expected to be delivered in two stages with the initial stage comprising 80 high care beds and the second stage comprising 64 high care beds and 14 low care beds. It is expected that stage two will be sequenced shortly after the completion of stage one (i.e. within 3-5 years).

The purpose of the assessment is to assess local supply and demand conditions to determine and highlight the level of economic need for the proposed RACF proposed at the subject site.

This report has been prepared based on the following sections and assessment tasks:

- **Section 1** provides an overview of the project scope and an introduction to the site and local area, including a summary of adjacent uses and complimentary local facilities;
- **Section 2** defines the catchment area based on a detailed review of specific drivers and local migration and review of the local socio-demographic profile; assesses the current and forecast population drivers of demand relevant to the potential aged care development within catchment area;
- **Section 3** assesses the current and future competitive supply conditions relevant to the potential aged care facility, as well as identifies local retirement living villages;
- **Section 4** assesses the market gap/opportunity for a RACF within the catchment area;

- **Section 5** presents a summary of the economic need implications for the proposed RACF onsite.

Section 1: Site and locational drivers

This section of the report provides an overview of the local and regional context of the subject site including locational and market drivers of demand.

1.1 Site and local area overview

The subject site is located at the intersection of Baileys Mountain Road and Reserve Road, relatively central to a developing residential area. This growing residential population and community within the proximate surrounding area will contribute to local demand for an aged care facility as the population continues to age.

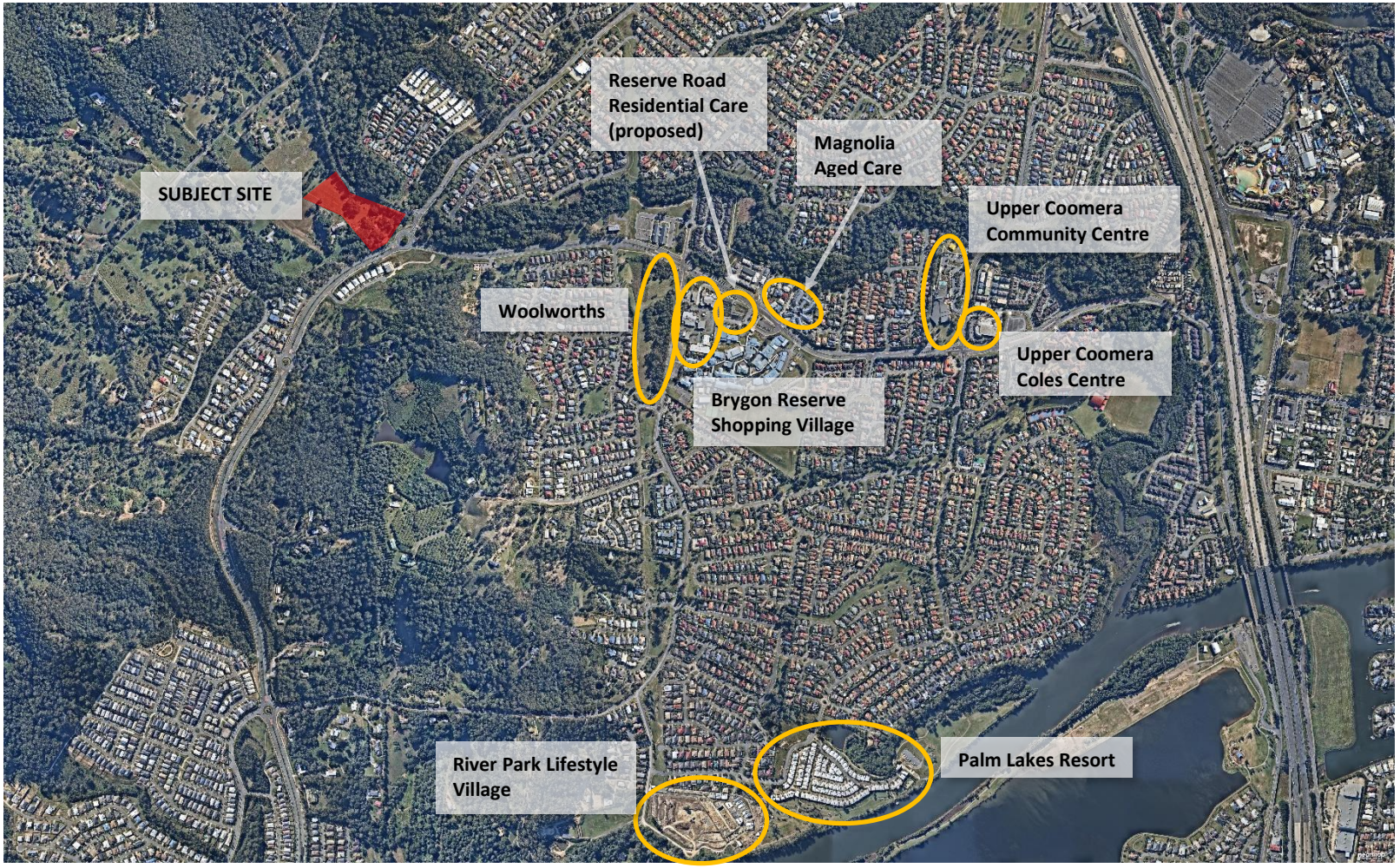
The site is well located in relation to local community facilities and services that support the convenience and accessibility needs of elderly residents. These facilities include the existing Brygon Reserve Shopping Village (1.3km east of site), the existing Upper Coomera Coles Centre (2.3km east of site), and the approved Upper Coomera Woolworths Shopping Centre (1.3km east of site). All three of these centres include a range of retail and services including health and medical services which will complement the proposed RACF.

In addition to these local retail centres, the site is also well located to benefit from the Upper Coomera Community Centre (2.3km east of site) which provides a number of public services including a library, aquatic centre, café, and CentraCare (catholic support services).

Other local attributes that are expected to supplement demand for the proposed RACF include nearby retirement villages and Manufactured Home Estates (MHE) which will help induce future demand. There are two new/additional MHE's within 3km of the subject site, including River Park Lifestyle Village (under construction) and Palm Lakes Resort (complete)

The regional context for the subject site is shown in Figure 1.

Figure 1. Regional Area and Context



Source: Nearmap (July 2018), MacroPlan

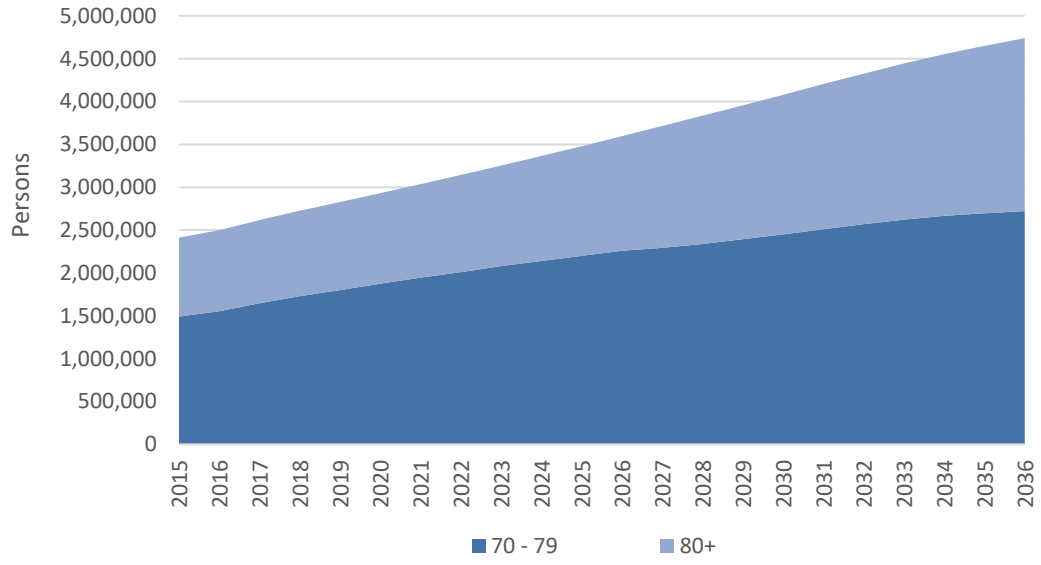
1.2 Market drivers: Aging population

Of the changes projected to occur in Australia's population, ageing is generally considered to be the most dramatic. With robust population growth in the 70+ year old population anticipated over the immediate future, the aged care sector faces an ongoing challenge to meet the demand for residential care going forward.

As illustrated in Figure 2, the Australian population aged 70+ is forecast to almost double over the next 20 years, increasing by 2.2million people over the period.

More importantly from an aged care perspective, both the number and proportion of Australians aged 80 and over will grow to represent nearly 43 per cent of the population aged 70+.

Figure 2. Underlying Demand - Projected Population 70+

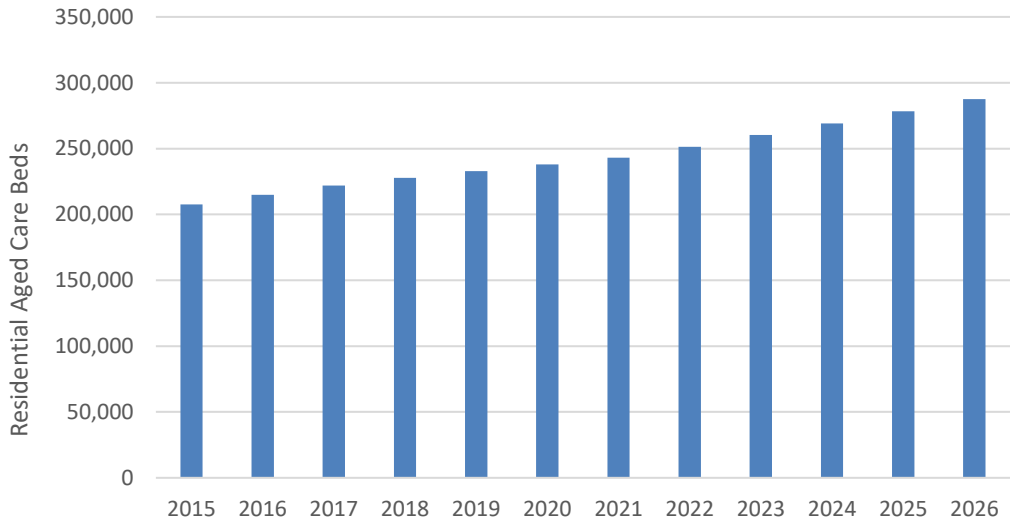


Source: ABS - Population Projections, Australia, 2012-2101 (Medium Series)

Despite a targeted reduction in the aged care provision ratios by the Australian Government, where home care packages are targeted to increase from 27 to 45 and the residential target will reduce from 86 to 80, significantly increased investment activity will be necessary to meet the underlying demand projected.

Figure 3 outlines this requirement, illustrating an additional 72,710 new residential aged care beds will be required by 2026. This equates to over four (4) new 150-bed aged care homes each month across Australia for the next decade.

Figure 3. Forecast RAC Supply[1]



Source: ABS, Aged Care Financing Authority – Third report on the Funding and Financing of the Aged Care Sector, July 2015, MacroPlan 2018.

While these overall demographic considerations will drive national outcomes, there will be differences between regions. For example, some regional areas attract retirees and will experience a more rapid ageing of their populations.

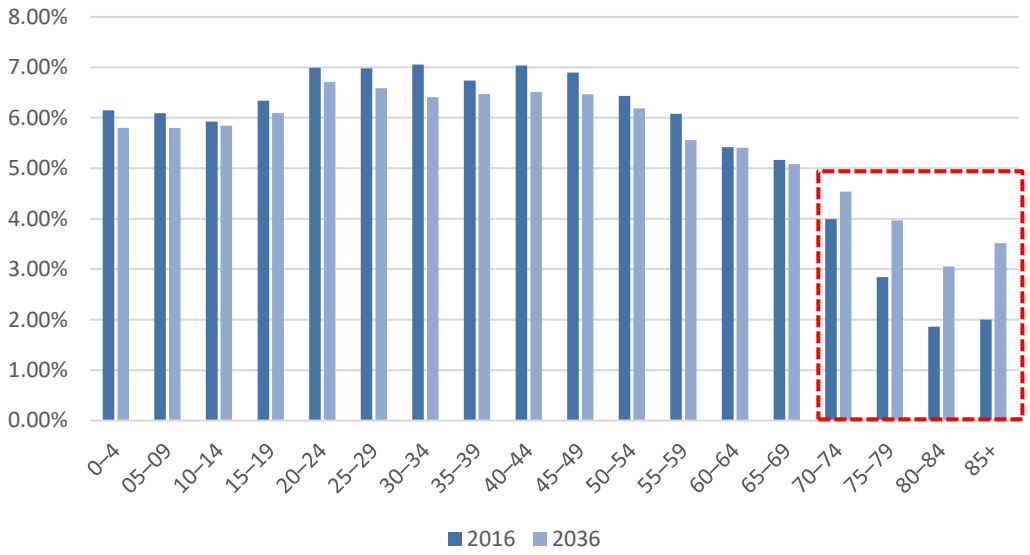
On the Gold Coast growth and ageing is particularly prevalent, with the future demographic profile looking quite different to what it does today. Quite simply, there will be many more older Gold Coast residents than there are today.

Figure 4 illustrates this phenomenon, with the proportion of Gold Coast residents aged 70+ projected to increase from 10.7% of the population currently to 15.1% by 2036. This represents more than doubling of the 70+ age cohort, an increase of 70,396 people (117%

[1] ABS, Aged Care Financing Authority – Third report on the Funding and Financing of the Aged Care Sector, July 2015

increase). **Based on the current aged care provision ratio this equates to a requirement for more than 5,600 beds to be delivered across the Gold Coast over the period, or more than 280 per annum.**

Figure 4. Gold Coast LGA – Population Profile (2016 and 2036)



Source: Queensland Government population projections, 2015 edition; Australian Bureau of Statistics, Population by age and sex, regions of Australia, 2014 (Cat no. 3235.0).

Fast growth is also a Gold Coast phenomena. In 2015/16, the Gold Coast had the second largest growth of all LGAs in Queensland, increasing by 12,056 people to 567,644. Only Brisbane experienced more growth, albeit at a slower rate than the Gold Coast.

Across Queensland, the Gold Coast also had the two fastest growing SA2 areas of Pimpama (+2,120 people at 35.1%) and Coomera (+1,348 at 11.3%). Pimpama was also the second fastest growing SA2 in Australia.

Both Pimpama and Coomera form key components of the catchment for the proposed Residential Aged Care Facility (RACF) at 202 Baileys Mountain Road, Upper Coomera.

Section 2: Trade area analysis

This section assesses the surrounding local area to delineate a catchment for the subject site, then goes on to analyse population and socio-demographic conditions within the catchment relevant to the proposed RACF onsite.

2.1 Catchment delineation

The catchment is defined as the area from which the majority of sales and enquiry are generated. Typically, this area would represent 70% or more of the total aged care bonds for a RACF however the spatial distribution of sales will differ for a variety of reasons, including:

- Location: The geographic location of a development project drives market reach and penetration. The amenity of an area, such as coastal or rural, and proximity to major urban areas drives migration patterns and has a major influence on the ability of projects to achieve sales.

- Price point and competitive framework: Price point and competitive positioning of the product relative to the local market dictates the level of affordability and local market attraction/relevance. If the product is pitched well above local median prices, it affects the ability of local residents to sell their current home and upgrade.

- Size of development: Generally, the larger the development project, the larger is its gross realisation and marketing budget. Larger marketing budgets can create greater market awareness achieve greater penetration. In contrast, smaller projects tend to rely on signage and local real estate representation.

- Developer / Operator: Developer/Operator can influence the spatial distribution of sales enquiry. Prominent national developers/operators with a history of success can generate a larger catchment area for sales enquiry and achieve increased market penetration based on reputation and brand awareness.

The defined catchment area is illustrated in figure 5 which also indicates the distribution of existing competitive aged care throughout the surrounding area.

The catchment for this site includes much of the Northern Gold Coast growth corridor. This relatively large catchment has been selected due to the current lack of supply to the north and the lack of planed supply in coastal suburbs to the east (as a result of increasing underlying land values).

While the defined catchment area represents that area anticipated to generate the majority of demand, the proposed Residential Aged Care Facility (RACF) at the subject site will attract additional demand from beyond the catchment, including:

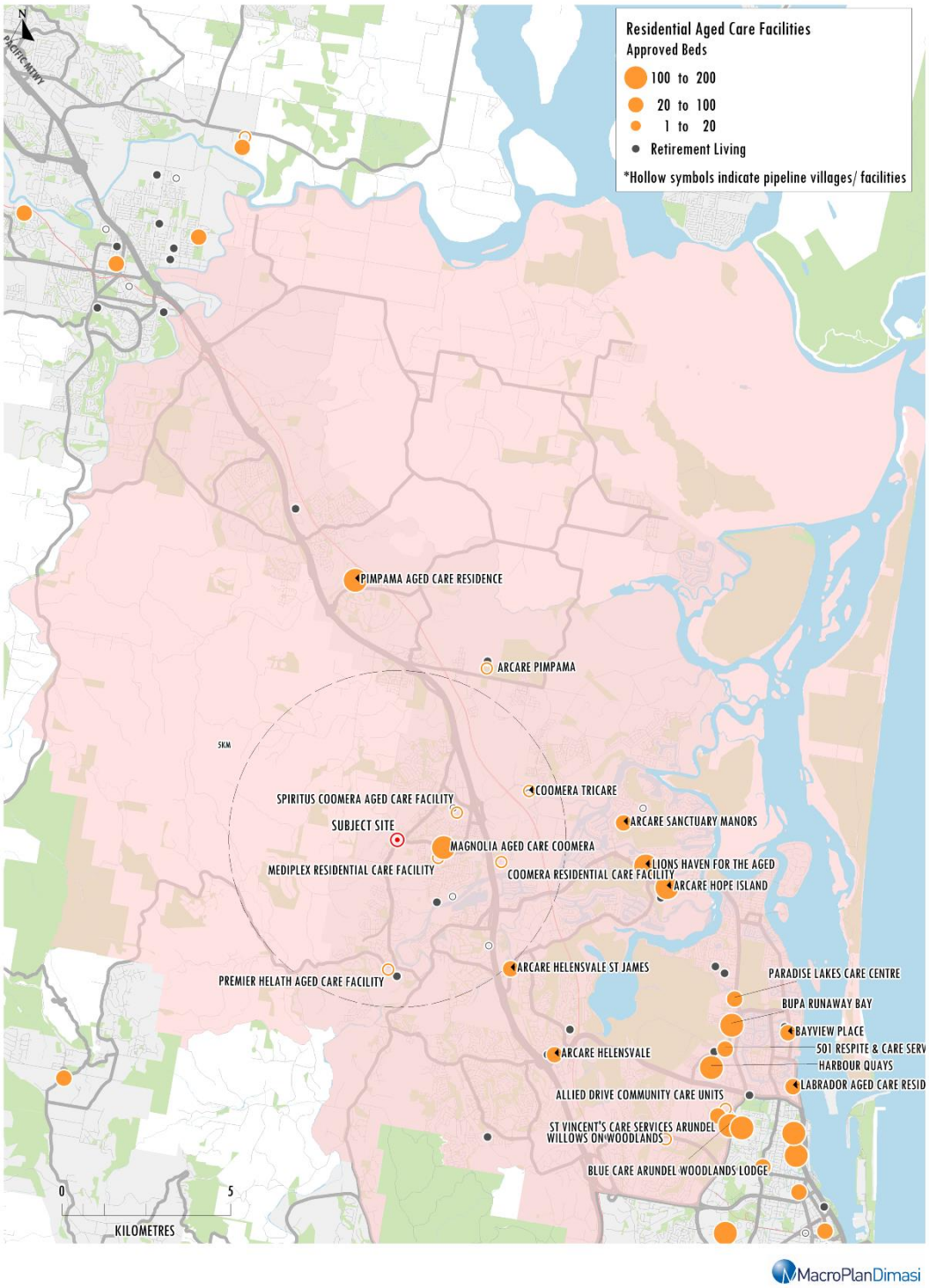
- Residents from existing established GC suburbs to the east and south, where new supply additions are restricted due to increasing underlying land values and competition from other uses;

- Regional and intrastate migrants seeking access to residential care facilities proximate to services;

- Parents/grandparents seeking a facility that is nearby to the homes of family members; and

- People on the wait list for the existing Paradise Lakes Care facility.

Figure 5. Catchment Area



Source: Department of Health Aged Care Services List (2016)

2.2 Catchment area assessment and characteristics

The following provides an overview of the population and socio-demographic characteristics of the defined catchment area. This includes the forecast population growth within the catchment, and the specific forecast growth of people aged 55+years old within the catchment.

The following population analysis has been based on the latest set of Department of Health and Aging population projections. These population projections were prepared by the Australian Bureau of Statistics (ABS) as consultant to the Australian Government Department of Social Services.

The projections are not official ABS data and the assumptions have been set by the Department of Social Services. The base Estimated Resident Population (ERP) used is the 30 June 2012 ERP as published in Australian Demographic Statistics, December 2012 (ABS cat. no. 3101.0) and released on 20 June 2013.

Over the past five years the catchment population has grown at an average annual growth rate of 2.0% per annum (approximately 3,576 new residents per annum). This rate of growth is expected to decline slowly out to 2027, with a total estimated population of 224,724 people by this time.

Table 1. Catchment Population Projections (2006-2026)

Actual Population	Forecast Population		
2012	**2017**	**2022**	**2027**
174,055	191,936	208,571	224,724
Average Annual Growth (no.)	**2012-2017**	**2017-2022**	**2022-2027**
	3,576	3,327	3,231
Average Annual Growth %	**2012-2017**	**2017-2022**	**2022-2027**
	2.0%	1.7%	1.5%

Source: Department of Social Services (2015) MacroPlan (2018)

In regard to the 55+ population across the catchment, the population is expected to increase from 48,678 people in 2017 to 62,430 people by 2027, an increase of 13,752 persons or 1,375

persons per annum. Growth is projected to be fastest over the period 2017-2022 (2.7%) before slowing slightly to 2.3% over the period from 2022 to 2027.

Within the 55+ age brackets, the strongest rate of growth, as illustrated in figure 3, is within the 75-79, 80-84 age and the 85+ cohorts. Importantly, based on typical age of entry data, these are the key target market brackets for residential age care products.

Table 2. Catchment Population Projections

	Actual Population	Forecast Population		Change
Age Cohort	**2017**	**2022**	**2027**	**2017-2027**
55-59	10,429	10,572	11,598	1,169
60-64	10,190	11,277	11,412	1,222
65-69	9,217	10,113	11,369	2,152
70-74	7,457	8,707	9,621	2,164
75-79	4,938	6,663	7,768	2,830
80-84	3,308	4,349	5,759	2,451
85+	3,139	3,911	4,903	1,764
Total	**48,678**	**55,592**	**62,430**	**13,752**
Average Annual Growth		**2017-2022**	**2022-2027**	**2017-2027**
55-59		0.3%	1.9%	1.1%
60-64		2.0%	0.2%	1.1%
65-69		1.9%	2.4%	2.1%
70-74		3.1%	2.0%	2.6%
75-79		6.2%	3.1%	4.6%
80-84		5.6%	5.8%	5.7%
85+		4.5%	4.6%	4.6%
Total		**2.7%**	**2.3%**	**2.5%**

Source: Department of Social Services (2015) MacroPlan (2018)

It is important to note that these additional 13,752 persons does not equate to seniors living product, as the vast majority of people over the age of 55 years still choose to reside in their own home.

Table 3 details the socio-demographic profile of this catchment as reported during the 2011 Census of Population and Housing.

Table 3. Catchment Socio-Demographic Profile

Catchment - socio-demographic profile, 2011			
Census item	Main TA	Sth East Qld avg.	Aust. avg.
Per capita income	$32,415	$34,087	$34,467
Var. from Sth East Qld benchmark	*-4.9%*		
Avg. household income	$88,989	$88,414	$88,205
Var. from Sth East Qld benchmark	*0.7%*		
Avg. household size	2.7	2.6	2.6
Age distribution (% of population)			
Aged 0-14	22.2%	19.7%	19.3%
Aged 15-19	6.7%	6.8%	6.5%
Aged 20-29	12.4%	14.4%	13.8%
Aged 30-39	14.9%	14.2%	13.8%
Aged 40-49	14.9%	14.3%	14.2%
Aged 50-59	11.7%	12.3%	12.8%
Aged 60+	17.2%	18.4%	19.6%
Average age	35.9	37.0	37.9
Housing status (% of households)			
Owner (total)	64.3%	65.4%	68.7%
• Owner (outright)	24.0%	28.7%	32.9%
• Owner (with mortgage)	40.3%	36.7%	35.8%
Renter	34.9%	33.7%	30.4%
Other	0.8%	0.9%	0.9%
Family type (% of households)			
Couple with dep't children	49.4%	45.5%	45.3%
Couple with non-dep't child.	6.9%	7.0%	7.7%
Couple without children	23.9%	23.9%	23.0%
One parent with dep't child.	9.6%	9.7%	9.2%
One parent w non-dep't child.	2.9%	3.4%	3.5%
Other family	0.7%	1.2%	1.1%
Lone person	6.6%	9.4%	10.2%

Source: ABS Census of Population & Housing, 2011; MacroPlan Dimasi

As a developing growth corridor, the catchment currently reflects a young family profile, with proportionally high distributions of children under the age of 14, persons aged 30-49, and high rates of couples with dependent children. This profile is also reflective of the comparatively

low rate of aged care penetration in the catchment relative to the national and SEQ benchmarks, which is assessed and discussed in section 4.

Section 3: Competitive assessment

This section provides an assessment of existing and any planned competitive RACF operators throughout the defined catchment area. This assessment considers the capacity of each facility in terms of number of approved beds.

3.1 Existing competition

The competitive supply assessment has considered the existing and planned supply of aged care facilities throughout the defined catchment area. Our survey revealed that there are 15 aged care providers with 1,329 beds, as well as 8 home care operators in the identified catchment region. This includes the current 48 beds at the existing Paradise Lakes Care Facility in Runaway Bay. Key observations about the supply include:

- There is only one other facility within a 5km radius of the subject site, despite the large amount of retirement living in the immediate area;
- The majority of the supply is clustered around the eastern suburbs of Runaway Bay and Hope Island;
- Arcare is a dominate provider within the catchment, currently operating 4 facilities and 262 beds;
- The average size of a facility within the catchment is 80 beds, largest facility within the catchment is 131 beds.

Figure 2 (in section 2) illustrates the competitive supply within the defined catchment, as well as the retirement living facilities in the local area (Retirement Villages and MHE's) which will support demand for aged care.

Table 4. Catchment Supply - Residential Care (No. Beds)

Service name	Residential Places
501 Respite & Care Services	62
Arcare Helensvale	72
Arcare Helensvale St James	70
Arcare Hope Island	120
Arcare Sanctuary Manors	39
Bayview Place Aged Care Residence	86
Blue Care Arundel Woodlands Lodge Aged Care Facility	108
Bupa Runaway Bay	108
Labrador Aged Care Residence	70
Lions Haven for The Aged	121
Magnolia Homestead	117
Masonic Care Queensland Jabiru Aged Care	50
Paradise Lakes Care Centre	48
Pimpama Aged Care Residence	127
Harbour Quays	131
TOTAL	**1,329**

Source: Department of Social Services (2015). MacroPlan Dimasi (2016)

3.2 Future competition

In addition to the above existing provision, seven additional facilities have been identified in the potential future supply pipeline. However, of this future supply, four have gained development approval although are yet to obtain bed allocations from the Department of Health. Only three of the facilities where identified as a likely contribution to future supply, as they have already received approval through ACAR (Aged Care Approvals Round). These facilities are:

- Arcare Pimpama – 90 beds
- Premier Health Aged Care Facility - 112 beds
- Willows on Woodlands – 60 beds

Table 5. Potential Future Supply – Residential Care (no. of beds)

Name	Project Address	Suburb	Additional Beds	Estimated Completion Date	Project Stage	Year Allocated
Allied Drive Community Care Units	120 Allied Dr	Arundel	38	15/12/2020	Development Approval	N/A
Spiritus Coomera Aged Care Facility	134 & 142 Billinghurst Cr	Upper Coomera	93	15/12/2018	Development Approval	N/A
Willows on Woodlands	172 Napper Rd & 2 Woodlands Wy	Parkwood	60	31/05/2019	Development Approval	2017
Premier Health Aged Care Facility	439 Tamborine-Oxenford Rd	Upper Coomera	112	31/05/2019	Development Approval	2016
Coomera Tricare	220 Foxwell Rd	Coomera	130	30/11/2020	Development Approval	N/A
Coomera Residential Care Facility	15 Hickey St	Coomera	14	30/11/2018	Development Approval	N/A
Arcare Pimpama	2 Halcyon Drive	Pimpama	90	Unknown	Development Approval	2016
Mediplex Residential Care Facility	159 Reserve Road	Upper Coomera	180	Unknown	Planning	N/A

Source: Cordells Connect (2017), Department of Health Aged Care Provisional Allocations (2016 & 2017) [2]

Those potential facilities identified in Table 5 that have not yet gained licensing through ACAR are considered speculative at this stage and have not been assessed as supply in the market gap analysis given the uncertainty of facilities progressing.

[2] Pipeline sites with no year allocation, are additional planned developments identified in Cordells Connect.

Section 4: Market gap and opportunity assessment

This section provides a comparison of market demand and competitive supply conditions to determine whether there is any existing market gap and economic need for additional aged care facilities within the catchment.

4.1 Market gap assessment

To evaluate aged care need based upon these population forecasts, we have undertaken an underlying demand assessment utilising a net bed model based on national benchmarks for the provision of aged care places, set by the Department of Health and Ageing.

These benchmarks were previously allocated and differentiated between low care and high care, however the latest 2015 ACAR places allocated on 5 September 2016 do not contain any reference to low care or high care residential aged care places.

The benchmarks themselves are calculated using the volume of people aged 70 plus years old and are used to determine the desired level of provision (or demand) for aged care places. Under the current framework, the Government seeks to achieve and maintain a specified national provision level of 125 residential and home care places for every 1,000 people aged 70 years or over, to be achieved by 2021-22. This is known as the aged care provision ratio.

These 125 places comprise a ratio of 80 places in a residential setting and 45 places in a home care setting.

To evaluate aged care need based upon the forecast population aging across the catchment, we have undertaken an underlying demand assessment utilising a net bed model based on national benchmarks for the provision of aged care places, set by the Department of Health and Aging. This was previously differentiated between low care and high care, however as previously mentioned this differentiation is no longer relevant and has been removed.

These benchmarks are calculated using the volume of people aged 70 plus years old and are used to determine the desired level of provision (or demand) for aged care places. The current national benchmarks 80 places per 1,000 persons aged 70+. We note the current catchment ratio is slightly lower than this at 75.5 places.

Based on observed migration trends across the catchment we have assumed that 30% of bonds are generated from beyond catchment residents.

Based on these Federal Government benchmarks and the projected population of resident's age 70+ years, the aged care need is outlined in Table 6 below. Based on the current population of 18,842 people aged 70+, the national benchmark rate indicates an undersupply of 661 bed places in 2018. Allowing for the future 112 bed facility at 436 Tamborine-Oxenford Road, the 90 bed facility at Yawalpah Road and the 60 bed facility at Woodlands Way by 2020, continued growth in the 70+ age cohorts will result in this undersupply increasing to 633 bed places by the anticipated operation commencement in 2020.

Table 6. Aged Care Demand Projections

	2018	2020	2022	2027
Population 70+	19,885	21,832	23,630	28,051
Australian Average				
Total Places (Aus. Ave)	1,591	1,747	1,890	2,244
Cum. Demand Growth		156	300	653
Catchment Average				
Total Places (Catchment. Ave)	1,329	1,459	1,579	1,875
Cum. Demand Growth		130	250	546
Catchment Provision	1,329	1,591	1,591	1,591
Catchment Generated Bonds	930	1,114	1,114	1,114
Net Bed Demand (Australia Average)				
Over / Under Supply	-661	-633	-777	-1,130

Source: MacroPlan (2018)

Section 5: Economic need implications

The following provides a summary of the economic need implications for the proposed RACF at the subject site:

- Analysis suggest that based on a current provision of 1,329 beds, there is a current (2018) estimated undersupply of 661 beds based on the national aged care provision benchmark;
- By 2020, forecast growth in demand is expected to generate need for an additional 633 aged care beds within the catchment area, demonstrating strong need for the additional[3] 110 bed spaces proposed onsite;
- There is only one other existing RACF within a 5km radius of the subject site, despite the growing residential community and several retirement living villages within this immediate area;
- The majority of existing supply is currently clustered around the eastern suburbs of Runaway Bay and Hope Island which do not offer a local option or convenience for elderly residents and/or families in the Upper Coomera area;
- The proposed development will include the relocation of an existing facility within the catchment, which is already at capacity and is understood to have a waiting list which demonstrates additional demand; and
- The subject site is well located to serve the demonstrated need for additional aged care facilities within the catchment, as well as provide convenience and accessibility to local centres and services for future residents.

In summary, there is considered economic need justifying the establishment of the proposed RACF at the subject site.

[3] Net provision onsite will be 110 aged care beds based on a total of 158 beds with 48 beds to be relocated from the existing Paradise Lakes Care Centre at Runaway Bay.

ATTACHMENT 15

Bushfire Management Plan, prepared by Eldon Bottcher Architect



URBAN PLANNING SERVICES

BUSHFIRE MANAGEMENT REPORT
FM 3812
for
SANDSON PTY LTD
at
202 BAILEYS MOUNTAIN ROAD
UPPER COOMERA

PREPARED BY
ELDON BOTTCHER ARCHITECT PTY LTD
145 VARSITY PARADE
VARSITY LAKES
PH 07 55920082
EMAIL bushfires@eb-a.com.au

25/07/2018

Member Australian Institute of Architects

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DISCLAIMER

Experienced fire fighters with extensive knowledge of building have prepared this Report. Their practical knowledge of fire fighting has been backed up by academic study.

However, fire is an element of nature. Small natural occurrences can disastrously affect the outcome of the best planning. Human actions similarly can have disastrous results.

Whilst every care has been taken in the formulation of this management report, there can be no guarantee that even the strictest adherence to its recommendations can guarantee safety of life and property.

The authors of this report accept no responsibility for any damage to life or property caused by fire or any other cause to persons using land or structures, which could in any way be construed to be the subject of this report.

The report has been commissioned as the land falls within an area deemed a fire risk by the local authority.

As such, it must be recognized that structures upon this land and those using the structures could be deemed at risk.

Very Important Note:

This report is valid for the following periods;

a) A time of 5 years from date of preparation.
b) The currency of the legislation referred to in Section 1 Report Brief
c) Changes to any legislation generally that may impact on the report outcomes.
d) Changes to vegetation which may impact on the results of this report
e) Any other changes that may impact on the report in any manner.

THE COPYRIGHT ACT AND MORAL RIGHTS ACT PROTECT THIS REPORT.

IRRESPECTIVE OF THIS REPORT APPEARING ON A COUNCIL PD OR OTHER ONLINE SITE, THERE IS NO PERMISSION IMPLIED OR GIVEN TO ANY PARTY TO DOWN LOAD OR TO USE THIS REPORT IN WHOLE OR IN PART IN ANY MANNER OTHER THAN THAT FOR WHICH IT WAS ORIGINALLY PREPARED.
ANY SUCH USE WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW.

THIS REPORT RELIES ON THE AS 3959-2009 FOR THE CALCULATION OF CONSTRUCTION LEVELS.
ANY POSSIBLE ERRORS IN THE STANDARD ARE NOT THE RESPONSIBILITY OF THE AUTHOR.

THIS REPORT IS ONLY TO BE USED AND DISTRIBUTED AS A COMPLETE REPORT CONTAINING AS A MINIMUM SECTIONS 1,2,3,4 AND 5 (SECTIONS 5.1 & 5.2)

THIS REPORT IS NOT TO BE AMENDED IN ANY WAY BY ANY PERSONS OTHER THAN THE ORIGINAL AUTHOR.

1 REPORT BRIEF

This Fire Management Report has been written for the benefit of future occupants of this proposed site and developed in accordance with the requirements of;

- The Gold Coast City Council Town Plan,
- SPP 2016.
- Queensland Planning Act 2016
- The National Construction Code and
- Australian Standard AS3959,
- International Fire Safety Engineering Guidelines

The report has been prepared as supporting documentation for a Material Change of Use (Building) Application.

1.1. **Address:**
202 Baileys Mountain Road
Upper Coomera

1.2. **Local Authority**
Gold Coast City Council

1.3. **R.P.D.**
Lot 58 on SP191940

1.4. **Site area**
3.087ha

1.5. **Responsible Fire Authority**
Rural Fire Service Queensland via the rural fire brigade for rural fires and QFES for Structural fires.

1.6. **Potential Bushfire Hazard Rating.**
The hazard rating maps prepared for the Council show the ratings on this property ranging from Medium to being in a Bushfire Hazard Buffer Area
The draft risk rating maps prepared for the State Government show the ratings on this property ranging from Medium to being in a Bushfire Hazard Buffer Area

1.7. **Land tenure**
Freehold

1.8. **Adjoining owners are:**
Freehold

1.9. **Current Land Use:**
Rural Residential

1.10. **Fire danger Index**
FDI 40 (nominated by AS 3959-2009)

1.11. **Topography**
Plain on subject site
Undulating under predominate threat vegetation

1.12. **Predominant Wind Direction**
The predominate wind direction is from the South East. In times of severe fire weather, the wind direction will be from the North West. The Topography will create microclimates, which will cause swirling, which will modify the apparent wind direction according to primary direction and velocity

1.13. **Slope**
-4.5degrees under threat vegetation

1.14. **Aspect**
West to South under threat vegetation

1.15. Fuel Type

REGIONAL ECOSYSTEM	VHC	VHC DESCRIPTION	POTENTIAL FUEL LOAD STATE-WIDE BUSHFIRE PRONE AREA MAPPING	PERCENTAGE COVER	EFFECTIVE FUEL LOAD
12.11.24 (12.11.5a)	9.2	Moist to dry eucalypt woodland on Coastal lowlands and ranges.	17.2	100	17.2

1.16. Fire History
There is no evidence of a recent fire event

1.17. Location of Access Tracks
The site is served by a sealed road system

1.18. Location of Fire Breaks
There are no formal firebreaks, Managed vegetation and road systems form effective fire breaks a minimum of 25m wide.

1.19. Location of existing firefighting Infrastructure
The site is served by reticulated water

1.20. Historical and Cultural Sites
There is no evidence of Historical and Cultural sites on the property.

2. SITE AND HAZARD ASSESSMENT

2.1. Discussion with Responsible Fire Authority

The fire management report has not been discussed with the First Officer of the Rural Fire Brigade.

2.2. Vegetation Types

The vegetation type predominate to this site is as scheduled below. Note that under SPP 2016, differing vegetation types are used. This report does not refer to these but does consider draft mapping prepared under different methodology and published by the State Government.

VEGETATION TYPE	STATE PLANNING POLICY 01/03 INDICE	AS 3959 CATEGORY	COMMENTS
Grassy Eucalypt and acacia forest, exotic pine plantations, Cyprus pine forests, wallum heath	6	B	For the purposes of construction level assessment under AS 3959-2009, woodland is the appropriate vegetation type to use due to fuel load.
Orchards, farmlands, kikuyu pastures	2	Low Threat Or G	Note that where grassland is maintained below 100m it is regarded as Low Threat by AS 3959.
Grazed grasslands, slashed grass	2	Low Threat Or G	Note that where grassland is maintained below 100mm it is regarded as Low Threat by AS 3959. State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.

VEGETATION TYPE	STATE PLANNING POLICY 01/03 INDICE	AS 3959 CATEGORY	COMMENTS
Desert lands (sparse fuels) Mowed grasslands	1	Low threat Or G	Note that where grassland is maintained below 100m it is regarded as Low Threat by AS 3959 State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.
Intact Rainforest, mangrove, intact riverine rainforest	0	F	State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.

2.3. Potential Bushfire Hazard Rating.

Site inspection confirms the mapping intent but not the detail.
Predominate vegetation is Medium Hazard and the site is in a Bushfire Hazard Buffer Area (See Appendix 5.3.1 for Fireline Intensity Calculations) .

2.4. Building Construction

All buildings situated within the site are in a Designated Risk Area. There is a requirement that certain Buildings within this area be constructed in accordance with the Building Code of Australia, which refers to either the Australian Standard for Construction in Bushfire Prone Areas or NASH Standard-Steel Framed Construction in Bushfire Areas.
The levels determined effect the types and usage of materials in relation to the type of Bushfire Attack, which may occur as assessed under the Standard. The Level of Bushfire Attack is assessed taking the vegetation types, slope, and distance from vegetation into

Attack is assessed taking the vegetation types, slope, and distance from vegetation into account. The most common elements affected are Windows and flyscreening, with some restrictions on cladding and timber types. A comprehensive breakdown is available in either the National Construction Code or the Australian Standard for Construction in Bushfire Prone Areas. Extracts of these documents are not provided due to copyright reasons. Full details can be obtained from your building designer or certifier.

Note that the Building Code of Australia only requires Classes 1,2 and 3 buildings and Class 10a building associated with those buildings to comply with the requirements of AS 3959-2009.

The proposed building does not include any of these classifications and is therefore not required to comply with AS 3959-2009.

2.5. **Ecological Requirements**

There are no specific ecological requirements in relation to bushfire management.

Note;
The Category of Bushfire Attack referred to in the Australian Standard is different to the Hazard/Risk area referred to above.

Extensive modification of the existing vegetation types including that on adjoining sites could result in a change of Category of Bushfire Attack and therefore variation in the Level of construction required.

It is the responsibility of the owner of each individual site to ensure that plantings subsequent to their occupation of the site do not reduce the safety of their buildings in a manner, which could require a higher level of Construction than that originally utilised

3. RISK MANAGEMENT PLAN

3.1. Agencies / Persons Responsible

The responsible Fire Authority is the Rural Fire Service Queensland through the Rural Fire Brigade being responsible for Bush Fires and the Queensland Fire and Emergency Service being responsible for Structural Fires

It is the responsibility of the Owners of the properties to ensure that the relevant measures required by this Management Report are in place prior to inspection by the Council and the Building Certifier and to ensure that those measures are in place prior to the occupation of any buildings, which are the subject of this report. It is the responsibility of Council and Building Certifiers to ensure that relevant measures within their responsibility are in place prior to the issuance of any certification.

3.2. Bushfire Safety Objective

The objective of this report is to minimise potential risk to life and property by protecting the buildings from the effects of bushfire.

3.3. Aims

The aims to achieve this objective are to mitigate the effect of the bushfire attack mechanisms of: -

3.3.1. Radiant Heat
3.3.2. Direct Flame Contact
3.3.3. Wind
3.3.4. Ember Attack
3.3.5. Smoke

3.4. Functional Requirements

The functional requirements to achieve this objective are: -

3.4.1. The provision of safe conditions for fire fighters
3.4.2. The provision of safe conditions for residents
3.4.3. Ensure adequate and safe access to and from the property
3.4.4. Ensure adequate and safe water supply to the property and the establishment of firefighting water reserves
3.4.5. Provide a system of fire breaks and trails to protect the building component
3.4.6. Remove vegetation that is considered dangerous and a hazard in Fire Conditions
3.4.7. To ascertain the required standard of construction of the buildings in accordance with the requirements of the National Construction Code and the Australian Standard for Construction in Bushfire Prone Areas or the provision of a satisfactory alternative solution
3.4.8. Facilitate the return to "normalcy "

3.5. Proposed Fire Fighting Infrastructure

3.5.1. The proposed building will be served by a reliable reticulated water supply.

3.6. Building Construction

Construction is not required to be in accordance with Australian Standard AS 3959 2009 Construction of Buildings in Bush Fire-Prone Areas .

The proposed building does not include any of the required classifications and is therefore not required to comply with AS 3959-2009.

The plans lodged for Building Certification are to be assessed on this basis by the Building Certifier.

A final stage completion certificate (Form 21) issued by the Building Certifier is to be received prior to occupation of the building.

Buildings are not to be occupied until certification is received

Buildings are to be maintained in a manner that protects the integrity of the construction and building elements as outlined in this report

3.7. Street Numbering

Numbering is to be installed in accordance with the current Street Numbering System at time of completion of building.

3.8. Less Flammable Landscaping

Any landscaping within the site is to be Less Flammable, in accordance with the list enclosed as an Appendix at the rear of this Report, rainforest species, or cultivated gardens.

3.9. Insurance

Failure to comply with this management report may have a detrimental effect upon the Insurance of the subject Buildings.

3.10. Emergency Response Procedures

3.10.1. In the event of Fire Emergency, assistance is to be obtained by dialling 000

3.10.2. The owner should read thoroughly the brochures contained and those recommended at the rear of this report. They contain valuable information that could assist in the saving of lives and property in a fire event!

3.11. Community Awareness Strategies

3.11.1. Each subsequent owner is to be provided with a copy of this Fire Management report with an alert placed on either Title or Council Rate searches that the Report is in existence and is to be made available to ensuing owners.

3.11.2. The hazard ratings are to be placed on Council Plans and Rate notices.

3.12. Administering Staff

It is the responsibility of the developers and owners to ensure compliance with this Report and the Town Plan, and to ensure that each of the new owners is provided with a copy of this report.

It is the responsibility of the Council and the Building Certifier to ensure that the relevant measures required by this management report are in place prior to the final completion stage inspection of any buildings on any sites which are the subject of this report as noted in Clause 3.1 of this report.

It is the responsibility of the ensuing owners of the properties to maintain the properties in the conditions outlined in this report.

4. FIRE MANAGEMENT ACTION SUMMARY AND SCHEDULE

DEVELOPMENT REQUIREMENTS	BUILDING REQUIREMENTS	MAINTENANCE
	Buildings not required to comply with the Australian Standard for Construction with in Bush Fire Prone Areas due to Building Classification.	Regular mowing and maintenance of the landscaping as set out in this report. Building materials are to be maintained in "as new "condition to preserve the integrity of the relevant materials.

5. APPENDICES

5.1. Form 15
5.2. Site Plans
5.3. Supporting Information:
5.3.1. Fire line Intensity Calculations
5.3.2. Fuel Load Calculation

Note. These items below are referenced for information purposes only and are not to be construed as being part of the management report
This information is generic and not provided or included within the documentation for approval purposes.
It is only provided for end user knowledge

5.3.3. Prepare. Act. Survive
5.3.4. Rural property Fire Management Guide 2010
5.3.5. Notes for Landholders
5.3.6. Bushfire Action Guide
5.3.7. Bushfire Safety in Urban Fringe Areas
5.3.8. Water + Power -Vital for Fire fighting
5.3.9. Less Flammable Vegetation
5.3.10. Tree selection for Fire-Prone Areas
5.3.11. First Draft (specifying timber in bush fire zones)
5.3.12. External water spray system
5.3.13. Fire Retardant Coating Solutions
5.3.14. Archicentre Bushfire Design Guide
5.3.15. Section 3.8 Sign Types - Fire Trail Signage of the GCCC Natural Areas Management Unit Guidelines (Page 16) Signage
5.3.16. Trail Number and Key Point signage
5.3.17. Bushfire Hydrant detail
5.3.18. Tank detail
5.3.19. Recycled Water for Firefighting
5.3.20. Sample Easement Document
5.3.21. Bushfire Windows and Shutters
5.3.22. A guide to retrofit your home for better protection from a bushfire.
5.3.23. FireFly BAL-FZ System
5.3.24. Extracts from Planning Act 2016 relating to clearing.
5.3.25. Bushfire Planning and Design Certification Scheme Update
5.3.26. SAC Notification Form

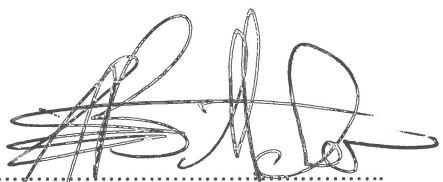
We also recommend that the landholder obtains and reads the following;

5.3.27. Bushfire Hazard Planning in Queensland
5.3.28. Protecting your home against Bushfire
Both available from the Dept. of Local Government and Planning, and

5.3.29. Building in Bushfire Prone Areas
Available from Standards Australia

5.3.30. Fire in Bushland Conservation
Available from the National Heritage Trust

Signed



.....

Eldon Bottcher
Grad. Dip. DBPA (UWS) Dip. Arch. (QIT), Cert. R.F.M. (USQ), F.R.A.I.A., M.A.I.E.S. AIFireE
Architect
BPAD-L3 Practitioner

BPAD
Bushfire
Planning & Design
Accredited Practitioner
Level 3

APPENDIX 5.1
FORM 15

Queensland Government

Department of Housing and Public Works

Form 15—Compliance certificate for building design or specification

Version 4 – July 2017

NOTE: This is to be used for the purposes of section 10 of the *Building Act 1975* and/or section 46 of the *Building Regulation 2006.*

RESTRICTION: A building certifier (class B) can only give a compliance certificate about whether building work complies with the BCA or a provision of the Queensland Development Code (QDC). A building certifier (Class B) can not give a certificate regarding QDC boundary clearance and site cover provisions.

1. Property description

This section need only be completed if details of street address and property description are applicable.

E.g. in the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address (include no., street, suburb/locality and postcode)

202 Baileys Mountain Road Upper Coomera

Postcode

Lot and plan details (attach list if necessary)

Lot 58 on SP191940

In which local government area is the land situated?

Gold Coast City Council

2. Description of component/s certified

Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.

Work as required for bushfire mitigation purposes as set out in the Bushfire Management Report prepared by Eldon Bottcher Architect Pty Ltd including assessment of Construction Levels assessed under AS 3959.

3. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

Compliance with the Bushfire Management Report prepared by Eldon Bottcher Architect Pty Ltd

No certification of components covered by The Building Act 1975, The building Code of Australia or AS 3959.

Gold Coast City Council Town Plan Bushfire Management Constraint code.

4. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Bushfire Management Report FM 3812

LOCAL GOVERNMENT USE ONLY

Date received		Reference Number/s	

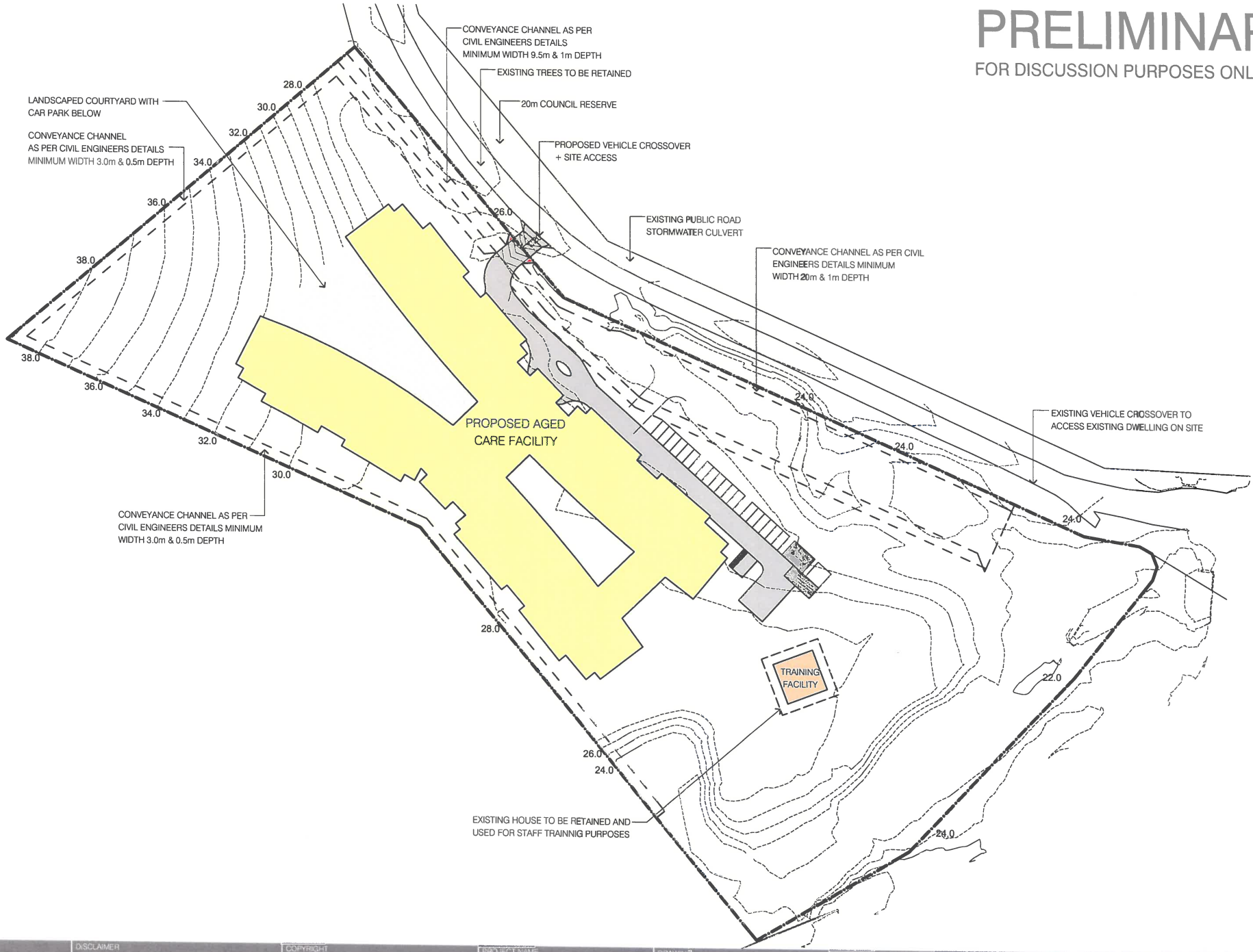
5. Building certifier reference number	**Building certifier reference number**
6. Competent person details A competent person for building work, means a person who is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, of the building work because of the individual's skill, experience and qualifications in the aspect. The competent person must also be registered or licensed under a law applying in the State to practice the aspect. If no relevant law requires the individual to be licensed or registered to be able to give the help, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help. If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.	**Name** (in full) Eldon John Bottcher Company name **(if applicable)**: **Eldon Bottcher Architect Pty Ltd** Contact person: **Eldon Bottcher** **Phone no.** (business hours): 07 55920082 **Mobile no.**: 0412434134 **Fax no.**: **Email address**: **bushfires@eb-a.com.au** **Postal address** P.O. Box 3606 Robina Town Centre **Postcode** 4230 **Licence or registration number** (if applicable) Reg Architect Qld 1325 FPA Australia BPAD Level 3 practitioner 16935
7. Signature of competent person This certificate must be signed by the individual assessed by the building certifier as competent.	**Signature** **Date**: 25 July 18

The *Building Act 1975* is administered by the Department of Housing and Public Works

APPENDIX 5.2
SITE PLANS

PRELIMINARY

FOR DISCUSSION PURPOSES ONLY



CLIENT SANDSON PTY LTD	DISCLAIMER These drawings are conceptual design drawings only. The information contained herewith is subject to design development and further input from independant planning, structural, services and other technical consultants.	COPYRIGHT Copyright in this drawing is the property of BDA Architecture and may not be retained, copied in whole or in part or used other than for the specific uses, licence and site for which it has been prepared and issued.	PROJECT NAME 202 BAILEYS MOUNTAIN ROAD AGED CARE FACILITY	DRAWING SITE PLAN	PROJECT NO: 409100 SCALE: 1:1000 @ A3 DATE: 24/07/2018	DRAWING NO:	ISSUE H		bda architecture

APPENDIX 5.3
SUPPORTING INFORMATION

(NOTE: SOME OF THIS INFORMATION IS GENERIC AND NOT INCLUDED FOR APPROVAL PURPOSES. IT IS ONLY PROVIDED FOR END USER KNOWLEDGE)

BUSHFIRE HAZARD ASSESSMENT

ELDON BOTTCHER ARCHITECT PTY LTD
145 VARSITY PARADE PH 0755920082
VARSITY LAKES E architects@eb-a.com.au
QLD. 4327

THIS ASSESSMENT IS BASED ON "A NEW METHODOLOGY FOR STATE WIDE MAPPINGOF BUSHFIRE PRONE AREAS IN QUEENSLAND" CSIRO
JANUARY 2014

PROJECT	**PROPOSED DEVELOPMENT**
SITE ADDRESS	**202 BAILEYS MOUNTAIN ROAD UPPER COOMERA**

INPUTS

FFDI	40	
TOTAL FUEL LOAD	17.2	tonnes/ha
SLOPE UNDER VEGETATION	4.5	degrees

RESULTS

POTENTIAL FIRE LINE INTENSITY	10008.22	kw/m
HAZARD	MEDIUM	
APPROPRIATE MAPPING COLOUR		

RE8	RE8_Label	VHC	VHC_DESC
12.1.1	Casuarina glauca woodland on margins of marine clay plains	28.2	28.2 Woodlands in coastal locations with species such as she-oak or swamp box
12.1.2	Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains	35.4	35.4 Tidal saltmarshes
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	35.3	35.3 Shrubland associated with mangroves and tidal saltmarshes
12.11.1	Simple notophyll vine forest often with abundant Archontophoenix cunninghamiana (gully vine forest) on metamorphics ± interbedded volcanics	4.1	4.1 Notophyll and notophyll palm or vine forest
12.11.10	Notophyll vine forest ± Araucaria cunninghamii on metamorphics ± interbedded volcanics	2.1	2.1 Complex to simple, semi-deciduous mesophyll to notophyll vine forest
12.11.11	Araucarian microphyll vine forest on metamorphics ± interbedded volcanics; usually southern half of bioregion	5.1	5.1 Notophyll to microphyll vine forests
12.11.12	Araucarian complex microphyll vine forest on metamorphics ± interbedded volcanics; usually northern half of bioregion	5.1	5.1 Notophyll to microphyll vine forests
12.11.13	Semi-evergreen vine thicket on metamorphics ± interbedded volcanics; usually northern half of bioregion	7.1	7.1 Semi-evergreen to deciduous microphyll vine forest
12.11.14	Eucalyptus crebra, E. tereticornis, Corymbia intermedia woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.15	Eucalyptus tereticornis, Corymbia intermedia open woodland with Xanthorrhoea johnsonii understorey on serpentinite	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.16	Eucalyptus cloeziana open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.16x1	Eucalyptus cloeziana ± E. propinqua, E. acmenoides, E. microcorys and E. grandis tall open forest on sedimentary rocks	8.1	8.1 Wet eucalypt tall open forest
12.11.17	Eucalyptus acmenoides or E. portuensis open forest on metamorphics ± interbedded volcanics	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.18	Eucalyptus moluccana woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.18a	Eucalyptus moluccana, E. tereticornis and Lophostemon confertus open forest in gullies on metamorphics ± interbedded volcanics	13.1	13.1 Dry to moist eucalypt open forests on undulating metamorphics and granite
12.11.19	Eucalyptus fibrosa subsp. fibrosa woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.2	Eucalyptus saligna or E. grandis, E. microcorys, Lophostemon confertus tall open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.20	Corymbia intermedia, Lophostemon suaveolens woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.21	Allocasuarina luehmannii, Melaleuca nervosa woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.22	Angophora leiocarpa, Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.23	Eucalyptus pilularis open forest on coastal metamorphics and interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.3	Eucalyptus siderophloia, E. propinqua ± E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides open forest on metamorphics ± interbedded volcanics	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.3a	Lophostemon confertus ± Eucalyptus microcorys, E. carnea, E. propinqua, E. major, E. siderophloia woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.3b	Eucalyptus pilularis tall open forest on subcoastal hills and ranges of metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.4	Semi-evergreen vine thicket on metamorphics ± interbedded volcanics	7.1	7.1 Semi-evergreen to deciduous microphyll vine forest
12.11.5	Corymbia citriodora subsp. variegata, Eucalyptus siderophloia, E. major open forest on metamorphics ± interbedded volcanics	10.1	10.1 Spotted gum dominated open forests
12.11.5a	Eucalyptus tindaliae, E. carnea, Corymbia intermedia ± E. siderophloia or E. crebra, Corymbia citriodora subsp. variegata woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5e	Corymbia citriodora subsp. variegata woodland ± Eucalyptus siderophloia or crebra, E. carnea, E. acmenoides, E. propinqua on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.5h	Eucalyptus planchoniana woodland to open forest on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5j	Eucalyptus racemosa subsp. racemosa and/or E. seeana and Corymbia intermedia woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5k	Corymbia henryi ± Eucalyptus crebra, E. carnea, E. tindaliae, E. fibrosa subsp. fibrosa woodland on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.6	Corymbia citriodora subsp. variegata, Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.7	Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.8	Eucalyptus melanophloia, E. crebra woodland on metamorphics ± interbedded volcanics	17.2	17.2 Dry woodlands dominated by poplar box, silver-leaved ironbark or White's ironbark on sand or depositional plains
12.11.9	Eucalyptus tereticornis open forest on metamorphics ± interbedded volcanics. Usually higher altitudes	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.9x1	Eucalyptus montivaga open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.12.1	Simple notophyll vine forest usually with abundant Archontophoenix cunninghamiana (gully vine forest) on Mesozoic to Proterozoic igneous rocks	4.1	4.1 Notophyll and notophyll palm or vine forest
12.12.10	Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks	29.3	29.3 Heathlands and associated scrubs and shrublands
12.12.11	Eucalyptus portuensis or E. acmenoides, Corymbia trachyphloia subsp. trachyphloia woodland on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.12.12	Eucalyptus tereticornis, Corymbia intermedia, E. crebra ± Lophostemon suaveolens woodland on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.12.13	Araucarian Complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks	2.1	2.1 Complex to simple, semi-deciduous mesophyll to notophyll vine forest
12.12.14	Eucalyptus racemosa subsp. racemosa ± Lophostemon confertus, Syncarpia glomulifera, Eucalyptus acmenoides woodland usually on rocky near coastal areas on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges

State-wide Bushfire Prone Area Mapping

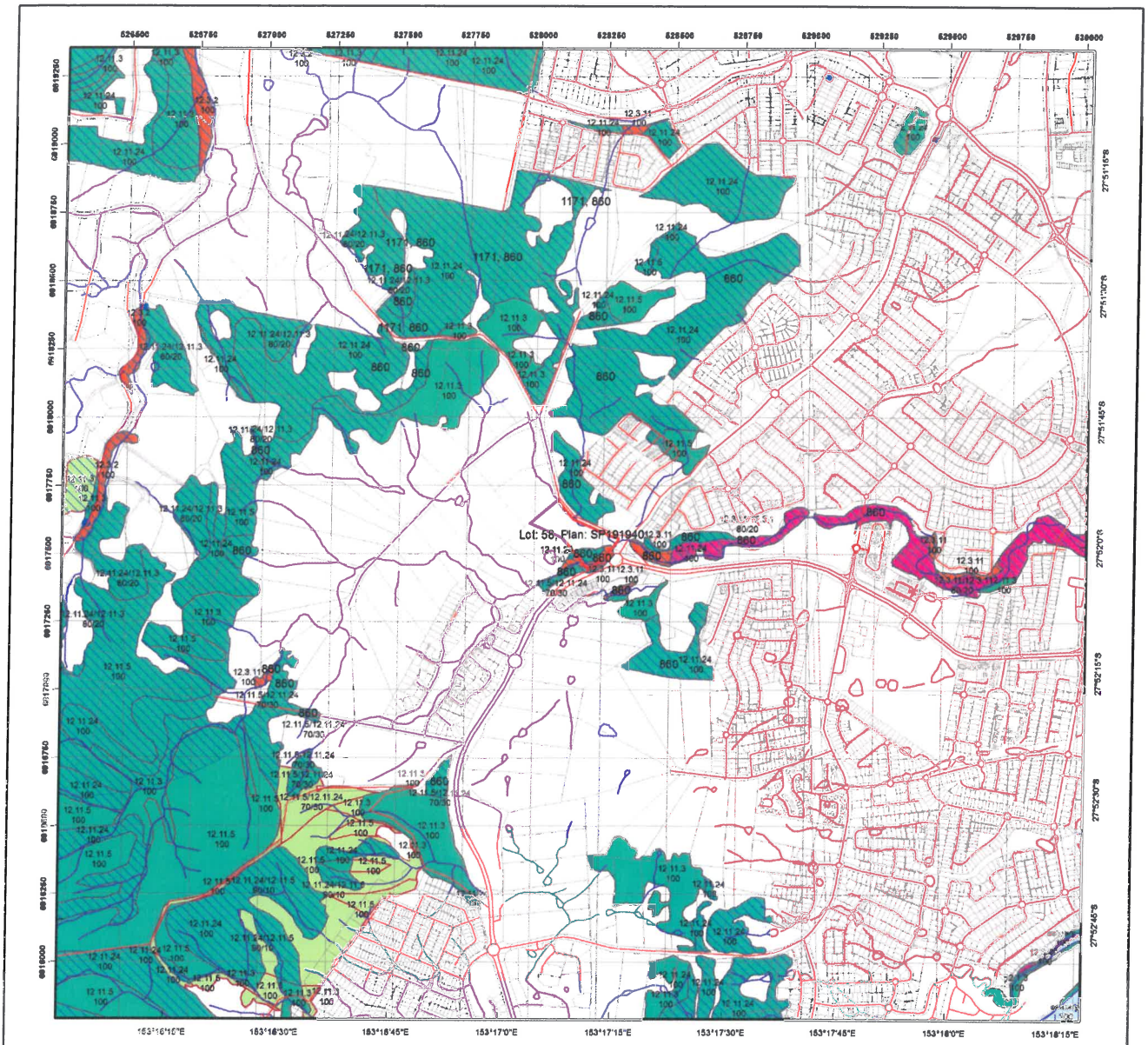
Vegetation Hazard Classes and Potential Fuel Loads

(Summary of updated descriptions and labels)

30 Sep 2014

Table 1. Vegetation Hazard Class Descriptions and Potential Fuel Load

Broad Vegetation Group / Vegetation Hazard Class	*Potential Fuel Load*
BVG 1. Complex mesophyll to notophyll vine forests of the Wet Tropics bioregion.	
1.1 Complex mesophyll to notophyll vine forests	2.6
BVG 2. Complex to simple, semi-deciduous mesophyll to notophyll vine forest, sometimes with Araucaria cunninghamii (hoop pine).	
2.1 Complex to simple, semi-deciduous mesophyll to notophyll vine forest	3.5
BVG 3. Notophyll vine forest/ thicket (sometimes with sclerophyll and/or Araucarian emergents) on coastal dunes and sandmasses.	
3.1 Notophyll vine forest	4.5
3.3 Notophyll vine thicket	4.4
BVG 4. Notophyll and notophyll feather palm or fan palm vine forest on alluvia, along streamlines and in swamps on ranges	
4.1 Notophyll and notophyll palm or vine forest	4.5
BVG 5. Notophyll to microphyll vine forests, frequently with Araucaria spp. or Agathis spp. (kauri pines)	
5.1 Notophyll to microphyll vine forests	3.9
5.2 Notophyll to microphyll vine forest with sparse overstorey	3.9
5.5 Sedgeland within Notophyll to microphyll vine forests	3.9
BVG 6. Notophyll vine forest and microphyll fern forest to thicket on high peaks and plateaus.	
6.1 Montane Notophyll vine forest and microphyll fern forest	3.9
6.3 Montane Notophyll vine thicket and microphyll fern thicket	3.9
BVG 7. Semi-evergreen to deciduous microphyll vine thicket.	
7.1 Semi-evergreen to deciduous microphyll vine forest	6.0
7.2 Sparse semi-evergreen to deciduous microphyll vine forest	6.0
BVG 8. Wet eucalypt tall open forest on uplands and alluvia.	
8.1 Wet eucalypt tall open forest	35.0
8.2 Wet eucalypt tall woodland	23.9
BVG 9. Moist to dry eucalypt open forests to woodlands usually on coastal lowlands and ranges.	
9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges	24.1
9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges	17.2
9.3 Shrubland within moist to dry eucalypt on coastal lowlands and ranges	12.7
BVG 10. Corymbia citriodora (spotted gum) dominated open forests to woodlands on undulating to hilly terrain.	
10.1 Spotted gum dominated open forests	20.8
10.2 Spotted gum dominated woodlands	18.0



Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM



N

0 140 280 420 560 700 m

This product is projected into:
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

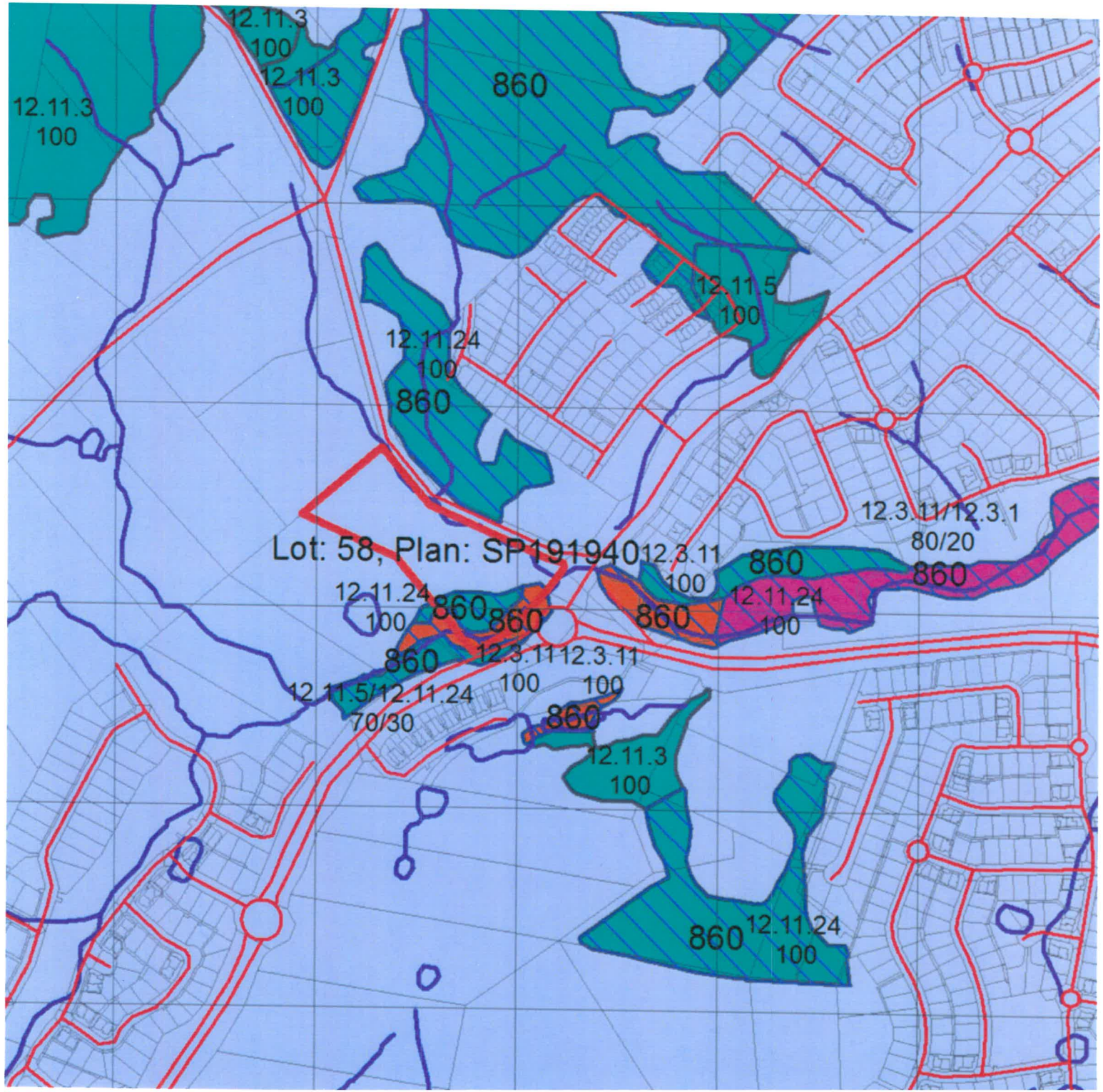
Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrme.qld.gov.au or contact the Department of Natural Resources, Mines and Energy.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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12.11.3
100
12.11.3
100
12.11.3
100
860
12.11.5
100
12.11.24
100
860
Lot: 58, Plan: SP191940
12.3.11/12.3.1
80/20
860
12.3.11
100
860
12.11.24
100
12.11.24
100
860
860
860
12.3.11
100
12.3.11
100
12.11.5/12.11.24
70/30
860
12.11.3
100
860
12.11.24
100

Regional ecosystem details for 12.11.24

< Back to search results (https://environment.ehp.qld.gov.au/regional-ecosystems/list/?page=74)

Regional ecosystem	12.11.24
Vegetation Management Act class	Least concern
Biodiversity status	No concern at present
Subregion	3, 1, (2), (4)
Estimated extent[1]	Pre-clearing 28000 ha; Remnant 2015 13000 ha
Extent in reserves	High
Short description	Eucalyptus carnea, E. tindaliae, Corymbia intermedia +/- E. siderophloia or E. crebra woodland on metamorphics +/- interbedded volcanics
Structure category	Sparse
Description	Eucalyptus carnea, E. tindaliae, Corymbia intermedia woodland +/- E. crebra or E. siderophloia, Eucalyptus resinifera, Eucalyptus major, E. helidonica, Angophora woodsiana, C. trachyphloia, E. microcorys, Corymbia citriodora subsp. variegata, C. henryi. Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and

	interbedded volcanics usually at altitudes <300 metres. (BVG1M: 9g)
Supplementary description	Ryan, T.S. (ed.) (2012); Bean et al. (1998), H39a
Protected areas	Nerang NP, Springbrook NP, Tamborine NP, D'Aguilar NP, Plunkett CP, Venman Bushland NP, Nerang CP, Buccan CP, Wickham NP, Daisy Hill CP, Springbrook CP, Toohey Forest CP, Pimpama CP
Special values	Habitat for threatened plant species including Sophora fraseri.
Fire management guidelines	SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.
Comments	Frequently grades upslope into 12.11.5 (Corymbia citriodora subsp. variegata) or 12.11.25 (C. henryi, E. fibrosa subsp. fibrosa) and downslope into 12.11.27 (E. racemosa/ E. seeana). Previously mapped as 12.11.5a. Lower altitude occurrences are being extensively cleared and fragmented. Caboolture south to the New South Wales border.

[1] Estimated extent is from version 10 pre-clearing and 2015 remnant regional ecosystem mapping. Figures are rounded for simplicity. For more precise estimates, including breakdowns by tenure and other themes see remnant vegetation in Queensland (https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/remnant-vegetation/).

[2] Superseded: Revision of the regional ecosystem classification removed this regional ecosystem code from use in version 10 RE mapping. It is included in the regional ecosystem description database because the RE code may appear in older versions of RE mapping and regulation.

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Last updated 10 April 2017

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Queensland Government (https://www.qld.gov.au/)

6.PROFILES

ELDON BOTTCHER

EDUCATION AND QUALIFICATIONS

Graduate Diploma in Design in Bushfire Prone Areas
University of Western Sydney
Diploma in Architecture
Queensland Institute of Technology
Certificate of Rural Fire Management
University of Southern Queensland
Registered Architect
Queensland
A+ Architect
Australian Institute of Architects
FPA Australia Certified Practitioner (BPAD-Level 3-16935)
Bushfire Planning and Design (BPAD-LEVEL 3), Alternate Solutions & DTS

PROFESSIONAL MEMBERSHIPS

Fellow
Australian Institute of Architects
Member
Australian Institute of Emergency Services
Member
Australian Institute of Engineers Society of Fire Safety
Member
Queensland Environmental Law Association.
Member Board of Experts
Bushfire Building Council of Australia
Associate Member
Institution of Fire Engineers
Corporate Member
Fire Protection Association of Australia

PROFESSIONAL EXPERIENCE

Director
Eldon Bottcher Architect Pty Ltd since 1978
Bushfire Assessment and Planning Consultant since 1998
Group Officer
Albert Rural Fire Brigades Group
Queensland Fire and Rescue Service
Group Officer
Gold Coast Rural Fire Brigades Group
Queensland Fire and Rescue Service
Group Officer
South East Regional Support Group
Queensland Fire and Rescue Service
Planning Officer
Gold Coast Rural Fire Brigades Group
Queensland Fire and Rescue Service
Member Practice Committee AIA Qld Chapter
BBCA representation to Australian Standards Committee FP20 (AS 3959)
Foundation & Life Member
Guanaba Rural Fire Brigade

OTHER BUSHFIRE RELATED COURSES AND TRAINING

I.C.S./AIIMS (40 hr. course) in Incident Command Systems
Certificate 4 (Workplace Training and Assessment)
RFSQ Level 1
RFSQ Level 2 (Officer)
RFSQ Fire Management 1
RFSQ Crew Leader
Certificate II in Public Safety (Firefighting Operations)
Fire Weather 1

BUSHFIRE RELATED AWARDS

National Planning Award
State Planning Award
Planning Institute of Australia
Gold Coast Bushfire Management Strategy
(Co-Initiator and Member of Preparation Committee)

Australian Government
National Medal
Long and Distinguished Service to Fire fighting
Queensland Fire and Rescue Service
Diligent and Ethical Service Medal + Clasp
Service to Fire fighting

Queensland Government
Australia Day Medallion
Services to Rural Fire Fighting
Queensland Government
Year of the Volunteer Medallion
Services to Fire fighting
UDIA
Best Consultancy Team Award in 2007.

SERVICES OFFERED

Bushfire management Reports

Bushfire Safety Engineering

Bushfire Planning and Design

Bushfire Hazard Assessment

Alternative Solutions

Expert Witnessing
(See Planning and Environment Court of Queensland Determination
File No. BD 624 of 2005 sections 28 to 35)

Continuing Professional Development Lectures

Tertiary Education Lectures and Tutorials

Town Planning Bushfire Codes for Local Authorities

Bushfire Burn Planning

General consultancy relating to all aspects of Bushfire

ATTACHMENT 16

Waste Management Plan, prepared by Mark Rigby & Associates



URBAN PLANNING SERVICES

MARK RIGBY & ASSOCIATES

excellence in environmental management

solutions • balance • growth

WASTE MANAGEMENT PLAN

202 BAILEY MOUNTAIN RD UPPER COOMERA AGED CARE FACILITY

AGED CARE DEVELOPMENT

Prepared for

SANDSON PTY LTD
C/ - URBAN PLANNING SERVICES

By
MRA ENVIRONMENTAL

JULY 2018

Mark Rigby & Associates Pty Ltd • ABN 21 082 910 218 • ACN 082 910 218
Suite 1/37 Commerce Drive, Robina • PO Box 480 Robina Q 4226
mail@mraenvironmental.com.au • Ph 07 5578 7040 • Fax 07 5578 7313

LIMITATIONS

MRA Environmental has prepared this Waste Management Plan for the sole use of Urban Planning Services, for the proposed development located at 202 Baileys Mountain Rd Upper Coomera QLD.

We have performed our services for this project in accordance with our current professional standards. No other warranty, expressed or implied is made as to the professional advice included in this submission.

Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions. The report also contains comments and information provided by others. MRA Environmental cannot take responsibility for advice provided by any third party.

This document has been prepared for the sole purpose of a Waste Management Plan, on the abovementioned property. It may not contain sufficient information for the purposes of other parties, for other uses or at other locations. It does not purport to present final or detailed engineering designs for construction.

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MARK RIGBY & ASSOCIATES
excellence in environmental management

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mrigby@mraenvironmental.com.au

Document No: MRA18-058

Date July 2018

Project Manager Matt Greer

***Title*:**	WASTE MANAGEMENT PLAN 202 Baileys Mountain Rd Upper Coomera QLD
***Author*:**	Matt Greer
***Client*:**	Sandson Pty Ltd C/ - Urban Planning Services
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***Summary*:**	A conceptual waste management plan for the operational phase of the development in regards to waste storage and collection.

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1.0 GLOSSARY OF TERMS

Bin carting route – the proposed route to move bins between the storage point and the servicing point.

Bulk bins – bins fitted with lids and side pockets to allow them to be serviced by a front-lift truck.

Clinical or related waste – waste that has the potential to cause disease, including, for example, animal waste, discarded sharps, human tissue waste or laboratory waste.

Commercial accommodation – for the purposes of this policy means commercial development that includes a domestic or residential component, such as Retirement facility, Community care centre, Rooming accommodation, Short term accommodation or Resort complex.

Commercial premises – for the purpose of this policy means any of the following types of premises:

- a Hotel, Short term accommodation, Tourist park, Food and drink outlet;
- an assembly building, institutional building, Child care centre, Educational establishment;
- premises where a sport or game is ordinarily played in public;
- an exhibition ground, show ground or racecourse; or
- an Office, Shop or other premises where business or work other than a manufacturing process is carried out.

Commercial waste – means waste, other than green waste, recyclable waste, and interceptor waste or waste discharged to a sewer, produced as a result of the ordinary use or occupation of commercial developments.

Common servicing point – a common area where more than two dwellings/tenancies stand their wheelie bins for servicing.

Common storage point – a common area where more than two dwellings/tenancies store their wheelie bins.

Constructed hardstand area – a hardstand area, for example a concrete pad which has been constructed for bin storage.

Digesters and dehydrators - machines specifically designed to reduce food waste volumes to allow for efficient disposal. Digesters typically process the material into sludge while dehydrators remove liquid from food waste generating a fertiliser as the end product. Disposal of end product can be used on either internal gardens or on external gardens/farms.

General waste – waste, other than domestic clean-up waste, green waste, recyclable waste, interceptor waste or waste discharged to a sewer, produced as a result of the ordinary use or occupation of domestic or commercial premises.

Glass crushers - machines that can reduce the volume of glass waste by up to 75%, saving valuable space.

Hazardous waste - solid waste that is toxic or contains toxic material. For example, light bulbs, fluorescence lights, batteries.

Internal servicing roadway – is a driveway, private roadway or other path intended for use by vehicles, in which the waste collection vehicle is required to use to service a bin.

Mixed-use development – for the purpose of this policy, any building or development complex used, or intended to be used, for residential purposes in combination with other commercial uses (e.g. Offices, Food and drink outlets etc).

Non-serviced area – an area within the boundaries of City of Gold Coast which is not serviced by Council's waste collection contractor.

Organic waste - is waste that comes from plants or animal that is biodegradable for example green waste and food waste.

Recycling chute - a duct in which recycling descends from one point to another.

Recyclable waste – for a local government's area, means clean and inoffensive waste that is declared by the local government to be recyclable waste for the area. In the City of Gold Coast the following wastes are deemed recyclable:

- all household plastics, bottles and containers;
- aluminium and steel cans and aerosols;
- bottles and jars made only of glass;
- clean cardboard, newspaper, loose paper, junk mail, magazines and cartons.

Related waste – means waste that constitutes, or is contaminated with, chemicals, cytotoxic drugs, human body parts, pharmaceutical products or radioactive substances.

Roll-on roll-off bin – large steel open top skip bins or enclosed bins. Bins are collected by a hook-lift truck.

Solid waste – any general or recyclable waste, be it commercial or domestic. Solid waste does not include waste discharges to sewer/water or the atmosphere.

Servicing point – the designated area allocated to the temporary storage of waste bins for the period of servicing only. The point may be within or external to a development.

Storage point – the area allocated to the permanent storage of waste bins. This is the normal location of the waste bins and excludes the period where the bin is serviced. A storage point may be a common storage point or an individual bin storage point.

Waste – includes anything, other than a resource that is:

- left over, or an unwanted by-product from an industrial, commercial, domestic or other activity; or
- surplus to the industrial, commercial, domestic or other activity generating the waste.

Waste carting distance – the distance required for a person to transport their waste from the nearest point of exit of their dwelling/tenancy to a storage point (or in the case of a multi-level building, to the nearest waste disposal point).

Waste chute – a duct in which waste descends from one point/level to a collection bin.

Waste disposal point – the point where waste is disposed of into the chute, also known as waste hopper. It consists of a fixed frame and hood unit, covered with a hinged or pivoted door.

Waste storage room – the room at the base of the chute used for the storage of waste bins.

Wheelie bin – two wheeled mobile garbage bins, made from high density polyethylene (HDPE). Wheelie bins are collected by a side-lift truck

2.0 INTRODUCTION

2.1 BACKGROUND

Sandson Pty Ltd propose to develop a low-rise development at 202 Baileys Mountain Rd Upper Coomera QLD. MRA Environmental (MRA) has been commissioned to prepare a Waste Management Plan (WMP) for the proposed Aged Care development that is to be submitted to City of Gold Coast (Council) as part of the Development Application (DA) being prepared for the site. This WMP ensures that the waste storage and collection activities for the operational phase of the development are in accordance with *SC6.13 City Plan Policy v.4 - Solid Waste Management*.

2.2 SITE DETAILS

The subject site is located at 202 Baileys Mountain Rd Upper Coomera QLD on approximately 30,870m^2 parcel of land known as Lot 58 on SP191940. The site is bound by residential dwellings and bushland to the north, south and west, with higher density residential dwellings to the east (refer to **Figure 1**).

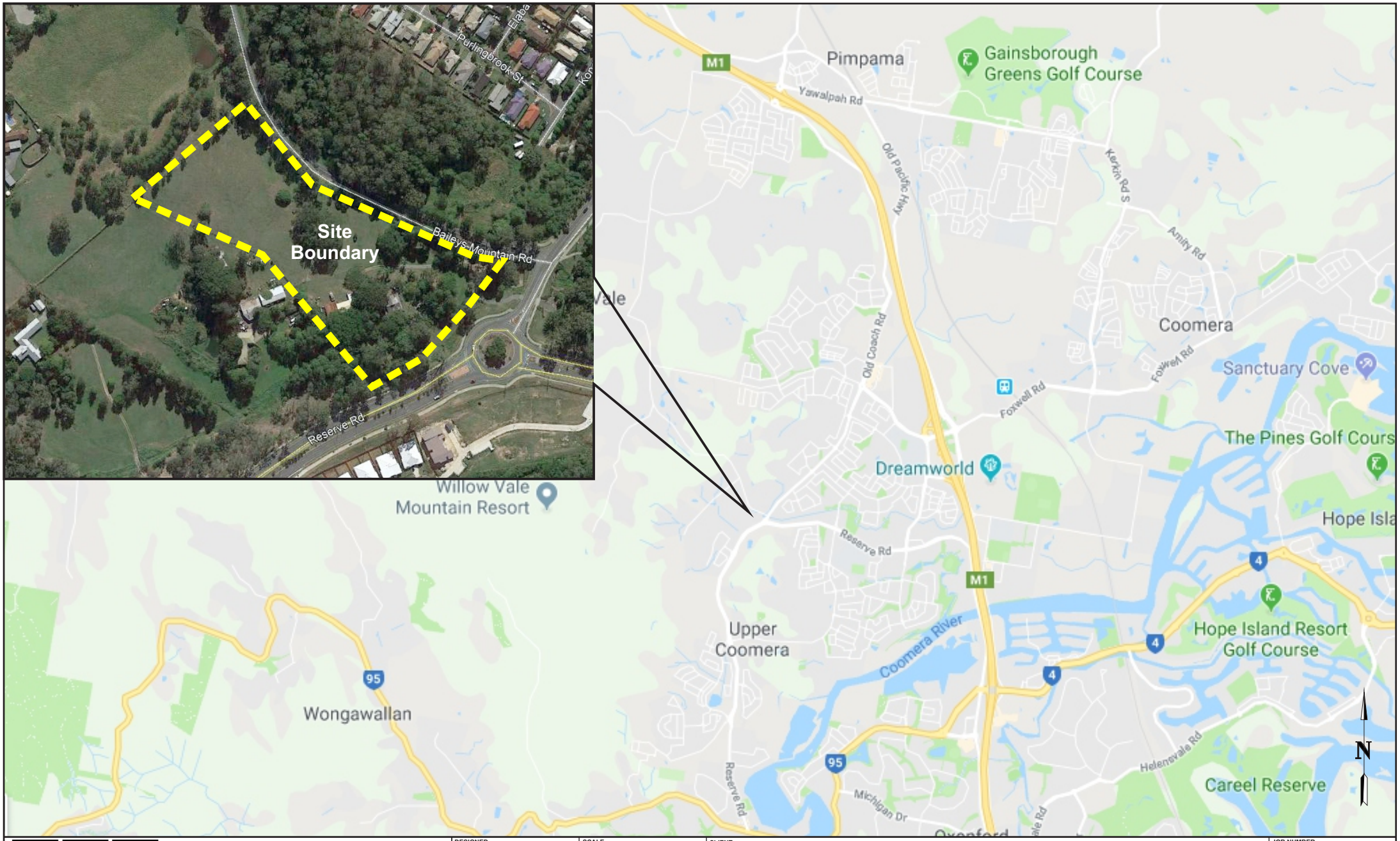
The proposed development will consist of a single low-rise construction that will include a total of 138 aged care dwellings, along with kitchen, recreational and medical facilities.

2.3 SCOPE OF REPORT

This report represents a Waste Management Plan for the operational phase of the development, which includes:

- Details on the anticipated type and quantity of waste (**Section 3.0**);
- Details of the waste storage room requirements and waste storage bins (**Section 4.0**); and
- Details of the proposed waste collection arrangements (**Section 5.0**).

This report presents conceptual information on the above dot points, rather than involving detailed designs and calculations. At the current phase of the proposal, the development of detailed engineering designs in regards to waste storage and collection is not practical.



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DESIGNED TH	SCALE NTS	CLIENT SANDSON PTY LTD C/- URBAN PLANNING SERVICES	JOB NUMBER MRA18-058
DRAWN TH	LEVEL DATUM -	PROJECT WASTE MANAGEMENT PLAN 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA	DRAWING Figure 001
CHECKED MG	SHEET SIZE A4		
APPROVED MG	CAD FILE	TITLE SITE LOCATION	REV A
DATE JUNE 2018	ISSUE FINAL		

3.0 WASTE QUANTITIES

3.1 TYPE OF WASTE

Table 1 outlines the predicted types of waste that are expected to be generated from the proposed development.

Table 1: Predicted waste types to be generated from the proposed development.

Tenancy Type	Predicted Waste Types
Aged care dwellings	General and recycling waste.
Recreational	General and recycling waste.
Kitchen and Dining	Waste cooking oil, cardboard, recycling and mixed food and beverage waste.
Medical Facilities	General, recycling and clinical waste.

Calculations of the anticipated waste quantities have been separated into the two different waste generation streams within the development. The aged care component and the commercial waste volumes have also been calculated separately however, these waste streams will ultimately be combined within the allocated waste storage area. The waste calculations were performed using typical waste generation rates as provided in Council's Solid Waste Management Policy.

3.2 AGED CARE

Table 2 displays the general waste quantities and **Table 3** displays the recycling quantities that are anticipated for the Aged Care development.

Table 2: Anticipated general waste quantities for the aged care portion of the development.

Dwelling Type	No.	Total Required Waste Capacity (L/week)	Estimated Waste Generation (m^3/week)	Estimated Daily Waste Generation (m^3/day)
Suite	116	2,320	2.32	0.33
1 Bedroom	14	1,120	1.12	0.16
2 Bedroom	8	800	0.80	0.11
TOTAL	138	4,240	4.24	0.61

Table 3: Anticipated recycling quantities for the aged care portion of the development.

Dwelling Type	No.	Total Required Waste Capacity (L/week)	Estimated Waste Generation (m^3/week)	Estimated Daily Waste Generation (m^3/day)
Suite	116	1,740	1.74	0.25
1 Bedroom	14	700	0.7	0.10
2 Bedroom	8	480	0.48	0.07
TOTAL	138	2,920	2.92	0.42

3.3 KITCHEN RECREATIONAL AND DINING

Table 4 displays the general waste quantities and **Table 5** displays the recycling waste quantities that are anticipated for the kitchen and dining portions of the aged care development.

It should be noted that waste cooking oil facilities will be provided for the kitchen, however the quantity of waste cooking oil generated can vary greatly, depending on seasonality etc. For that reason, no estimates for waste cooking oil have been provided. Similarly, no estimates for clinical waste generation have been provided for the medical centre.

Table 4: Anticipated general waste quantities for the kitchen, recreational and dining portions of the aged care development.

Commercial Type	Approximate Floor Space (m^2).	Waste Generation (L/week)	Estimated Waste Generation (m^3/week)	Estimated Daily Waste Generation (m^3/day)
Recreational	50	50	0.35	0.05
Dining	360	1,080	7.56	1.08
Medical	50	100	0.70	0.10
TOTAL	460	1,230	8.61	1.23

Table 5: Anticipated recycling waste quantities for the kitchen, recreational and dining portions of the aged care development.

Commercial Type	Approximate Floor Space (m^2).	Waste Generation (L/week)	Estimated Waste Generation (m^3/week)	Estimated Daily Waste Generation (m^3/day)
Recreational	50	25	0.18	0.03
Dining	360	720	5.04	0.72
Medical	50	60	0.42	0.06
TOTAL	460	805	5.64	0.81

3.4 TOTAL WASTE CAPACITY

The aged care portion of the development is estimated to generate a total of **0.61m^3** per day of general waste and **0.42m^3** per day of recycling material. The kitchen, recreational and dining portion of the development is estimated to generate a total of **1.23m^3** per day of general waste and **0.81m^3** per day of recycling material.

This equates to a combined total of **1.84m^3** per day of general waste and **1.22m^3** per day of recycling material for the entire development.

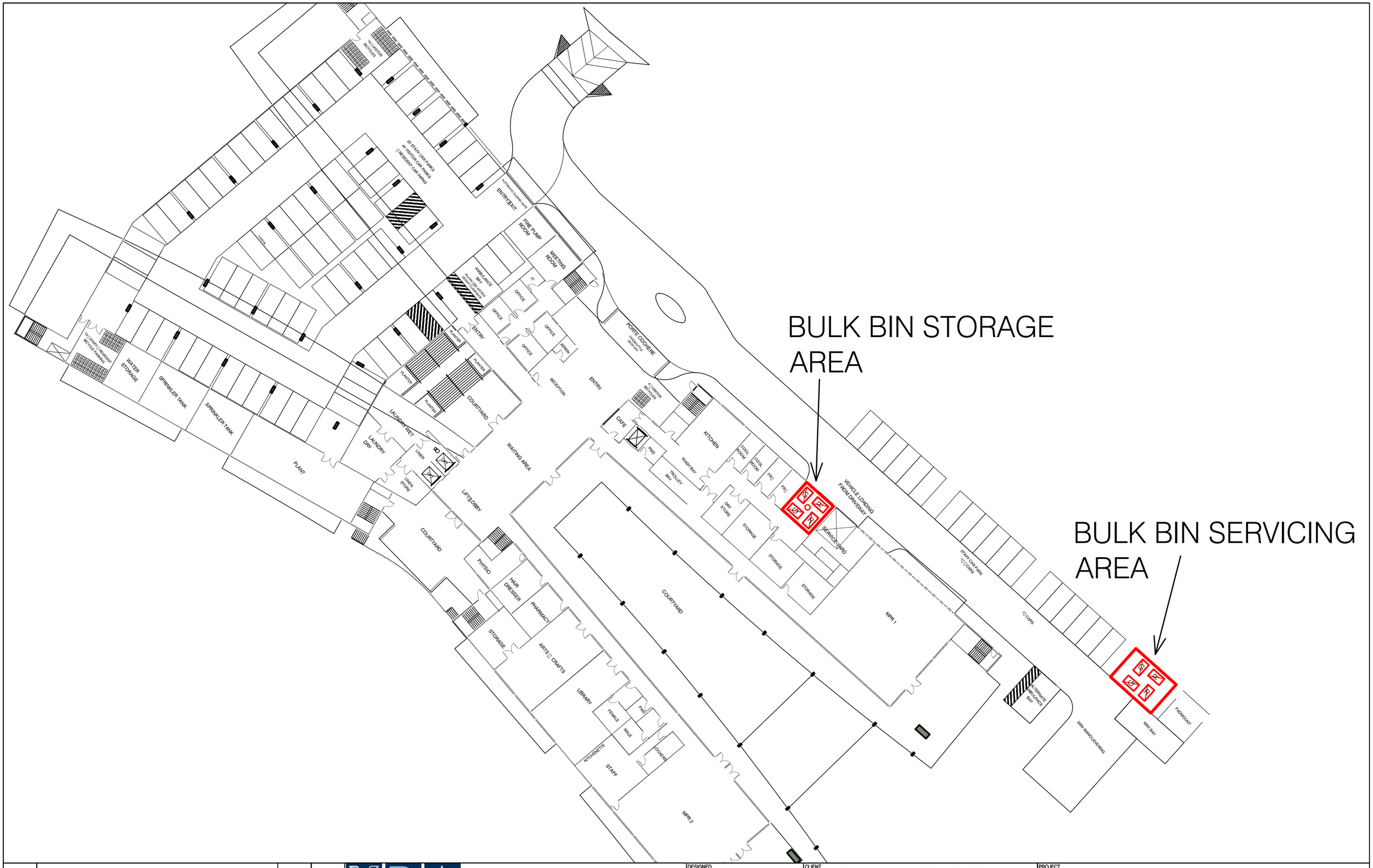
4.0 WASTE STORAGE

This section outlines the general design criteria of the waste storage room as required by *SC6.13 City Plan Policy v.4 - Solid Waste Management* along with a description of the proposed bins to be used. Should the proposed development be unable to meet any of the following requirements, alternative arrangements may be negotiated with Council at the appropriate time.

4.1 PROPOSED WASTE STORAGE AREAS

A single waste storage area is proposed for the development for the storage of all waste generated at the site, while waste receptacle store rooms will be located on both the first and second floor of the development. Cleaning staff will transport all generated waste via stored waste receptacles to the ground floor waste storage area, where bin lift mechanisms will enable safe waste transfer. Example bin lift mechanisms are shown in **Attachment B**. Cleaning staff will endeavour to perform waste transport activities outside visiting hours. The waste storage area will be located at ground level adjacent to the storage and plant rooms as shown in **Figure 2**. The bulk bins will be carted to the bulk bin servicing area as shown in Figure 2 where they will be serviced by the service provider.

Note that any waste cooking oil generated from the kitchen will be stored in a drum in a bunded area of the waste storage room at ground level. Clinical waste will also be generated at the site. In the absence of any guidelines for clinical waste generation, a number of clinical waste bins will be allocated for the medical clinic. Any clinical or related waste will be stored in an area that is not accessible to animals or persons, other than persons who are authorised.



REV.	DESCRIPTION / NOTES	DATE	APPROVED

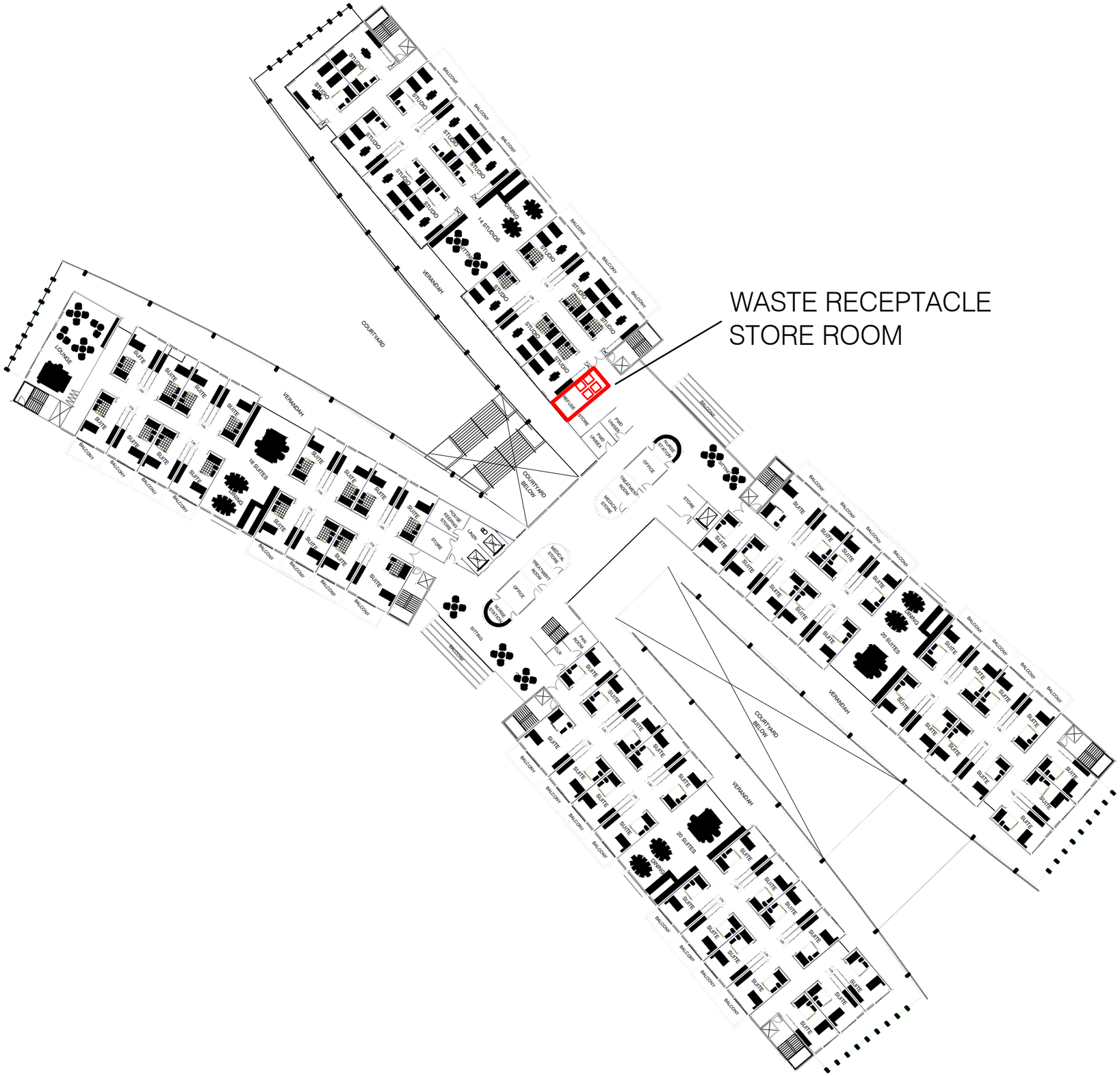
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DESIGNED	MG	CLIENT	URBAN PLANNING SERVICES PTY LTD
DRAWN	MG	LEVEL DATUM	AHD
CHECKED	MR	JOB NUMBER	MRA18-058
APPROVED	MR	SHEET SIZE	A3
DATE	JULY 2018	REVISION	A

PROJECT: WASTE MANAGEMENT PLAN
202 BAILEYS MOUNTAIN ROAD

TITLE: GROUND LEVEL LAYOUT &
WASTE STORAGE SERVICE AREAS

SCALE	ISSUE	DRAWING NO.
NTS	FINAL	FIGURE 2



REV.	DESCRIPTION / NOTES	DATE	APPROVED

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DRAWN	MG	LEVEL DATUM	AHD
CHECKED	MR	JOB NUMBER	MRA18-058
APPROVED	MR	SHEET SIZE	A3
DATE	JULY 2018	REVISION	A

PROJECT	WASTE MANAGEMENT PLAN 202 BAILEYS MOUNTAIN ROAD	
TITLE	LEVEL 1 LAYOUT & WASTE RECEPTACLE LOCATION	
SCALE	NTS	ISSUE: FINAL
DRAWING NO.	FIGURE 3	

4.1.1 BULK BIN STORAGE AREA

The bulk bin storage area will be designed to meet the following requirements as per Council's Solid Waste Management Policy. The bulk bin storage areas will be:

1. Designed to allow the bins to be easily transported to a separate servicing point (no steps or lips on bin carting route);
2. Waste carting distance generally should not exceed 60 metres and in any case be reasonable to ensure ease of use;
3. Located at least five (5) metres from any door, window or fresh air intake within the development or any adjoining site;
4. Screened to ensure bins are not visible from a public place or sensitive land use;
5. Provided with safe access to the disposal area;
6. Of sufficient size to accommodate the required number of bins;
7. Allow for at least an additional 500mm clearance surrounding each bin;
8. Provide adequate storage for recyclable waste that all users can safely and easily access via the provision of suitably located bulk bins;
9. Constructed hardstand area with a solid concrete base or acceptable equivalent;
10. Roofed and designed to prevent entry to rainwater;
11. Graded to fall to a drainage point within the storage point that is connected to sewer in accordance with trade waste requirements;
12. Not be located within a building structure, unless it is in a well ventilated area at ground level and not within thirty (30) metres of an opening to a food premises or food handling area;
13. Insect and vermin proof;
14. Doors must be wide enough to allow for the easy removal of the largest container to be stored;
15. The walls, ceiling, floor and equipment of each waste storage room are to be designed and constructed of impervious material with a smooth finish to allow for easy cleaning;
16. A hose cock must be provided immediately outside the room for cleaning bins and the room;
17. Provided with adequate artificial lighting; and
18. Not located adjacent to or within any habitable portion of a building or place used in connection with food preparation (including food storage).

4.2 PROPOSED WASTE CONTAINERS

To ensure that the design of each waste storage area is sufficient, the details of the type and quantity of waste and number of bins to be stored at each location are outlined on **Table 8**. Dimensions of the proposed containers are detailed in **Section 4.5**.

Table 6: Details of general and recycling waste to be stored within the development.

Waste Area	Waste Type	Estimated Waste Quantity (m^3/day)	Bins Proposed in Area	Collection Frequency
Bulk Bin Storage Area	General Waste	1.84	2 x 2.0m^3 bulk bins	Three times per week
	Recycling Waste	1.22	2 x 2.0m^3 bulk bin	Twice per week

4.3 DIMENSIONS OF WASTE CONTAINERS

Table 9 below provides dimensions of the bins to be used on-site. The 2.0m^3 bulk bin will be composed of galvanised or rust-free metal with lightweight plastic lids.

Table 7: Dimensions of proposed waste storage containers.

Bin Type	Volume	Length (mm)	Width/ Diameter (mm)	Height (mm)	Collection Vehicle Type
Bulk bin	2.0m^3	2,040	1,180	1,430	Front-lift Truck
Waste Oil Drum	250L	-	600	900	Tandem waste oil collection tanker

4.4 DRAINAGE AND BIN WASH

Bin wash facilities (including hosecock) will be provided within the waste storage area. The waste storage area will be graded to a central drainage point that is connected to sewer in accordance with trade waste requirements. It will be the responsibility of on-site management to wash bins and to maintain the cleanliness of the waste storage areas. Waste receptacles that are stored within the first and second floor waste receptacle areas will be washed within the waste storage area when necessary.

5.0 DETAILS OF COLLECTION

5.1 FREQUENCY

It is proposed that all bulk bins for general waste and recycling waste will be transported by on-site management to the designated servicing point. The contracted waste service vehicle will collect all general and recyclable waste from this nominated waste servicing point, with its serviceability to be proven through the production of swept path diagrams.

5.2 BULK BIN SERVICE POINT

The proposed location of the bulk bin servicing point is shown in **Figure 2**. The servicing point has been designed to allow for easy access by collection vehicles and provides sufficient turnaround area and clearance heights through accompanying swept path diagrams.

The bulk bin servicing point will be designed to meet the following requirements as per Council's Solid Waste Management Policy. The bulk bin servicing point will be:

1. Sufficient access and clearance for the waste and recycling collection vehicles to service the bins, including adequate unobstructed overhead space for the swinging arm action of the waste collection vehicle;
2. Bins serviced safely while minimising the impediment of traffic flow during servicing;
3. Clearly separated from car parking bays, loading bays, footpaths and pedestrian access, and any other similar areas;
4. Clear of speed control devices or similar provisions which inhibit direct access to the bins for servicing;
5. Bin-carting route must allow bins to be easily manoeuvred and be devoid of steps or steep rises;
6. Bin-carting route must not extend through habitable parts of a building, or a food premises, and only occur through common property or publicly accessible locations;
7. Where site has frontage to a number of roads, the servicing occurs on the roadway of the lowest order where possible;
8. Must be positioned to allow waste and recycling collection vehicles to enter and exit the site in a forward gear (internal servicing roadway);
9. Positioned on a level pad;
10. Over five metres from any door, window or fresh air intake within the development or any adjoining site;
11. Bins to be removed from and returned to the storage point;
12. Screened to minimise the view of bins from neighbouring properties, or passing vehicles and pedestrian traffic external to the site;
13. Bin carting must be via hard stand pathways or internal roads and can be easily moved to the temporary storage area either side of the property entry point, and is not stored on a section of the driveway that falls away (e.g. to the basement); and

14. Positioned away from entrances to shops or residential premises.

As service vehicles will be required to use internal driveways, the internal servicing roadways will be designed to meet the following requirements:

1. Gradients of roadways the waste collection vehicle needs to access are to be in accordance with *SC6.9 City Plan policy – Land development guidelines*;
2. Constructed to withstand the fully loaded weight of the waste and recycling collection vehicles;
3. Provide sufficient clearance height for the waste collection vehicle when travelling and servicing the bins under a structure or roof, taking into account the following:
    - Travelling height of vehicle (and bins);
    - Servicing height of vehicle and bins;
    - Gradient of roadways;
    - Obstructions such as roof-mounted services, signage, driveway doors, etc.
4. Allow an additional 0.6 metres to the applicable waste vehicle turning dimensions when relying on 'wall-to-wall' dimensions within a basement.

5.3 COLLECTION VEHICLE ACCESS

Table 9 details the dimensions of the waste collection vehicle that will service the development. An overhead, front lifting truck will service the proposed bulk bins, importantly, there is sufficient clearance available to service the bins at the nominated servicing point.

Service vehicle swept paths have been prepared by the project traffic engineers to demonstrate adequate access, egress and manoeuvring for the vehicles to service the bins at the nominated locations (refer to traffic report).

Table 8: Waste service vehicle dimensions as per council guidelines.

Collection Vehicle Type	Front lift truck
Height	4.3m
Width	2.5m
Length	10.2m
Working Height	6.4m*
Total Tonnage	27.5 tonne maximum
Min Turning Circle (wall to wall)	13.2m
Min Turning Circle (kerb to kerb)	12.3m

*Note that the waste collection vehicle clearance height (working height) is to be calculated according to the following formula as a minimum:

SUITABLE CLEARANCE = VEHICLE OPERATING DIMENSIONS + 100mm + CLEARANCE FOR SERVICES + CALCULATION FOR ROADWAY GRADIENT

6.0 SUMMARY

The main objectives of this report are to provide conceptual details for optimal waste management in the operational phase of the development. Additional detailed engineering designs in regards to waste area size, drainage, and service vehicle access will be completed by others.

The main objectives of this report are to provide conceptual details for optimal waste management in the operational phase of the development. Additional detailed engineering designs in regards to waste area size, drainage, and service vehicle access will be completed by others.

Details of this Waste Management Plan are summarised below:

- The proposed development is located at 202 Baileys Mountain Rd Upper Coomera QLD and has an approximate area of 30,870m^2;
- The proposed development will consist of a single low-rise construction that will include a total of 138 aged care dwellings, along with kitchen, recreational and medical facilities;
- Waste for the proposed development is expected to consist of general, recycling, food and clinical waste;
- The aged care dwellings are expected to generate an estimated total of approximately 1.84m^3/day of general waste and 1.22m^3/day of recyclable waste;
- All general waste generated will be delivered to waste storage room at ground level via cleaning staff and waste receptacles located on the first and second floor of the development;
- The waste storage room will be equipped with a bin lift mechanism to allow safe waste transfer.
- Site management will transport all bulk bins to the servicing point as required;
- Bulk bins will be serviced by the contracted service provider from the designated servicing point as required;
- Sufficient space and clearance is available at the nominated servicing point for the service vehicles to empty the bulk bins (refer to traffic report for further detail).

ATTACHMENT A

Solid Waste Management Code (9.4.12 v.4)

ASSESSABLE DEVELOPMENT CRITERIA
9.4.12 SOLID WASTE MANAGEMENT CODE (v.4)

Performance Outcomes	Acceptable Outcomes	Compliance Achieved	Comments
Waste and recycling storage and bin wash-down facilities			
PO1 Development provides waste and recycling storage facilities that are appropriate and adequate for the type and volume of waste generated.	**AO1.1** Development includes waste storage points of sufficient size to accommodate the required number of waste and recyclable bins consistent with **SC6.13 City Plan policy – Solid waste management**.	✓	The Waste Management Plan confirms that the development includes waste storage points of sufficient size to accommodate the required number of waste and recyclable bins consistent with **SC6.13 City Plan policy – Solid waste management**.
	AO1.2 Waste and recycling storage points are located, designed and sized consistent with **SC6.13 City Plan policy – Solid waste management**.	✓	The Waste Management Plan confirms that the development includes waste and recycling storage points that are located, designed and sized consistent with **SC6.13 City Plan policy – Solid waste management**.
	AO1.3 Development with a dwelling above the third storey include appropriate waste removal systems which incorporate: (a) waste chutes; (b) hoppers; and (c) separate waste storage rooms. **Note: Waste removal system design is to be consistent with SC6.13 City Plan policy – Solid waste management.**	N/A	The development does not extend above three storeys.
	AO1.4 Developments that include a commercial kitchen or generate clinical or related waste incorporate additional waste facilities consistent with **SC6.13 City Plan policy – Solid waste management**.	✓	The Waste Management Plan confirms that the development incorporates additional waste facilities consistent with **SC6.13 City Plan policy – Solid waste management**

PO2 Development provides a bin wash-down facility that maintains appropriate environmental health and amenity standards.	**AO2** Development includes appropriately sized and located bin wash-down facilities consistent with **SC6.13 City Plan policy –Solid waste management**.	✓	The Waste Management Plan confirms that the development includes appropriately sized and located bin wash-down facilities consistent with **SC6.13 City Plan policy –Solid waste management**.
Amenity			
PO3 Waste and recycling storage and servicing points are appropriately located and designed for convenient and safe access by all users and to minimise the potential for nuisance to occupants of the development or adjoining properties.	**AO3.1** Direct unobstructed paths exist between waste and recycling storage and servicing points and road frontages.	✓	The Waste Management Plan confirms that direct unobstructed paths exist between waste and recycling storage and servicing points and road frontages.
	AO3.2 Waste and recycle storage points are screened by solid fencing or vegetation to ensure they are not visible from a public place or sensitive land use.	✓	The Waste Management Plan confirms that waste and recycling storage points are screened by solid fencing or vegetation to ensure they are not visible from a public place or sensitive land use.
Waste servicing			
PO4 Waste and recycling servicing points are appropriately located and designed to facilitate safe, unobstructed and efficient servicing of waste containers.	**AO4** Waste and recycling servicing points are located, designed and sufficiently sized consistent with **SC6.13 City Plan policy –Solid waste management**. **Note: Regulation of the access, stopping and manoeuvring of refuse collection vehicles are subject to meeting, Part 9.4.13 Transport code and associated City Plan guidelines.**	✓	The Waste Management Plan confirms that the waste and recycling servicing point is designed and sufficiently sized consistent with **SC6.13 City Plan policy –Solid waste management.** Refer to traffic engineers report for further detail on service vehicle movements.
Non-serviced areas			
PO5 Developments in non-serviced areas have appropriate solid waste management measures to adequately service the development. **Note: For Commercial developments a Waste management plan, prepared in accordance with SC6.13 City Plan policy – Solid waste management, is Council's preferred method of addressing the above outcome.**	**AO5** The development has appropriate solid waste management measures to adequately service the development as outlined in this Waste Management Plan and attached **SC6.13 City Plan policy.**	✓	The Waste Management Plan is produced in accordance with **SC6.13 City Plan policy –Solid waste management**.

ATTACHMENT 17

Acoustic Report,
prepared by Acoustic Works



URBAN PLANNING SERVICES

acousticworks)))

Proposed Aged Care Facility
202 Baileys Mountain Road
Upper Coomera

ACOUSTIC REPORT






Client:
Sandson Pty Ltd

Reference:
2018200 R01B 202 Baileys Mountain Road Upper Coomera RTN ENV

Date Issued:
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1. Introduction

The following report is in response to a request by Sandson Pty Ltd for an environmental noise assessment of a proposed aged care facility located at 202 Baileys Mountain Road, Upper Coomera. To facilitate the assessment, unattended noise monitoring was conducted to establish traffic noise impacts and measure ambient noise levels in the vicinity of the site to determine the criteria for onsite activities.

2. Site Description

2.1 Site Location

The site is described by the following;

202 Baileys Mountain Road, Upper Coomera.
Lot 58 on SP191940.

Figure 1: Site location (not to scale)



A detailed site survey was conducted on Monday the 8th of June 2018 which identified the following in relation to the subject site;

a) An existing two-storey residential dwelling currently occupies the site.
b) Baileys Mountain Road bounds the site to the northeast, separating the development from a vacant parcel of land.
c) Horse paddocks bound the site to the northwest.
d) A property with a single-storey residential dwelling bounds the site to the southwest.
e) Reserve Road bounds the site to the southeast, separating the development from residential land uses.

2.2 Proposal

The aged care development is proposed to consist of the following;

- The three-storey aged care building will be located centrally on the site.
- The ground level will consist of offices, kitchen, MPR, library, arts and crafts, staff, offices, amenities, service areas, laundromat, café hairdresser, physio, pharmacy and courtyard areas.
- Levels 1 and 2 will consist of aged care suites/studios/apartments, with associated communal dining and lounge areas.
- There will be a total of 65 ground level parking spaces, with site access via Baileys Mountain Road.

Refer to the development application for development plans.

2.3 Acoustic Environment

The ambient noise environment at the site is primarily affected by noise from Reserve Road and the local road network.

3. Equipment

The following equipment was used to record noise levels:

- 2 Rion NL42 Environmental Noise Monitors
- BSWA Technology Co. Ltd Sound Calibrator

The sound measuring equipment holds current NATA Laboratory Certification and was field calibrated before and after the monitoring period with no significant drift from the reference signal recorded.

4. Offsite Sources and Noise Monitoring

4.1 Receiver Locations

The nearest noise sensitive receiver locations to the proposed development were identified as follows;

1. A single-storey dwelling is located to the southwest at Reserve Road.
2. Dwellings are located to the northwest at 17 and 31 Courtney Drive.
3. Dwellings are located to the east at Purlingbrook Street and Wendy Court.
4. Single storey dwellings are located to south at Tian Crescent.

These locations were chosen as being representative of the nearest noise sensitive receivers to the proposed development. Refer to Figure 2 for these locations.

Figure 2: Noise monitoring and receiver locations



4.2 Unattended Noise Monitoring

The first Rion NL42 environmental noise monitor (Noise Monitor 1) was placed onsite approximately 5m from the nearest lane of Baileys Mountain Road. The microphone was located approximately 1.4m above ground level in a free field location. The noise monitor was set to record noise levels between the 9th and 14th of June 2018.

The second Rion NL42 environmental noise monitor (Noise Monitor 2) was placed onsite, approximately 34m from the nearest lane of Reserve Road. The microphone was located approximately 1.4m above ground level in a free field location. The noise monitor was set to record noise levels between the 9th and 14th of June 2018.

The Rion NL42 environmental noise monitors were set to record noise levels in "A" Weighting, Fast response using 15 minute statistical intervals. Ambient noise monitoring was conducted generally in accordance with Australian Standard *AS1055:1997 Acoustics – Description and measurement of environmental noise* with road traffic noise monitoring conducted in accordance with Australian Standard *AS2702:1984 'Acoustics - Methods for the measurement of road traffic noise'*.

Refer to Figure 2 for the noise monitoring location.

5. Measured Noise Levels

The following tables present the measured road traffic and ambient noise levels from the unattended noise survey. Any periods of inclement weather or extraneous noise were omitted from the measured data prior to determining the results.

5.1.1 Road Traffic Noise Levels

The measured road traffic noise levels were as follows;

Table 1: Measured traffic noise levels - Noise Monitor 1

Day	Date	L10(18h) 0600-2400	Leq(1h) Day	Leq(1h) Night	L90(8h) 2200-0600	L90(18h) 0600-2400
Saturday	9/06/18	57	64	56	32	38
Sunday	10/06/18	54	66	53	25	37
Monday	11/06/18	57	64	57	30	39
Tuesday	12/06/18	57	65	58	30	37
Wednesday	13/06/18	57	67	58	28	36
Thursday	14/06/18	57	62	57	27	37
Overall value		57	67	58	29	37

Table 2: Measured traffic noise levels - Noise Monitor 2

Day	Date	L10(18h) 0600-2400	Leq(1h) Day	Leq(1h) Night	L90(8h) 2200-0600	L90(18h) 0600-2400
Saturday	9/06/18	57	62	55	38	48
Sunday	10/06/18	55	60	53	31	45
Monday	11/06/18	57	65	56	35	48
Tuesday	12/06/18	58	65	56	36	48
Wednesday	13/06/18	57	67	57	34	48
Thursday	14/06/18	57	68	57	34	48
Overall value		57	65	57	35	47

5.1.2 Background noise levels

The measured background noise levels at the monitoring location are as follows;

Table 3: Measured LA90 noise levels - Noise Monitor 1

Day	Date	L90 dBA		
		Day	Evening	Night
Saturday	9/06/18	45	43	32
Sunday	10/06/18	43	41	28
Monday	11/06/18	43	41	31
Tuesday	12/06/18	42	39	30
Wednesday	13/06/18	41	41	25
Thursday	14/06/18	41	39	27
Overall value		43	41	29

Table 4: Measured LA90 noise levels - Noise Monitor 2

Day	Date	L90 dBA		
		Day	Evening	Night
Saturday	9/06/18	51	45	39
Sunday	10/06/18	49	42	32
Monday	11/06/18	51	46	37
Tuesday	12/06/18	51	46	37
Wednesday	13/06/18	51	46	36
Thursday	14/06/18	51	46	35
Overall value		51	45	36

Refer to the Appendices for graphical representation of the measured noise levels.

6. Noise Criteria

6.1 Road Traffic Noise

The City of Gold Coast criteria for road traffic noise is outlined in the City Plan Version 4, 8.2.14 Regional Infrastructure Overlay Code. Table 8.2.14-3 of the code outlines the criteria for road traffic noise as follows;

Table 5: Road Traffic Noise Criteria

Measurement location	Design level road noise criteria
1m in front of the most exposed part of a proposed sensitive land use	60 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are greater than 40 dB (A) L90 (8 hour) between 10pm and 6am. (L10 (18 hour) is the arithmetic average of 18 hourly L10 levels measured in dB (A) between the hours of 6am and midnight). 57 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are less than or equal to 40 dB (A) L90 (8 hour) between 10pm and 6am. Where the above criteria cannot be met, internal maximum design criterion levels specified in Table 1 AS2107-2000 apply, particularly for buildings greater than 1 storey high.
Balconies and formal external open space	60 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are greater than 45 dB (A) L90 (18 hour). 57 dB (A) L10 (18 hour) or less, where existing levels measured at the setback for the zone are less than or equal to 45 dB (A) L90 (18 hour).

Based on the measured noise levels presented in Table 1, the applicable road traffic noise limits for the development are as follows:

Table 6: Applicable External Road Traffic Noise Limits

Location	Noise Level dBA
All Facades (free field)	LA10(18hr) 57 dBA
All open spaces and recreation areas of accommodation activities and residential care facilities (free field)	LA10(18hr) 57 dBA

The applicable internal noise limits from AS2107-2000 are provided in Table 7.

Table 7: Applicable Internal Road Traffic Noise Limits – AS2107

Location	Noise Level dBA
Living Areas	Leq 45
Sleeping Areas	Leq 40
Work Areas	Leq 45
Wards	Leq 40
Waiting Rooms, Reception Areas	Leq 50
Office Areas	Leq 45
Nurses Stations	Leq 45

6.2 Environmental noise

The noise criteria as applied by City of Gold Coast under the City Plan Version 5 (commenced 27 June 2018) are as follows;

6.2.1 Acoustic Quality Objectives

Table 8 below presents the acoustic quality objectives at noise sensitive receptors as detailed in Schedule 1 of the EPP (Noise) 2008.

Table 8: Acoustic Quality Objectives at Noise Sensitive Properties

Sensitive Receptor	Time of Day	Acoustic Quality Objectives, dBA		
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$
Dwelling (outdoors)	Day and Evening (7am – 10pm)	50	55	65
Dwelling (Indoors)	Day and Evening (7am – 10pm)	35	40	45
	Night (10pm - 7am)	30	35	40

6.2.2 Background Creep

The Background Creep criterion is as follows;

Time-varying noise:

$$L_{Aeq,adj,T,} \leq \text{Ambient } L_{A90,T} + 5\text{dBA}$$

Steady-state noise:

$$L_{A90,T} \leq \text{Ambient } L_{A90,T}$$

The time period (T) is a time interval of at least 15 minutes, or if the noise continues for less than 15 minutes, the duration of the noise source.

Based on the results of ambient noise monitoring, the project specific background creep noise limits are shown in Table 9.

Table 9: Background creep noise limits

Time Period	Noise Level Limits SPL dBA	
	$L_{Aeq,adj,T}$	$L_{A90,T}$
Day 7am – 6pm	48	43
Evening 6pm – 10pm	46	41
Night 10pm – 7am	34	29

7. Road Traffic Assessment

Road traffic noise associated with Reserve Road, Baileys Mountain Road, and Old Coach Road was assessed at the development over a ten year planning horizon to determine any requirements for acoustic treatments.

7.1 Traffic Volumes

Traffic volumes for Reserve Road, Baileys Mountain Road, and Old Coach Road were obtained from Bitzios Consulting and are presented in Table 10.

Table 10: Traffic Volumes

Location	2018 Predicted AADT	2030 Predicted AADT	Percentage of Heavy Vehicles
Reserve Road (East)	6,390	13,915	2.3
Reserve Road (West)	11,500	25,042	1.6
Baileys Mountain Road	1,150	2,505	2.7
Old Coach Road	12,240	26,654	1.9

7.2 Road Traffic Noise Verification

Traffic noise levels were predicted with SoundPLAN 3D modelling software, which uses Calculation of Road Traffic Noise (CoRTN) algorithms to calculate levels as L10 (18h).

Verification of the predicted L10 (18h) was done using the CoRTN method and compared to the measured noise level. Traffic volumes applied in the model were based on the year 2016 data provided in Section 7.1. The CoRTN method allows a ±2dBA variation between the predicted and measured level, if the variation exceeds 2dBA, a correction to the predicted level is required.

Table 11: Comparison of measured and predicted noise levels

Location	Measured LA10(18hr) dBA	Predicted LA10(18hr) dBA	Correction
Monitor 1	57.1	58.1	0
Monitor 2	57.1	57.9	0

7.3 Predicted Road Traffic Noise Levels - 2028

Road traffic noise modelling for the proposed development was based on the following information:

- Site layout provided by BDA Architects, 202 Baileys Mountain Road, DA issue drawings dated 27/07/2018.
- Reserve Road speed limit of 70km/h.
- Old Coach Road and Baileys Mountain Road speed limit of 60km/h.
- Receiver heights based on 1.5m above finished floor level.

Figures 3 to 5 present the predicted noise impacts for the development.

Figure 3: Road traffic noise contours – LA10(18h) Ground Level

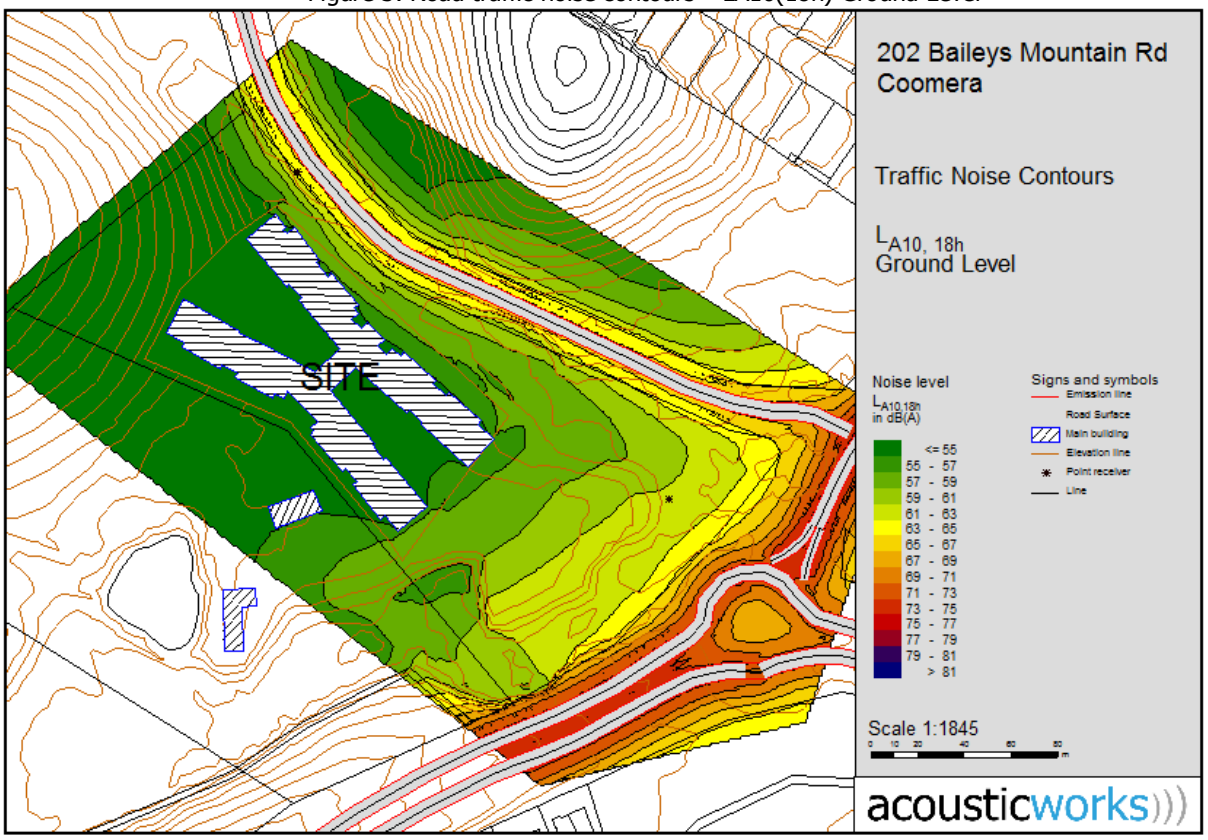


Figure 4: Road traffic noise contours – LA10(18h) Level 1

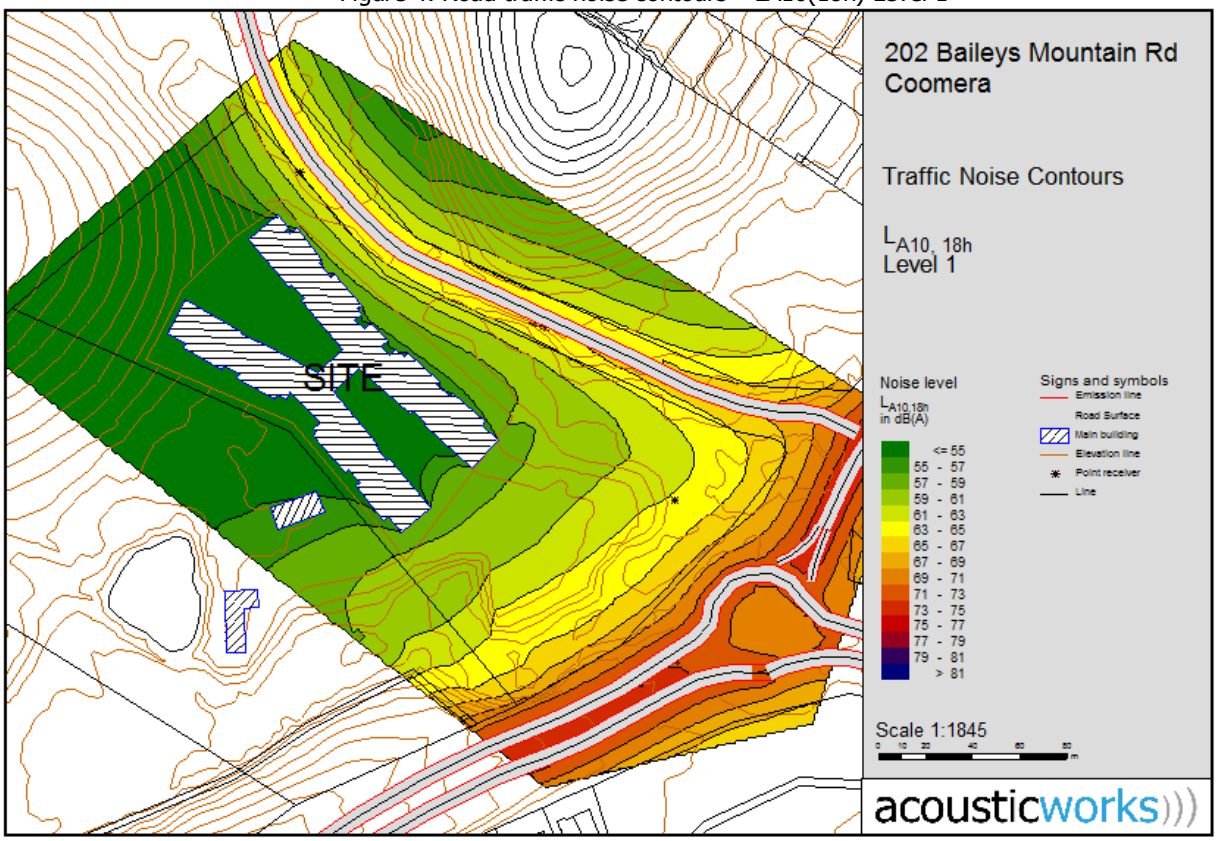
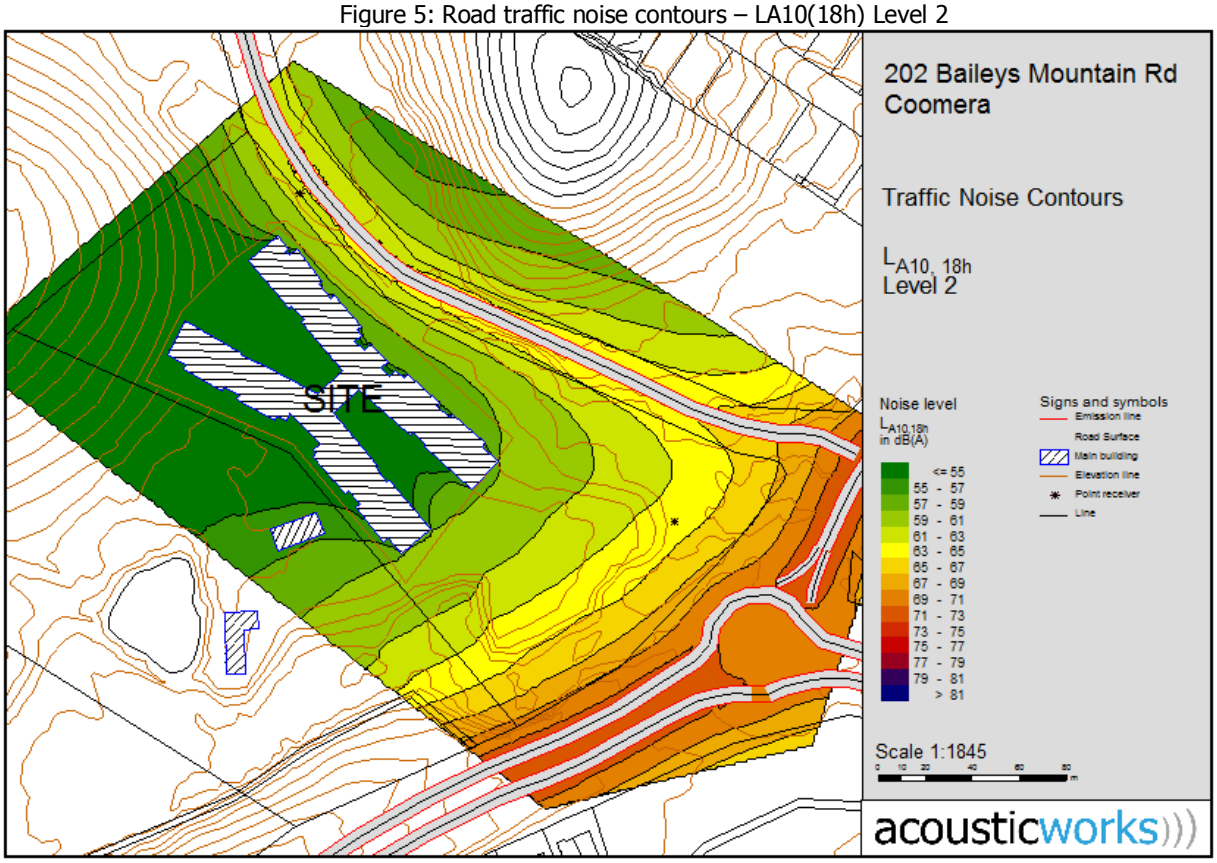


Figure 5: Road traffic noise contours – LA10(18h) Level 2



Based on the predicted traffic noise levels, further acoustic treatments are recommended in Section 9.

8. Environmental Assessment

Noise associated with the proposed development was assessed based on measurements of similar activities. The calculations assume that the nominated activities are located at a representative distance within the development site to each receiver location. Any relevant shielding or building transmission loss is taken into account for these activities.

8.1 Acoustic Quality Objectives

The average maximum noise source levels and predicted levels at the receiver locations are shown in Table 12. Note: LA10 and LA1 results are not shown in cases where the total duration of the events is less than the minimum time required e.g. LA10(1hr) requires noise events to occur for at least 360 seconds of an hour long period. LAeq results are not shown where the calculated total is less than 0dBA.

Table 12: Acoustic Quality Objective Noise Levels, 1 hour

Receiver	Receivers 1. 274 Reserve Road. 2. 17 and 31 Courtney Drive. 3. Purlingbrook Street and Wendy Court residents. 4. Tian Crescent residents. Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 1hr Day	No. of events per 1hr Eve	No. of events per 1hr Night	Duration per event	Distance (m)	No	Barrier (height (r	Barrier screening dB	Building TL or shield dB	Topo screening dB	Dist atten. @-6dB/dd	LAeq adj.1hr ext. dB(A) Day	LAeq adj.1hr int. dB(A) Day	LAeq adj.1hr ext. dB(A) Eve	LAeq adj.1hr int. dB(A) Eve	LAeq adj.1hr ext. dB(A) Night	LAeq adj.1hr int. dB(A) Night	LA10 adj.1hr ext. dB(A) Day	LA10 adj.1hr int. dB(A) Day	LA10 adj.1hr ext. dB(A) Eve	LA10 adj.1hr int. dB(A) Eve	LA10 adj.1hr ext. dB(A) Night	LA10 adj.1hr int. dB(A) Night	LA1 adj.1hr ext. dB(A) Day	LA1 adj.1hr int. dB(A) Day	LA1 adj.1hr ext. dB(A) Eve	LA1 adj.1hr int. dB(A) Eve	LA1 adj.1hr ext. dB(A) Night	LA1 adj.1hr int. dB(A) Night	Amenity LAeq Compliance			LA10 Compliance			LA1 Compliance		
																																			Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor	Day / eve	Day / eve indoor	Night indoor
	Criteria																																			50	35	30	55	40	35	65	45	40
1	Car door closure	75	2	77	40	32	20	2	53						-35	25	15	24	14	22	12							31	21	31	21	31	21	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car passby	69		69	40	32	20	15	57						-35	26	16	25	15	23	13	29	19	29	19			31	21	31	21	31	21	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	40	32	20	2	53						-34	24	14	23	13	21	11							30	20	30	20	30	20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1	1	300	69						-37	38	28	38	28	38	28							45	35	45	35	45	35	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4	0	900	39						-32	38	28	38	28			41	31	41	31			45	35	45	35			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Total															41	31	41	31	39	29	41	31	41	31			48	38	48	38	46	36	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																	50	35	30	55	40	35	65	45	40
2	Car door closure	75	2	77	40	32	20	2	183						-46	14	4	13	3	11	1							20	10	20	10	20	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car passby	69		69	40	32	20	15	183						-45	16	6	15	5	13	3	19	9	19	9			21	11	21	11	21	11	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	40	32	20	2	183						-45	14	4	13	3	11	1							20	10	20	10	20	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1	1	300	290						-49	26	16	26	16	26	16							33	23	33	23	33	23	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4		900	183						-45	25	15	25	15			28	18	28	18			32	22	32	22			Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	n/a
	Total															29	19	29	19	27	17	28	18	28	18			36	26	36	26	34	24	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																	50	35	30	55	40	35	65	45	40
3	Car door closure	75	2	77	40	32	20	2	155						-44	16	6	15	5	13	3							22	12	22	12	22	12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car passby	69		69	40	32	20	15	147						-43	18	8	17	7	15	5	21	11	21	11			23	13	23	13	23	13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	40	32	20	2	155						-44	16	6	15	5	13	3							22	12	22	12	22	12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1	1	300	147						-43	32	22	32	22	32	22							39	29	39	29	39	29	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4		900	155						-44	26	16	26	16			29	19	29	19			33	23	33	23			Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	n/a
	Total															33	23	33	23	32	22	30	20	30	20			40	30	40	30	39	29	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Criteria																																	50	35	30	55	40	35	65	45	40
4	Car door closure	75	2	77	40	32	20	2	151						-44	16	6	15	5	13	3							22	12	22	12	22	12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car passby	69		69	40	32	20	15	151						-44	18	8	17	7	15	5	21	11	21	11			23	13	23	13	23	13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Car start	74	2	76	40	32	20	2	151						-44	16	6	15	5	13	3							22	12	22	12	22	12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1	1	300	136						-43	33	23	33	23	33	23							40	30	40	30	40	30	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Voice conversation	70		70	4	4		900	140						-43	27	17	27	17			30	20	30	20			34	24	34	24			Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	n/a
	Total															34	24	34	24	33	23	31	21	31	21			41	31	41	31	40	30	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:1997.

Compliance is predicted with the Acoustic Quality Objectives for all activities associated with the development on the condition the recommendations in Section 9.2 are implemented.

8.2 Background Creep

The noise source levels and predicted levels at the receiver locations are shown as follows;

Table 13: Background Creep Noise Levels, 15min

Receiver	Description	Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per 15min Day	No. of events per 15min Eve	No. of events per 15min Night	Duration per event	Distance (m)	Barrier (height (r Inc	Barrier screening dB	Building TL or shield dB	Topo screening dB	Dist atten. @-6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq adj,T int. dB(A) Day	LAeq adj,T ext. dB(A) Eve	LAeq adj,T int. dB(A) Eve	LAeq adj,T ext. dB(A) Night	LAeq adj,T int. dB(A) Night	LAeq 15 min Compliance Day	Eve	Night
Receivers: 1. 274 Reserve Road. 2. 17 and 31 Courtney Drive. 3. Purlingbrook Street and Wendy Court residents. 4. Tian Crescent residents.																							
	Criteria																				48	46	34
1	Car door closure	75	2	77	10	8	5	2	53					-35	25	15	24	14	22	12	Yes	Yes	Yes
	Car passby	69		69	10	8	5	15	57					-35	26	16	25	15	23	13	Yes	Yes	Yes
	Car start	74	2	76	10	8	5	2	53					-35	24	14	23	13	21	11	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1		300	69					-37	44	34	44	34			Yes	Yes	n/a
	Voice conversation	70		70	1	1		900	39					-32	38	28	38	28			Yes	Yes	n/a
	Total														45	35	45	35	27	17	**Yes**	**Yes**	**Yes**
	Criteria																				48	46	34
2	Car door closure	75	2	77	10	8	5	2	183					-46	14	4	13	3	11	1	Yes	Yes	Yes
	Car passby	69		69	10	8	5	15	183					-45	16	6	15	5	13	3	Yes	Yes	Yes
	Car start	74	2	76	10	8	5	2	183					-45	14	4	13	3	11	1	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1		300	290					-49	32	22	32	22			Yes	Yes	n/a
	Voice conversation	70		70	1	1		900	183					-45	25	15	25	15			Yes	Yes	n/a
	Total														33	23	33	23	18	8	**Yes**	**Yes**	**Yes**
	Criteria																				48	46	34
3	Car door closure	75	2	77	10	8	5	2	155					-44	16	6	15	5	13	3	Yes	Yes	Yes
	Car passby	69		69	10	8	5	15	147					-43	18	8	17	7	15	5	Yes	Yes	Yes
	Car start	74	2	76	10	8	5	2	155					-44	16	6	15	5	13	3	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1		300	147					-43	38	28	38	28			Yes	Yes	n/a
	Voice conversation	70		70	1	1		900	155					-44	26	16	26	16			Yes	Yes	n/a
	Total														38	28	38	28	19	9	**Yes**	**Yes**	**Yes**
	Criteria																				48	46	34
4	Car door closure	75	2	77	10	8	5	2	151					-44	16	6	15	5	13	3	Yes	Yes	Yes
	Car passby	69		69	10	8	5	15	151					-44	18	8	17	7	15	5	Yes	Yes	Yes
	Car start	74	2	76	10	8	5	2	151					-44	16	6	15	5	13	3	Yes	Yes	Yes
	Loading Bay Delivery	86		86	1	1		300	136					-43	39	29	39	29			Yes	Yes	n/a
	Voice conversation	70		70	1	1		900	140					-43	27	17	27	17			Yes	Yes	n/a
	Total														39	29	39	29	19	9	**Yes**	**Yes**	**Yes**

*Correction due to tonality and impulsiveness as per AS1055:1997.

Compliance is predicted with the Background Creep criteria for all activities associated with the development on the condition the recommendations in Section 9.2 are implemented.

9. Recommendations

9.1 Building Façade Treatments

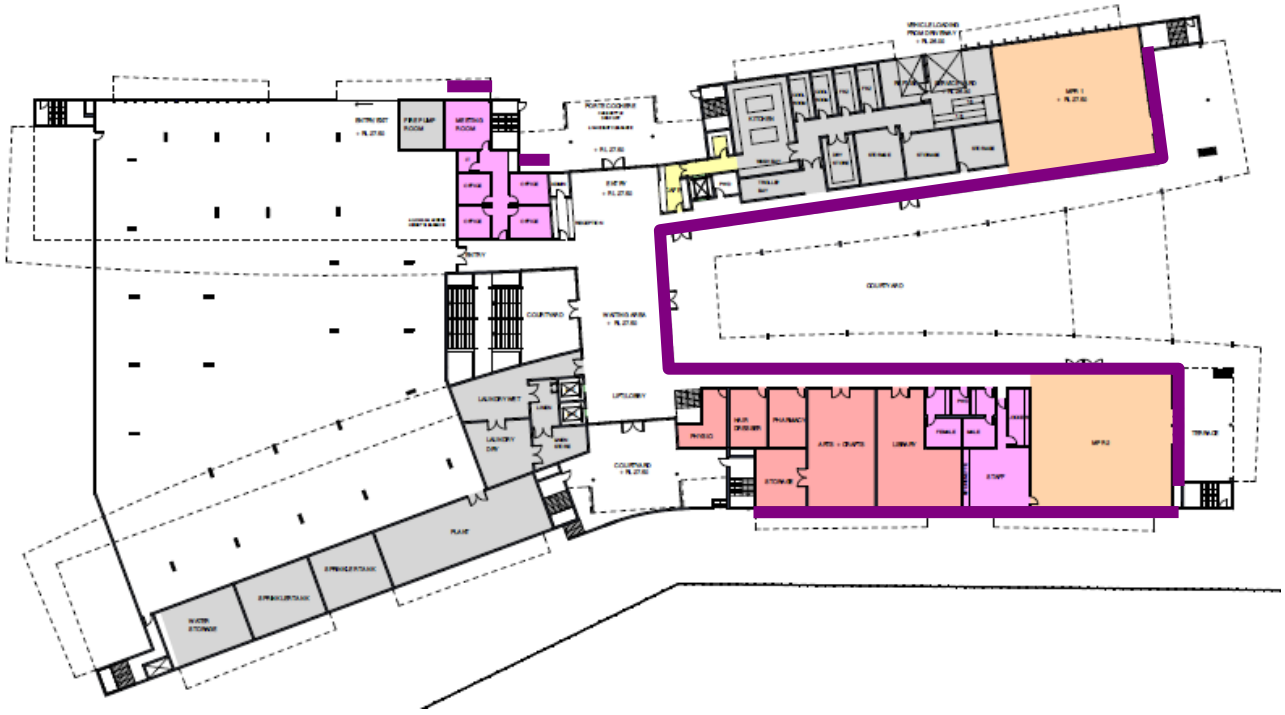
All building treatments were calculated using Australian Standard AS3671:1989 *'Road Traffic Noise Intrusion – Building Siting and Construction'*.

9.1.1 Glazing

The minimum glazing treatments are presented in Figures 6 to 8, with the installed glazing systems to comply with the following:

- The minimum glass thickness specified shall not be reduced regardless of the Rw performance of the glazing system.
- If compliance cannot be achieved with the minimum Rw ratings, the glazing system shall be upgraded until compliance is achieved.
- Glazing specified with acoustic seals requires a Q-lon seal or an equivalent product, mohair seals are not acceptable.
- The glazier shall provide NATA test reports on request to verify compliance with the minimum Rw ratings. Generic reports are not acceptable.

Figure 6: Recommended Glazing Treatments – Ground Floor



Rw 22 4mm float glass
Rw 27 4mm float glass with acoustic seals
Rw 29 6mm float glass with acoustic seals
Rw 31 6.38mm lam with acoustic seals

Figure 7: Recommended Glazing Treatments – Level 1

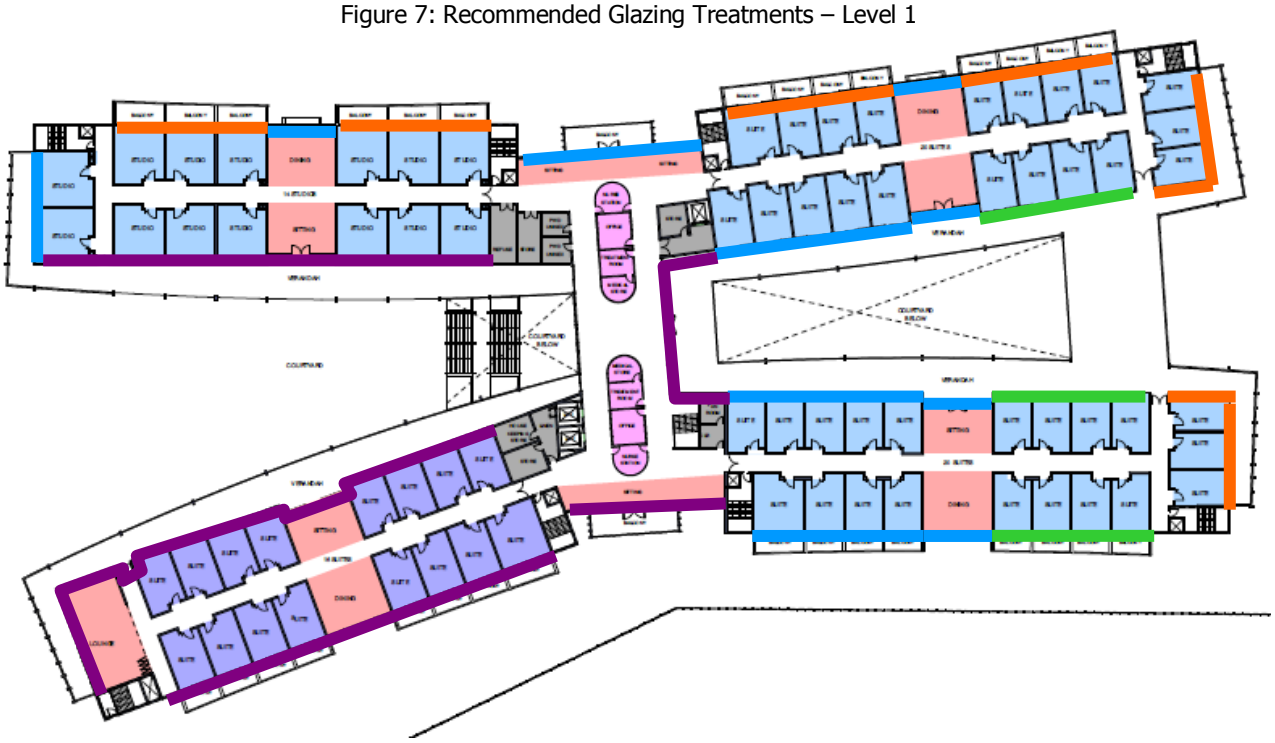


Figure 8: Recommended Glazing Treatments – Level 2



Rw 22 4mm float glass
Rw 27 4mm float glass with acoustic seals
Rw 29 6mm float glass with acoustic seals
Rw 31 6.38mm lam with acoustic seals

9.1.2 Alternative Ventilation

To achieve the required internal noise levels for the development, all locations may require the provision for an alternative ventilation system similar to air-conditioning or mechanical ventilation to allow windows to be closed.

9.1.3 Wall Construction

External facades are predicted to require a weighted sound reduction index of Rw 35. Typical construction examples satisfying the required acoustic ratings are provided in Table 14.

Table 14: Example external wall construction

Description	Cavity Insulation	Minimum Rw Rating
140-190mm core filled blockwork with 13mm plasterboard on a 28mm furring channel	Nil	50-53
200mm concrete panel with 13mm plasterboard on a 28mm furring channel	Nil	51
Minimum 6mm fibre cement sheet external 70mm studs 13mm standard plasterboard internal	Minimum R1.5 75mm glasswool batts or equivalent	35

9.1.4 Roof Construction

Roof construction is predicted to require a weighted sound reduction index of Rw 35. A typical construction example satisfying the required acoustic rating is provided in Table 15.

Table 15: Example roof construction

Description	Cavity Insulation	Minimum Rw Rating
Pitched sheet metal or pitched concrete tiled roof 10mm thick plasterboard ceiling	Minimum 75mm glasswool batts	40

9.2 Onsite Activities

For compliance with the night time criteria, we recommend the following management controls;

- Deliveries and waste collection should be limited to the daytime period (7am-10pm).

9.3 Mechanical Plant

No information regarding mechanical services was available at the time of the assessment. We recommend that any new mechanical plant is designed to comply with the criteria stated in Section 6.2. We recommend an assessment by qualified acoustic consultant be conducted prior to installation to determine any requirements for acoustic treatments to mechanical plant.

10. Conclusion

An environmental noise assessment has been conducted for the proposed aged care facility located at 202 Baileys Mountain Road, Upper Coomera. With the inclusion of recommendations, the development is expected to comply with the relevant noise criteria.

If you should have any queries please do not hesitate to contact us.

Report Compiled by:

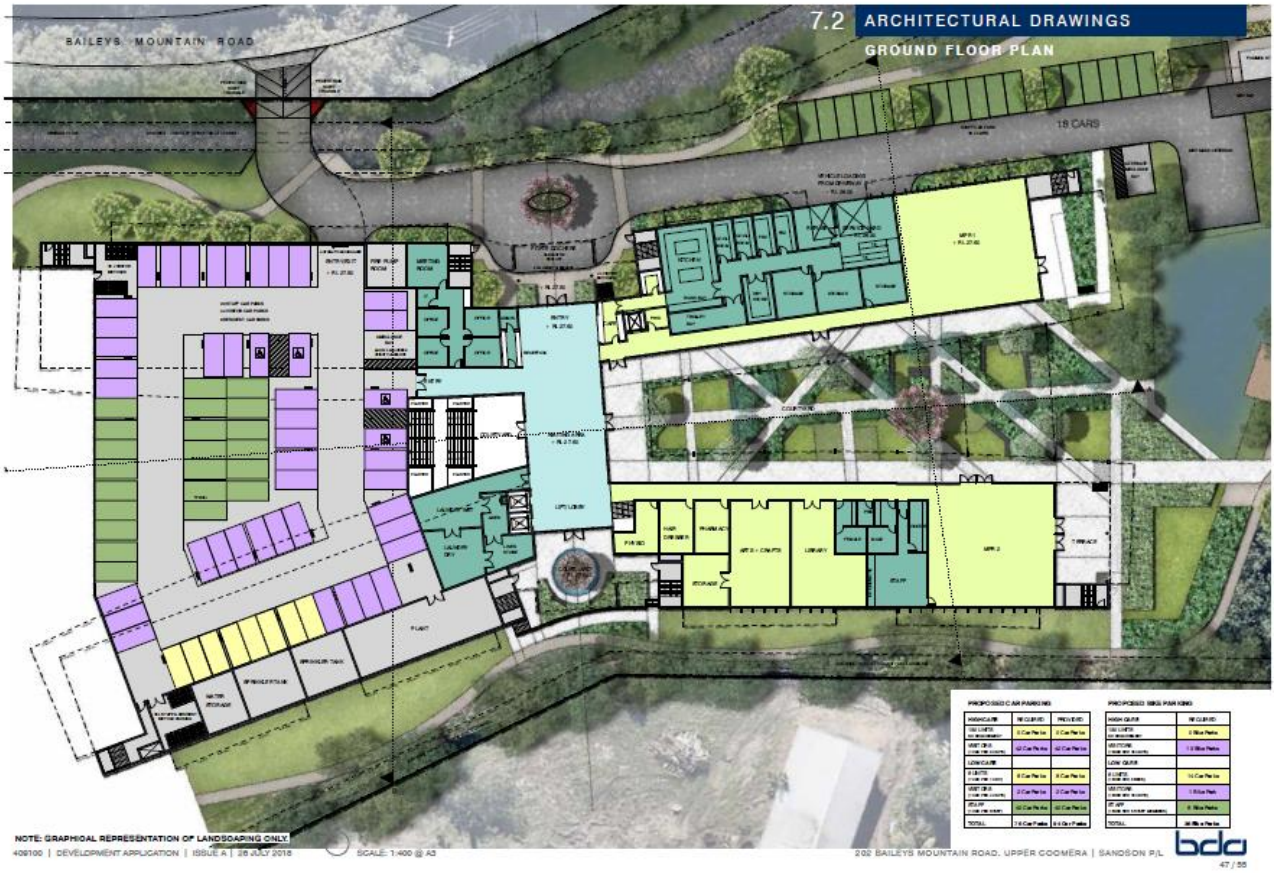


Paul Lonard B.Env.Sc
Senior Acoustic Consultant
acousticworks)))

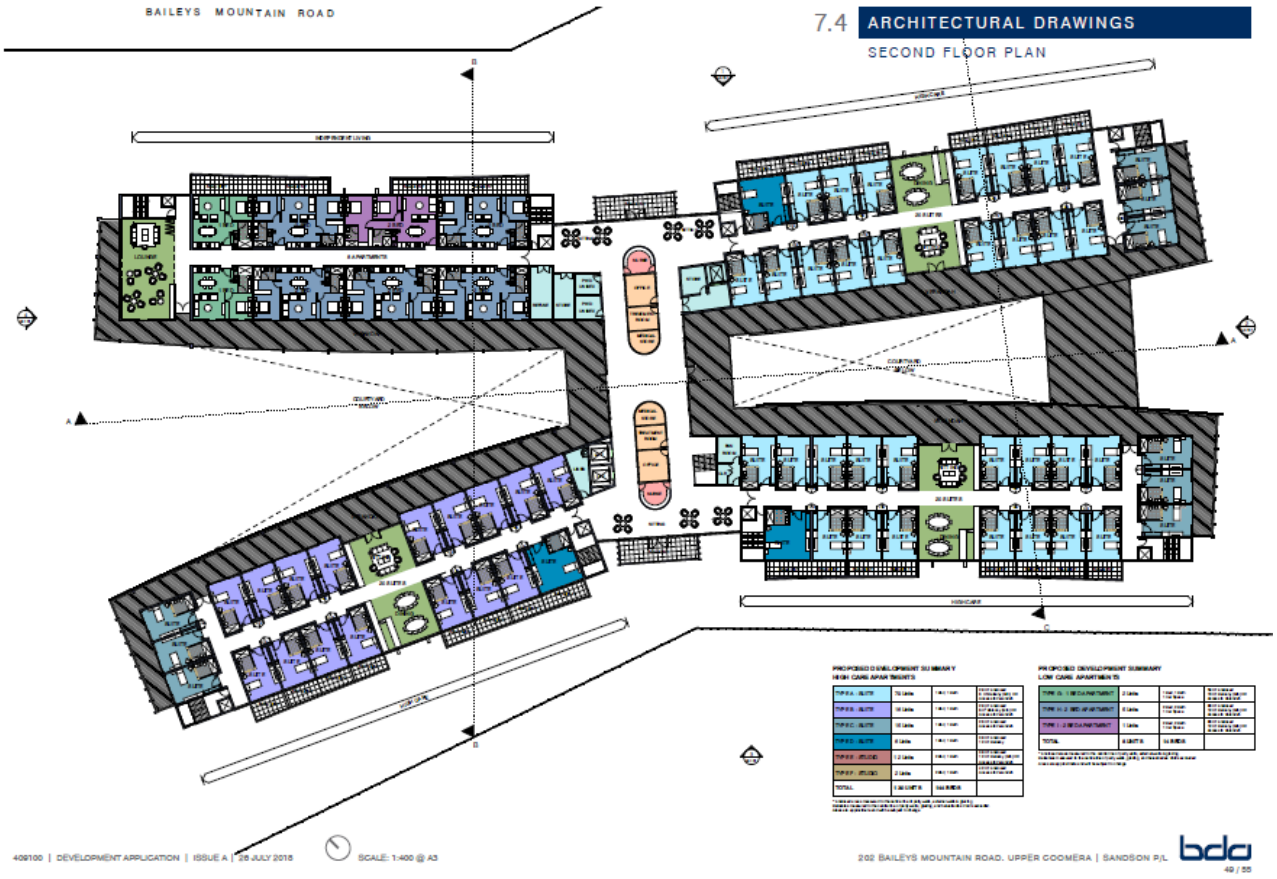
11. Appendices

11.1 Development Plans

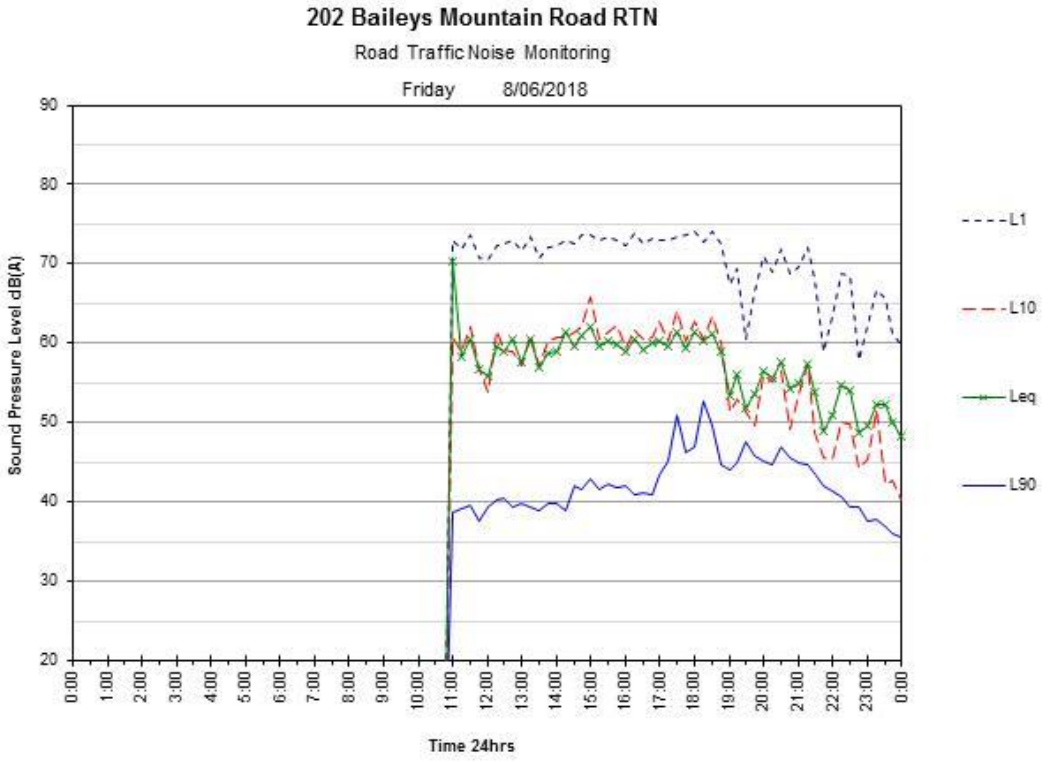


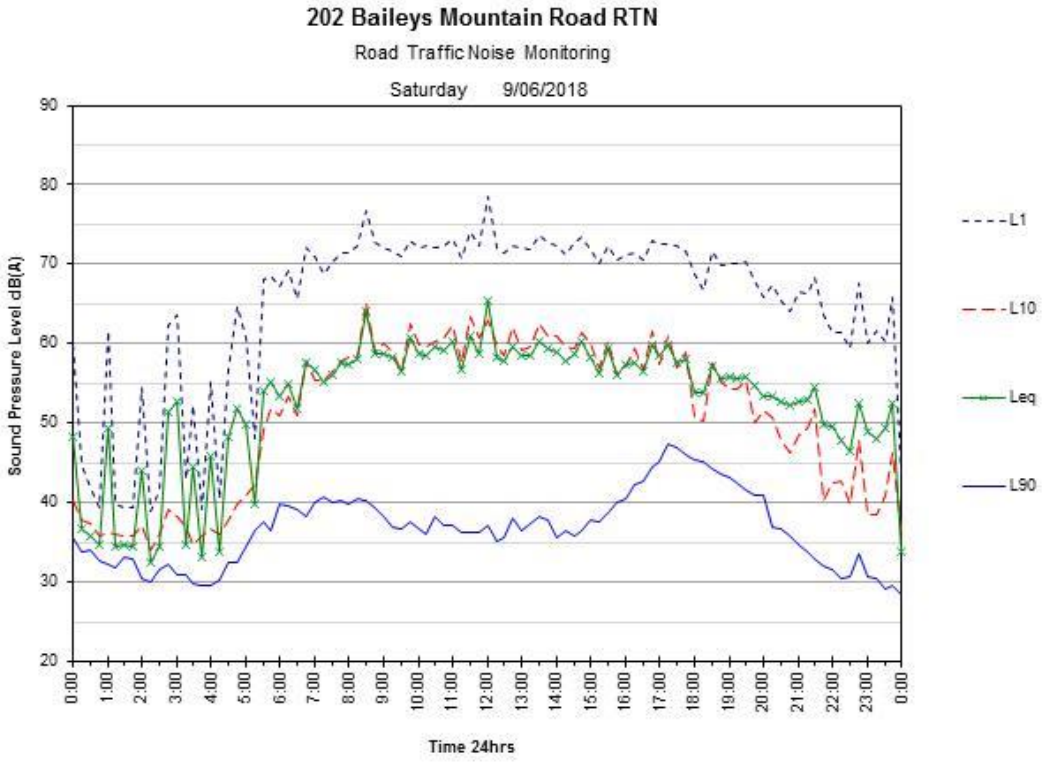

BAILEYS MOUNTAIN ROAD
7.2 ARCHITECTURAL DRAWINGS
GROUND FLOOR PLAN
18 CARS
NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY
409100 | DEVELOPMENT APPLICATION | ISSUE A | 26 JULY 2018
SCALE: 1:400 @ A3
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA | SANDSON P/L
bda
47 / 55

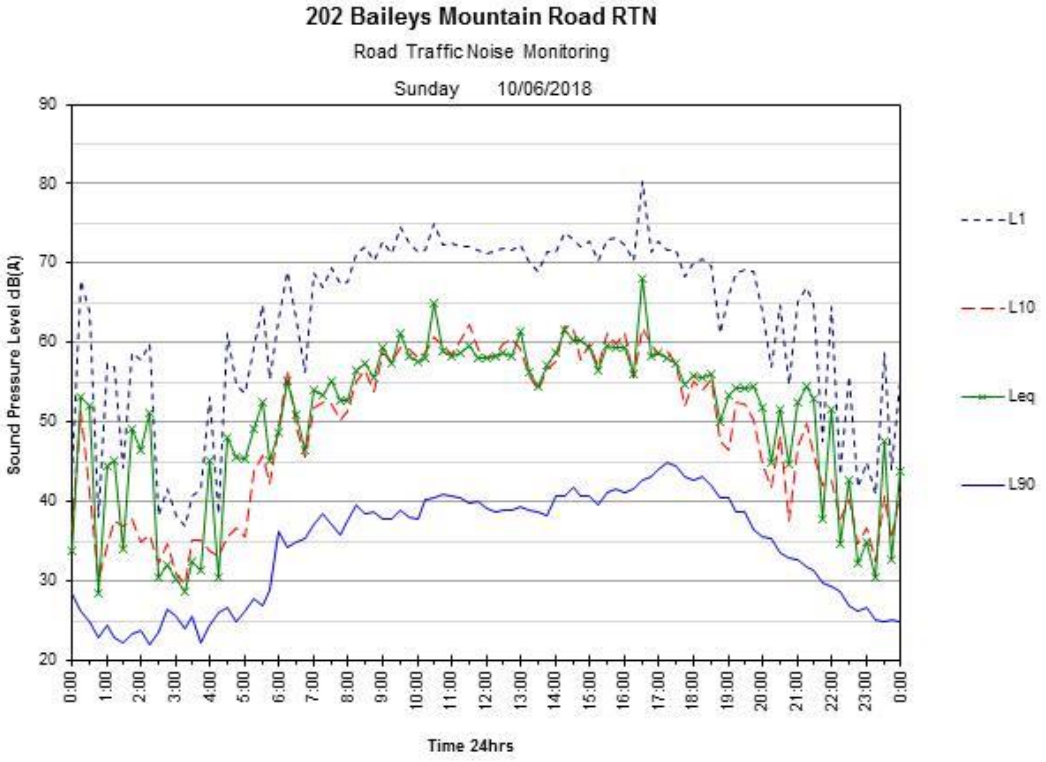

BAILEYS MOUNTAIN ROAD
7.3 ARCHITECTURAL DRAWINGS
FIRST FLOOR PLAN
NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY
409100 | DEVELOPMENT APPLICATION | ISSUE A | 26 JULY 2018
SCALE: 1:400 @ A3
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA | SANDSON P/L
bda
46 / 55

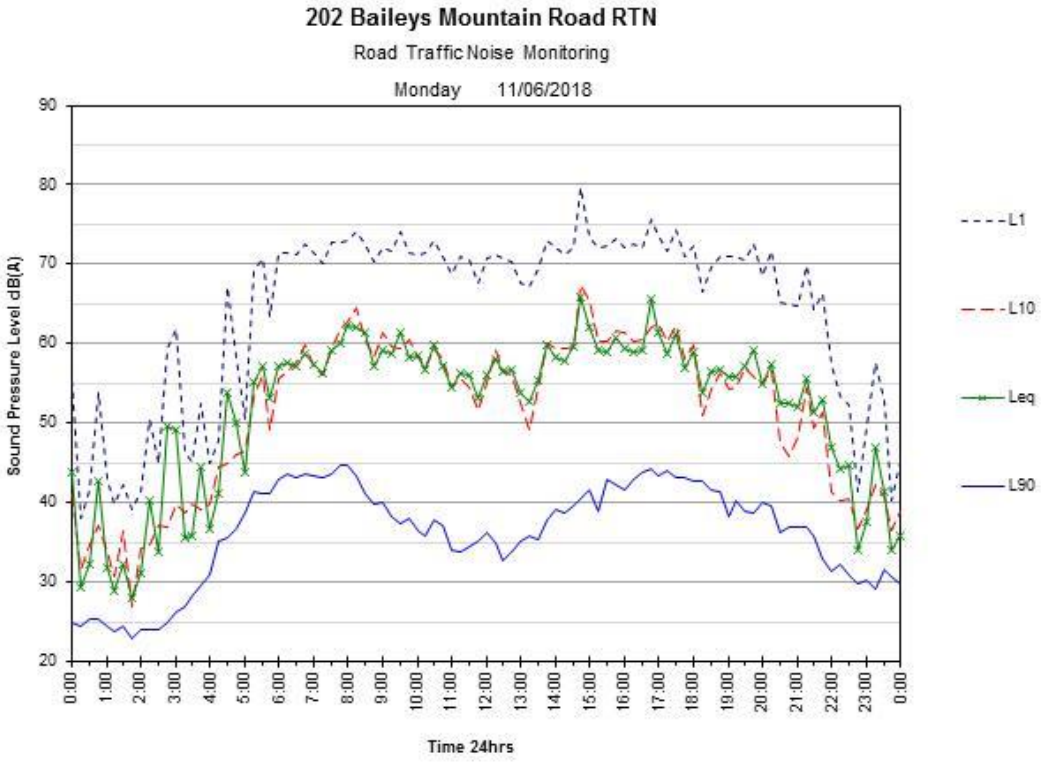

BAILEYS MOUNTAIN ROAD
7.4 ARCHITECTURAL DRAWINGS
SECOND FLOOR PLAN
409100 | DEVELOPMENT APPLICATION | ISSUE A | 26 JULY 2018
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202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA | SANDSON P/L
bda
49 / 55

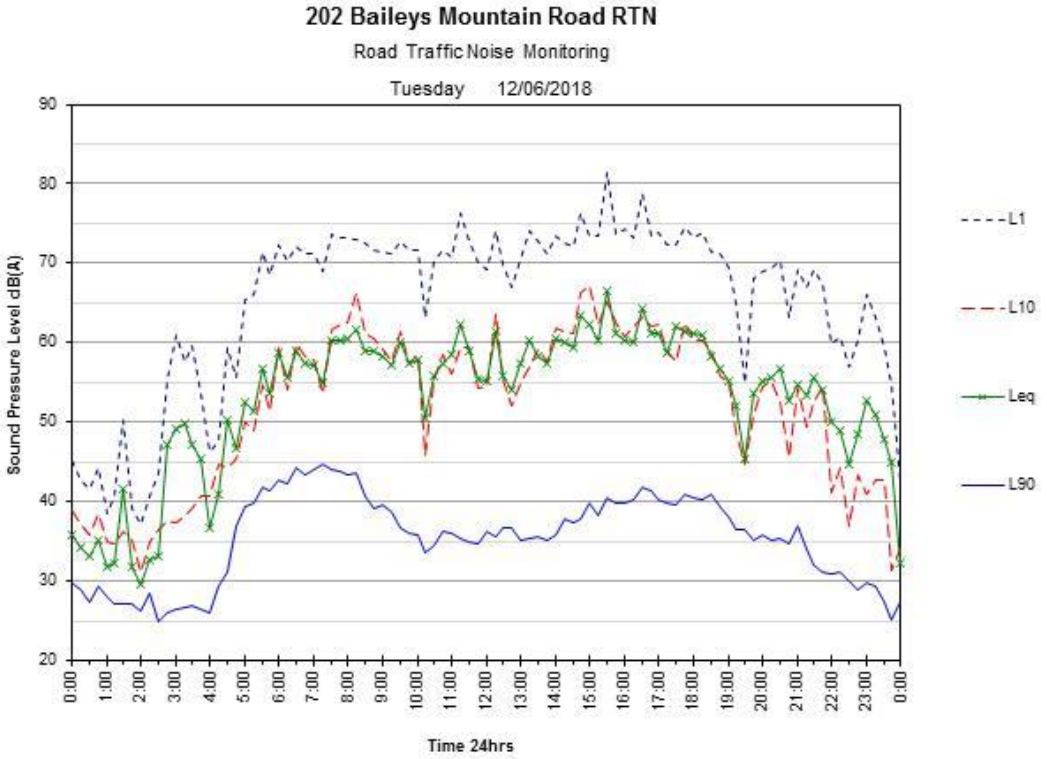
11.2 Noise Monitoring Charts

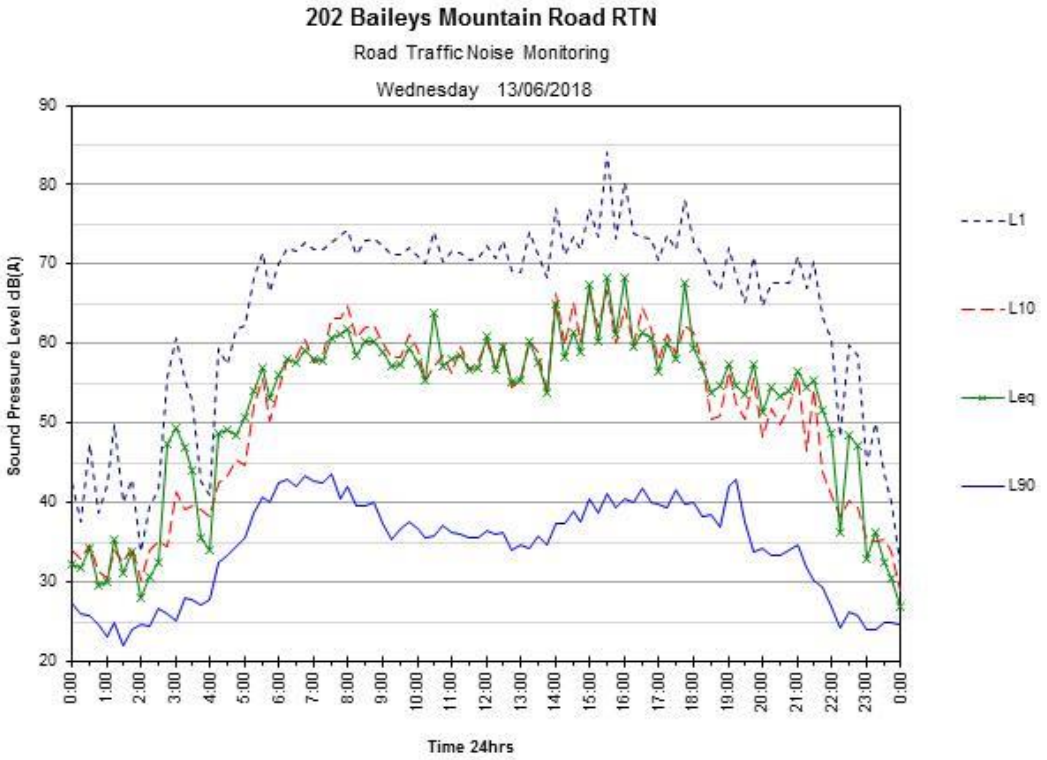


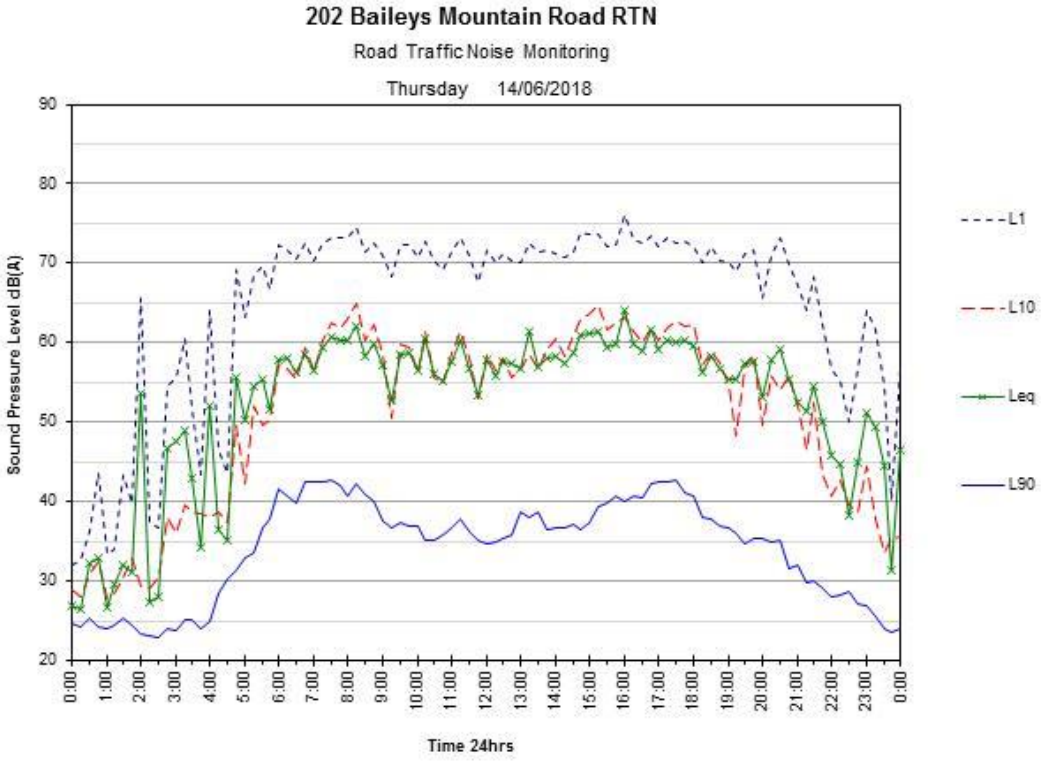


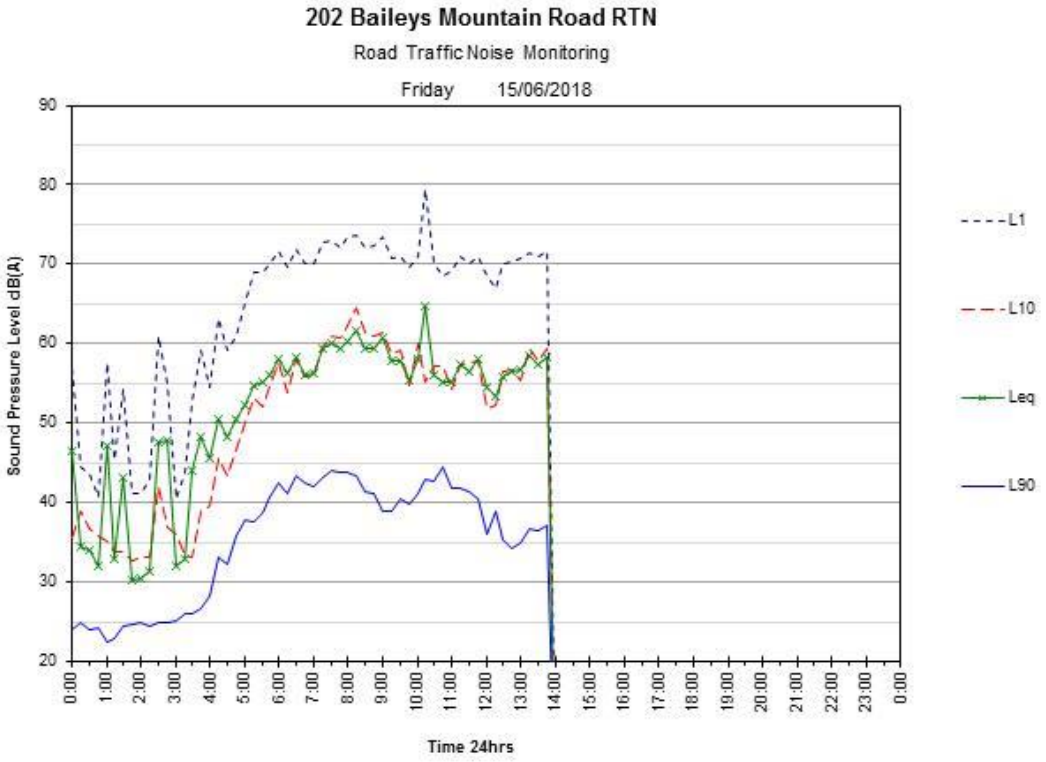

202 Baileys Mountain Road RTN
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Sunday 10/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90

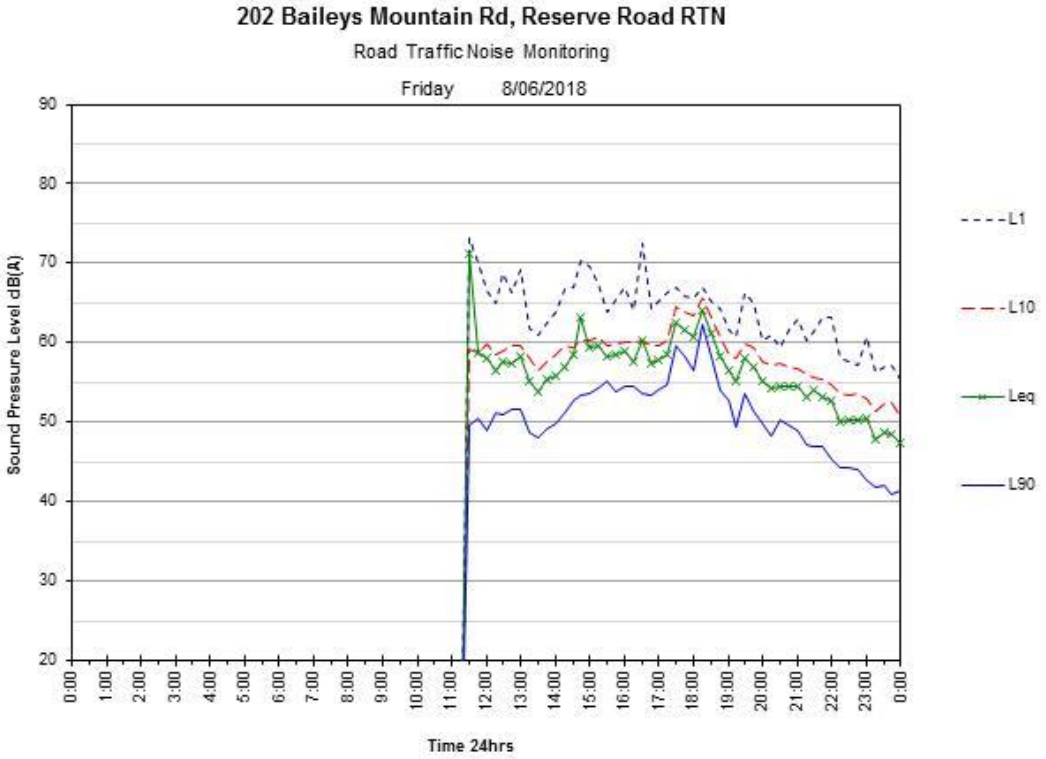

202 Baileys Mountain Road RTN
Road Traffic Noise Monitoring
Monday 11/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90

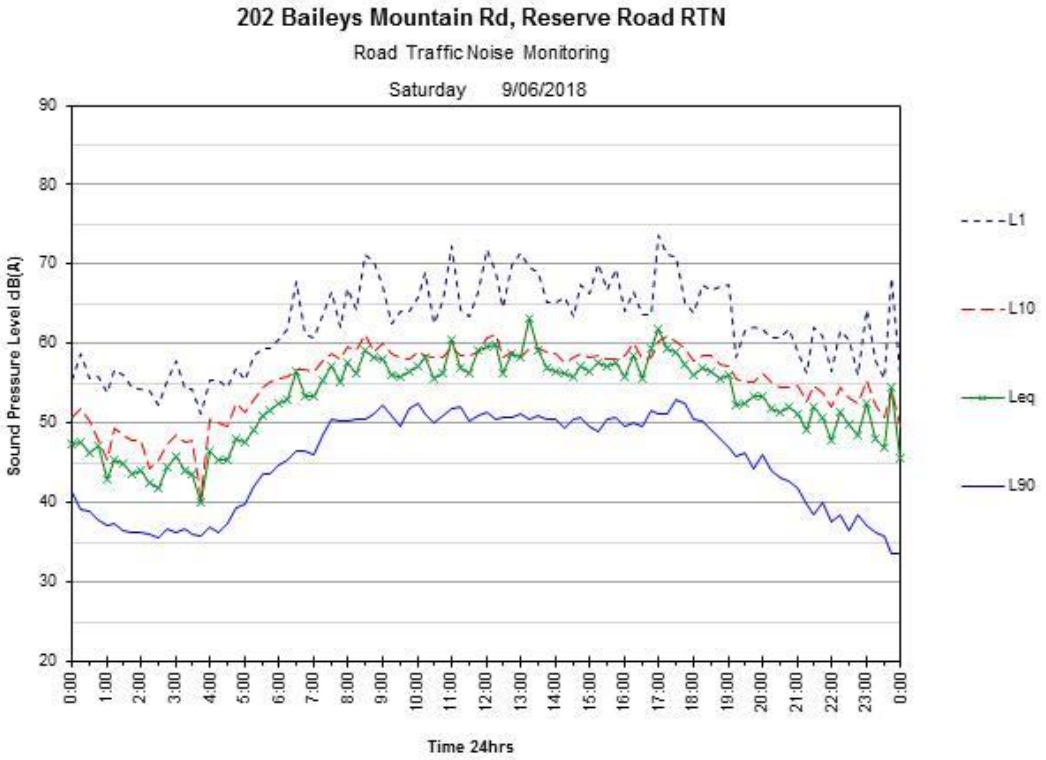

202 Baileys Mountain Road RTN
Road Traffic Noise Monitoring
Tuesday 12/06/2018
Sound Pressure Level dB(A)
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80
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2:00
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21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90

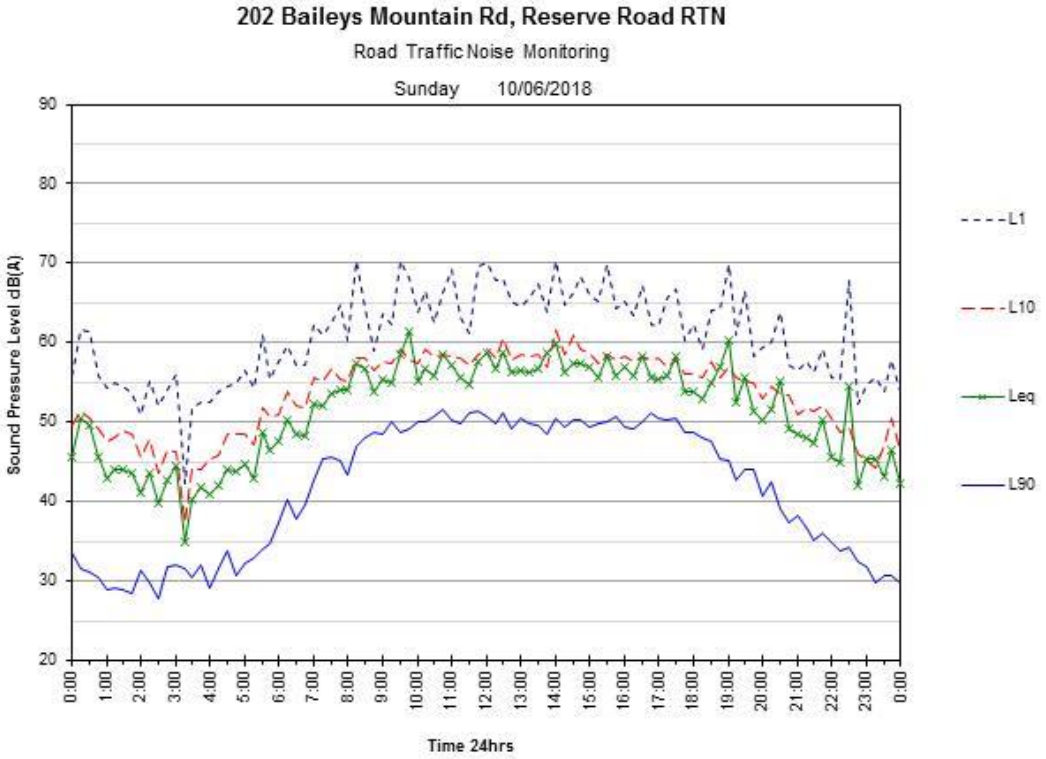

202 Baileys Mountain Road RTN
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Wednesday 13/06/2018
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Time 24hrs
L1
L10
Leq
L90

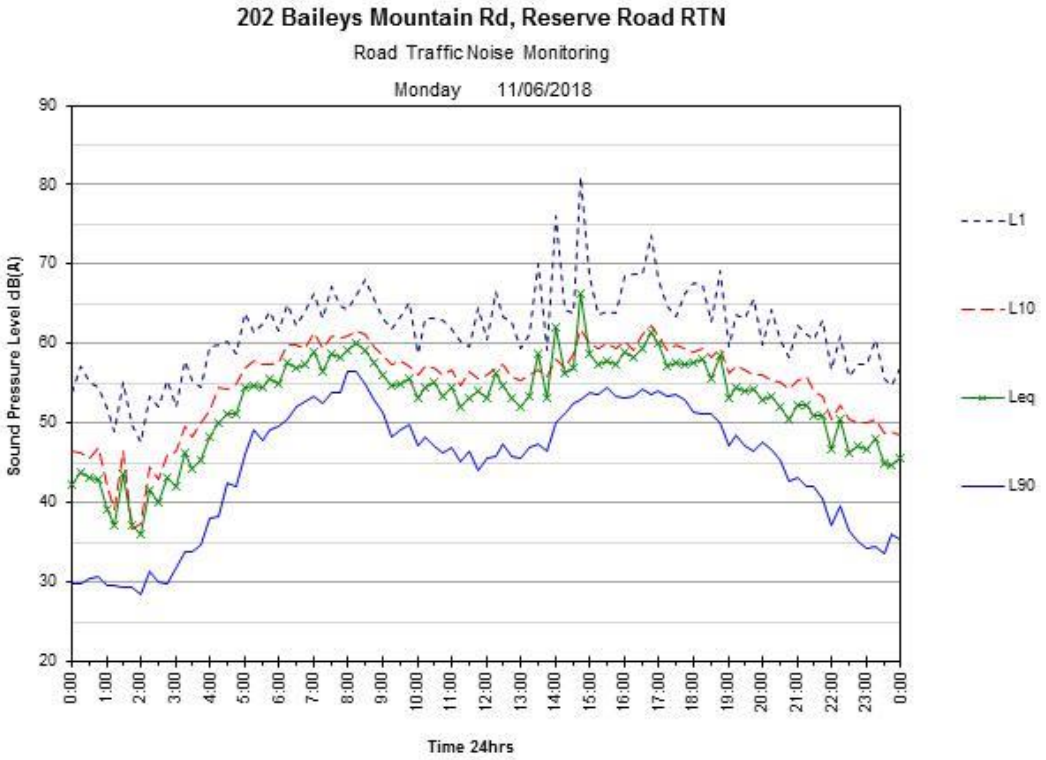

202 Baileys Mountain Road RTN
Road Traffic Noise Monitoring
Thursday 14/06/2018
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Time 24hrs
L1
L10
Leq
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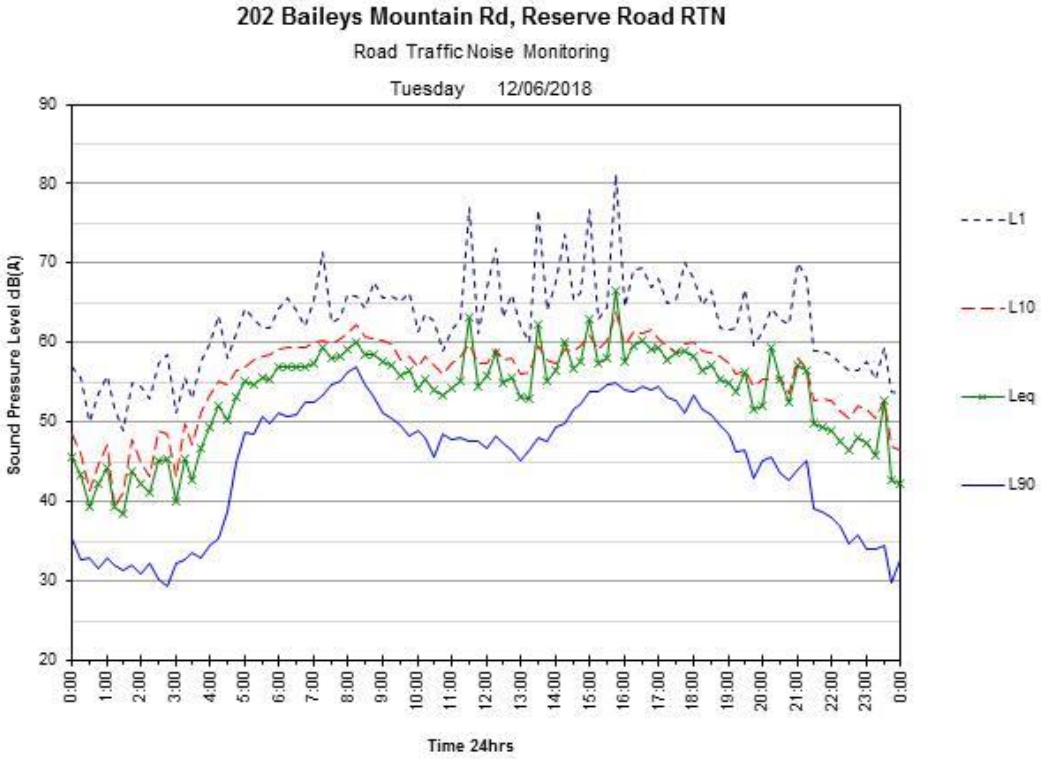

202 Baileys Mountain Road RTN
Road Traffic Noise Monitoring
Friday 15/06/2018
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22:00
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Time 24hrs
L1
L10
Leq
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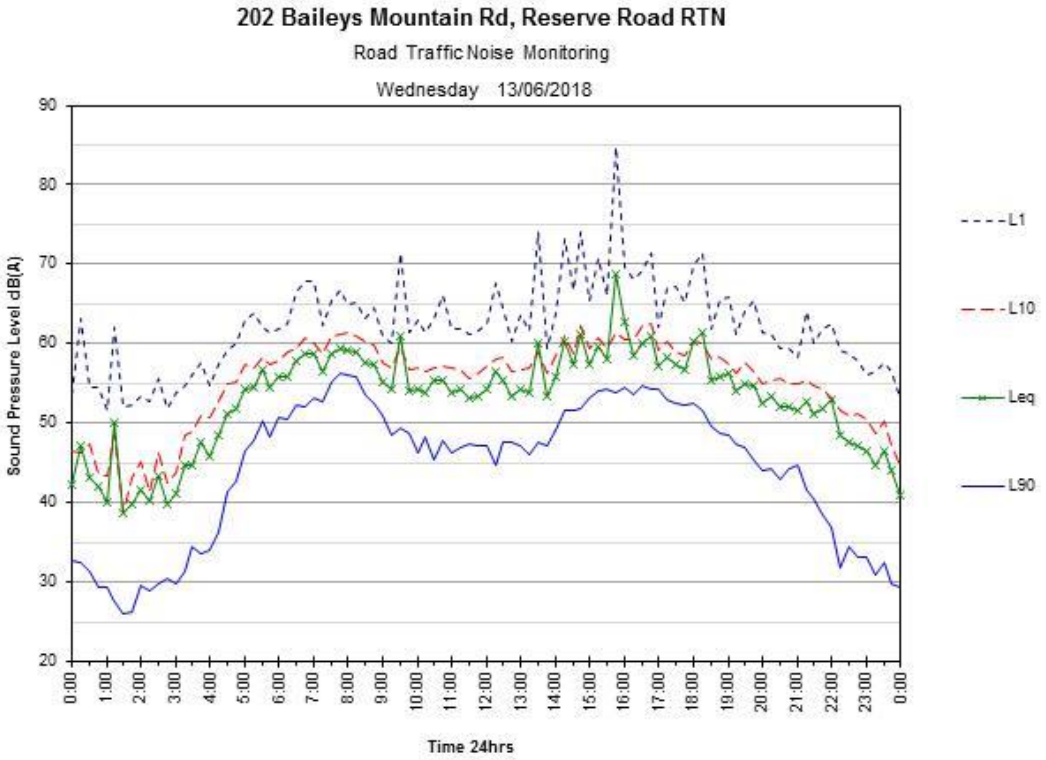

202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Friday 8/06/2018
Sound Pressure Level dB(A)
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Time 24hrs
L1
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Leq
L90

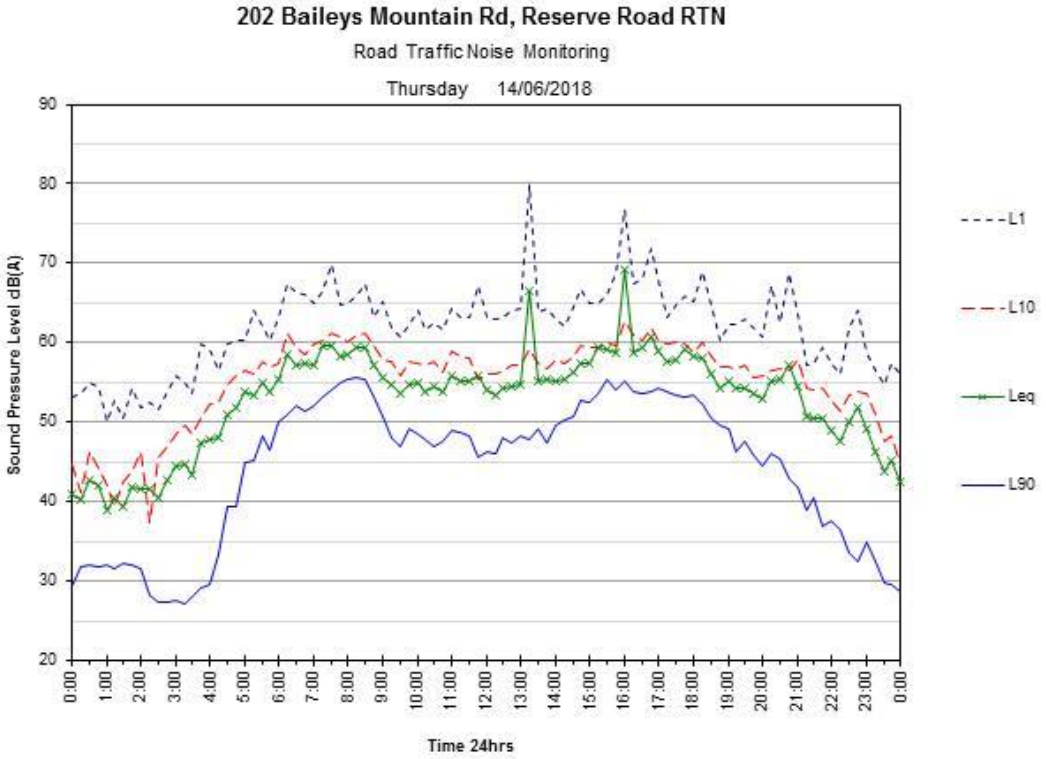

202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
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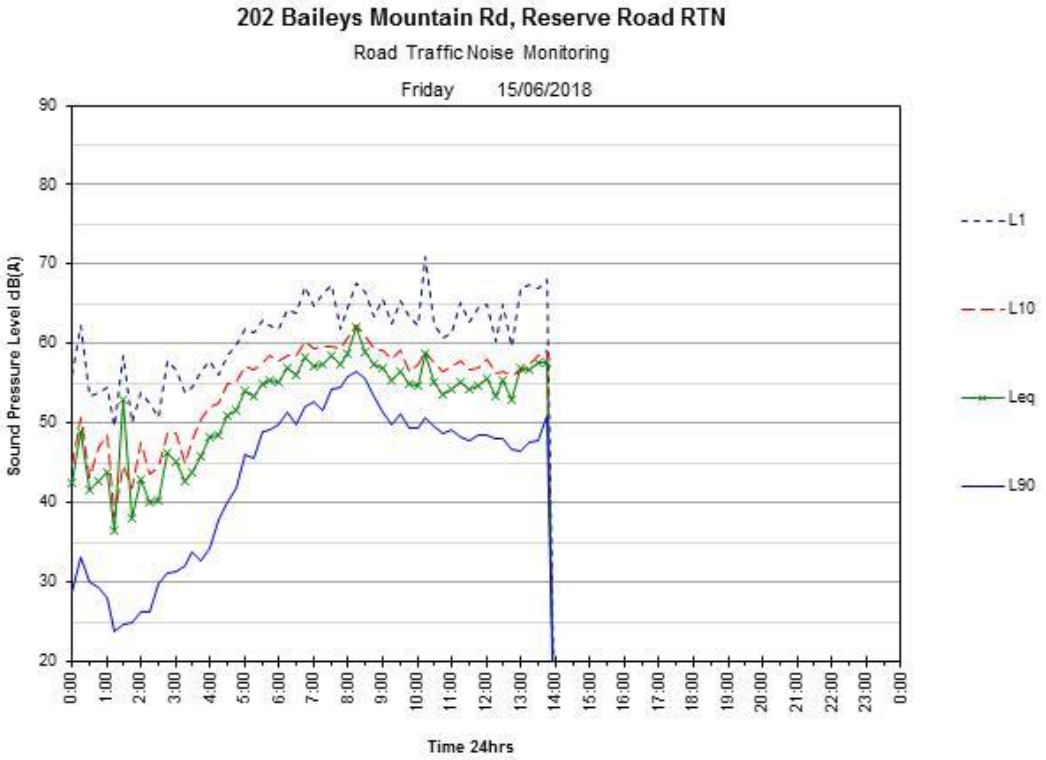

202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Sunday 10/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Monday 11/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Tuesday 12/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Wednesday 13/06/2018
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
Leq
L90


202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
Thursday 14/06/2018
Sound Pressure Level dB(A)
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202 Baileys Mountain Rd, Reserve Road RTN
Road Traffic Noise Monitoring
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