DA ISSUE

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PROPERTY DESCRIPTION

RPD: LOT 81 ON SP300144
COUNCIL: ROCKHAMPTON REGIONAL

DEVELOPMENT ASSESSMENT

TOTAL SITE AREA	- 10,000m²
LANDSCAPED AREA	- 2,943m²
BUILDING SITE COVER (INCLUDES ALL ROOFED AREAS)	- 9.66%

IMPERVIOUS AREAS

PRE-DEVELOPMENT	- 0m²
POST-DEVELOPMENT	- 7,038m²

BUILDING AREAS

T1 - SERVICE STATION	- 350m²

EXTERNAL STRUCTURES

CAR FUEL FORECOURT (UNENCLOSED BUILDING FOOTPRINT)	- 428m²
TRUCK FUEL FORECOURT (UNENCLOSED BUILDING FOOTPRINT)	- 158m²
T1 REFUSE ENCLOSURE	- 30m²

CAR PARKING

PARKING REQUIRED	- 14
PARKING PROVIDED	- 14
CAR REFUELING POSITIONS	- 8
TRUCK REFUELING POSITIONS (DOUBLE SIDED REFUELING)	- 2

PROPOSED ENTRY
EASEMENT A
U/GROUND FUEL STORAGE TANKS
SIZE, COMPARTMENTS & LOCATION SHOWN INDICATIVE ONLY
PASSING LANE
SITE BOUNDARY
ACOUSTIC BARRIER REFER TO ACOUSTIC REPORT FOR DETAILS
PYLON SIGN
TRUCK REFUELING FORECOURT
19m AV PARKING - 6
SITE BOUNDARY
EASEMENT D
CAR FUEL FORECOURT
T1 SERVICE STATION
DELIVERY/REFUSE COLLECTION BAY
REFUSE
B-DOUBLE TRUCK PARKING - 2
BIKE RACK
YAAMBA ROAD
EASEMENT B
19m AV PARKING
PROPOSED BIO-RETENTION BASIN
ACOUSTIC BARRIER REFER TO ACOUSTIC REPORT FOR DETAILS
PROPOSED ON-SITE DETENTION REFER TO FLOOD IMPACT STATEMENT FOR DETAILS
EASEMENT E
EASEMENT D
PROPOSED EXIT
SITE BOUNDARY
SITE BOUNDARY

EXISTING GREENFIELD SITE (NTS)

ROCKHAMPTON REGIONAL COUNCIL APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/25-2020

Dated: 4 July 2023

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Revision and approvals

Rev	Date	Drn	Description	Appr
P1	19.10.2022	TM	PRELIMINARY ISSUE	GN
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Project Description: PROP. SERVICE STATION DEVELOPMENT
1018 BRUCE HIGHWAY, PARKHURST

Scale @A1: As indicated
Date: SEPT 2022
Drawn: TM
Approved By: GN

Drawing Title: DEVELOPMENT SITE PLAN

Job Number - Drawing Number: 22175 DA01
Revision: E

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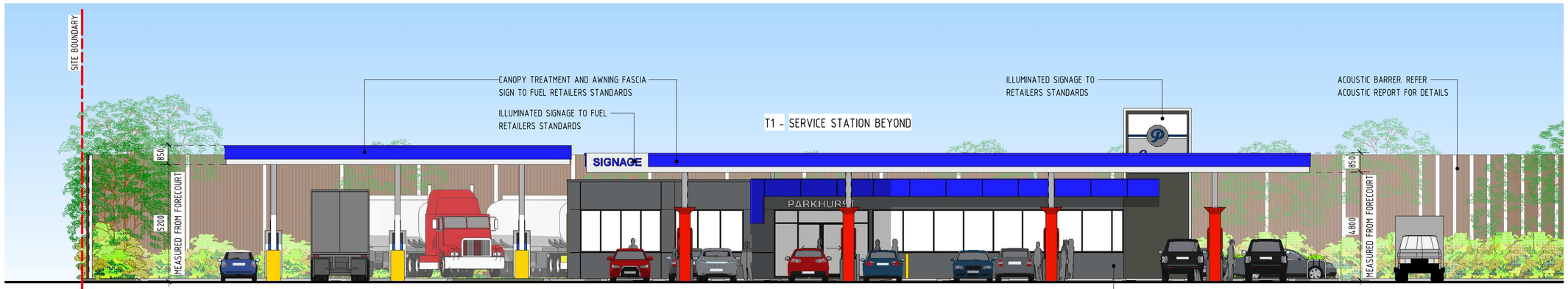
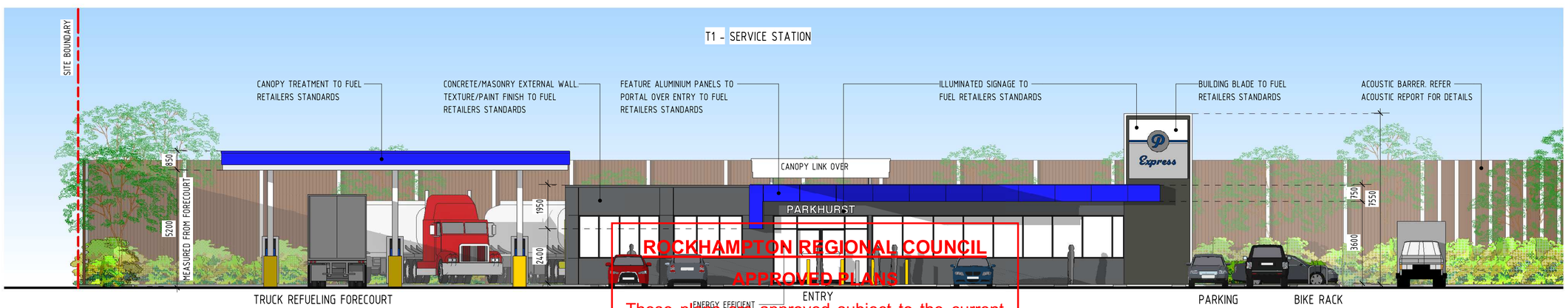
1 PERSPECTIVE 1



2 ELEVATION WEST - CANOPY
1 : 100



3 ELEVATION WEST - SHOPFRONT
1 : 100

ROCKHAMPTON REGIONAL COUNCIL
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Development Permit No.: D/25-2020
Dated: 4 July 2023

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Project Description: PROP. SERVICE STATION DEVELOPMENT
1018 BRUCE HIGHWAY, PARKHURST

Scale @A1: As indicated
Date: SEPT 2022
Drawn: TM
Approved By: GN

Drawing Title: BUILDING ELEVATIONS & PERSPECTIVES

Job Number - Drawing Number: 22175 DA03
Revision: D

DA ISSUE

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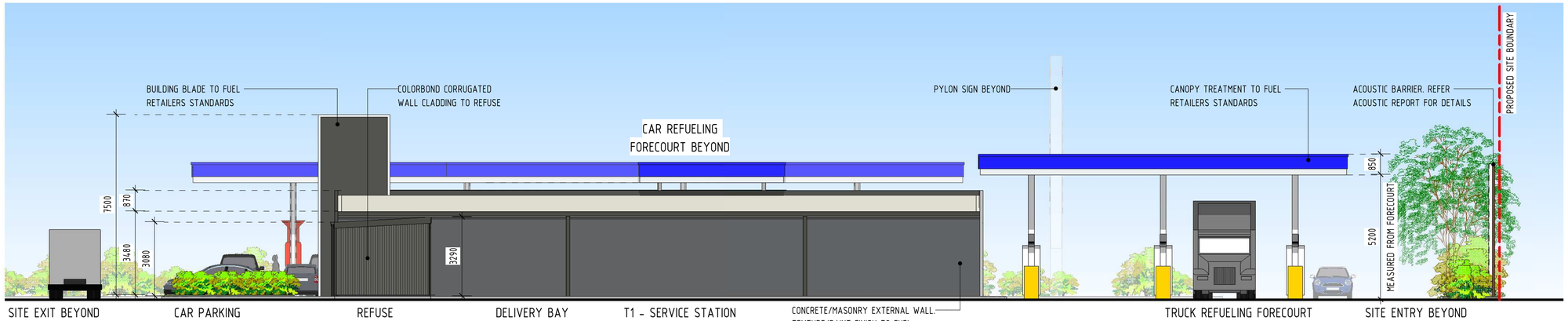

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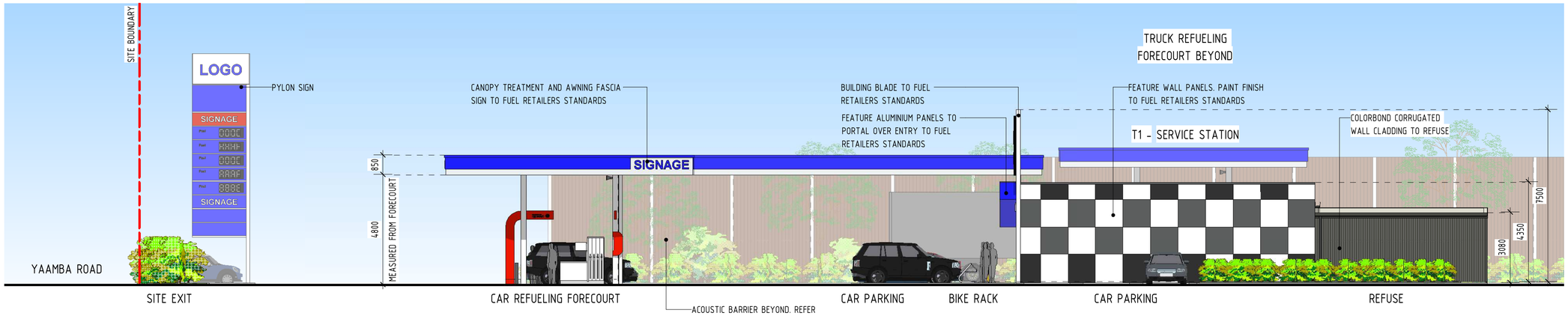

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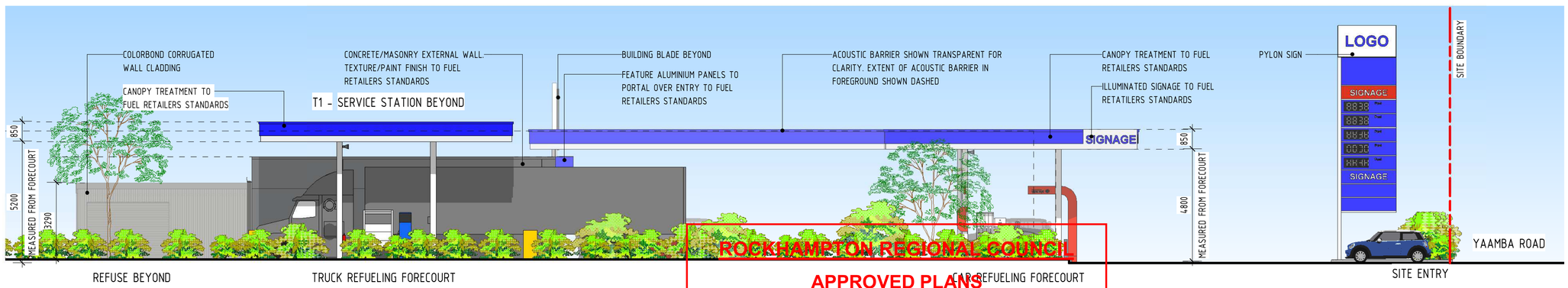

3 ELEVATION NORTH
1 : 100

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D	14.03.2023	TM	RESPONSE TO INFORMATION REQUEST	GN

Project Description: PROP. SERVICE STATION DEVELOPMENT
1018 BRUCE HIGHWAY, PARKHURST

Drawing Title: BUILDING ELEVATIONS & PERSPECTIVES

Scale @A1: As indicated
Date: SEPT 2022
Drawn: TM
Approved By: GN

Job Number - Drawing Number: 22175 DA04
Revision: D

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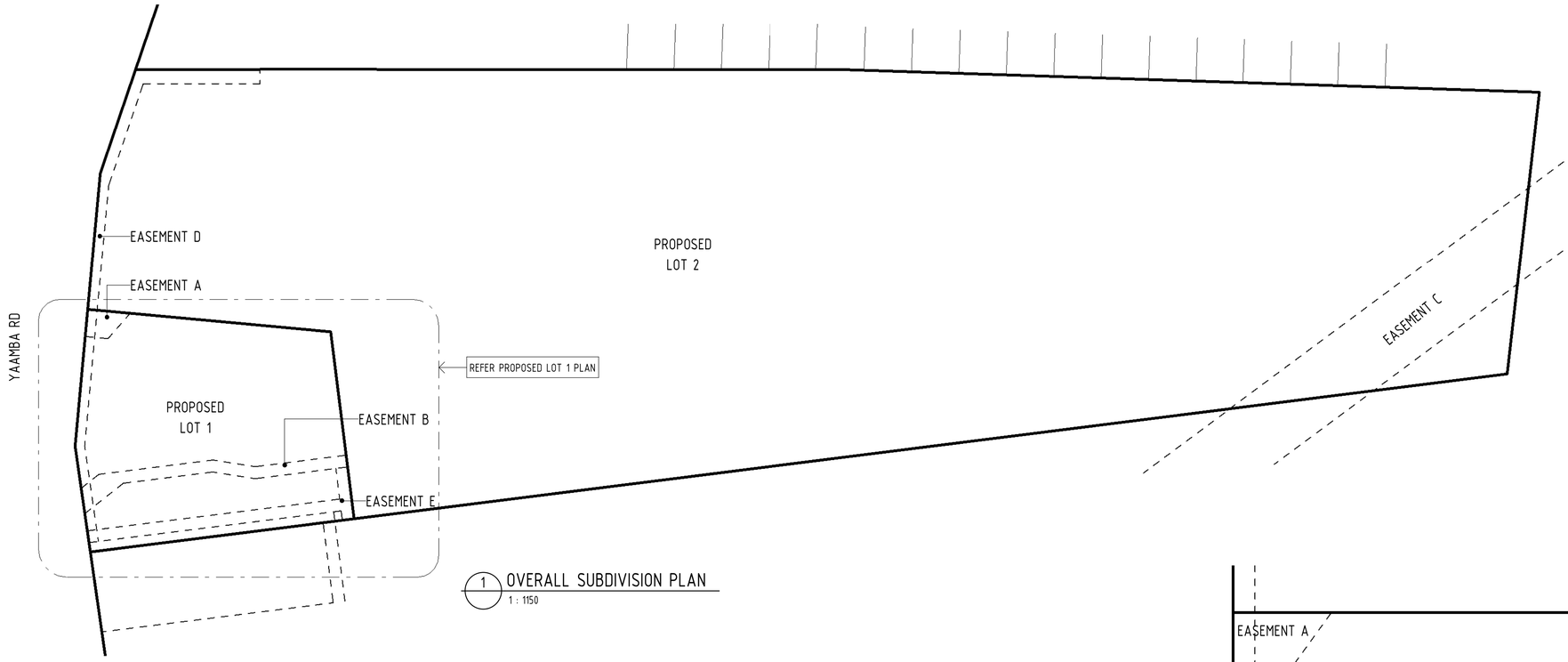
CURRENT LOT & EASEMENTS

LOT 1 SP300144	- 98,470m²
EASEMENT C RP614982	- ELECT. INFRASTRUCTURE
SEWER EASEMENT D SP270265	- SEWER INFRASTRUCTURE

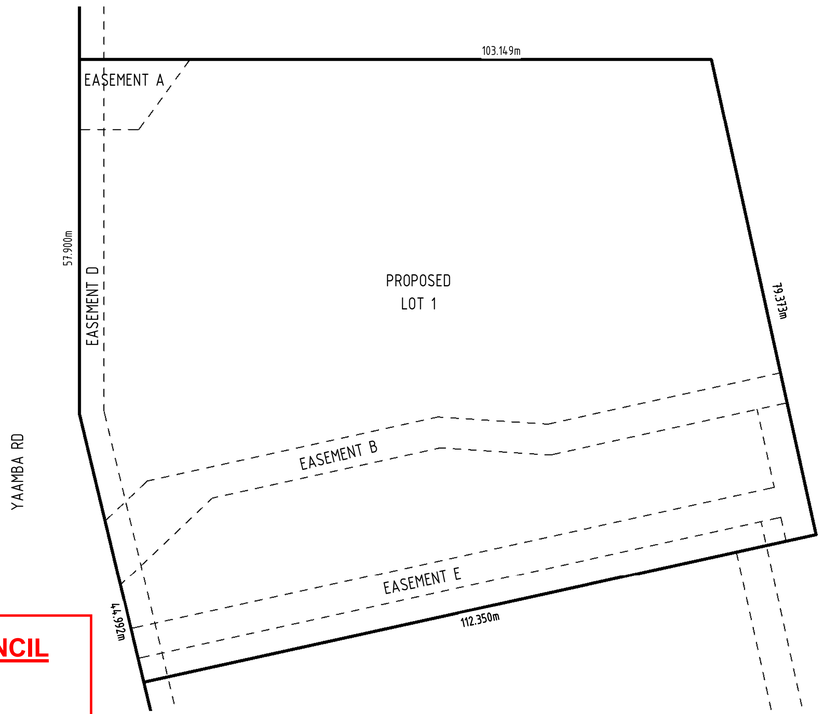
PROPOSED LOTS & EASEMENTS

PROPOSED LOT 1	- 10,000m²
PROPOSED LOT 2	- 88,470m²
PROPOSED EASEMENT A(ACCESS)	- 159m²
PROPOSED EASEMENT B(ACCESS)	- 643m²
PROPOSED EASEMENT E	- 647m²

STORMWATER LPOD



1 OVERALL SUBDIVISION PLAN
1 : 1150



2 PROPOSED LOT 1
1 : 500

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Dated: 4 July 2023

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Project Description: PROP. SERVICE STATION DEVELOPMENT

1018 BRUCE HIGHWAY, PARKHURST

Scale @A1: As indicated
Date: SEPT 2022
Drawn: TM
Approved By: GN

Drawing Title: SUBDIVISION PLAN

Job Number - Drawing Number: 22175 DA06
Revision: D

mcmurtrie
CONSULTING ENGINEERS

Traffic Impact Assessment Report

Proposed Parkhurst Service Station
1018 Bruce Highway (Lot 81 SP300144), Parkhurst, QLD

Prepared For: Pearl Energy

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: **D/25-2020**
Dated: **4 July 2023**

Job No. 007-18-19
November 2022
Revision C

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Traffic Impact Assessment Report

Rev.	Description	Signature	Date
C	Updated for RRC and SARA RFI's	-	25.11.22
B	Change to Access	-	14.02.20
A	Final	-	31.10.19

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Traffic Impact Assessment Report

Parkhurst Service Station, 1018 Bruce Highway (Lot 81 SP300144), Parkhurst QLD

1.0 INTRODUCTION

1.1. PROJECT BACKGROUND

Pearl Energy are proposing to establish a service station on part of the property at 1018 Bruce Highway (Lot 81 SP300144) in Parkhurst, Queensland. The service station is expected to cater for passing traffic on the adjacent section of the Bruce Highway, and provides refueling and parking facilities for both light and heavy vehicles.

1.2. SCOPE AND STUDY AREA

McMurtrie Consulting Engineers (MCE) have been commissioned by Pearl Energy to undertake a Traffic Impact Assessment (TIA) for the proposed Service Station, located at 1018 Bruce Highway (Lot 81 SP300144) in Parkhurst, Queensland.

This Traffic Impact Assessment (TIA) was carried out to determine the level of potential impacts of the Project on the operation of the surrounding road network. The outcomes of the TIA will be used in support of the Development Application which will be assessed by Department of Transport and Main Roads (TMR) and Rockhampton Regional Council (RRC).

The assessment methodology adopted for this TIA is summarised in the key tasks listed below.

- Broadly identify the existing transport infrastructure which is of relevance to the Project.
- Estimate traffic generation associated with the Project and the distribution of this development traffic on the identified road network.
- Assess the potential impact of the Project on the surrounding transport infrastructure.
- Identify potential mitigation and management strategies to be implemented to offset the impact of the proposed Project (if required).

As outlined above, the adopted methodology centers on establishing a background, “without development” traffic scenario for the identified transport routes and comparing this with a scenario including the Project-generated traffic, i.e. the “with development” scenario.

The process allows for the assessment of the traffic impacts of the Project in terms of road safety, access requirements, intersection operations, road link capacity, pavement and other transport infrastructure. Following this, if required, potential mitigation and/or management measures would be formulated to address the potential traffic impacts caused by the proposed Project.

Additionally, we have included further information to address the SARA and RRC Information Requests from March 2020 to provide swept paths and address minor traffic generation associated with an occasional vehicle accessing the exiting Rural Shed use on the balance lot to the North of the Service Station site.

1.2.1 STUDY AREA

As previously identified, the planned service station is proposed to be at 1018 Bruce Highway, Parkhurst, on the land parcel formally described as Lot 81 SP300144. The site is located within the area of the recently completed TMR roadworks project for the Rockhampton Northern Access Upgrade (RNAU) project, as shown in **Figure 1** below.

Figure 1 Study Area – 1018 Bruce Highway, Parkhurst Qld **[Source: Qld Globe]**

2.0 EXISTING CONDITIONS

2.1. SURROUNDING ROAD NETWORK DETAILS

2.1.1 ROAD LINKS

Bruce Highway (Rockhampton-St Lawrence) – 10F

The Bruce Highway links the east coast of Queensland running from Brisbane to Cairns. In the Parkhurst area the link is the primary north-south road transport route for both passenger and road freight vehicles within Central Queensland. At the time of the initial TIA submission the highway through Parkhurst was typically a two-way, two lane rural standard road with a posted speed limit of 70km/h, generally with direct access to properties fronting the route.

In the vicinity of the proposed development site, and with the completion of the RNAU works the section through Parkhurst is now a 4 lane divided urban highway standard permitting left in/left out access directly to the highway or via service roads, the speed limit on the Highway will be 70km/hr and the link is currently and approved 23m and 25m B-Double route.

Access to the highway for the proposed development will be from the southbound or against gazettal direction as indicated in **Figure 3** below.

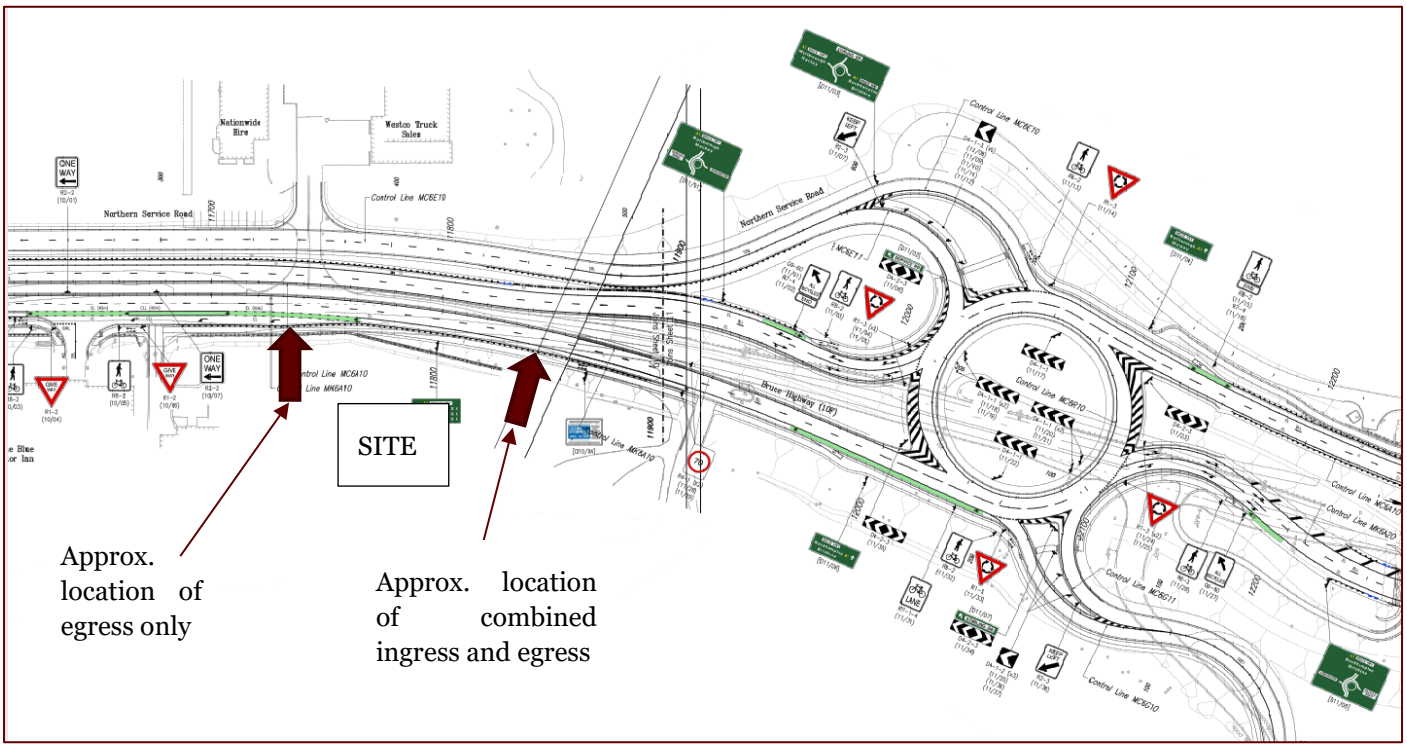


Figure 3 Bruce Highway frontage post RNAU construction

2.2. TRAFFIC VOLUMES

2.2.1 ROAD LINK VOLUMES

The background traffic volumes for the relevant section of the state-controlled road network were established using the available 2020 AADT segment traffic count data provided by TMR (refer **Appendix A**) and the latest 2021 counts with a 50/50 directional split. Using these established traffic volumes for the relevant road link, the development year (2023) daily traffic volumes on the network were established assuming a 10 year growth rate of 3%. Noting that TMR shows a 10 year growth factor of 1.34.

A summary of the forecast background traffic volumes for each of the relevant road segments for the development year (2023) is provided in **Table 1** and refer to **Appendix A** for peak hourly counts.

Table 1 Forecast Future Background AADT Traffic Volumes

Site ID	AADT Segment		Base Data Year	Base Year (2021) AADT				10 Yr. GR %	Background AADT (2023)			
	Start (km)	End (km)		Gaz	% HV	A-Gaz	% HV		Gaz		A-Gaz	
									Total	HV	Total	HV
Bruce Highway – 10F												
60926	8.55	13.18	2021	6392	16.6	6392	16.6	3	6781	1126	6781	1126

2.3. NETWORK PERFORMANCE

2.3.1 ROAD LINKS

Based on the daily traffic volumes identified in **Table 1** above, and following completion of the RNAU works, it is anticipated that all relevant sections of the Bruce Highway can be considered to be currently operating satisfactorily well under capacity, as the existing mid-block traffic volumes identified are considered well within the capacity of a two-way, four lane sealed urban road / highway.

2.4. ROAD SAFETY ISSUES

2.4.1 EXISTING SITE CONDITIONS

A site inspection of the existing traffic conditions on the relevant road network was undertaken by Chris Hewitt (RPEQ/Road Safety Auditor) on Friday 11 November 2022. No safety issues were identified.

2.4.2 ROAD CRASH HISTORY REVIEW

A review of the road crash history of the section of the Bruce Highway 500m either side of the proposed access point was undertaken using the road crash data available from the Queensland Globe database, with the assessment completed for the available data range (2002-2018).

The results of this assessment identified 5 crashes in the nominated extents within this timeframe, with the approximate location of the recorded crashes shown in **Figure 4** below, while a summary of the details of the road crash data is provided in **Table 2**.

Figure 4 Road Crash Locations – Bruce Highway / Proposed Site Access Intersection [Source: QLD Globe]

Table 3 Summary of Road Crash History (2002-2018)

Crash Ref. No.	Crash Year	Crash Severity	Crash Type	DCA Description	Crash Description
Bruce Highway					
194279	2009	Hospitalisation	Multi-Vehicle	Veh'S Manoeuvring: Leaving Driveway	Vehicle leaving driveway
25506	2002	Hospitalisation	Multi-Vehicle	Veh'S Same Direction: Right Rear	Rear-end
61114	2003	Hospitalisation	Multi-Vehicle	Veh'S Same Direction: Right Rear	Rear-end
251512	2012	Hospitalisation	Single Vehicle	Off Path-Straight: Left Off Cway Hit Obj	Off carriageway on straight hit object
175307	2001	Minor Injury	Single Vehicle	Off Path-Curve: Other	Other

The results above indicate that no one traffic movement can be considered a specific safety risk, with only 5 crashes recorded along the section of the Bruce Highway in the vicinity of the proposed site over the last 16 years (2002-2018) and no recent accidents recorded in the past 7 years.

2.5. SITE ACCESS

As previously identified, access to the site will be via a left in/left out intersection to the southbound lanes.

The access intersection will need to cater for vehicles up to a B-Double size.

3.0 PROPOSED DEVELOPMENT DETAILS

3.1. OPERATIONAL DETAILS

The proposed development is a service station, which will occupy the southern portion of the subject site as shown in the site plan included as **Appendix B** and the extract provided as **Figure 5** below. The balance of the lot is to remain operating as per its existing use of a rural lot with a vacant shed under the proposed development. Traffic generation associated with the existing use is negligible and separate low-level access, contingent with the existing use, to this part of the lot has been provided by TMR as part of the RNAU works. Access to this existing use is less than 1 vehicle per week so is not included in any peak hour generation rates. In any case, further development of this lot will be referred to TMR and require separate traffic and access analysis and approvals.

The development will provide four (4) bowsers for cars (i.e. eight (8) refueling positions), and three (3) bowsers for heavy vehicles/trucks. Vehicular access is proposed via a left in/left out access intersection with the Bruce Highway, while the largest design vehicle anticipated to require access to the site is a 25m B double combination vehicle.

The proposed service station building has an area of 350m² GFA, with parking bays provided for cars parking in close proximity to the building and truck parking areas provided to the east of the main service station area.

The traffic elements of the proposed development are discussed further in the following sections.

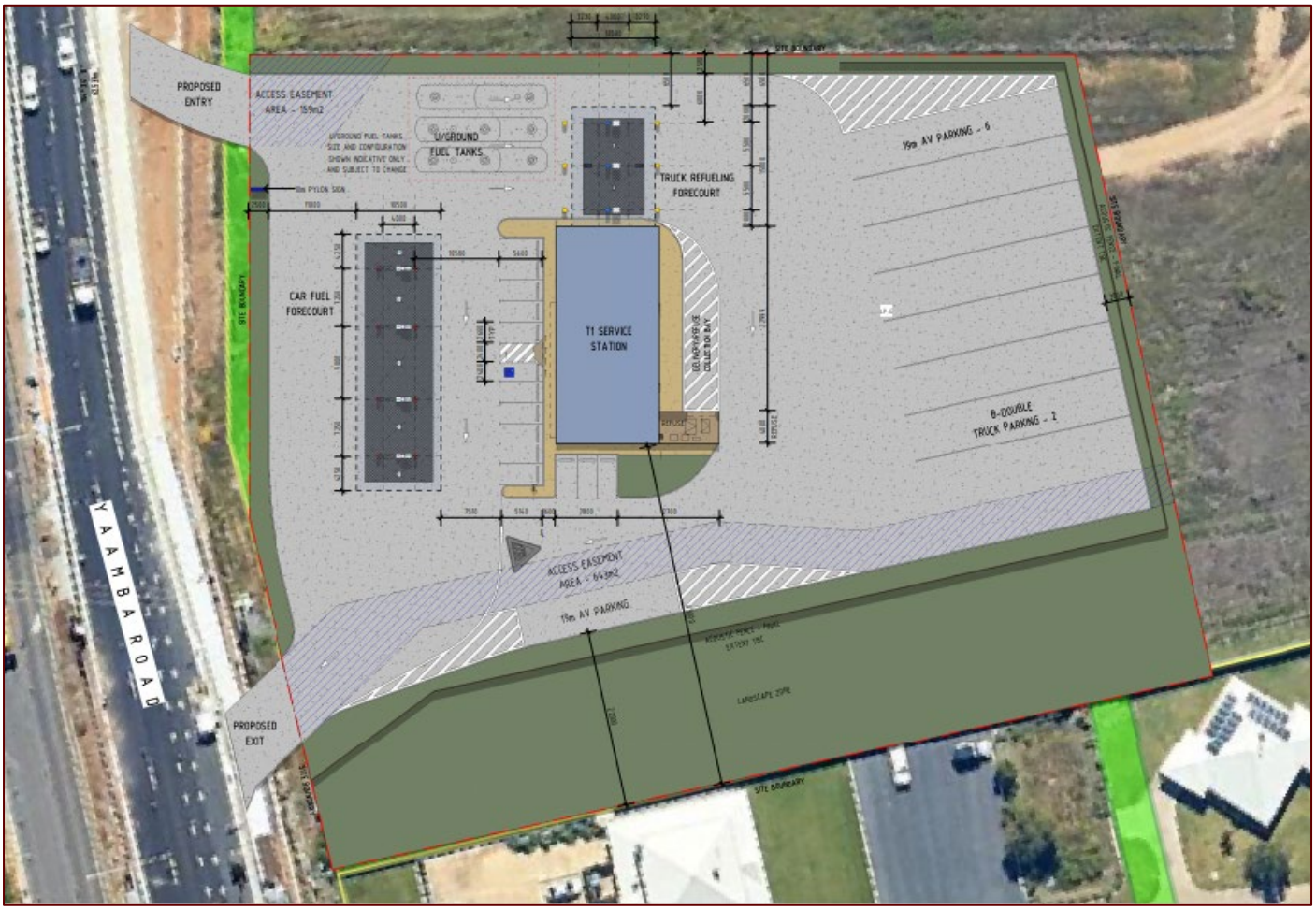


Figure 5 Extract from Site Plan (Dwg. 22175 – DA01 Rev P1) **[Source: Verve Building Design Co.]**

3.2. PROPOSED ACCESS AND PARKING

3.2.1. SITE ACCESS

As previously identified, vehicular access to the service station development is proposed to be provided via a left in/left out access intersection with the Bruce Highway catering for vehicles in the Southbound lanes.

3.2.2 INTERNAL SITE FACILITIES

In order to assess the adequacy of the internal traffic facilities, reference has been made to the Access, Parking and Transport Code within the Rockhampton Regional Council Planning Scheme, as well as the relevant Australian Standards.

Compliance with the requirements of these documents is discussed in the following sections.

3.2.2.1 CAR PARKING

Table 9.3.1.3.2 of RRC's Access, Parking and Transport Parking Code stipulates a car parking requirement of 1 space per 25m² GFA for the relevant shop area of a service station. Given the proposed service station includes approximately 350m² GFA of shop area, the recommended parking provision for the development is therefore 14 parking spaces (minimum).

As shown in the site plan (included within **Appendix B**), a total of 14 parking spaces are proposed on site, including 1 PWD Bay for Persons with Disabilities and an additional 9 truck parking bays at the rear of the service station shop area.

All parking spaces proposed for light vehicles (cars) are generally 5.4m long and 2.6m wide and are accessed by a parking aisle exceeding 6.6m width, which meets the requirements stipulated in AS2890.1 for short term, high turnover parking, while the provision of 1 PWD bay for the proposal aligns with the general PWD bay provision rate of between 1-2% of the overall parking bays on site.

3.2.2.2 QUEUING AND VEHICLE CIRCULATION

As shown in the Site Plan (refer **Appendix B**) the proposed site layout nominates one-way traffic flow (clockwise) for vehicles through the petrol pump lanes in the vicinity of the service station, with the vehicle access to the pump area located off the main access road. Vehicle swept paths have also been undertaken which confirm the ability of a B double combination to travel through the site as required, with a copy of the relevant swept paths for the proposal included for reference in **Appendix B and C**.

3.2.2.3 SERVICE VEHICLE ACCESS, CIRCULATION AND LOADING

RRC's Access, Parking and Transport Parking Code does not stipulate any specific requirement for servicing at service station developments. Notwithstanding this, a service vehicle bay is proposed to the east of the building.

Finally, it is also understood that the fuel tanker which is expected to be used for regular refueling of the service station tanks will be a B-Double configuration vehicle. The swept path for the proposed refueling activities on site is shown on Dwg. 18284 – TP03 (refer **Appendix B**),and clearly indicates that the B-Double can comfortably access the proposed fuel fill points within the truck stop area.

4.0 DEVELOPMENT TRAFFIC

4.1. TRAFFIC GENERATION

As mentioned previously it is envisioned that the site will cater for south bound traffic only as there is no direct access to or from the site from the north bound lanes other than by convoluted means. In any case for heavy vehicles there is no close practical facility for a heavy vehicle to exit the site and continue north bound.

In order to determine the traffic generation of the proposed service development, reference has been made to the Traffic Generation Data—2006–2017 recently published on the Queensland Government website (https://data.qld.gov.au/dataset/traffic-generation-data-2006-2018) which includes the recorded weekday trip generation rates for 10 separate service stations locations in Queensland.

A summary of the relevant service station data is provided in **Table 4** below, which reveals an average trip generation rate of 29.32 trips / 100m² GFA for service stations which are less than 1,000m² GFA. Applying this rate to the identified service station tenancy area (350m² GFA) would equate to a peak hour trip generation for the proposed development site of 104 trips (entry and exit).

Table 4: Summary of Trip Generation Data (Service Stations)

Year	Land use	Suburb	Variable Units	Variable Value	Start Date	End Date	Weekday Peak Hour Start	Weekday Peak Hour End	Weekday Peak Volume	Average Weekday Peak Hour Trip Generation Rate
2009	Service Station	MORAYFIELD	GLFA	3521	9/05/2009	15/05/2009	13:30:00	14:30:00	584	16.59
2009	Service Station	BURPENGARY EAST	GLFA	3246	9/05/2009	15/05/2009	9:00:00	10:00:00	535	16.48
2009	Service Station	CARSELDINE	GLFA	1772	9/05/2009	15/05/2009	15:00:00	16:00:00	423	23.87
2009	Service Station	STAPYLTON	GLFA	2273	9/05/2009	15/05/2009	12:30:00	13:30:00	577	25.38
2009	Service Station	UPPER COOMERA	GLFA	2396	9/05/2009	15/05/2009	5:30:00	6:30:00	759	31.68
2009	Service Station	COLLEGE VIEW	GLFA	796	9/05/2009	15/05/2009	13:30:00	14:30:00	355	44.60
2011	Service Station	WOODRIDGE	GLFA	332	14/03/2011	20/03/2011	5:30:00	6:30:00	156	46.99
2011	Service Station	SUNNYBANK HILLS	GLFA	542	14/03/2011	20/03/2011	15:00:00	16:00:00	93	17.16
2011	Service Station	MACGREGOR	GLFA	529	23/03/2011	29/03/2011	14:45:00	15:45:00	117	22.12
2011	Service Station	ELANORA	GLFA	793	8/04/2011	14/04/2011	7:45:00	8:45:00	125	15.76
									AVERAGE	29.32

Source: https://data.qld.gov.au/dataset/traffic-generation-data-2006-2018/resource/73079dc1-c34e-44cf-9e9a-8acb13591c1b

It is considered that this calculated rate is more appropriate for the site than the standard trip generation rates recommended in the DTMR's *Road Planning and Design Manual (Chapter 3)* and the RTA *Guide to Traffic Engineering Developments* of 66 trips / 100m² GFA in the peak hour. This is because the adoption of this rate for the development would equate to a peak hour generation of 231 trips for the site, which is considered to be excessive when compared to the peak hourly traffic on the adjacent section of the Bruce Highway (peak approx. 914 vph). While the main use of the service station is expected to be "drop-in" trips by vehicles passing on the Highway, it is not considered reasonable to assume that almost 25% of the passing vehicles would utilise the service station development.

As such the adoption of the calculated rate from the Queensland Government's Traffic Generation Data—2006–2017 of 29.32 trips / 100m² for service stations under 1,000m² GFA is considered acceptable, and equates to a peak hour traffic generation of 104 trips during the AM and PM periods.

4.2. TRAFFIC DISTRIBUTION

Given the proposed development is a service station, it is anticipated that the vast majority of trips generated (if not all) will be undiverted "drop-in" trips undertaken by vehicles travelling past on the Bruce Highway.

However with a view to maintaining a conservative approach, it has been assumed that 20% of trips generated by the service station during the peak hours will be destination (i.e. new) trips, with a summary of the expected distribution of traffic from the development provided in **Table 5** below.

Table 5 Proposed Development Traffic Distribution

AM PEAK	PM PEAK
ARRIVAL / DEPARTURE SPLIT	
• 50% traffic inbound to development; and • 50% traffic outbound from development.	• 50% traffic inbound to development; and • 50% traffic outbound from development.
"NEW" TRIP DISTRIBUTION (20% Overall Trips)	
INBOUND • 100% from Bruce Highway (North). **OUTBOUND** • 100% to Bruce Highway (South).	**INBOUND** • 100% from Bruce Highway (North). **OUTBOUND** • 100% to Bruce Highway (South).
"DROP-IN" TRIP DISTRIBUTION (80% Overall Trips)	
INBOUND • 100% from Bruce Highway (North). **OUTBOUND** • 100% to Bruce Highway (South).	**INBOUND** • 100% from Bruce Highway (North). **OUTBOUND** • 100% to Bruce Highway (South).

4.3. DEVELOPMENT TRAFFIC VOLUMES ON THE NETWORK

Based on the information outlined above and the conservative assumptions applied, an estimate of the additional development traffic volumes at the key site access intersection of the Bruce Highway were established, with a summary of the resultant AM and PM peak hour development traffic volumes provided in **Figure 6** to **Figure 11** below, noting that 20% of the development traffic is assumed to be heavy vehicles.

The development year has been assumed as 2023 thus resulting in a 10 year design period of 2033.

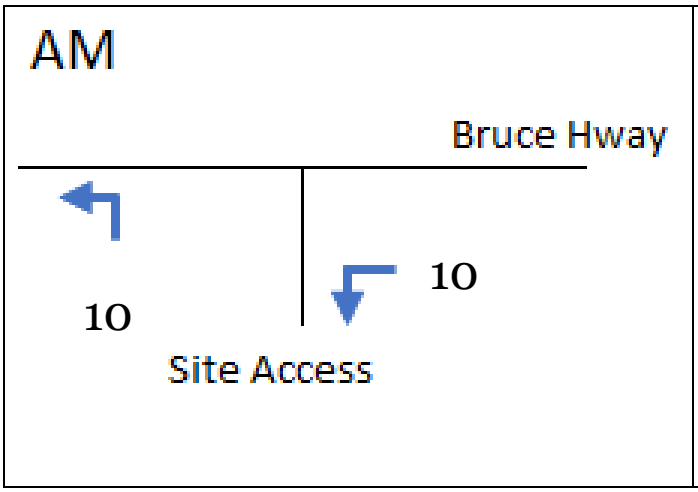


Figure 6 "New Trip" Development Volumes AM Peak

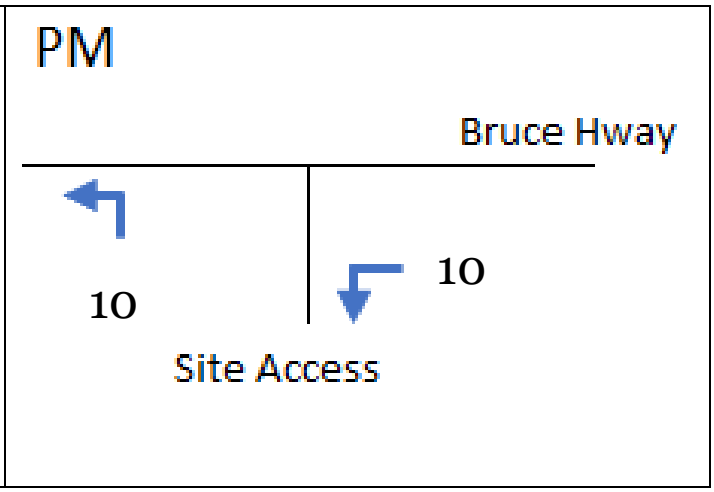


Figure 7 "New Trip" Development Volumes PM Peak

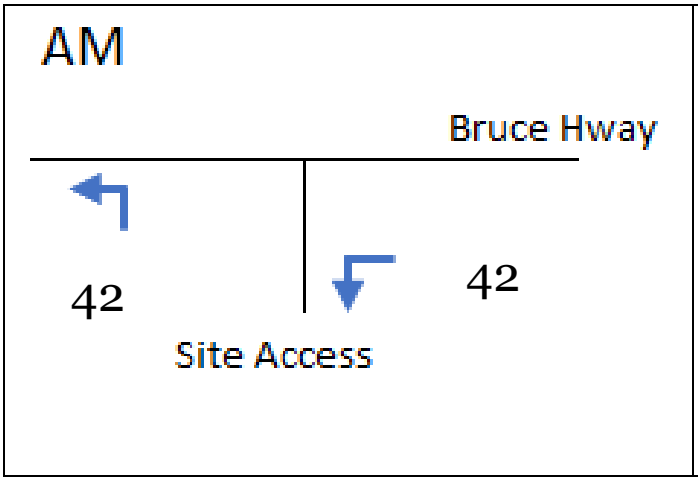


Figure 8 "Drop In" Development Volumes AM Peak

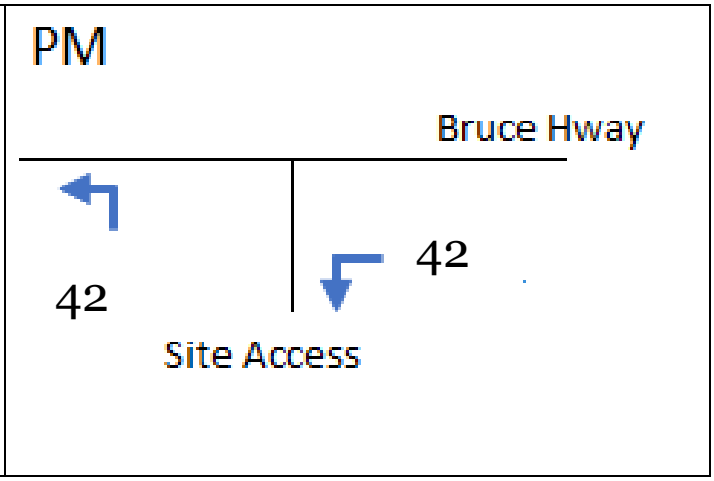


Figure 9 "Drop In" Development Volumes PM Peak

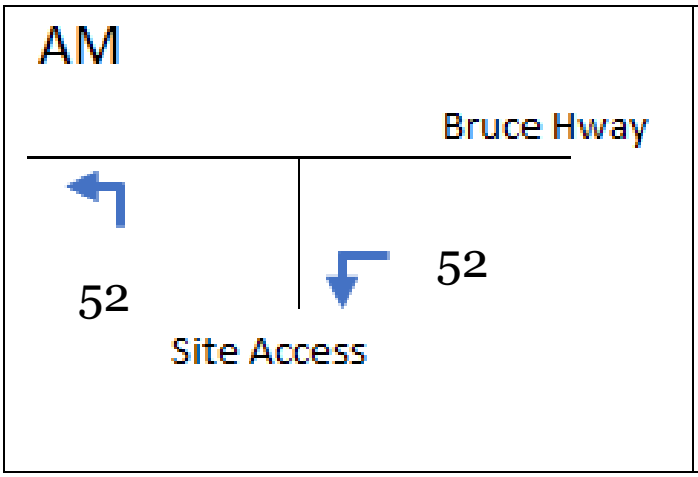


Figure 10 Total Development Traffic Volumes AM Peak

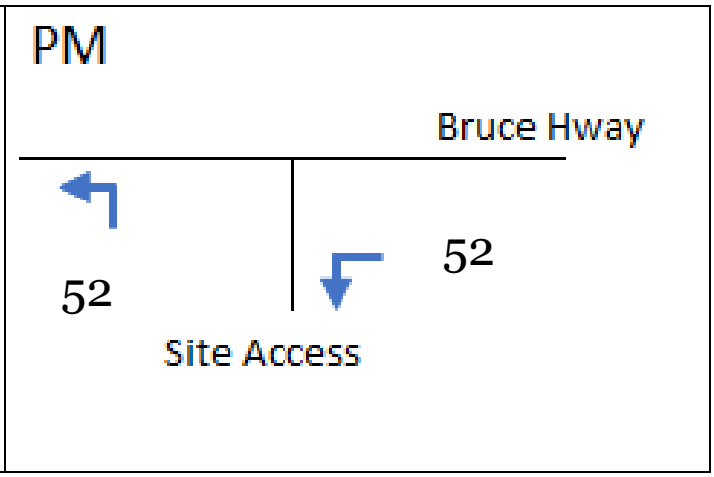


Figure 11 Total Development Traffic Volumes PM Peak

5.0 IMPACT ASSESSMENT AND MITIGATION

Based on the information provided above, it was determined that the critical elements of the surrounding road network in terms of the potential impact of the proposed service station development was the Bruce Highway access intersection.

Further details of the assessment of the impact of the development on road network is provided in the following sections.

5.1. WITH AND WITHOUT DEVELOPMENT TRAFFIC VOLUMES

5.1.1 ROAD LINK VOLUMES

As previously discussed, given the proposed development is a service station it is anticipated that the vast majority of trips generated by the proposed development will be undiverted drop-in trips.

Whilst the development is predicted to generate in the order of 104 vehicle trips (entry and exit) in the AM and PM peak hours, at least 80% of these trips are expected to be undiverted drop-in trips by vehicles travelling past the site on the Bruce Highway, which would have been on the road network even in the absence of the proposed development. Accordingly, the impact of the proposed development upon existing road link volumes is anticipated to be negligible.

5.2. ACCESS AND FRONTAGE IMPACT ASSESSMENT AND MITIGATION

The proposed access locations were discussed at a meeting with TMR 13 November 2018, attended by Chris Murphy,Anton DeKlerk (TMR), Gideon Genade and Chris Hewitt along with representatives of the RNAU project team. At this meeting TMR indicated general acceptance of the proposed access locations.

The proposed site access ingress and egress will be provided as per **Figures 3 and 5** with an egress only point located approximately 290m downstream of the roundabout and an ingress/egress access point located approximately 200m downstream from the roundabout. Access visibility from both locations will be able to sight a vehicle leaving the roundabout thus comfortably achieving SISD of 181m for an 80 kph design speed.

Forecast through road and access volumes based on **Table 1** and **Figures 10 and 11,** the detailed hourly volumes from **Appendix A** and a compound growth rate of 3% are shown in **Figures 12 to 15** below for the opening year of 2023 and the 10 year design horizon of 2033. We have also assumed 50% of traffic will utilize the outside lane of the 2 southbound lanes.

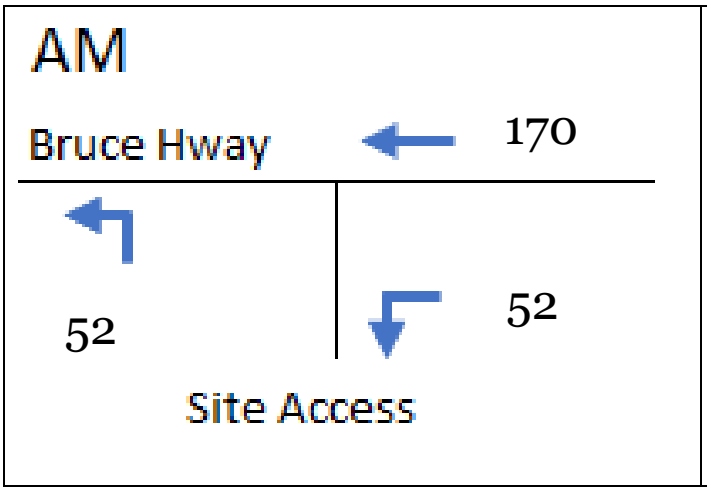


Figure 12 Development Volumes AM Peak 2023

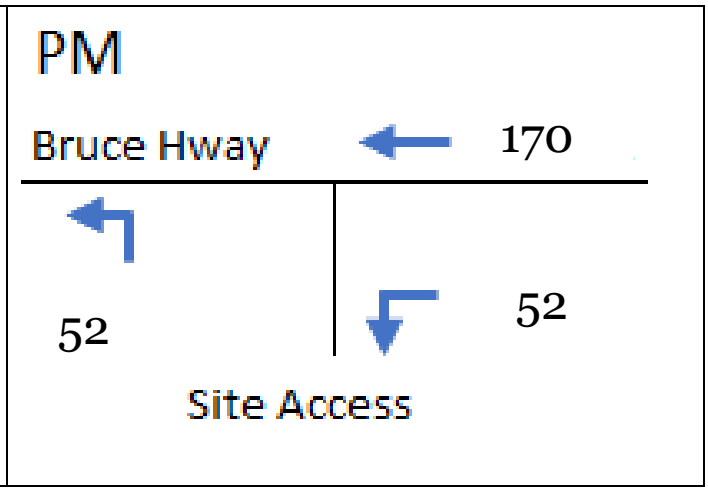


Figure 13 Development Volumes PM Peak 2023

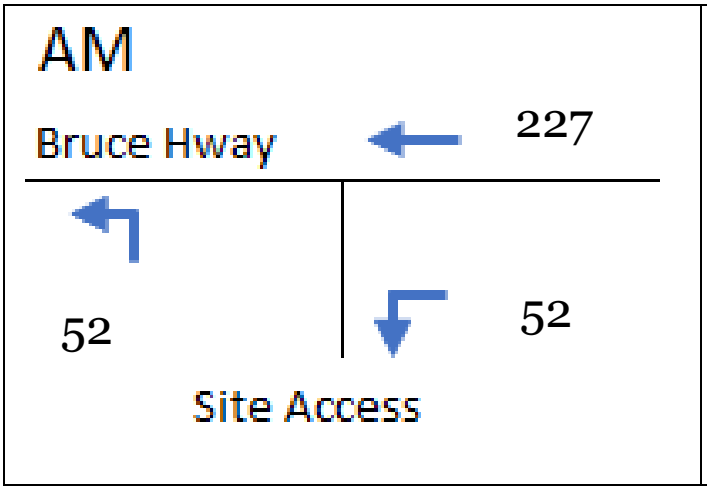


Figure 14 Development Volumes AM Peak 2033

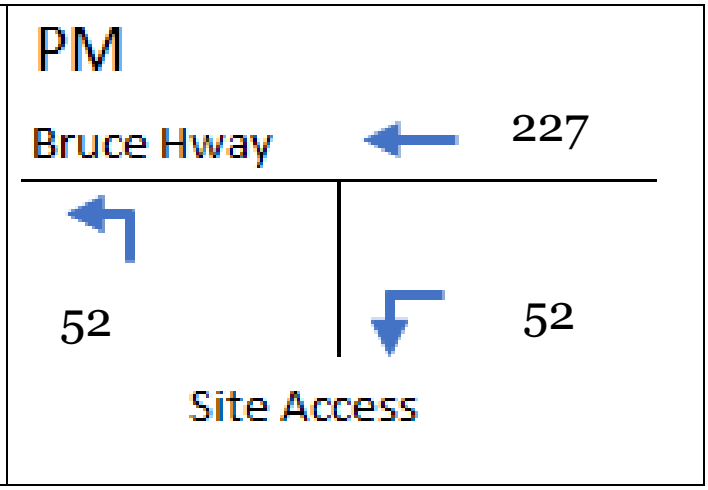


Figure 15 Development Volumes PM Peak 2033

A turn warrants assessment was undertaken for the current site access intersection with the Bruce Highway based on the forecast 2033 post development traffic volumes from the proposed Parkhurst Service Station as identified in **Figure 14** and **Figure 15** above. The assessment was completed using Figure 2.26b of Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings, which depicts the turn warrants graph for design speeds between 70km/h and 100km/h.

The resultant graph from the assessment for the post development (2033) traffic conditions is provided in **Figure 16** below.

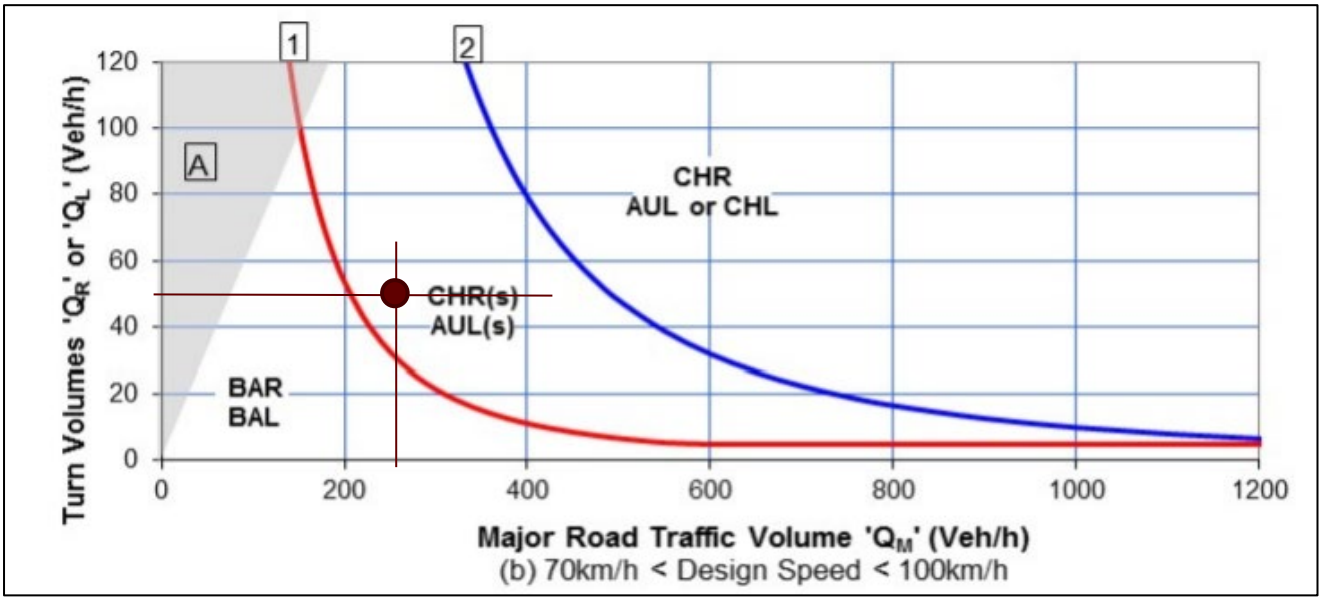


Figure 16 Turn Warrants Graph (70-100km/hr) – Post Development Traffic Volume Scenario (2030)

The results of the turn warrants assessment indicate that the recommended turn treatments at the intersection of the Bruce Highway for the post development traffic volume scenario was an AUL(s) treatment.

As such a functional layout plan for the upgrade works to the Bruce Highway / site access intersection proposed as part of the service station development has been developed. This layout (refer **Appendix C**) identifies the expected works required at the intersection including the provision of the required AUL(s) turn treatment. Swept paths for a B double combination have also been detailed as part of this plan. Please note that this layout is only functional/conceptual in nature being sufficient to approve an MCU/ROL – detailed design will of course need to follow and TMR will have the opportunity at that time to approve the detail.

5.3. PAVEMENT IMPACT ASSESSMENT AND MITIGATION

Given the proposed development is a service station on a major arterial road and is not expected to generate a significant number of new heavy vehicle movements under typical operation, no pavement mitigation works are deemed warranted or required as a result of the proposal.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1. SUMMARY OF IMPACTS AND MITIGATION MEASURES PROPOSED

6.1.1 INTERNAL FACILITIES

The traffic elements of the proposed plan of development have been designed generally in accordance with the requirements of AS2890 and the Access, Parking and Transport Code within the Rockhampton Regional Council Planning Scheme.

The proposed on-site parking provision a total of 14 parking spaces, including 1 PWD Bay for Persons with Disabilities and an additional 9 truck parking bays at the rear of the service station shop area is considered adequate to cater for the parking demand expected to be generated by the development.

In addition, the proposed shop and petrol tank servicing and refuse collection arrangements for the service station development can be considered adequate, with the swept paths of the largest vehicle entering the site shown to comfortably be able to enter the site.

6.1.2 TRAFFIC IMPACTS

The turn warrants assessment undertaken based on the estimated post development traffic volumes (2033) indicated that the recommended turn treatments for the site access intersection of the Bruce Highway / site access was an AUL(s) treatment.

These works are proposed to be completed generally in accordance with the functional layout plan for the intersection provided in **Appendix C,** which identifies the required AUL(s) turn treatment and the minor widening works to the Bruce Highway (site access) approach to the intersection required to accommodate the vehicle swept path of a B double combination vehicle.

6.1.3 RECOMMENDATIONS

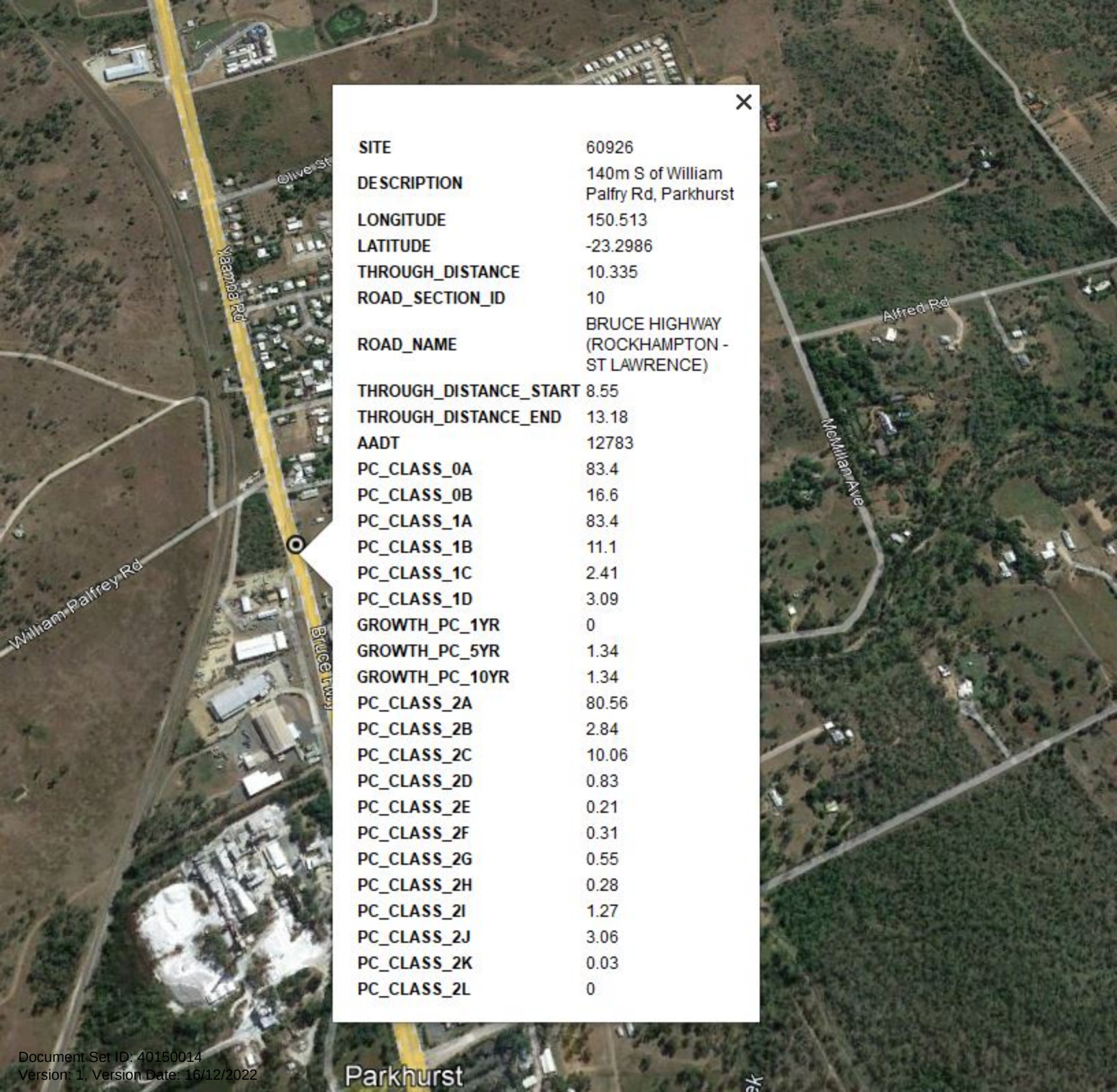
In light of the information provided above, it is concluded that conditional to the provision of the identified upgrade works to the Bruce Highway/site access intersection, the proposed development will have a negligible impact on the adjacent road network and can therefore be recommended to be approved from a traffic engineering perspective.

6.2. CERTIFICATION STATEMENT AND AUTHORISATION

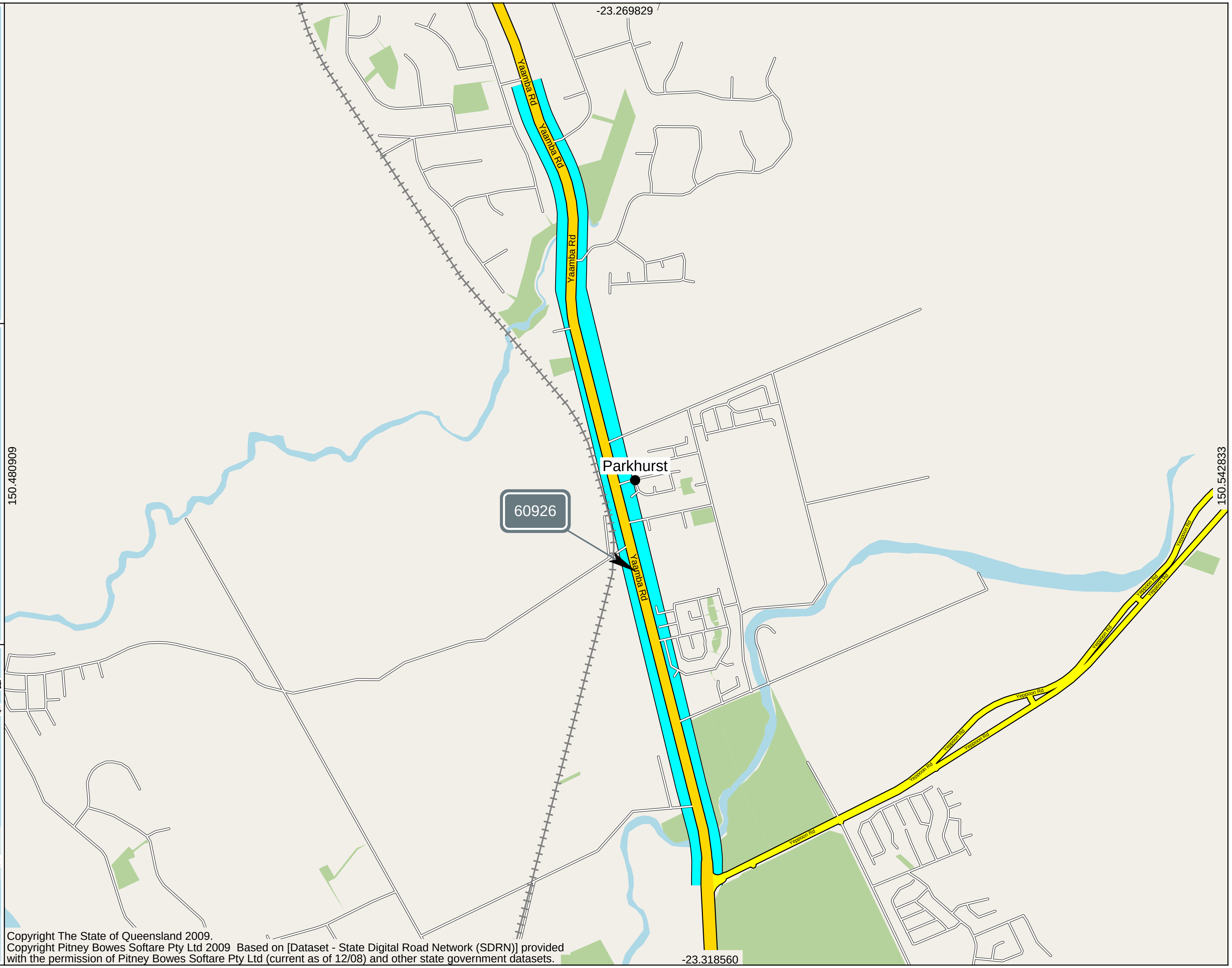
A copy of the RPEQ certification and authorisation statement covering this assessment of the proposed Parkhurst Service Station development located at 1018 Bruce Highway (Lot 81 SP300144) is included for reference as **Appendix D**.

APPENDIX A

TMR Traffic Data



SITE	60926
DESCRIPTION	140m S of William Palfry Rd, Parkhurst
LONGITUDE	150.513
LATITUDE	-23.2986
THROUGH_DISTANCE	10.335
ROAD_SECTION_ID	10
ROAD_NAME	BRUCE HIGHWAY (ROCKHAMPTON - ST LAWRENCE)
THROUGH_DISTANCE_START	8.55
THROUGH_DISTANCE_END	13.18
AADT	12783
PC_CLASS_0A	83.4
PC_CLASS_0B	16.6
PC_CLASS_1A	83.4
PC_CLASS_1B	11.1
PC_CLASS_1C	2.41
PC_CLASS_1D	3.09
GROWTH_PC_1YR	0
GROWTH_PC_5YR	1.34
GROWTH_PC_10YR	1.34
PC_CLASS_2A	80.56
PC_CLASS_2B	2.84
PC_CLASS_2C	10.06
PC_CLASS_2D	0.83
PC_CLASS_2E	0.21
PC_CLASS_2F	0.31
PC_CLASS_2G	0.55
PC_CLASS_2H	0.28
PC_CLASS_2I	1.27
PC_CLASS_2J	3.06
PC_CLASS_2K	0.03
PC_CLASS_2L	0



Site 60926. Point 260000686. 140m S of William Palfry Rd, Parkhurst.

10.34 km

The width of each Road Segment is proportional to its AADT.

8.55 km

Start Point 260000303. Yaamba Rd/Bruce Hwy to City @ Yeppoon Rd.

13.18 km

End Point 260000531. Bruce Hwy to R'ton CBD @ Terra Nova Dr.

This report shows Annual Average Daily Traffic values (AADTs). Because the AADT values are converted to whole numbers, there will be occasional inaccuracies due to rounding. These inaccuracies are statistically insignificant.

All Vehicles (00)

G	6,366	100%
A	6,384	100%
B	12,750	100%

Light Vehicles (0A)

G	5,495	86.32%
A	5,796	90.79%
B	11,291	88.56%

Heavy Vehicles (0B)

G	872	13.70%
A	588	9.21%
B	1,460	11.45%

Short Vehicles (1A)

G	5,495	86.32%
A	5,796	90.79%
B	11,291	88.56%

Trucks and Buses (1B)

G	565	8.88%
A	306	4.79%
B	871	6.83%

Articulated Vehicles (1C)

G	142	2.23%
A	127	1.99%
B	269	2.11%

Road Trains (1D)

G	165	2.59%
A	155	2.43%
B	320	2.51%

Short 2-Axle Vehicles (2A)

G	5,340	83.88%
A	5,629	88.17%
B	10,969	86.03%

Short Vehicles Towing (2B)

G	155	2.43%
A	167	2.62%
B	322	2.53%

2-Axle Trucks and Buses (2C)

G	514	8.07%
A	254	3.98%
B	768	6.02%

3-Axle Trucks and Buses (2D)

G	43	0.68%
A	45	0.70%
B	88	0.69%

4-Axle Trucks (2E)

G	8	0.13%
A	7	0.11%
B	15	0.12%

3-Axle Articulated (2F)

G	13	0.20%
A	6	0.09%
B	19	0.15%

4-Axle Articulated (2G)

G	22	0.35%
A	15	0.23%
B	37	0.29%

5-Axle Articulated (2H)

G	22	0.35%
A	20	0.31%
B	42	0.33%

6-Axle Articulated (2I)

G	85	1.34%
A	86	1.35%
B	171	1.34%

B Double (2J)

G	164	2.58%
A	154	2.41%
B	318	2.49%

Double Road Trains (2K)

G	1	0.02%
A	1	0.02%
B	2	0.02%

Triple Road Trains (2L)

G	0	0%
A	0	0%
B	0	0%

AADT Segment Annual Volume Report
Provides summary data for the selected AADT Segment of a Road Section. Summary data is presented as both directional information and a combined bi-directional figure. The data is then broken down by Traffic Class, when available. The report also includes maps displaying the location of both the AADT Segment and the traffic count site.

Annual Average Daily Traffic (AADT)
Annual Average Daily Traffic (AADT) is the number of vehicles passing a point on a road in a 24 hour period, averaged over a calendar year.

AADT Segments
The State declared road network is broken into Road Sections and then further broken down into AADT Segments. An AADT Segment is a sub-section of the declared road network where traffic volume is similar along the entire AADT Segment.

Area
For administration purposes the Department of Transport and Main Roads has divided Queensland into 12 Districts. The Area field in TSDM reports displays the District Name and Number.

District Name	District
Central West District	401
Darling Downs District	402
Far North District	403
Fitzroy District	404
Mackay/Whitsunday District	405
Metropolitian District	406
North Coast District	407
North West District	409
Northern District	408
South Coast District	410
South West District	411
Wide Bay/Burnett District	412

AADT Values
AADT values are displayed by direction of travel as:

- G Traffic flow in gazettal direction
- A Traffic flow against gazettal direction
- B Traffic flow in both directions

Data Collection Year
Is the most recent year that data was collected at the data collection site.

Please Note:
Due to location and/or departmental policy, some sites are not counted every year.

Gazettal Direction
Is the direction of the traffic flow. It can be easily recognised by referring to the name of the road eg. Road Section: 10A Brisbane - Gympie denotes that the gazettal direction is from Brisbane to Gympie.

Maps
Display the selected location from a range of viewing levels, the start and end position details for the AADT Segment and the location of the traffic count site.

Road Section
Is the Gazetted road from which the traffic data is collected. Each Road Section is given a code, allocated sequentially in Gazettal Direction. Larger roads are broken down into sections and identified by an ID code with a suffix for easier data collection and reporting (eg. 10A, 10B, 10C). Road Sections are then broken into AADT Segments which are determined by traffic volume.

Segment Site
Is the unique identifier for the traffic count site representing the traffic flow within the AADT Segment.

Site
The physical location of a traffic counting device. Sites are located at a specified Through Distance along a Road Section.

Site Description
The description of the physical location of the traffic counting device.

Start and End Point
The unique identifier for the Through Distance along a Road Section.

Vehicle Class
Traffic is categorised as per the Austroads Vehicle Classification scheme. Traffic classes are in the following hierarchical format:

Volume or All Vehicles
00 = 0A + 0B

Light Vehicles
0A = 1A
1A = 2A + 2B

Heavy Vehicles
0B = 1B + 1C + 1D
1B = 2C + 2D + 2E
1C = 2F + 2G + 2H + 2I
1D = 2J + 2K + 2L

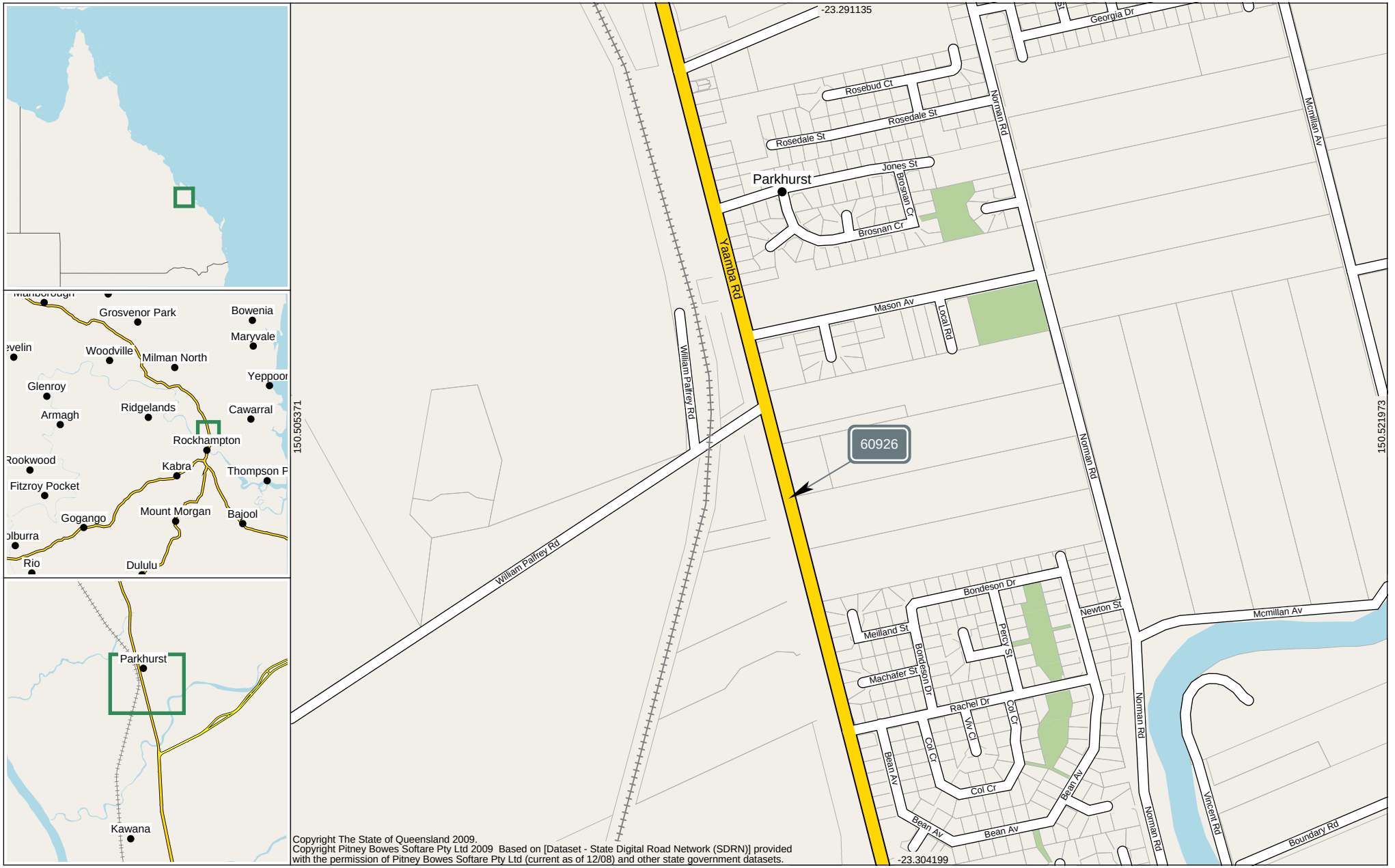
The following classes are the categories for which data can be captured:

Volume
00 All vehicles

2-Bin
0A Light vehicles
0B Heavy vehicles

4-Bin
1A Short vehicles
1B Truck or bus
1C Articulated vehicles
1D Road train

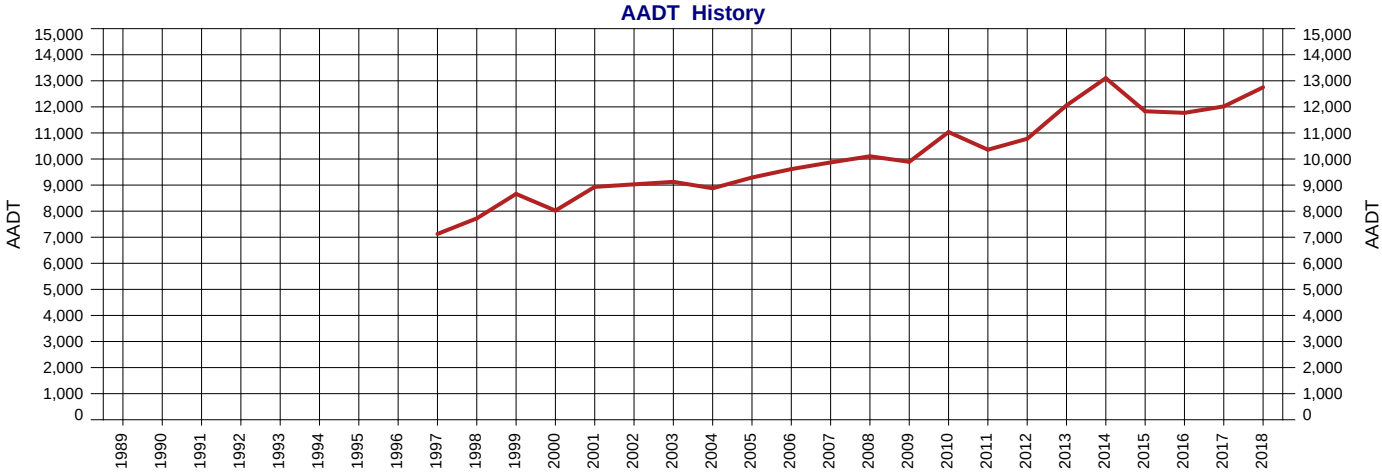
12-Bin
2A Short 2 axle vehicles
2B Short vehicles towing
2C 2 axle truck or bus
2D 3 axle truck or bus
2E 4 axle truck
2F 3 axle articulated vehicle
2G 4 axle articulated vehicle
2H 5 axle articulated vehicle
2I 6 axle articulated vehicle
2J B double
2K Double road train
2L Triple road train



Area	404 - Fitzroy District
Road Section	10F - BRUCE HIGHWAY (ROCKHAMPTON-ST LAWRENCE)
Site	60926 - 140m S of William Palfry Rd, Parkhurst
Thru Dist	10.335
Type	C - Coverage
Stream	TB - Bi-directional traffic flow

Year	2018	Growth last Year	6.10%
AADT	12,750	Growth last 5 Yrs	1.12%
Avg Week Day	13,260	Growth last 10 Yrs	2.32%
Avg Weekend Day	9,945		

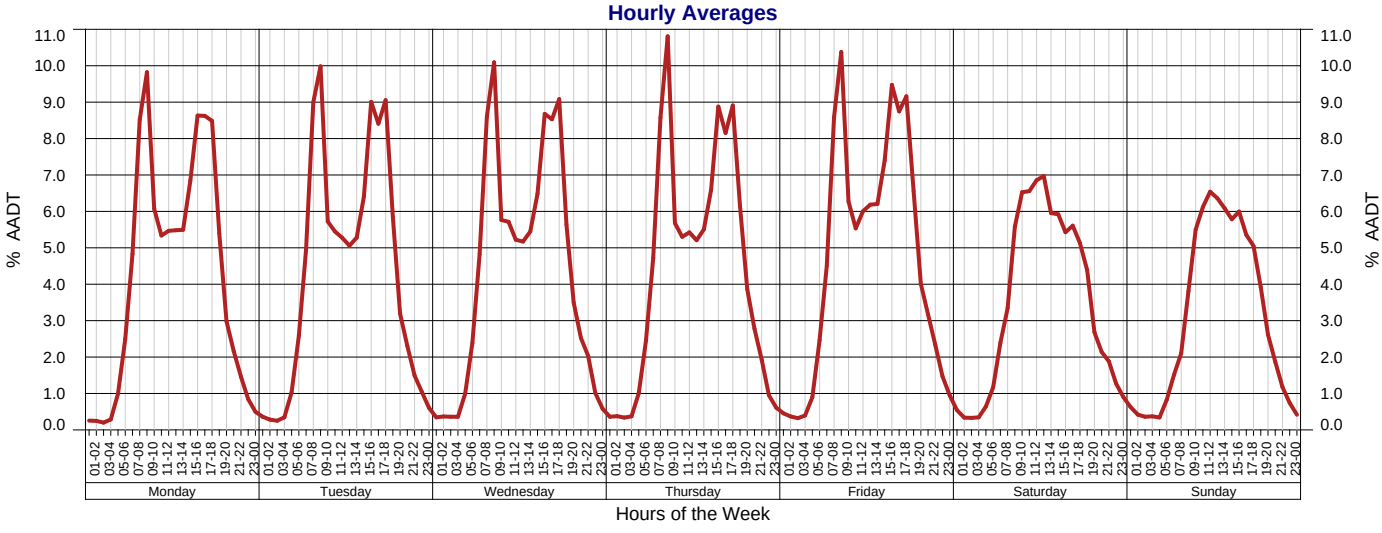
AADT History



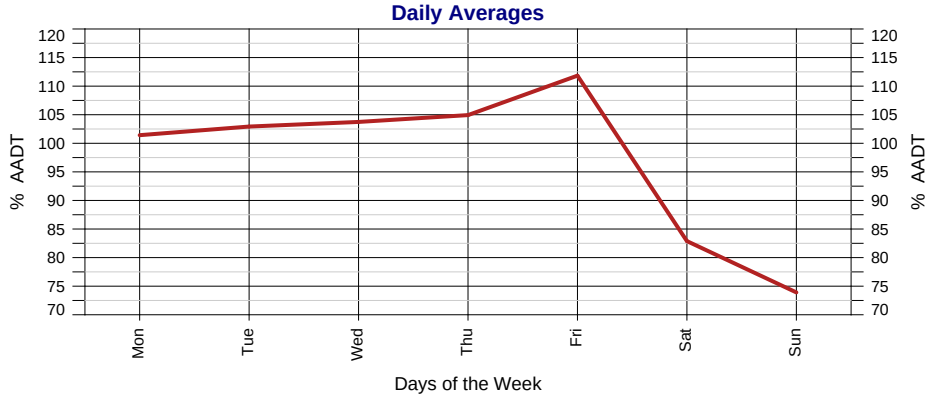
Year	AADT	1-Year Growth	5-Year Growth	10-Year Growth
2018	12,750	6.10%	1.12%	2.32%
2017	12,017	2.09%	0.59%	1.81%
2016	11,771	-0.51%	1.29%	1.87%
2015	11,831	-9.70%	1.87%	2.35%
2014	13,102	8.67%	6.13%	4.32%
2013	12,057	11.89%	4.38%	3.37%
2012	10,776	4.06%	1.74%	1.96%
2011	10,356	-6.14%	1.22%	1.60%
2010	11,034	11.54%	3.76%	3.00%
2009	9,892	-2.10%	1.58%	1.58%
2008	10,104	2.38%	2.58%	2.33%
2007	9,869	2.66%	2.25%	2.57%
2006	9,613	3.48%	1.78%	
2005	9,290	4.65%	1.94%	
2004	8,877	-2.72%	0.82%	

Year	AADT	1-Year Growth	5-Year Growth	10-Year Growth
2003	9,125	1.07%	2.73%	
2002	9,028	1.09%	4.04%	
2001	8,931	11.35%		
2000	8,021	-7.39%		
1999	8,661	12.15%		
1998	7,723	8.38%		
1997	7,126			
1996				
1995				
1994				
1993				
1992				
1991				
1990				
1989				

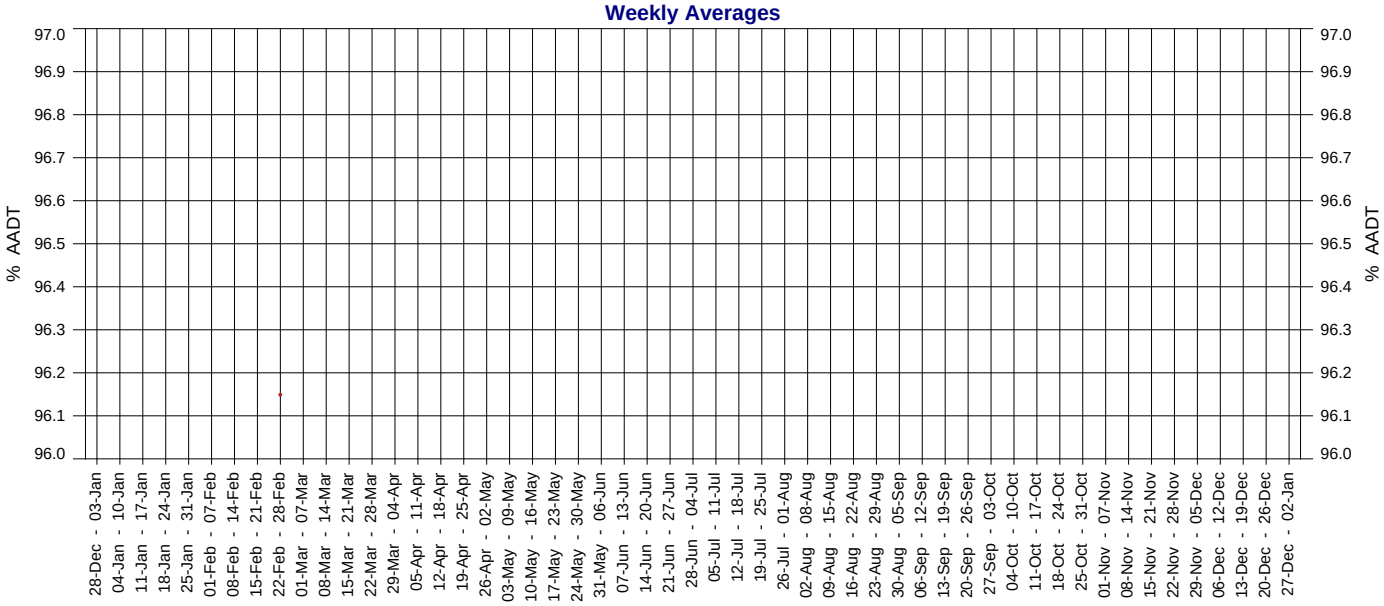
Hourly Averages



Daily Averages



Weekly Averages



2018 Calendar

January

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

February

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

March

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April

M	T	W	T	F	S	S
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

May

M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

June

M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

July

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

August

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September

M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

December

M	T	W	T	F	S	S
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Days on which traffic data was collected.

Annual Volume Report
Displays AADT history with hourly, daily and weekly patterns by Stream in addition to annual data for AADT figures with 1 year, 5 year and 10 year growth rates.

Annual Average Daily Traffic (AADT)
Annual Average Daily Traffic (AADT) is the number of vehicles passing a point on a road in a 24 hour period, averaged over a calendar year.

AADT History
Displays the years when traffic data was collected at this count site.

Area
For administration purposes the Department of Transport and Main Roads has divided Queensland into 12 Districts. The Area field in TSDM reports displays the District Name and Number.

District Name	District
Central West District	401
Darling Downs District	402
Far North District	403
Fitzroy District	404
Mackay/Whitsunday District	405
Metropolitian District	406
North Coast District	407
North West District	409
Northern District	408
South Coast District	410
South West District	411
Wide Bay/Burnett District	412

Avg Week Day
Average daily traffic volume during the week days, Monday to Friday.

Avg Weekend Day
Average daily traffic volume during the weekend, Saturday and Sunday.

Calendar
Days on which traffic data was collected are highlighted in green.

Gazettal Direction
The Gazettal Direction is the direction of the traffic flow. It can be easily recognised by referring to the name of the road eg. Road Section: 10A Brisbane - Gympie denotes that the gazettal direction is from Brisbane to Gympie.

- G Traffic flowing in Gazettal Direction
- A Traffic flowing against Gazettal Direction
- B The combined traffic flow in both Directions

Growth Percentage
Represents the increase or decrease in AADT, using a exponential fit over the previous 1, 5 or 10 year period.

Hour, Day & Week Averages
The amount of traffic on the road network will vary depending on the time of day, the day of the week and the week of the year. The ebb and flow of traffic travelling through a site over a period of time forms a pattern. The Hour, Day and Week Averages are then used in the calculation of AADT.

Road Section
Is the Gazetted road from which the traffic data is collected. Each Road Section is given a code, allocated sequentially in Gazettal Direction. Larger roads are broken down into sections and identified by an ID code with a suffix for easier data collection and reporting (eg. 10A, 10B, 10C). Road Sections are then broken into AADT Segments which are determined by traffic volume.

Site
The unique identifier and description of the physical location of a traffic counting device. Sites are located at a Through Distance along a Road Section.

Stream
The lane in which the traffic is travelling in. This report provides data for the combined flow of traffic in both directions.

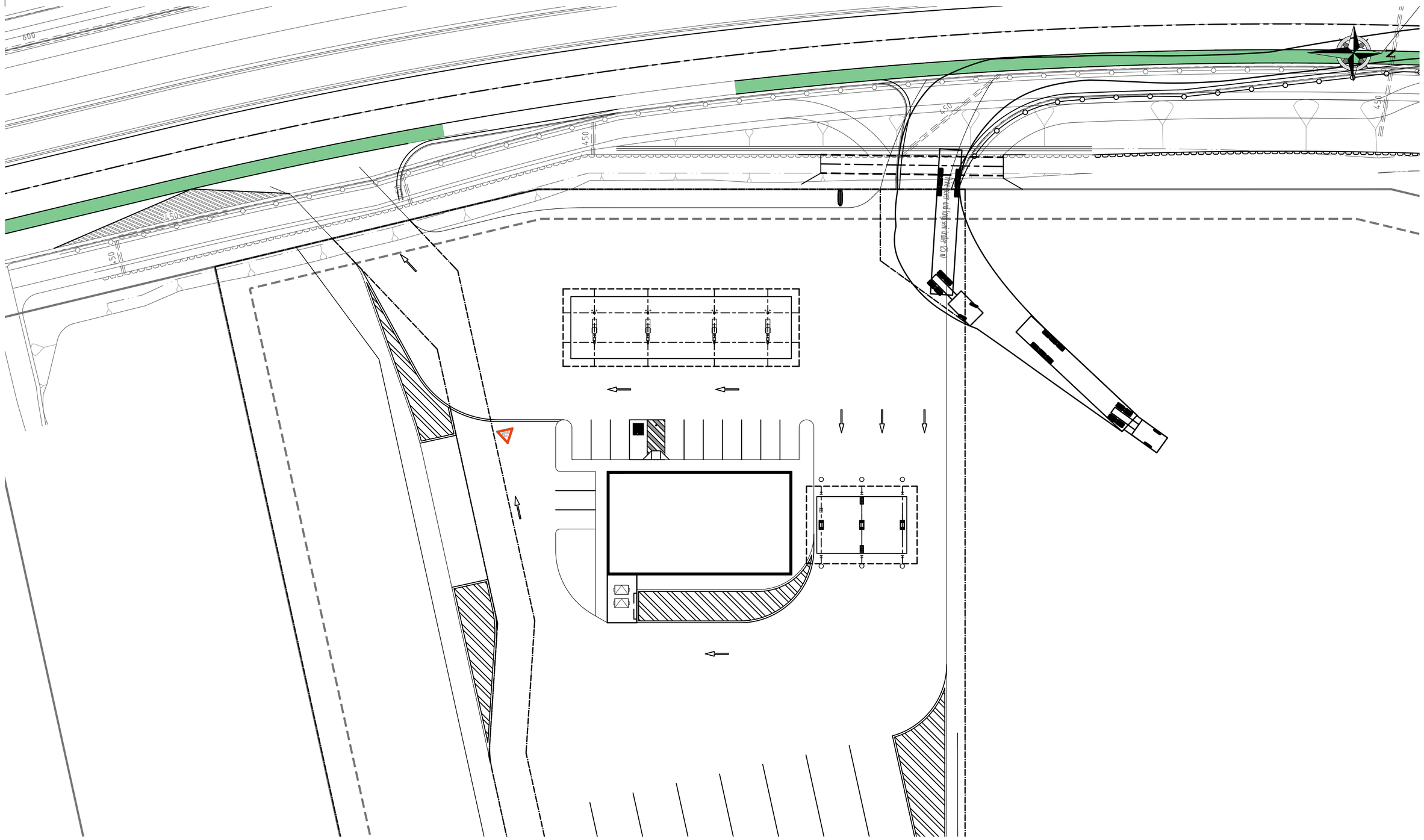
Thru Dist or TDist
The distance from the beginning of the Road Section, in kilometres.

Type
There are two types of traffic counting sites, Permanent and Coverage. Permanent means the traffic counting device is in place 24/7. Coverage means the traffic counting device is in place for a specified period of time.

Year
Is the current year for the report. Where an AADT Year record is missing a traffic count has not been conducted, for that year.

APPENDIX B

Site Layout Plan and Swept Paths



INFORMATION ONLY

SURVEYOR										
ADDRESS:										
CO-ORDINATE DATUM										
HEIGHT DATUM										
	DRAWING No.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK
			A		SUBMITTED FOR INFORMATION				

	BY	DATE
REVIEWED		
RPEQ ENG		

RPEQ No:

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SCALE: NTS

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Mobile: 0407 631 066
Fax: (07) 4921 1790

CLIENT

PROJECT TITLE: PARKHURST SERVICE STATION

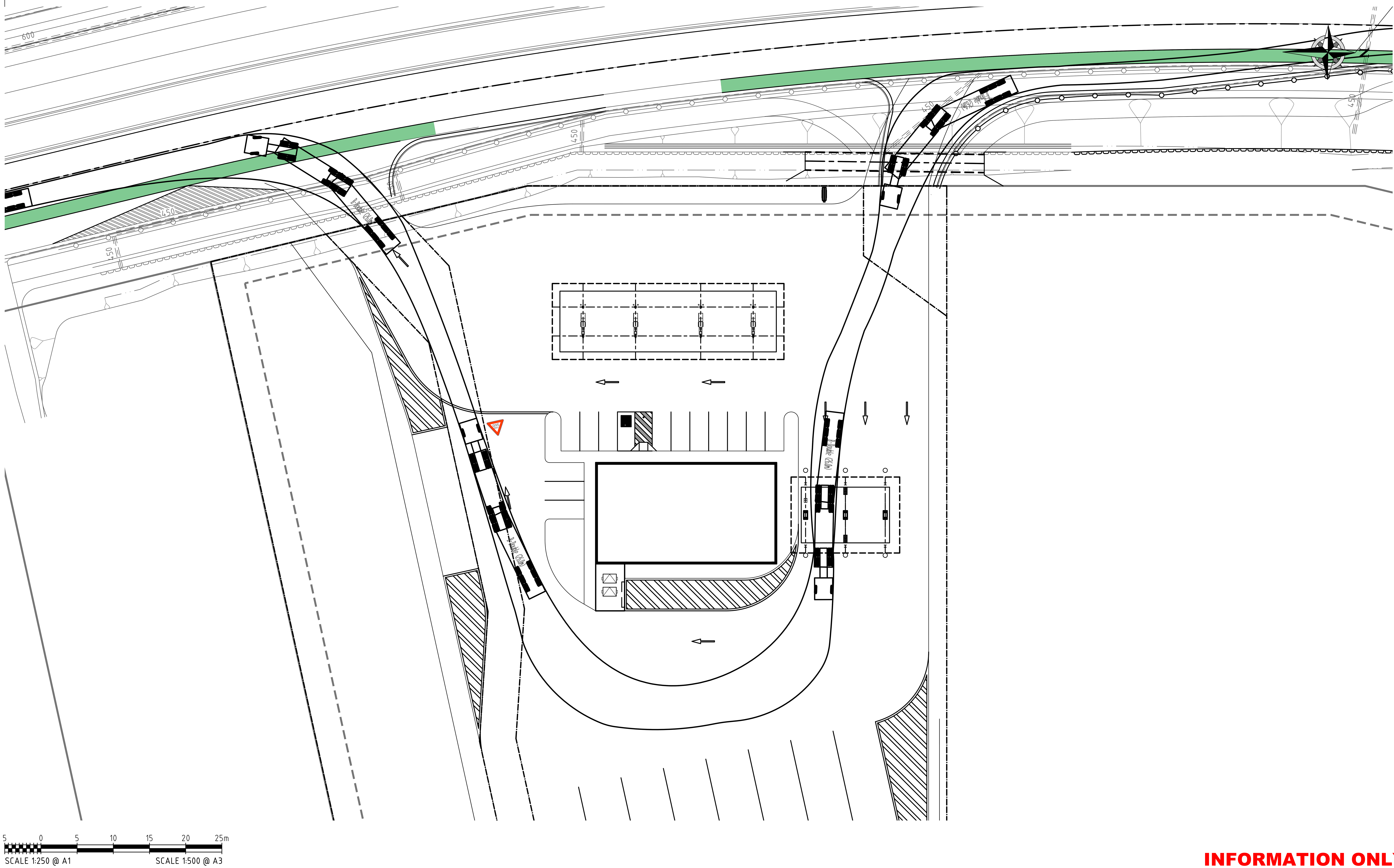
SEMI TRAILER VEHICLE PATH

A1

DRAWING NUMBER: 0071819-SK01

REVISION: A

PLOT DATE: 21/11/2022 3:44:07 PM DRAWING LOCATION: Z:\ARCHIVED_PROJECT RECORDS\18-19\007-18-19\ACAD\2212\PRELIMINARY ACCESS AND EXIT SKETCHES REV B.DWG



INFORMATION ONLY

SURVEYOR											BY	DATE
ADDRESS:										REVIEWED		
CO-ORDINATE DATUM										RPEQ ENG		
HEIGHT DATUM			A		SUBMITTED FOR INFORMATION					RPEQ No:		
	DRAWING No.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK			

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SCALE: NTS

PREPARED BY

MCE McMurtrie Consulting Engineers

007-18-19

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Fax: (07) 4921 1790

CLIENT

PROJECT PARKHURST SERVICE STATION

TITLE

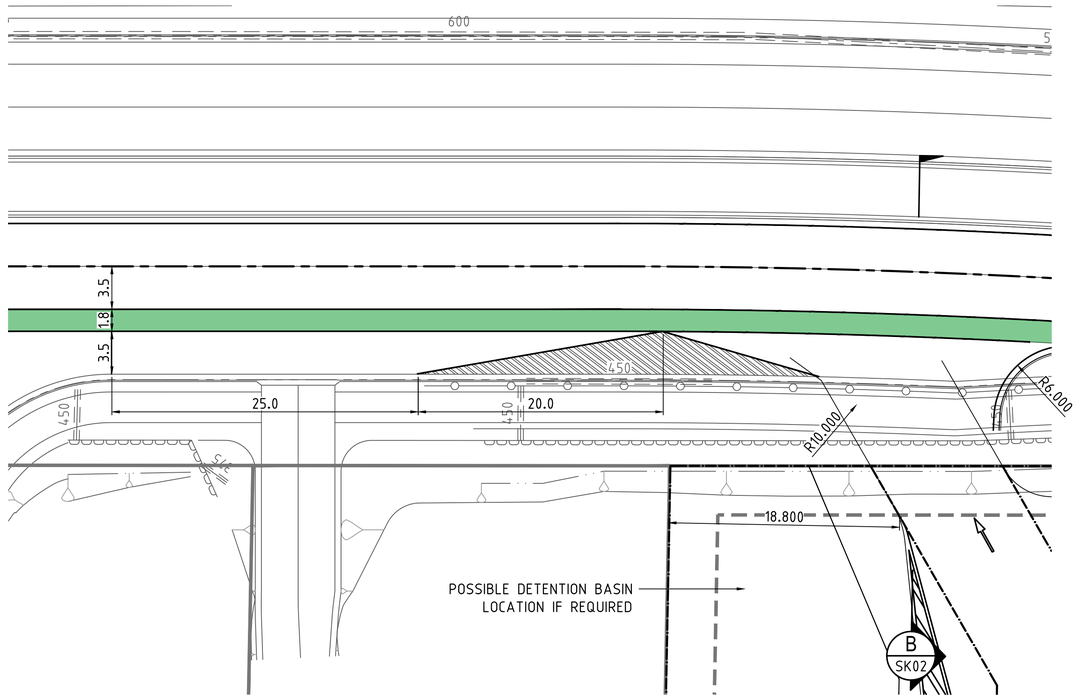
B DOUBLE VEHICLE PATH

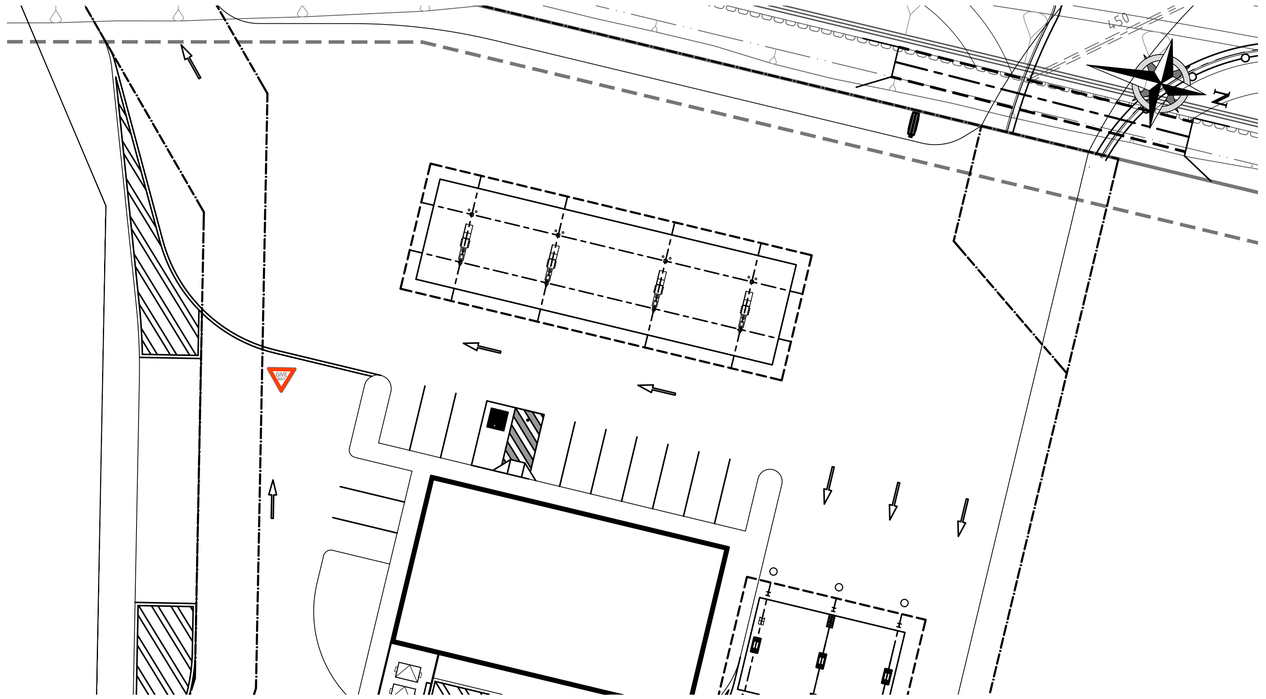
	DRAWING NUMBER	REVISION
A1	0071819-SK01	A

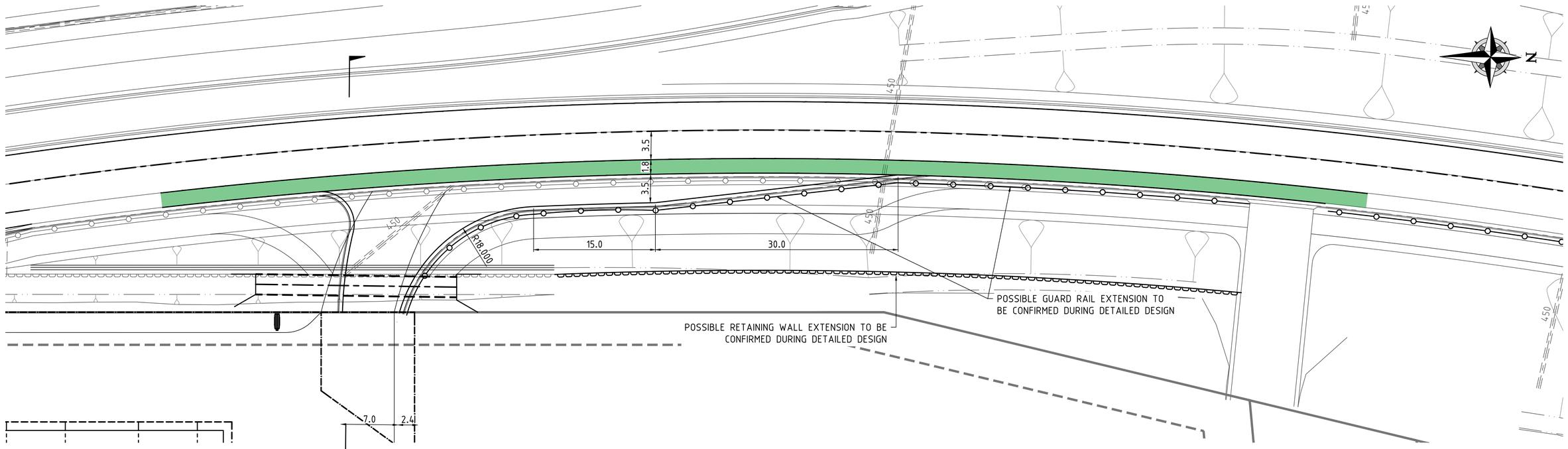
PLOT DATE: 21/11/2022 3:44:11 PM DRAWING LOCATION: Z:\ARCHIVED (PROJECT RECORDS)\18-19\007-18-19\ACAD\221121\PRELIMINARY ACCESS AND EXIT SKETCHES REV B.DWG

APPENDIX C

Bruce Highway / Site Access Intersection Upgrade Plan







5 0 5 10 15 20 25m

SCALE 1:250 @ A1 SCALE 1:500 @ A3

INFORMATION ONLY

DRAWING No.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK
		A		SUBMITTED FOR INFORMATION				

SURVEYOR

ADDRESS:

CO-ORDINATE DATUM

HEIGHT DATUM

RPEQ No:

	BY	DATE
REVIEWED		
RPEQ ENG		

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CLIENT

PROJECT TITLE PARKHURST SERVICE STATION

PRELIMINARY ENTRY AND EXIT LAYOUTS

A1

DRAWING NUMBER 0071819-SK01

REVISION A

DRAWING LOCATION: Z:\ARCHIVED_PROJECT RECORDS\18-19\007-18-19\ACAD\2211211\PRELIMINARY ACCESS AND EXIT SKETCHES REV B.DWG

PLOT DATE: 21/11/2022 3:42:48 PM

APPENDIX D

RPEQ Certification

Certification of Traffic Impact Assessment Report

Registered Professional Engineer Queensland

for

Project Title:	Parkhurst Service Station

As a professional engineer registered by the Board of Professional Engineers of Queensland pursuant to the *Professional Engineers Act 2002* as competent in my areas of nominated expertise, I understand and recognise:

- the significant role of engineering as a profession, and that
- the community has a legitimate expectation that my certification affixed to this engineering work can be trusted, and that
- I am responsible for ensuring its preparation has satisfied all necessary standards, conduct and contemporary practice.

As the responsible RPEQ, I certify:

i) I am satisfied that all submitted components comprising this traffic impact assessment, listed in the following table, have been completed in accordance with the *Guide to Traffic Impact Assessment* published by the Queensland Department of Transport and Main Roads and using sound engineering principles, and

ii) where specialised areas of work have not been under my direct supervision, I have reviewed the outcomes of the work and consider the work and its outcomes as suitable for the purposes of this traffic impact assessment, and that

iii) the outcomes of this traffic impact assessment are a true reflection of results of assessment, and that

iv) I believe the strategies recommended for mitigating impacts by this traffic impact assessment,

v) embrace contemporary practice initiatives and will deliver the desired outcomes.

Name:	Chris Hewitt	**RPEQ No:**	5141
RPEQ Competencies:	Civil		
Signature:		**Date:**	21 November 2022
Postal Address:	PO Box 2149 Wandal QLD 4700		
Email:	chris@mcmengineers.com		

Traffic impact assessment components to which this certification applies	✓
1. Introduction	
Background	✓
Scope and study area	✓
Pre-lodgement meeting notes	✓
2. Existing Conditions	
Land use and zoning	✓
Adjacent land uses / approvals	✓
Surrounding road network details	✓
Traffic volumes	✓
Intersection and network performance	N/A
Road safety issues	✓
Site access	✓
Public transport (if applicable)	N/A
Active transport (if applicable)	N/A
Parking (if applicable)	N/A
Pavement (if applicable)	N/A
Transport infrastructure (if applicable)	N/A
3. Proposed Development Details	
Development site plan	✓
Operational details (including year of opening of each stage and any relevant catchment / market analysis)	✓
Proposed access and parking	✓
4. Development Traffic	
Traffic generation (by development stage if relevant and considering light and heavy vehicle trips)	✓
Trip distribution	✓
Development traffic volumes on the network	✓
5. Impact Assessment and Mitigation	
With and without development traffic volumes	✓
Construction traffic impact assessment and mitigation (if applicable)	N/A
Road safety impact assessment and mitigation	✓
Access and frontage impact assessment and mitigation	✓
Intersection delay impact assessment and mitigation	N/A
Road link capacity assessment and mitigation	✓
Pavement impact assessment and mitigation	✓
Transport infrastructure impact assessment and mitigation	N/A
Other impacts assessment relevant to the specific development type / location (if applicable)	N/A
6. Conclusions and Recommendations	
Summary of impacts and mitigation measures proposed	✓
Certification statement and authorisation	✓

MCE
McMurtrie Consulting Engineers

Engineering reimagined.

1018-1038 Bruce Highway, Parkhurst

Flood Impact Assessment & Stormwater Management Plan

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: **D/25-2020**

Dated: **4 July 2023**

DATE
6 March 2023

REF
J20037

CLIENT
Pearl Energy Pty Ltd

COMMERCIAL IN CONFIDENCE

Engineering reimagined.

Contact Information

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Rockhampton Office
63 Charles Street
North Rockhampton, QLD 4701
www.mcmengineers.com
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mail@mcmengineers.com

Document Information

Prepared for	Pearl Energy Pty Ltd
Document Name	Flood Impact Assessment & Stormwater Management Plan
Job Reference	J20037
Revision	R1v3

Document History

Revision	Date	Description of Revision	Prepared by	Name	Signature	RPEQ No
R1v1	25/11/2022	Draft	L. Allan	L. Allan		
R1v2	29/11/2022	For Submission	L. Allan	L. Allan		
R1v3	6/03/2023	RFI Response	L. Allan	L. Allan	RPEQ 17118 2023.03.06 18:28:53 +10'00'	

Nomenclature

Abbreviation	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Aerial Laser Survey
ARI	Average Recurrence Interval
ARR	Australia Runoff and Rainfall
Council	Rockhampton Regional Council
DA	Development Application
FIA	Flood Impact Assessment
IR	Information Request
MCE	McMurtrie Consulting Engineers
MCU	Material Change of Use
RoG	Rain on Grid
SARA	State Assessment and Referral Agency
SGS	Sub Grid Sampling
SMP	Stormwater Management Plan
TMR	Queensland Department of Transport and Main Roads
WQO	Water Quality Objectives

In-line with the recent implementation of ARR (Ball, et al., 2019) design storm events are described in terms of AEP, the probability of a storm event magnitude exceeded in any given year as a percentage. This terminology was implemented to replace the ARI, of which is commonly misinterpreted, for example, that a 1 in 10 year ARI will occur exactly once in every ten years. The reference equivalency of standard design storm events are presented below:

AEP (%)	ARI (year)	Shorthand
63	1 in 1	Q1
39	1 in 2	Q2
18	1 in 5	Q5
10	1 in 9.49	Q10
5	1 in 20	Q20
2	1 in 50	Q50
1	1 in 100	Q100

Contents

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3 Pollutant Impact Assessment 9
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Appendix B: Proposed Scenario Flood Maps 20

1 Introduction

MCE has been commissioned to conduct a FIA and SMP for the proposed development of 1018-1038 Yaamba Road, Parkhurst, described as Lot 81 SP300144 (the Site) to support a MCU DA for the Site.

The site has an area of 9.849 ha and has direct road access to Yaamba Road on the site's western boundary.

The site almost entirely falls west towards Yaamba Road from a ridgeline on the site's eastern boundary and as such is almost entirely its own catchment, with some external discharge entering the site from the north-west corner as overflow from the existing stormwater channel between Longford Court and Yaamba Road to the north of the site.

The site is predominately grassed open space, with several informal tracks and a single structure in the site's north-west corner.

It is proposed to construct a new fuel station on fill within the site's south-western corner, with the remainder of the site to be developed in the future. The development of the fuel station will include diversion channels around the eastern and southern sides of the fill pad, with the southernmost channel doubling as on-site detention.

The proposed fuel station will be accessed directly from Yaamba Road, as shown in the attached reference drawings. It is noted that the lot layout included in this FIA and SMP is preliminary and likely to change.

The site is not affected by regional Fitzroy River flooding, however is affected by local Ramsay Creek flooding.

Version 3 of this report was updated to include a response to SARA and Council IR's dated 23 and 27 January 2023 respectively.

2 Flood Assessment

2.1 Methodology

The Site is situated within Council's Ramsay Creek Flood Study (AECOM, 2017) model extents, as illustrated in Figure 1. This model was obtained from Council and used as the basis of this FIA.

Council provided two key scenarios for this model:

- E2b – Existing – This model is the existing (base) scenario assessed by AECOM (2017).
- D3b – Rockhampton Northern Access Upgrade and associated Mitigation Works as per (AECOM, 2017).

Council confirmed that the D3b scenario should be used as the 'Existing/Base' scenario for this FIA.

MCE reviewed the model with respect to the Site and the proposed works and noted the following limitations that may affect the FIA:

- The Ramsay Creek model was modelled using TUFLOW (Version 2016-03-AE-DP) as a Rain-on-Grid (RoG) model;
- Considered a 3 m computational grid;
- Various 1d pipes were included, however not all pipes are based on surveyed data;
- Cut of map depth of 100 mm was applied to all cells;
- Rainfall and inflow data files were only provided for the 30, 45, 60, 90, 120 and 180 minute duration for the 1% AEP with 30, 60, 90 and 120 minute duration provided for the 2% AEP, 5% AEP, 10% AEP and 0.2% AEP with only the 120 minute duration provided for the 0.05% AEP; and
- The hydraulic model utilised lumped inflows from an XP-RAFTS model at two upstream locations, as shown on Figure 2.

2.1.1 Regional Flooding

The site is not affected by regional flooding from the Fitzroy River.

2.2 Model Revision

To rectify / reconcile these potential issues the following model changes were considered to conduct a robust FIA of the Site.

2.2.1 Hydrology

The hydrologic approach undertaken by (AECOM, 2017) was to define rainfall runoff within the study area through the application of rainfall directly onto the two dimensional hydraulic model, this method is known as Rain on Grid (RoG) using standard techniques from AR&R (Pilgrim, 1987) to determine rainfall intensities. Due to the size of the Ramsay Creek catchment, part of the upstream catchment was modelled using a conventional hydrologic model (XP-RAFTS) with lumped inflows applied to the upstream Ramsay Creek boundary within the hydraulic model.

Following discussions with Council, it was discovered that Council did not hold rainfall boundary files for all storm durations and AEP's.

IFD parameters required to determine rainfalls for events not previously modelled were sourced using a single set of parameters, derived at the location (150.500 E, 23.300 S) for Rockhampton, analogous to AECOM (2017).

It was decided to recreate the all rainfall boundary files for all AEP's from 63% to 1% for all standard durations from 5 minutes to 72 hours, including those that were already included in Council's model. This was determined due to minor rounding and significant figures differences between the original AECOM approach and the revised MCE approach.

It is noted that the XP-RAFTS model was not provided. With the site situated downstream of the lumped inflow locations, flows from these external sources may have an influence on flood levels at the site. As such, the AEP and storm durations assessed in this FIA are limited to those with available inflow files, as noted above.

Whilst the direct rainfall inflows were recreated for the 63%, 39% and 18% AEP, external inflows for these AEP's were based on the provided 10% AEP. This conservative approach was conducted as the 10% AEP external inflows do not affect the water levels within the site. Furthermore, a sensitivity assessment of the 63%, 39% and 18% AEP's using no external inflows was undertaken, confirming that these external inflows have no influence on the predicted water levels within or surrounding the site.

2.2.2 Sub Model

A sub-model of the TUFLOW hydraulic model was created due to:

- Curtailing the downstream extent of the model, as shown on Figure 2, is sufficiently downstream as to have no influence on flood levels at the Site; and to
- Provide a faster hydraulic model in order to rapidly conduct multiple design iterations efficiently.

The sub-model included the following:

- The TUFLOW sub-model adopted the latest version (2020-10-AA) with the numerical scheme updated from 'Classic' to HPC including SGS;
- The sub-model maintained a 3 m computational grid resolution, however increased resolution was added using a 1 m SGS;
- The sub-model covers the entire local catchment upstream of the Site, and includes the external Ramsay Creek lumped inflows to ensure that all areas draining to the Site as overland and creek flow in the full model continues to do so in the same manner in the sub-model;
- Hydraulic roughness of the Site was updated to be reflective of the current existing site, based on current aerial imagery.
- Curtailed model simulation time such that flood levels peaked in all AEP and durations;
- Hydraulic results cut off depth removed;
- Hydraulic impact mapping blanking of results ± 10mm;
- Revised model boundaries adopted HQ downstream boundaries, analogues with the full model; and
- The sub-model shares a common upstream boundary with the full model, north-east of the site.

It is noted that curtailing the downstream extent of the model, as shown on Figure 2, is sufficiently downstream as to have no influence on flood levels at the Site.

2.3 Flood Impact Assessment

2.3.1 Proposed Development

As part of the development, it is proposed to incorporate fill pads grading from Yaamba Road generally east towards the rear of the proposed development. This runoff will be directed to a bio-retention basin and drainage channels, as shown on Figure 6 and within Appendix B. The fill pads are currently assumed to have a minimum 1% longitudinal fall.

Table 1 details the proposed channel dimensions, as shown on Figure 6. Figure 4 shows the topographic difference between the existing scenario and the purposed development of the Site, with Figure 5 illustrating the hydraulic roughness.

TABLE 1: CHANNEL PROPERTIES

Channel ID	Longitudinal Grade (%)	Base Width (m)	Side Batter
East	0.5	3	1 in 4
South (Basin)	0.5	15	1 in 4
West (Table Drain)	0.5	4	1 in 4

The southern channel doubles as a detention basin providing attenuation of the increased runoff from the proposed development, with 4/0.6 m RCP culvert outlet directly to the table drain between the site and Yaamba Road. Hydraulic characteristics of the detention basin are included in Table 2 below.

The proposed site includes two driveways to access the site, each with a single 1.2 m x 0.9 m RCBC, as shown on Figure 6.

TABLE 2: BASIN HYDRAULIC CHARACTERISTICS

AEP (%)	Pipe Discharge (m^3/s)	Weir Discharge (m^3/s)	Depth (m)	Volume (m^3)
63	1.06	0.03	0.54	481
39	1.52	0.02	0.65	653
18	1.99	0.11	0.83	920
10	2.16	0.52	0.88	1009
5	2.26	1.27	0.96	1131
2	2.25	2.08	1.02	1244
1	2.25	2.50	1.07	1318

2.3.2 Results

It is noted that with direct rainfall and RoG hydraulic models all cells are wet, often with very low depths, making it difficult to properly convey hydraulic impacts within a FIA. For instance, if the topography of the underlying cell is changed (increased or decreased due to fill or cut), the flood depths may not necessarily change significantly, however the difference in flood level can appear to be significant even though the relative flood depth in both scenarios may be similar. It is for his reason that both flood level and depth impacts are used to demonstrate no adverse impacts.

Likewise, RoG hydraulic models, with all cells being wet often show disconnected 'pockets' of 'flooding, depending on the chosen cut off depth. This can sometimes also result in isolated hydraulic impacts that may or may not be correct, and may be considered numerical noise of no significance. For this reason, no cut-off depth was used in this FIA.

Appendix B contains consolidated flood level/depth difference figures along with velocity difference figures for all AEP's and generally show that the proposed site can occur without causing any actionable increase in flood levels external to the Site.

The proposed stormwater channels within the site are anticipated to be grass lined with vegetated batters.

3 Pollutant Impact Assessment

The proposed development exceeds 2,500m², and as such, water quality assessment benchmarks set out in State Planning Policy (DILGP, July 2017) are applicable.

To ensure the development can comply with applicable WQO, a pollutant impact assessment was conducted using MUSIC (Version 6.3).

Lumped industrial pollutant generation parameters were implemented in accordance with the MUSIC Modelling Guidelines (WaterbyDesign, 2018) with sub-catchment properties listed in Table 3 below.

The Rockhampton AERO (Station Number 039083) meteorological data for the 10-year period from 1st January 1980 to 31st December 1989 with a 6-minute time step.

TABLE 3: MUSIC CATCHMENT PROPERTIES

Land Use	Area (ha)	Impervious (%)
Industrial	0.701	90
East Open Space	0.286	0
West Open Space	0.027	0

3.1 Proposed Treatment Train

In order to achieve the applicable WQO, a bio-retention system is proposed, as detailed in Table 4.

TABLE 4: PROPOSED TREATMENT TRAIN

Parameter	Bioretention
Filter and surface area (m²)	100
Extended detention depth (m)	0.3
Filter depth (m)	0.5
Saturated hydraulic conductivity (mm/hour)	200
Total Nitrogen content of filter media (mg/kg)	400
Orthophosphate content of filter media (mg/kg)	40
Exfiltration rate (mm/hour)	0
Overflow weir (m)	2

It is noted that whilst this assessment only considered the sizing of an above ground bio-retention system. The proposed stormwater channels along the site's northern boundary and centrally located within the site will be vegetated and further contribute to the site's overall water quality treatment.

The bio retention basin location is indicatively shown on Figure 6. It is also noted that the lot layout shown is indicative and subject to change, however generally will not affect the outcomes of this assessment.

3.2 Results

Table 5 below presents the MUSIC results indicating compliance with applicable WQOs.

TABLE 5: MUSIC RESULTS

Parameter	Sources	Residual Load	% Reduction	WQO
Flow (ML/year)	4.5	4.3	5.3	-
Total Suspended Solids (kg/year)	831	117	85.9	85
Total Phosphorus (kg/year)	1.32	0.46	65.1	65
Total Nitrogen (kg/year)	9.72	4.64	52.2	45
Gross Pollutants (kg/year)	113	0	100	90

Whilst not explicitly sized or calculated in this SMP, the proposed Fuel and Service Station component of the site will incorporate a suitable oil/grease/petroleum separator and the Fuel Service area will be bunded to capture any spills and direct them to this underground device.

4 Erosion and Sediment Control

4.1 Construction Phase

During construction phase of the development, disturbances to the existing ground has the potential to increase sediment loads entering downstream drainage systems and watercourses. Table 6 details the key construction phase pollutants identified for this development.

TABLE 6: CONSTRUCTION PHASE KEY POLLUTANTS

Pollutant	Sources
Litter	**Paper, construction packaging, food packaging, cement bags, material off cuts.**
Sediment	**Exposed soils and stockpiles during earthworks and building works.**
Hydrocarbons	**Fuel and oil spills, leaks from construction equipment and temporary car park areas.**

ESC devices employed on the site shall be designed and constructed in accordance with Council's guidelines.

PRE-CONSTRUCTION

- Stabilise site access on (Yaamba Road);
- Sediment fences to be located along the eastern and southern boundaries of the site and around all works;
- Protect the existing stormwater outlets along the site's western boundary;
- Where practical, minor diversion drains along the eastern and southern boundaries of the site may be utilised to divert clean water from around the construction site; and
- Educate site personnel to the site's erosion and sediment control requirements.

CONSTRUCTION

- Maintain construction access/exit, sediment fencing, catch drains and all other existing controls as required;
- Progressively surface and revegetate finished areas as appropriate;
- During construction, all areas of exposed soils allowing dust generation are to be suitably treated. Treatments may include mulching the soil and watering;
- Road access is to be regularly cleaned to prevent the transmission of soil on vehicle wheels and eliminate any build-up of typical road dirt and tyre dusts from delivery vehicles;
- Provide and maintain adequate waste disposal facilities on the site to cater for all waste materials such as litter hydrocarbons, toxic materials, acids or alkaline substances; and
- The proposed bioretention/detention basin can be arranged as a sediment basin during construction to ensure appropriate erosion and sediment controls are met.

5 Response to Information Request

5.1 SARA IR

On 23 January 2023 issued an IR (ref 2301-32776 SRA). A response to this IR is included herein.

STATE-CONTROLLED ROAD

Issue:
The Flood Impact Assessment and Stormwater Management Plan, prepared by McMurtrie Consulting Engineers, dated 29 November 2022, reference J20037, revision R1v2, does not adequately details the stormwater quantity impacts of the development onto the state-controlled road network.

Action:
To demonstrate compliance with Performance Outcomes 8 to 12 of the State Development Assessment Provisions (SDAP) State code 1: Development in a state-controlled road environment, provide the following information:
1) Catchment plans, peak flows, impervious / pervious areas, time of concentrations in both pre-developed and post-developed scenarios.
2) Survey, earthworks and erosion and sediment control plans.
3) Additional details on the proposed detention basin including the volume, shape and size, outlet control mechanisms, cross sectional details, storage depth, freeboard allowances and so on.

It is noted that a Catchment plan was not previously provided as the hydraulic model used for this assessment is a Rain on Grid model, as used in the recent Yaamba Road upgrade by TMR. However, Figure 3 illustrates the local catchment extent, with hydraulic roughness land use illustrated on Figure 5.

Ground survey for the site is yet to be undertaken, and will be conducted prior to detailed design.

Erosion and sediment control plans will be prepared as part of detailed design, with preliminary details in Section 4.

The detention basin size and shape is illustrated on Figure 6, with basin volumes detailed in Section 2.3.1.

5.2 Council IR

On 27 January 2023 issued an IR (ref D/25-2020). A response to flooding and stormwater items of this IR is included herein.

1. STORMWATER MANAGEMENT REQUIREMENTS

1.1 Provide a complete stormwater quality assessment report including the MUSIC model assessment to support the application in accordance with State Planning Policy 2017 for Water Quality. Please also provide a digital copy of the MUSIC model to Council for review.

Section 3 of this report contains details of the MUSIC assessment. The MUSIC model will be provided with this response.

1.2 PROVIDE ADDITIONAL INFORMATION REGARDING SUPPLIED FLOOD REPORT.

1.2.1 It is understood that Council supplied rainfall data, which did not include the more frequent events such as the Q2 (39% AEP) and Q5 (18% AEP) events. However, it is the Applicant's responsibility to also provide data for these more frequent events. Please provide the model outcomes for the more frequent events (39% AEP and 18% AEP) to satisfy this requirement.

As noted in Section 2.2.1 the rainfall files were created for the missing events (63%, 39% and 18% AEP) with results included in Appendices A and B for the existing and proposed scenarios respectively.

1.2.2 Confirm the fully developed upstream catchment scenario has been adopted within the RNAU flood model. Please also confirm that the final development site levels including cut/fill has been adopted for the RNAU flood model

The RNAU model, as provided by Council, was adopted for this FIA.

1.2.3 Confirm the freeboard adopted for the proposed development.

Due to the nature of direct rainfall models, all grid cells are wet with some depth of water throughout the simulation. However, generally the fill pad has been lifted above the 1% AEP flood levels within the adjacent channels and drains. The fill pad itself has been provided a minimum grade of 1% to limited ponding depth across the proposed fill pad.

Further details of the fill pad, grading, batters and drainage infrastructure will be provided as part of the detailed design of the site.

1.2.4 Indicate the changes applied to the RNAU flood model to reflect the proposed development including changed-in model parameters.

Section 2.1, 2.2.1 and 2.2.2 summarise the changes made to the RNAU flood model.

1.2.5 Provide the full digital TUFLOW model including the changes to Council for review and record

Model files will be included with this response.

1.2.6 Provide the appropriate Registered Professional Engineer of Queensland (RPEQ) certification/signature for the Flood report

This report has been prepared and authored by a RPEQ.

1.2.7 It is noted that some afflux will occur within the Yaamba Road reserve, which is a State controlled road. Please confirm whether applicant has engaged with the Department of Transport and Main Roads in this regard

SARA have separately provided an IR for this site.

It is noted, however, that the afflux within the Yaamba Road reserve is contained to existing table drains that are collocated within the subject site and the road reserve.

1.3 PROVIDE DETENTION BASIN ENGINEERING DETAILS AS BELOW:

1.3.1 Volume, shape and size of the detention basin.

The detention basin is illustrated on Figure 6, with basin hydraulic characteristics detailed in Section 2.3.1.

1.3.2 Low flow and high flow discharges from the basin.

The detention basin is illustrated on Figure 6, with basin hydraulic characteristics detailed in Section 2.3.1.

1.3.3 Cross section of the detention basin including outlets details;

The basin has a typical trapezoidal cross-sectional shape, with an 18 m base and 1:4 side batters. The basin has a longitudinal grade of 0.5% to promote free drainage.

The overflow weir is situated 0.8m above the invert of the outlet pipe (approximately 27.3 mAHD).

1.3.4 Depth and freeboard details; and

The detention basin is illustrated on Figure 6, with basin hydraulic characteristics detailed in Section 2.3.1.

1.3.5 How the flows from the proposed development will be discharged to the detention basin.

It is anticipated that the proposed development will include an internal stormwater pipe network that will discharge frequent flows directly to the detention basin.

The fill pad itself will be graded towards the detention basin, with flows exceeding the pipe capacity discharging from the fill pad down a protected batter to the detention basin.

Specific details of this arrangement will be considered during detailed design.

1.4 Provide cut-off drain details and commentary regarding the detention basin's ability to accommodate the upstream developed catchment for the defined flood event (1%AEP)

As illustrated on Figure 3, the upstream catchment is entirely the balance of the site.

A small drain is proposed along the eastern boundary of the proposed development. This drain will allow flows from the future development of the balance of the site to be conveyed to the detention basin.

As the balance of the site is further developed, additional DA's will be required to assess the stormwater detention requirements of the balance of the site.

1.5 Demonstrate how the flows from developed upstream catchment will be accommodated within the development site.

Note: Council believes the proposed stormwater easement (Easement E) must be extended to the boundary of Yaamba Road to facilitate unrestricted flow through the site.

The future upstream catchment, as shown on Figure 3, is the balance of this site. As the balance of the site is further developed, additional DA's will be required to assess the stormwater detention requirements of the balance of the site.

1.6 The proposed detention basin/Bio Basin must be completely outside of the existing sewerage easement.

The location of existing underground services will be confirmed with ground survey, yet to be undertaken.

1.7 Confirm whether the fuel dispensing area will be drained into the stormwater detention basin or sewerage network.

Fuel dispensing areas (indicatively shown on Figure 6) will be pre-treated with oil-grease separators (such as SPEL Puraceptor or Ocean Protect ESK type devices) before discharge to the stormwater network.

6 Conclusion & Qualifications

MCE has been commissioned to conduct a FIA and SMP for the proposed development of 1018-1038 Yaamba Road, Parkhurst, described as Lot 81 SP300144 (the Site) to support a MCU DA for the Site.

The analysis and overall approach was specifically catered for the particular project requirements, and may not be applicable beyond this scope. For this reason any other third parties are not authorised to utilise this report without further input and advice from MCE.

The report is based on the following information provided by others:

- Ramsay Creek hydraulic model (AECOM, 2017) provided by Council.

The accuracy of the report is dependent upon the accuracy of this information.

Whilst this report accurately assesses catchment hydraulic performance, using industry standard theoretical modelling techniques and engineering practices, actual future observed catchment flows, levels and extent of inundation may vary from those predicted herein. It is for this reason that flood freeboards should be adopted.

7 References

AECOM. (2017). *Limestone Creek Local Catchment Study Baseline Flooding and Hazard Assessment - Volume 1.* Rockhampton: AECOM Australia Pty Ltd.

AECOM. (2017). *Ramsay Creek Local Catchment Study Baseline Flooding and Hazard Assessment - Volume 1.* Rockhampton: AECOM Australia Pty Ltd.

AECOM. (2017). *Rockhampton Northern Access Upgrade - Parkhurst Drainage Strategy - Norman Road Open Channel Design.* Rockhampton: AECOM Australia Pty Ltd.

AIDR. (2017). *Australian Disaster Resilience Guideline 7-3 Flood Hazard.* Australian Institute for Disaster Resilience, Commonwealth of Australia Attorney-General's Department. Australian Institute for Disaster Resilience, on behalf of the Australian Government Attorney-General's Department.

Ball, J., Babister, M., Nathan, R., Weeks, W., Weinmann, E., Retallick, M., & Testoni, I. (Eds.). (2019). *Australian Rainfall and Runoff: A Guide to Flood Estimation.* Commonwealth of Australia (Geoscience Australia).

DILGP. (July 2017). *State Planning Policy.* Department of Infrastructure, Local Government and Planning.

IPWEAQ. (2016). *Queensland Urban Drainage Manual – Forth Edition.* Institute of Public Works Engineering Australasia, Queensland.

Pilgrim, D. H. (Ed.). (1987). *Australian Rainfall & Runoff – A Guide to Flood Estimation – Volume 1.* The Institution of Engineers, Australia.

WaterbyDesign. (2018, November). MUSIC Modelling Guidelines.

Reference Drawings

THIS DRAWING PACKAGE IS FOR **D.A. PURPOSES ONLY** AND IS **NOT** TO BE USED FOR TENDER PURPOSES.
ALL DESIGN COMPONENTS ARE SHOWN INDICATIVE ONLY AND ARE SUBJECT TO FINAL DESIGN DURING DETAILED DESIGN BY THE RESPECTIVE CONSULTANT.
ANY PRICING BASED UPON THE DETAILS SHOWN IN THESE DRAWINGS ARE COMPLETELY AT THE **RESPONSIBILITY OF THE TENDERER.**
VERVE BUILDING DESIGN CO SHALL NOT BE HELD RESPONSIBLE FOR ANY REQUIRED CHANGES OR UPDATES TO THE DESIGN, POST D.A. THAT ARE PRICE IMPACTED.

LEGEND	
LP-E	LIGHT POLE, EXISTING.

PRELIMINARY
THIS DRAWING IS NOT FOR CONSTRUCTION

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2. ALL DIMENSIONS MEASURED FROM FINISHED GROUND FLOOR LEVEL UNLESS NOTED OTHERWISE
3. ALL SIGNAGE INCLUDING LOCATIONS AND HEIGHTS ARE SUBJECT TO A SEPARATE SIGNAGE APPLICATION AND APPROVAL BY LOCAL AUTHORITY
4. LANDSCAPING IS SHOWN FOR "ARTIST IMPRESSION" PURPOSES ONLY. REFERENCE SHOULD BE MADE TO THE LANDSCAPE DRAWINGS PREPARE BY THE RELEVANT CONSULTANT.

PROPERTY DESCRIPTION

RPD: LOT 81 ON SP300144
COUNCIL: ROCKHAMPTON REGIONAL

DEVELOPMENT ASSESSMENT

DEVELOPMENT SITE AREA	- 10,000m²
LANDSCAPED AREA	- 2,950m²
SITE COVER (INCLUDES ALL ROOFED AREAS)	- 8.43%

IMPERVIOUS AREAS

EXISTING	- 0m²
PROPOSED	- 7,050m²

BUILDING AREAS

T1 - SERVICE STATION	- 350m²

EXTERNAL STRUCTURES

CAR FUEL FORECOURT (UNENCLOSED BUILDING FOOTPRINT)	- 335m²
TRUCK FUEL FORECOURT (UNENCLOSED BUILDING FOOTPRINT)	- 158m²
T1 REFUSE ENCLOSURE	- 26m²

CAR PARKING

PARKING REQUIRED	- 14
PARKING PROVIDED	- 14
CAR REFUELING POSITIONS	- 8
TRUCK REFUELING POSITIONS (DOUBLE SIDED REFUELING)	- 2

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2. SCHEDULED RATES AND AREAS ARE INTENDED FOR ASSISTANCE ONLY. NO RESPONSIBILITY IS TAKEN FOR THE ACCURACY OF QUANTITIES
3. ANY DISCREPANCIES IN SCHEDULES SHOULD BE IDENTIFIED TO THE AUTHOR NOTED
4. ALL AREAS ARE GROSS AREAS, UNLESS NOTED OTHERWISE

CONSULTING ENGINEER

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imagine ▫ create ▫ deliver

▫ commercial / industrial / retail
▫ fast food restaurant design
▫ travel centre / service station
▫ project concept to completion

Revision and approvals					
Rev	Date	Drn	Description	App	
P1	29.11.2022	TM	PRELIMINARY ISSUE	GH	

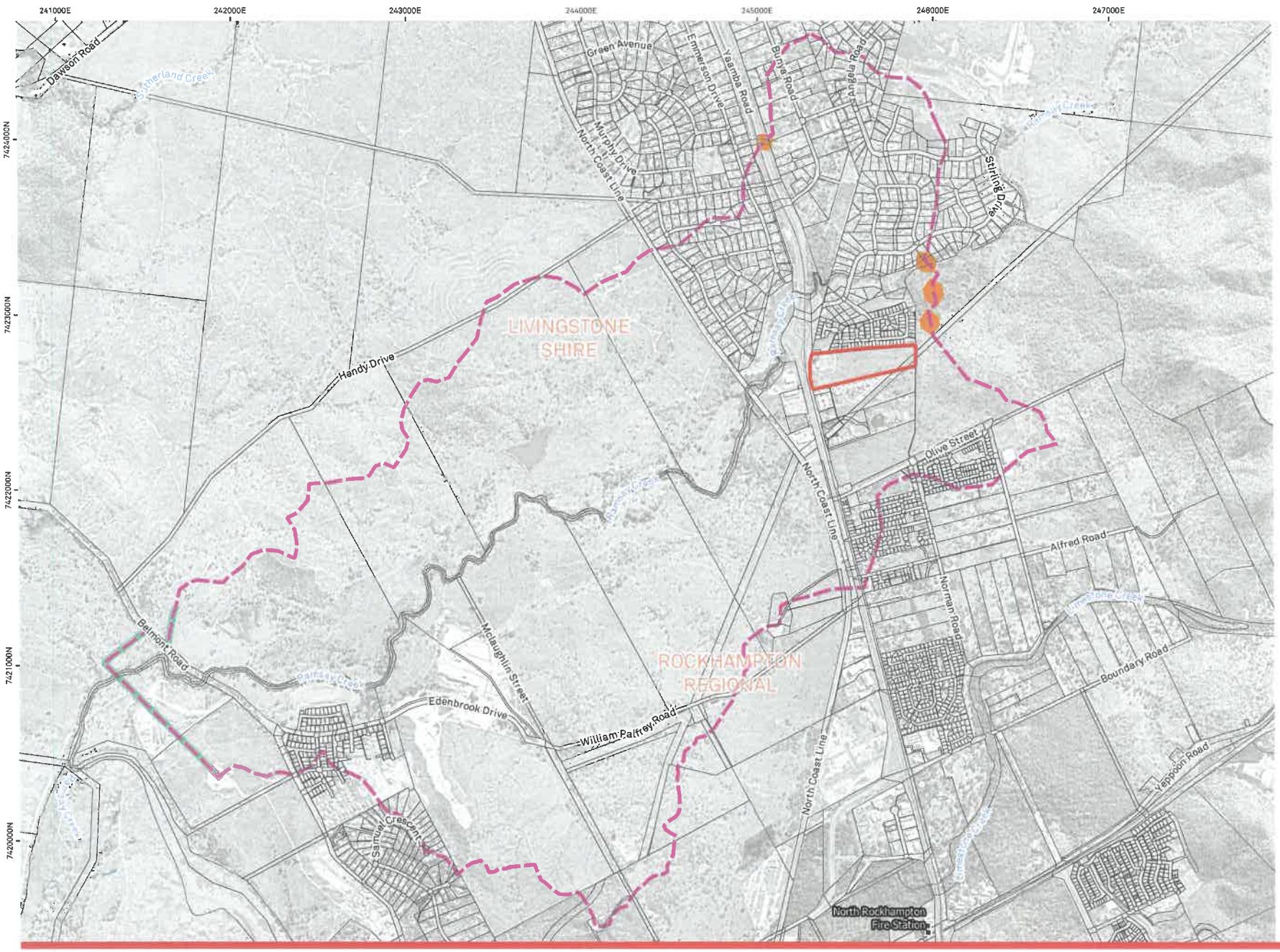
Project Description: **PROP. SERVICE STATION DEVELOPMENT**
1818 BRUCE HIGHWAY, PARKHURST

Drawing Title: **DEVELOPMENT SITE PLAN**

Scale @A1	Date	Job Number - Drawing Number	Revision
As indicated	SEPT 2022	22175 DA01	P1
Drawn: TM	Approved By: GH		

Figures

Figure 1 – Site Location and Full Model Extents
Figure 2 – Sub-Model Extents
Figure 3 – Local Catchment
Figure 4 – Topography Difference
Figure 5 – Hydraulic Roughness and Land Use
Figure 6 – Conceptual Stormwater Management Plan

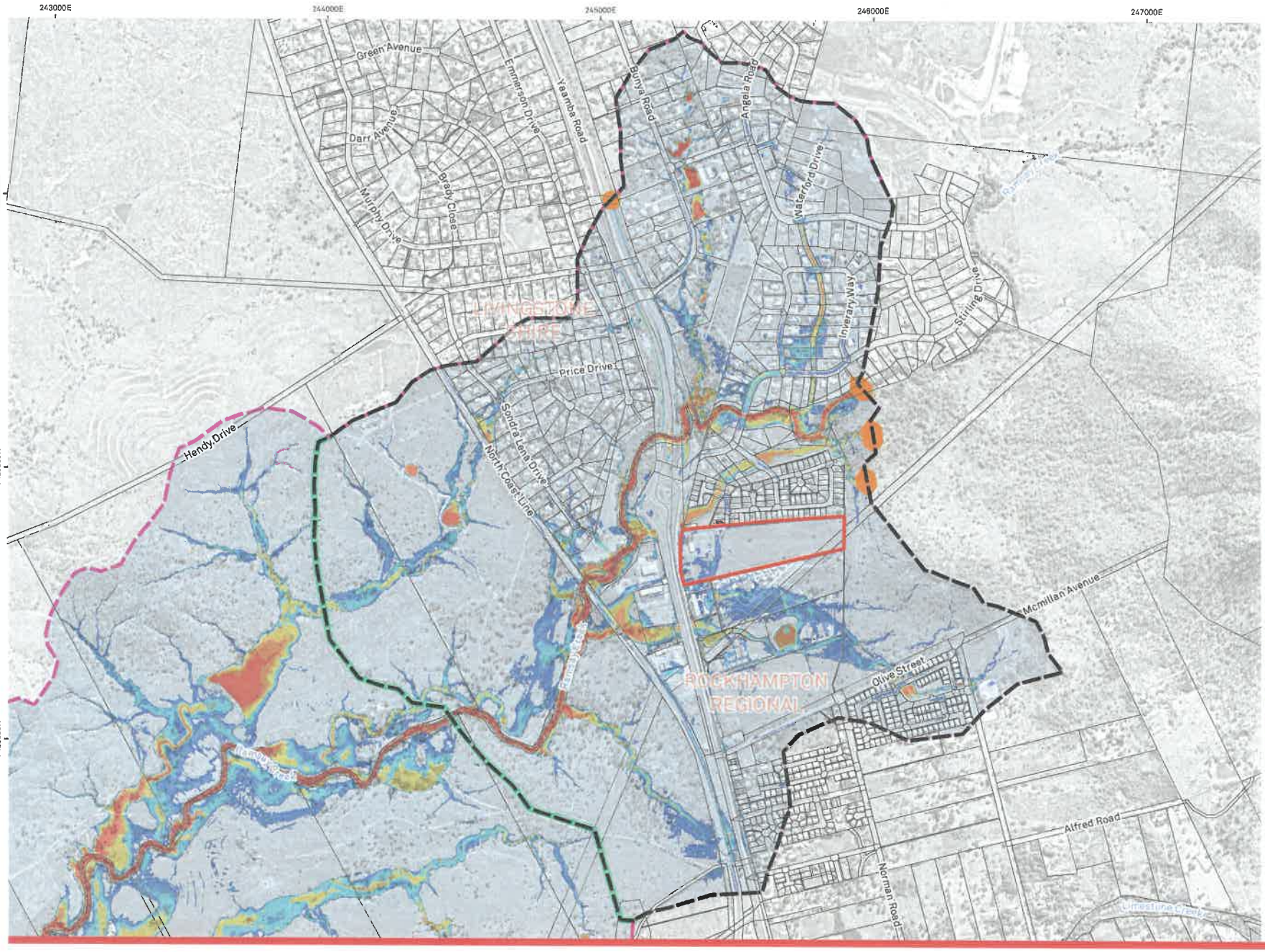


McMurtrie Consulting Engineers

DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:21,000

0 500 1,000 1,500 2,000 2,500 m

FIGURE 1
SITE LOCATION & RAMSAY CREEK MODEL EXTENT
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



McMurtrie Consulting Engineers

DATE 06 March 2023

REFERENCE J20037

SIZE A3

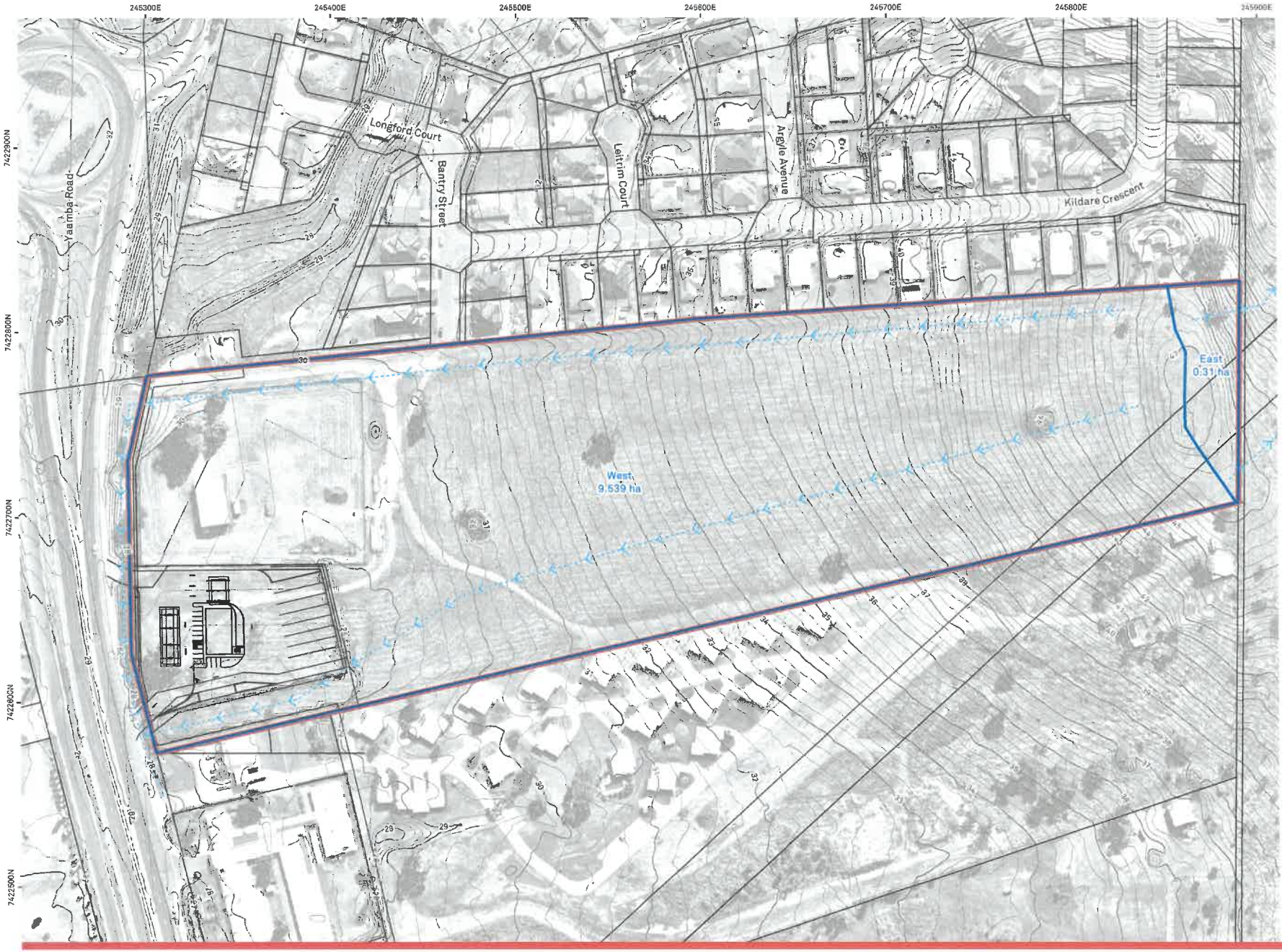
SCALE 1:13,500

0 300 600 900 1,200 1,500 m

FIGURE 2

SUB-MODEL EXTENT & 1% AEP FLOOD DEPTH (D3b Scenario - Full Model)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 06 March 2023
SIZE A3
REFERENCE J20037
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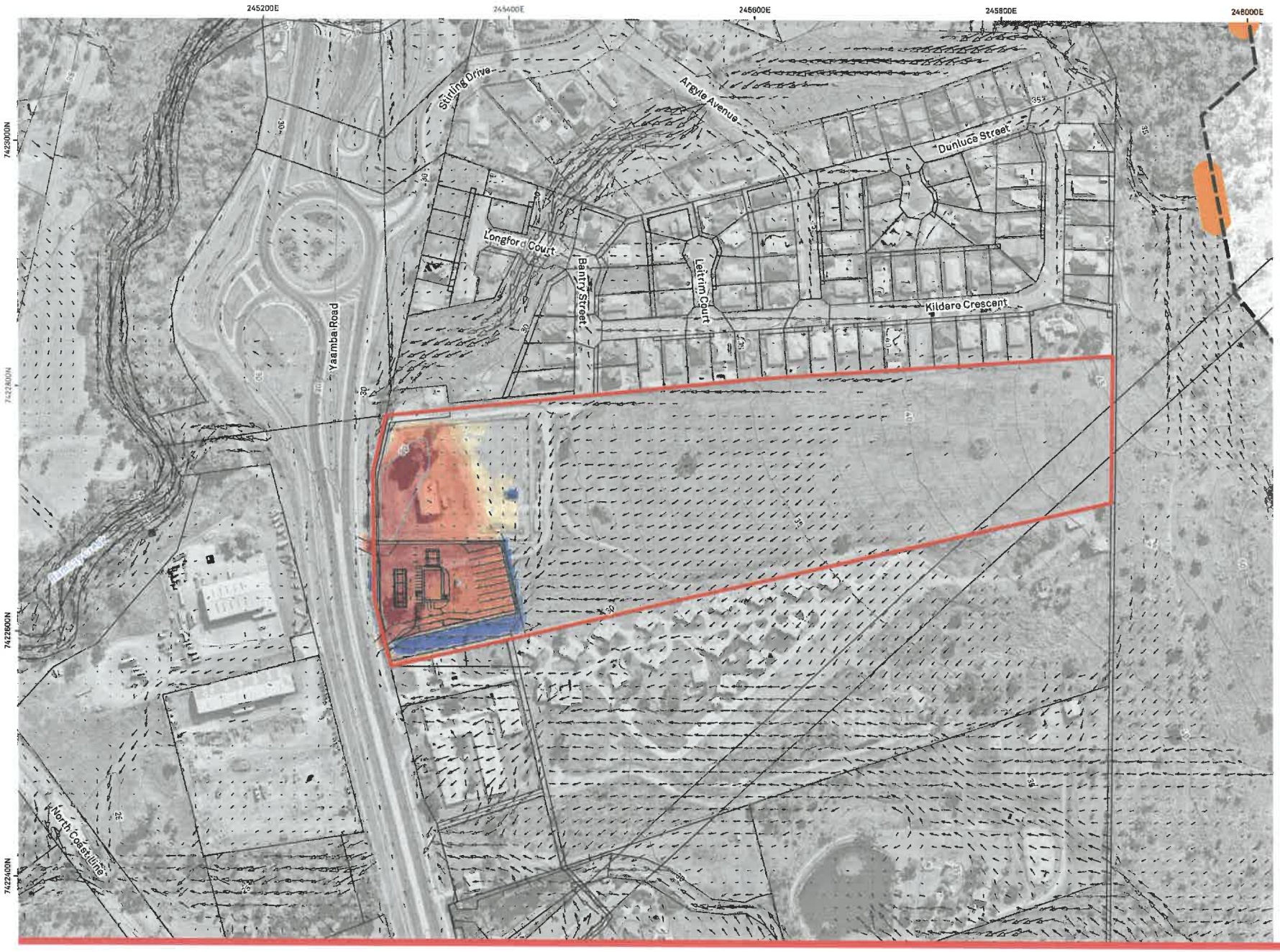
FIGURE 3
LOCAL CATCHMENT

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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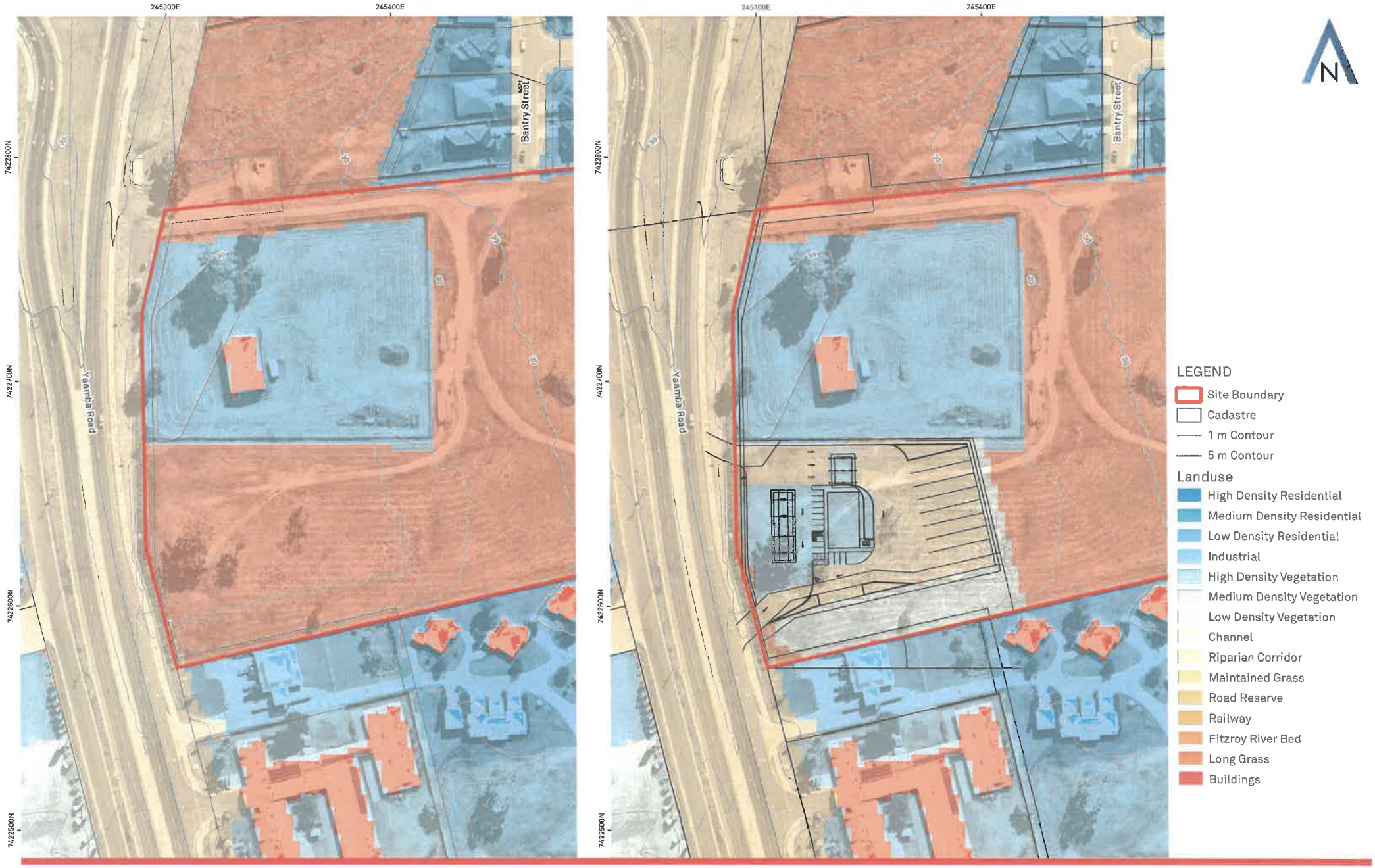
DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE 4

LOCAL CATCHMENT 1% AEP TOPOGRAPHY DIFFERENCE (DE06f-EX01)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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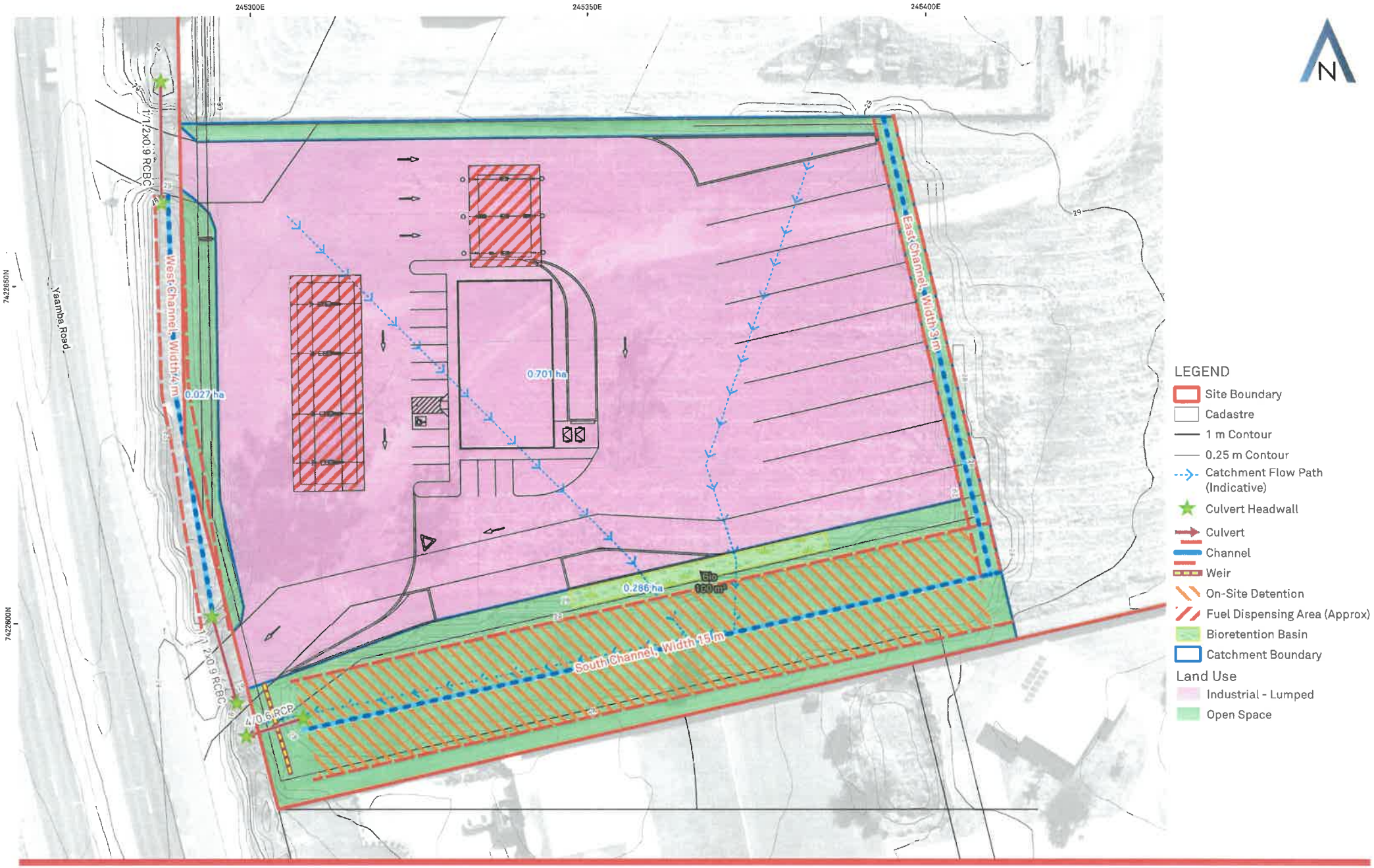
DATE 06 March 2023
REFERENCE J20037
SIZE A3
SCALE 1:1,500

0 30 60 90 120 150 m

FIGURE 5
HYDRAULIC ROUGHNESS & LANDUSE

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:500

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FIGURE 6
CONCEPTUAL STORMWATER MANAGEMENT PLAN

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

Appendix A: Existing Scenario Flood Maps

A-1: 63% AEP

A-2: 39% AEP

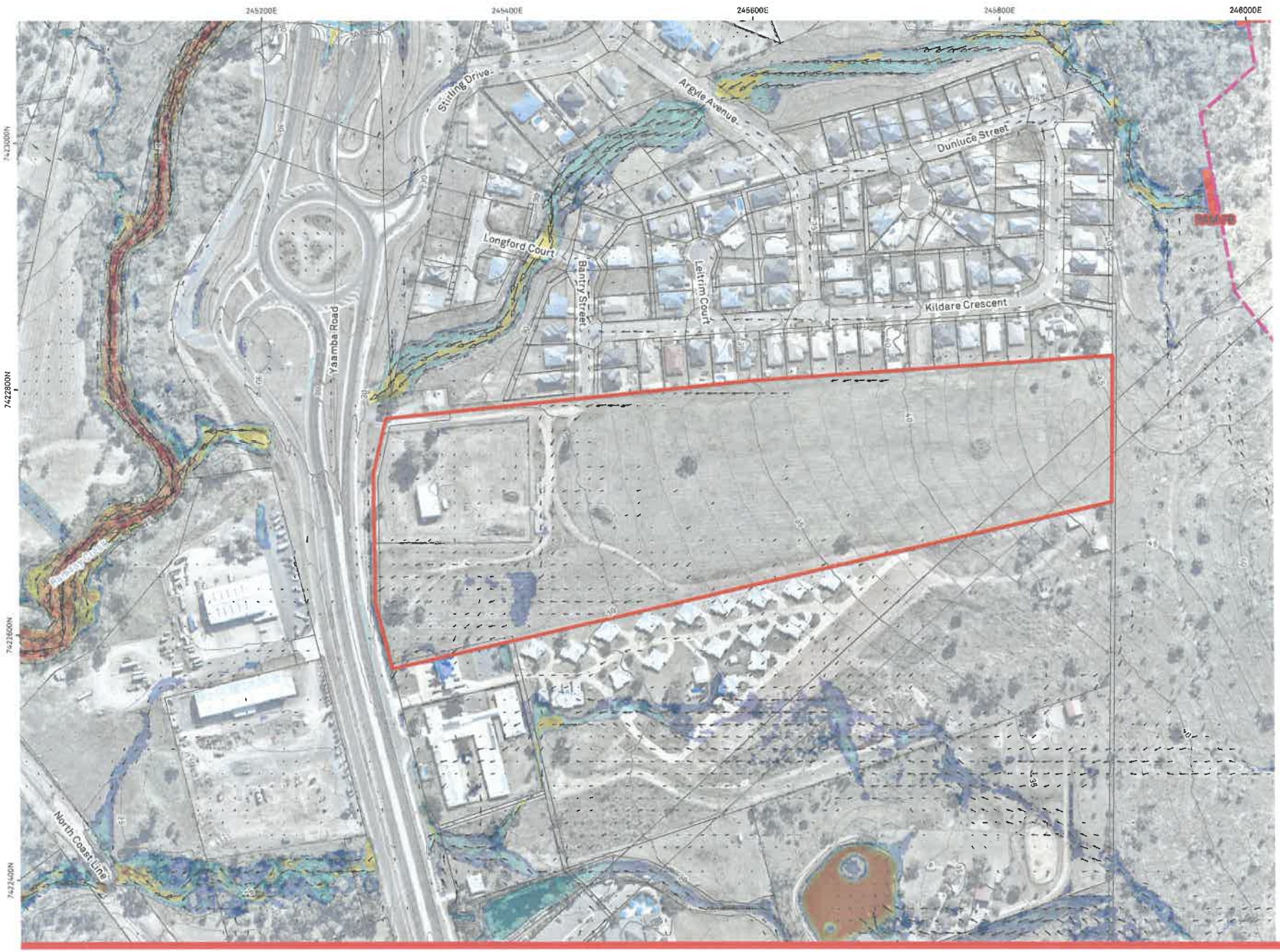
A-3: 18% AEP

A-4: 10% AEP

A-5: 5% AEP

A-6: 2% AEP

A-7: 1% AEP

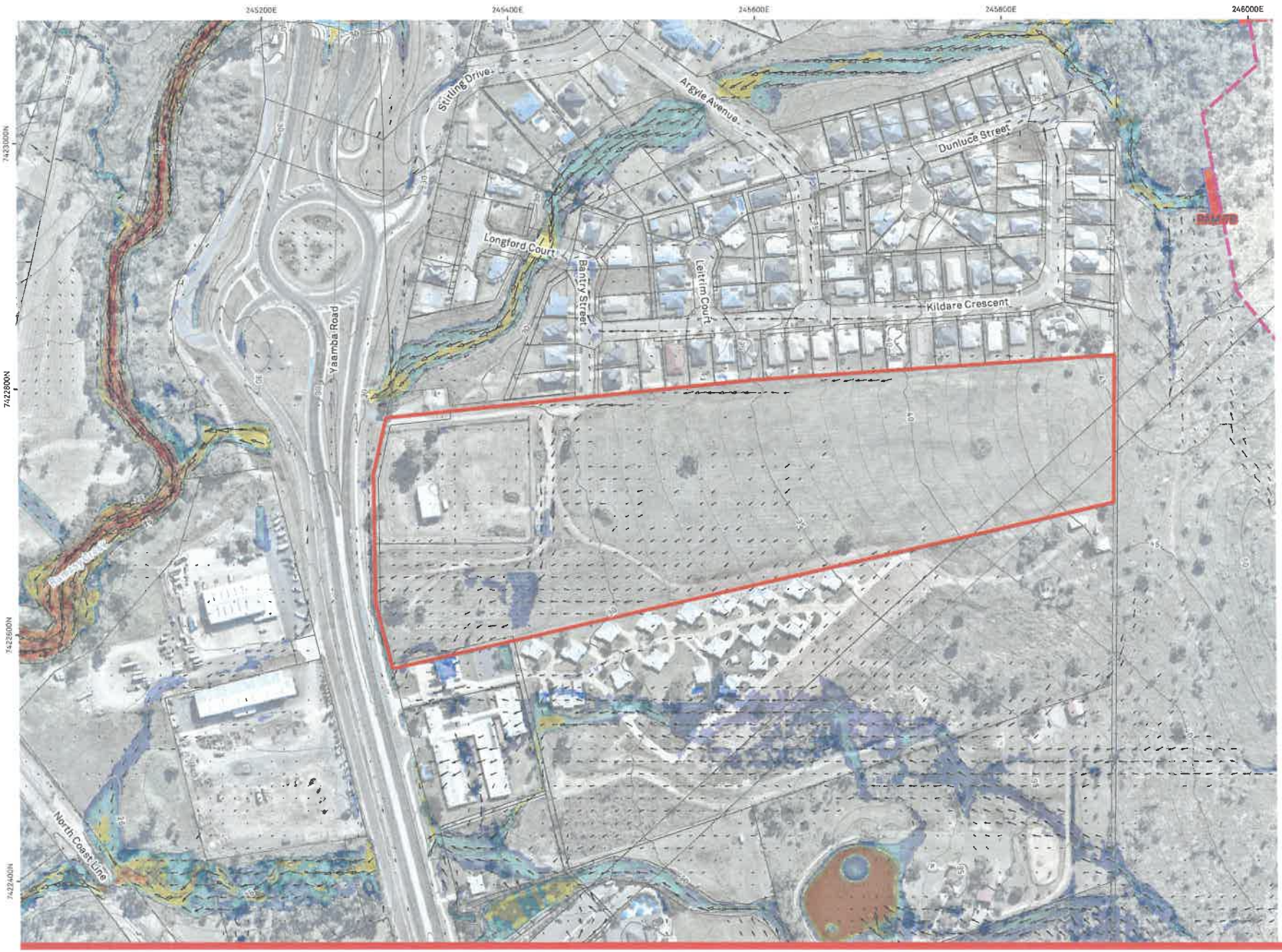


McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.1.1
LOCAL CATCHMENT 63% AEP FLOOD DEPTH (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

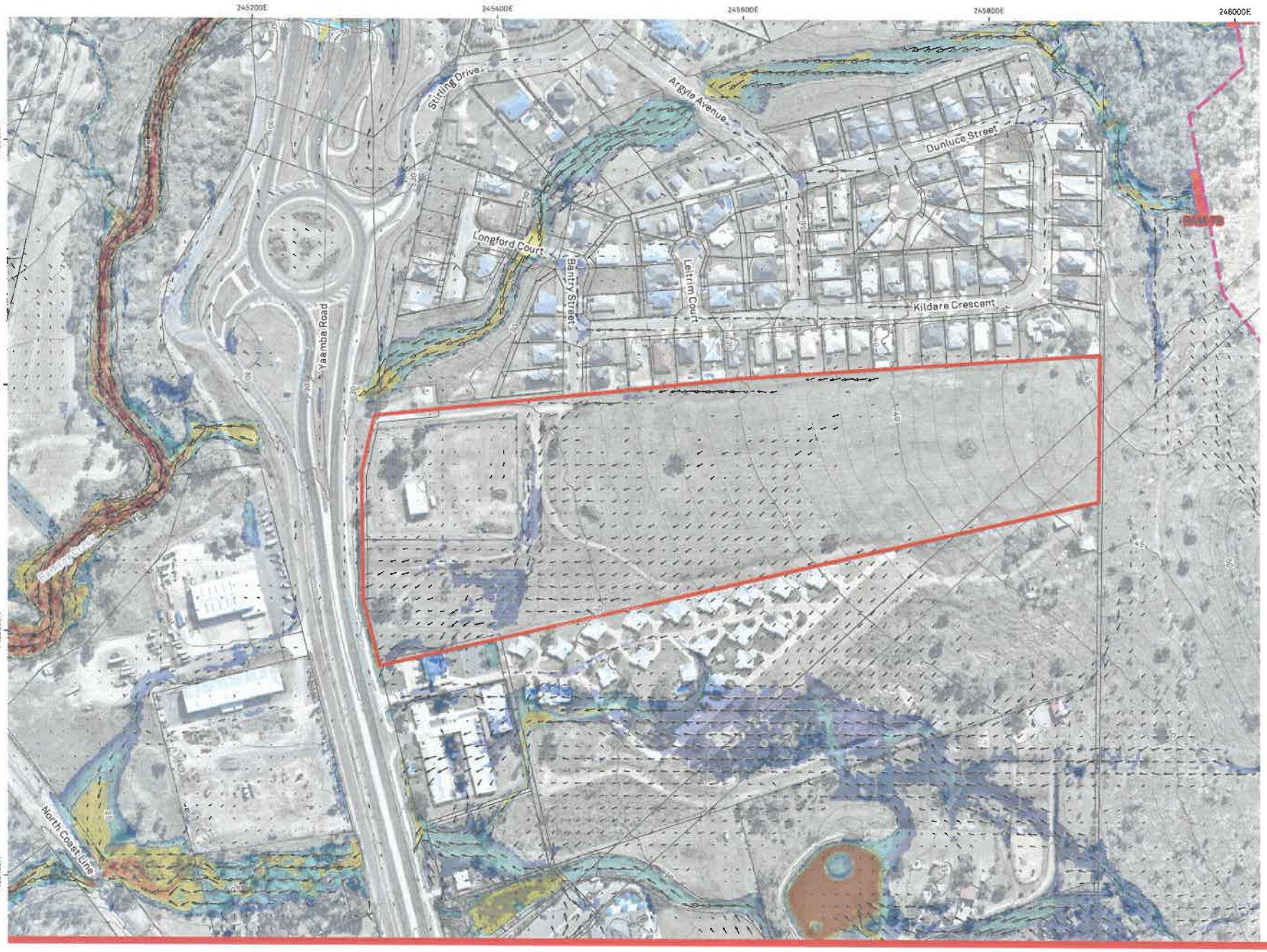


McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.2.1
LOCAL CATCHMENT 39% AEP FLOOD DEPTH (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

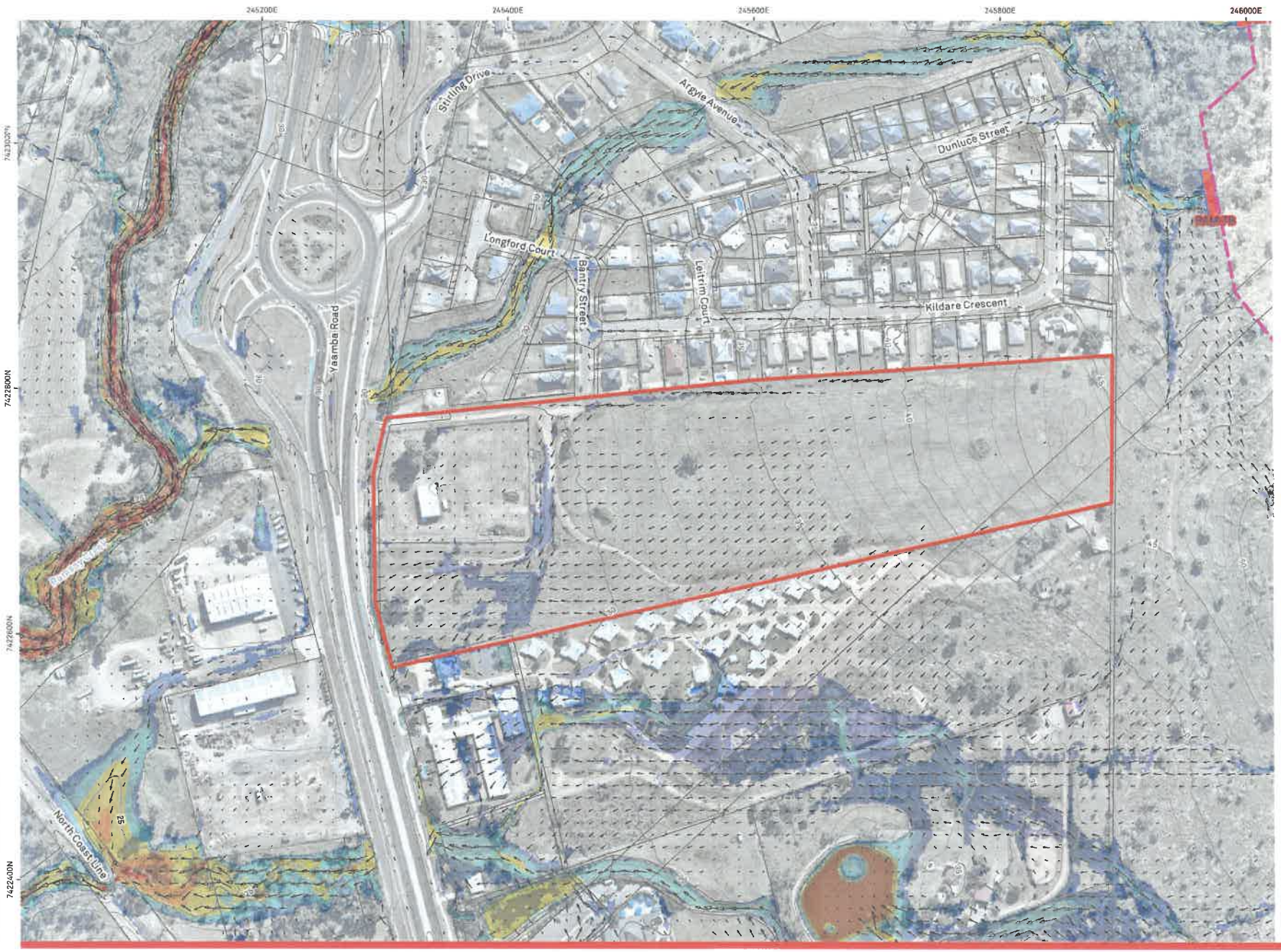


McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.3.1
LOCAL CATCHMENT 18% AEP FLOOD DEPTH (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



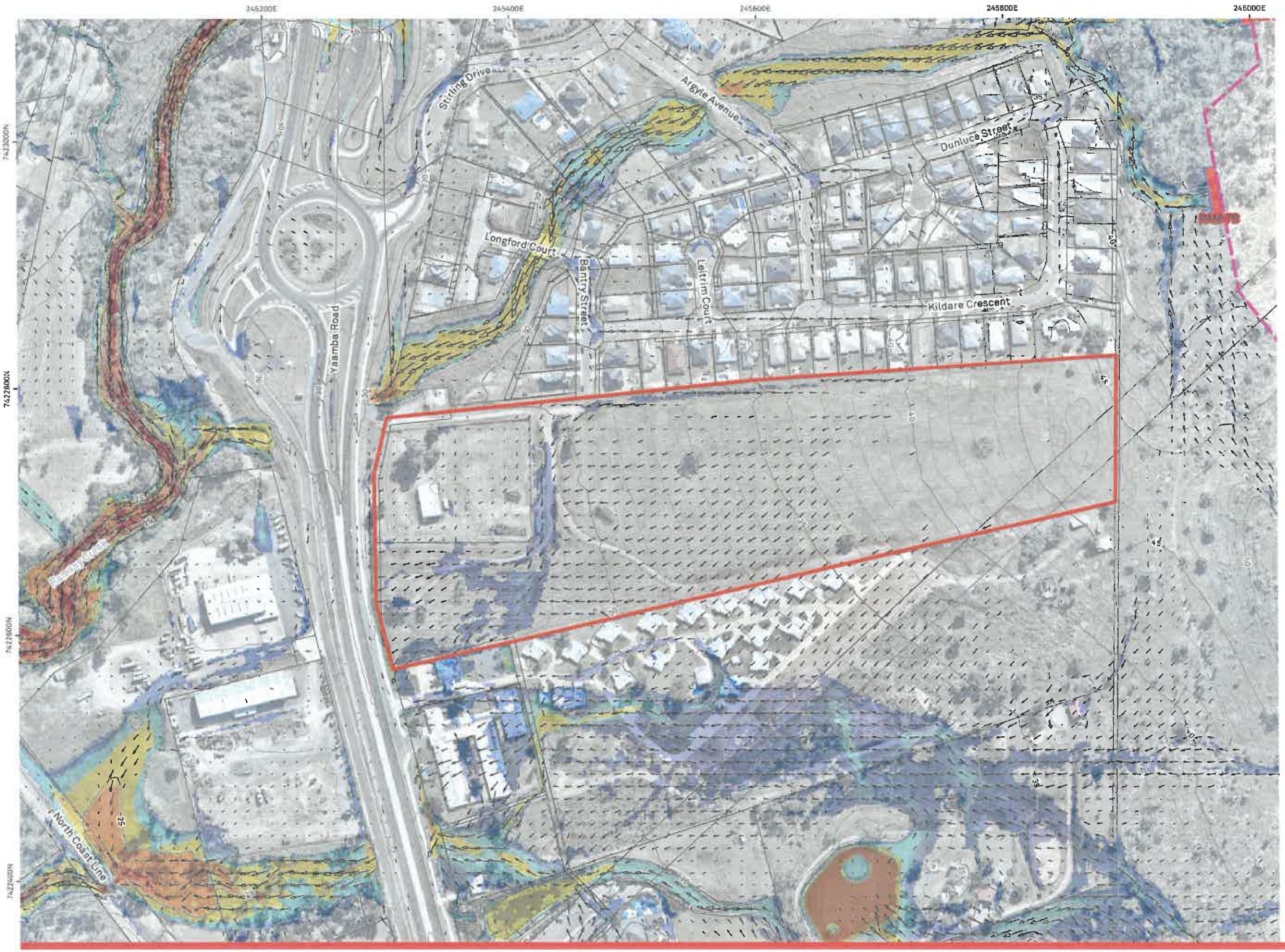
McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.4.1
LOCAL CATCHMENT 10% AEP FLOOD DEPTH (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
SIZE A3
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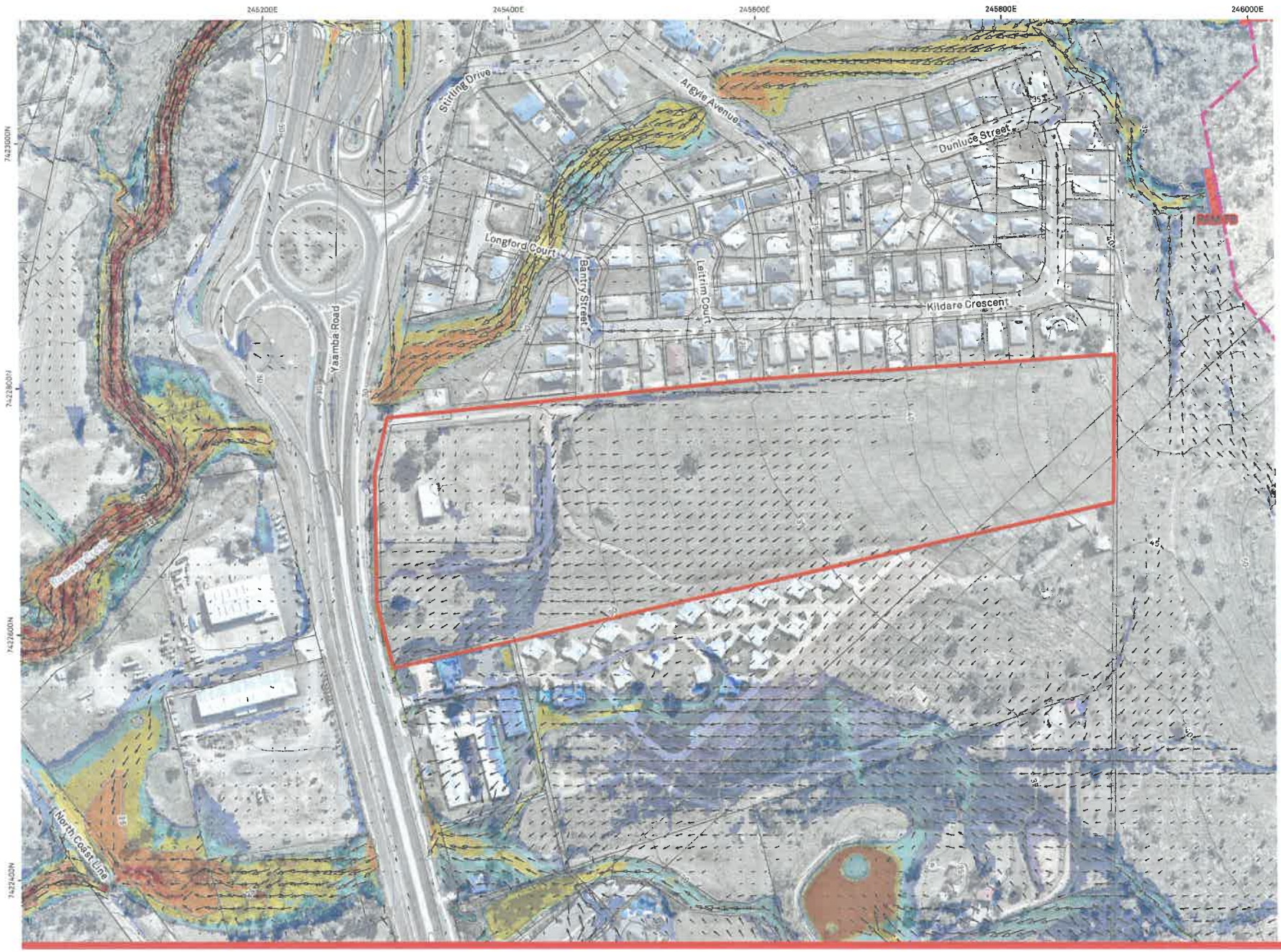
FIGURE A.5.1
LOCAL CATCHMENT 5% AEP FLOOD DEPTH (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
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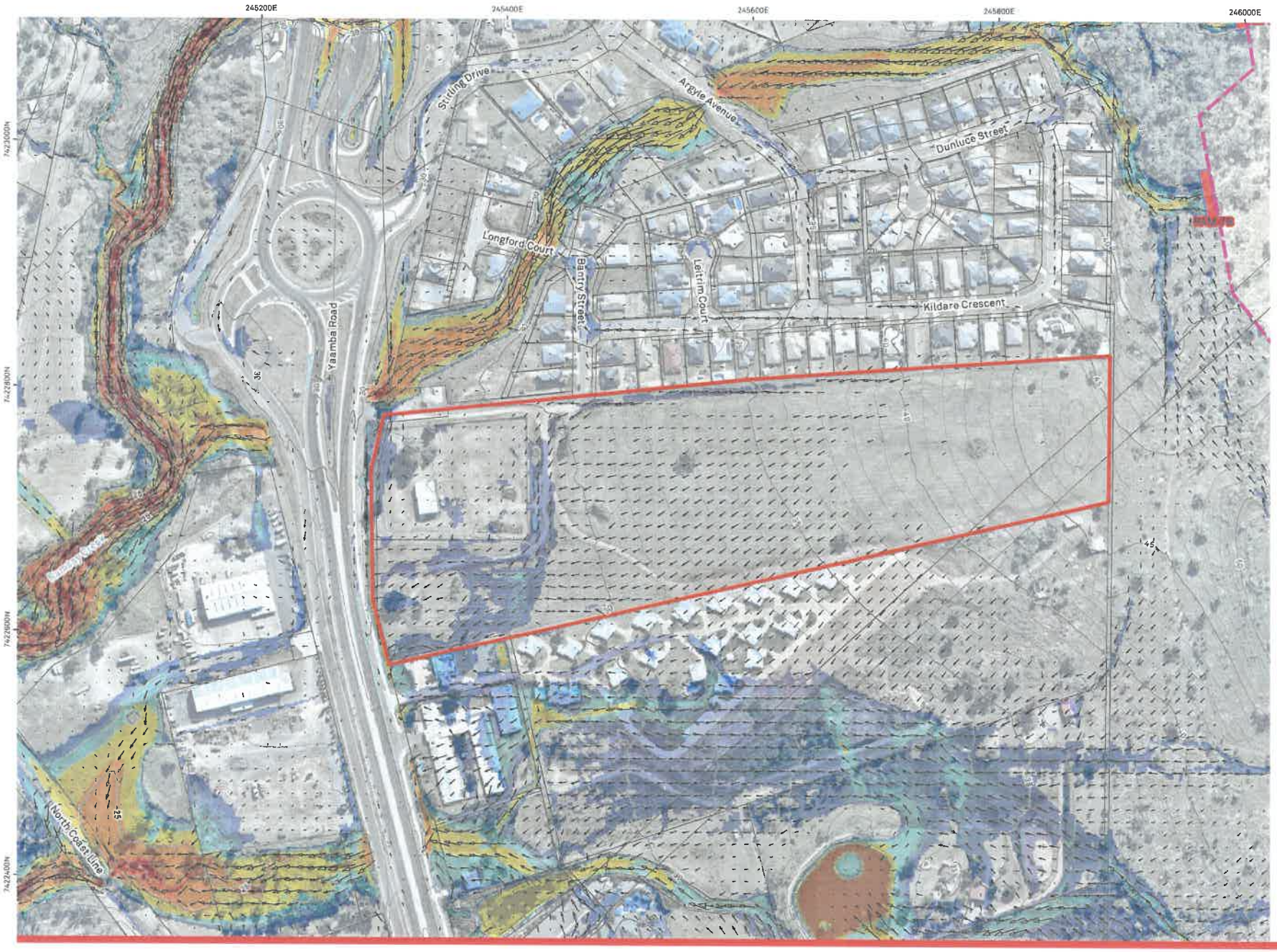
FIGURE A.6.1
LOCAL CATCHMENT 2% AEP FLOOD DEPTH (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
SIZE A3
REFERENCE J20037
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FIGURE A.7.1
LOCAL CATCHMENT 1% AEP FLOOD DEPTH (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

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DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.1.2
LOCAL CATCHMENT 63% AEP FLOOD VELOCITY (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

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DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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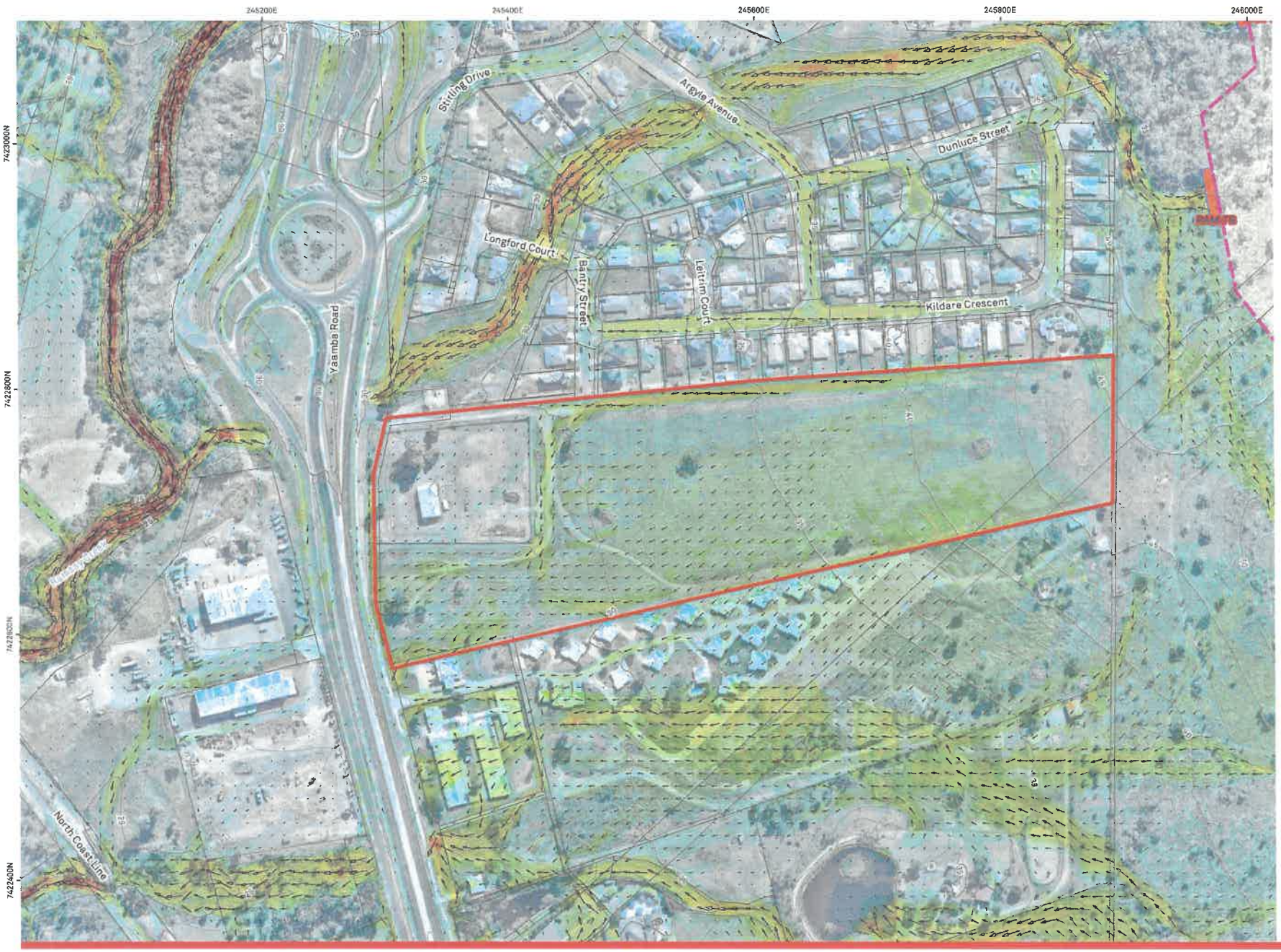
FIGURE A.2.2
LOCAL CATCHMENT 39% AEP FLOOD VELOCITY (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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Version: 1, Version Date: 20/03/2023

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DATE 20 February 2023
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FIGURE A.3.2
LOCAL CATCHMENT 18% AEP FLOOD VELOCITY (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

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DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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FIGURE A.4.2

LOCAL CATCHMENT 10% AEP FLOOD VELOCITY (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

McMurtrie Consulting Engineers

DATE 20 February 2023
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FIGURE A.5.2
LOCAL CATCHMENT 5% AEP FLOOD VELOCITY (EX03)
1018-1038 Yaamba Rd, Parkhurst
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SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.6.2
LOCAL CATCHMENT 2% AEP FLOOD VELOCITY (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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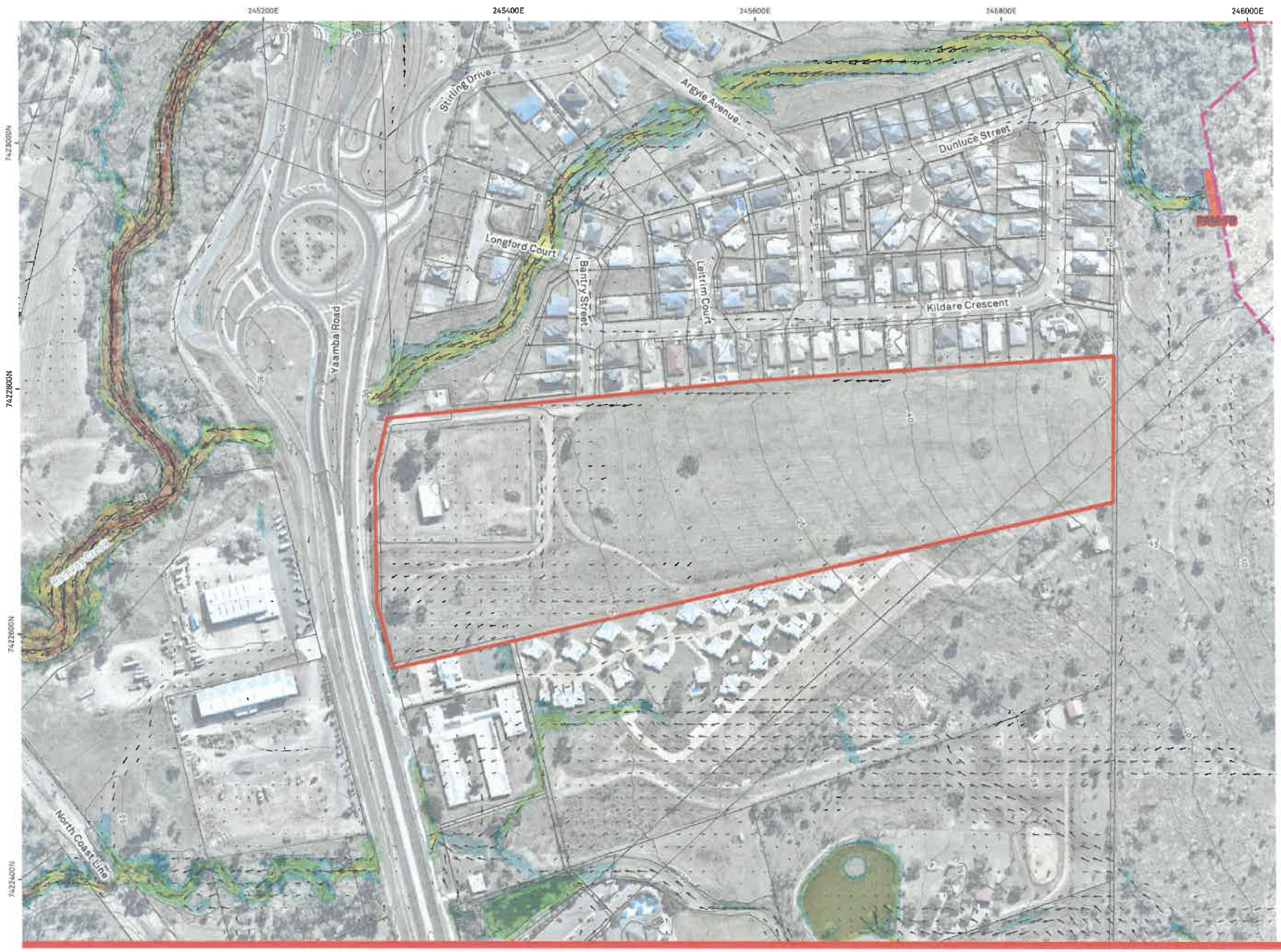
FIGURE A.7.2
LOCAL CATCHMENT 1% AEP FLOOD VELOCITY (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
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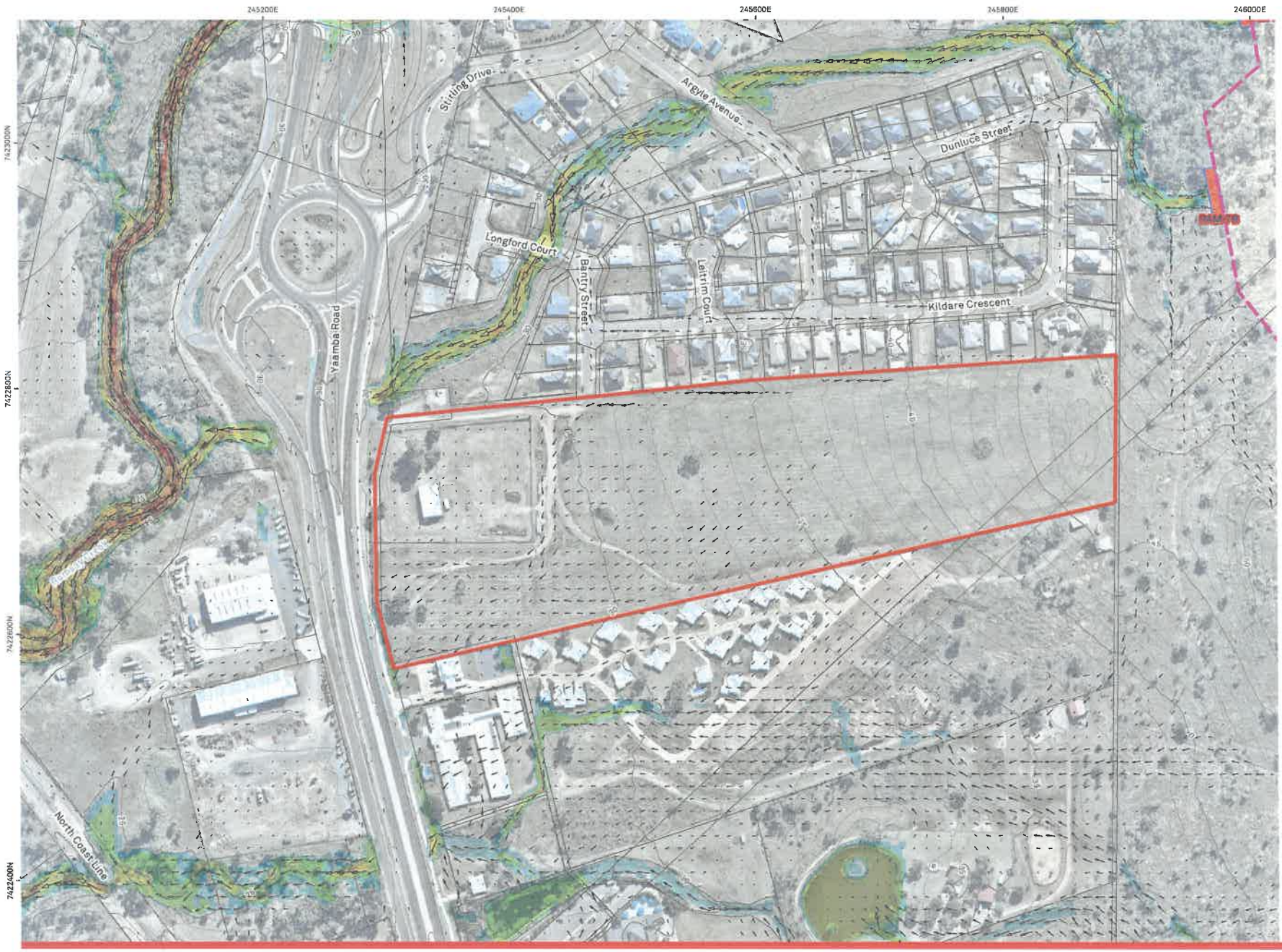
FIGURE A.1.3
LOCAL CATCHMENT 63% AEP FLOOD HAZARD (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
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FIGURE A.2.3
LOCAL CATCHMENT 39% AEP FLOOD HAZARD (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

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DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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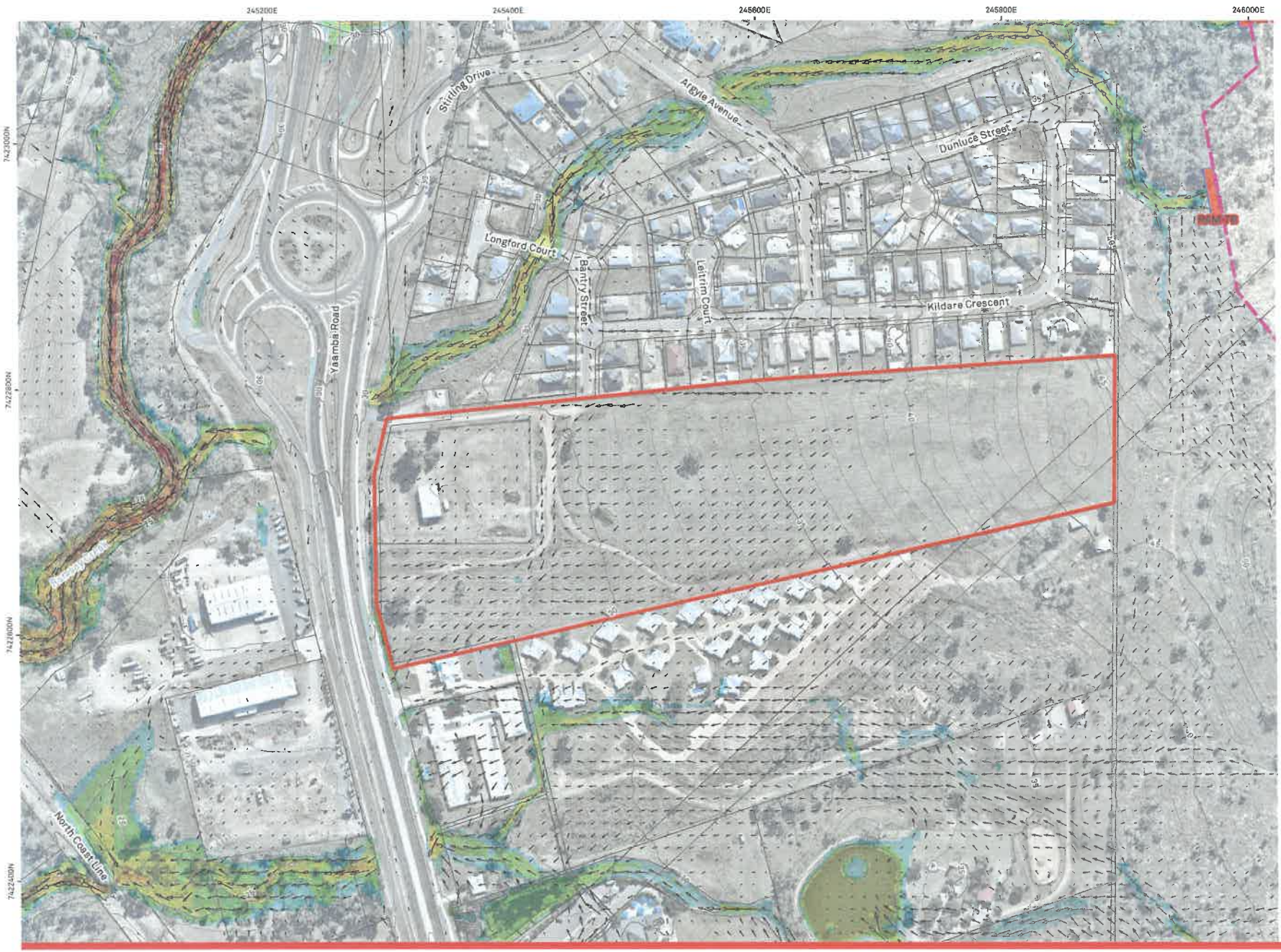
FIGURE A.3.3
LOCAL CATCHMENT 18% AEP FLOOD HAZARD (EX03)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
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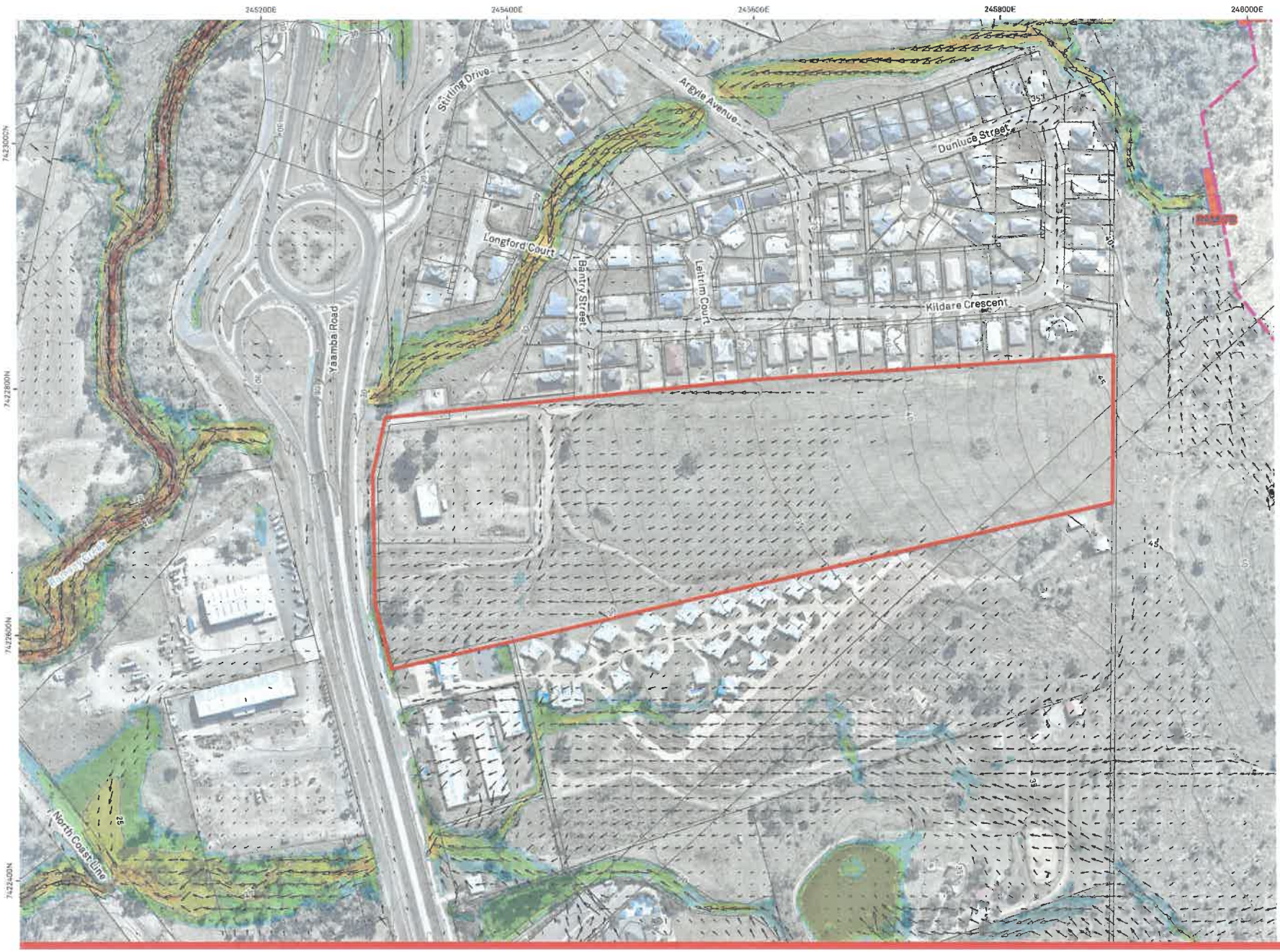
FIGURE A.4.3
LOCAL CATCHMENT 10% AEP FLOOD HAZARD (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



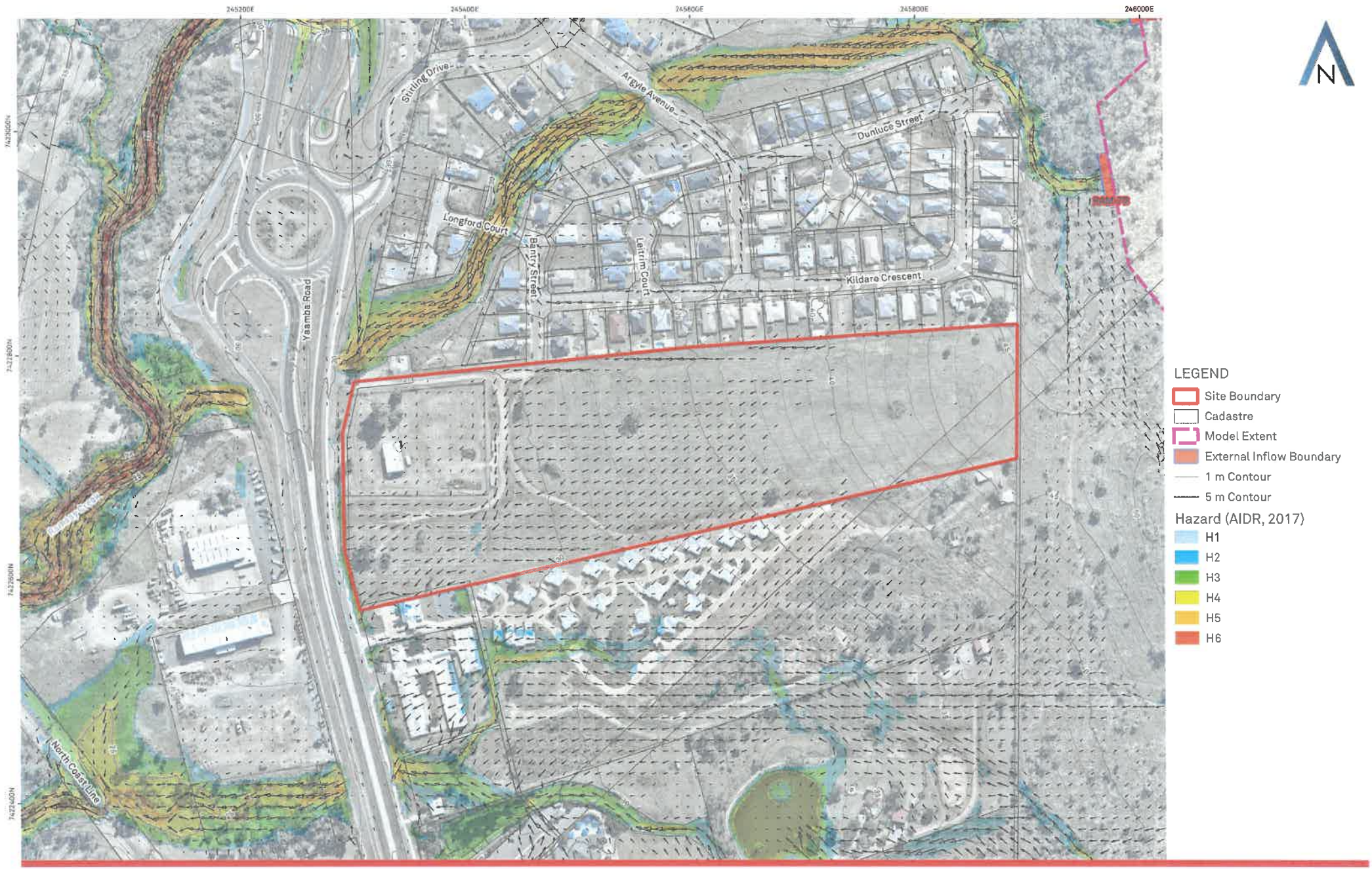
McMurtrie Consulting Engineers

DATE 20 February 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

0 70 140 210 280 350 m

FIGURE A.5.3
LOCAL CATCHMENT 5% AEP FLOOD HAZARD (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
SIZE A3
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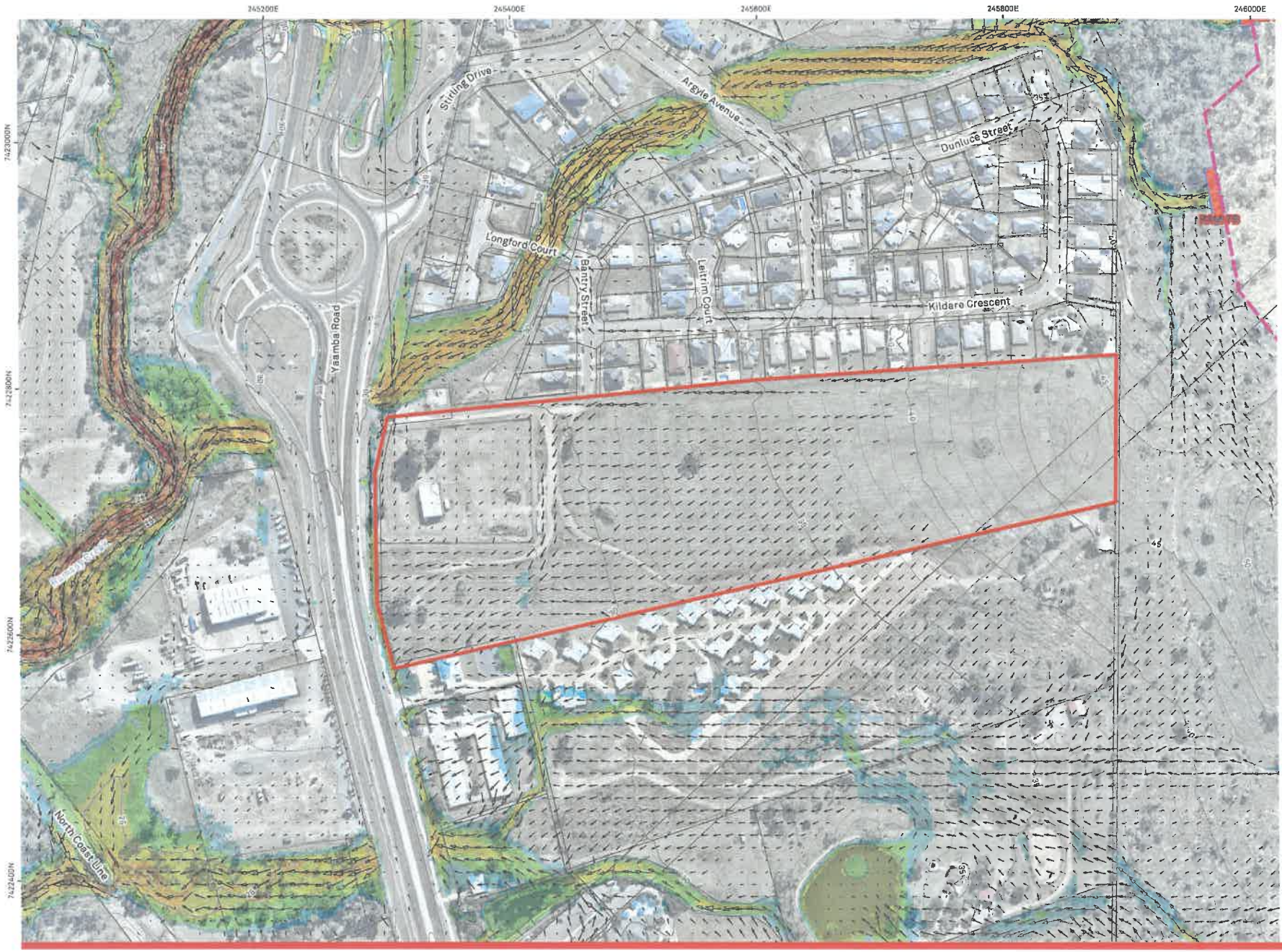
FIGURE A.6.3
LOCAL CATCHMENT 2% AEP FLOOD HAZARD (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 20 February 2023
SIZE A3
REFERENCE J20037
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FIGURE A.7.3
LOCAL CATCHMENT 1% AEP FLOOD HAZARD (EX03)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

Appendix B: Proposed Scenario Flood Maps

B-1: 63% AEP

B-2: 39% AEP

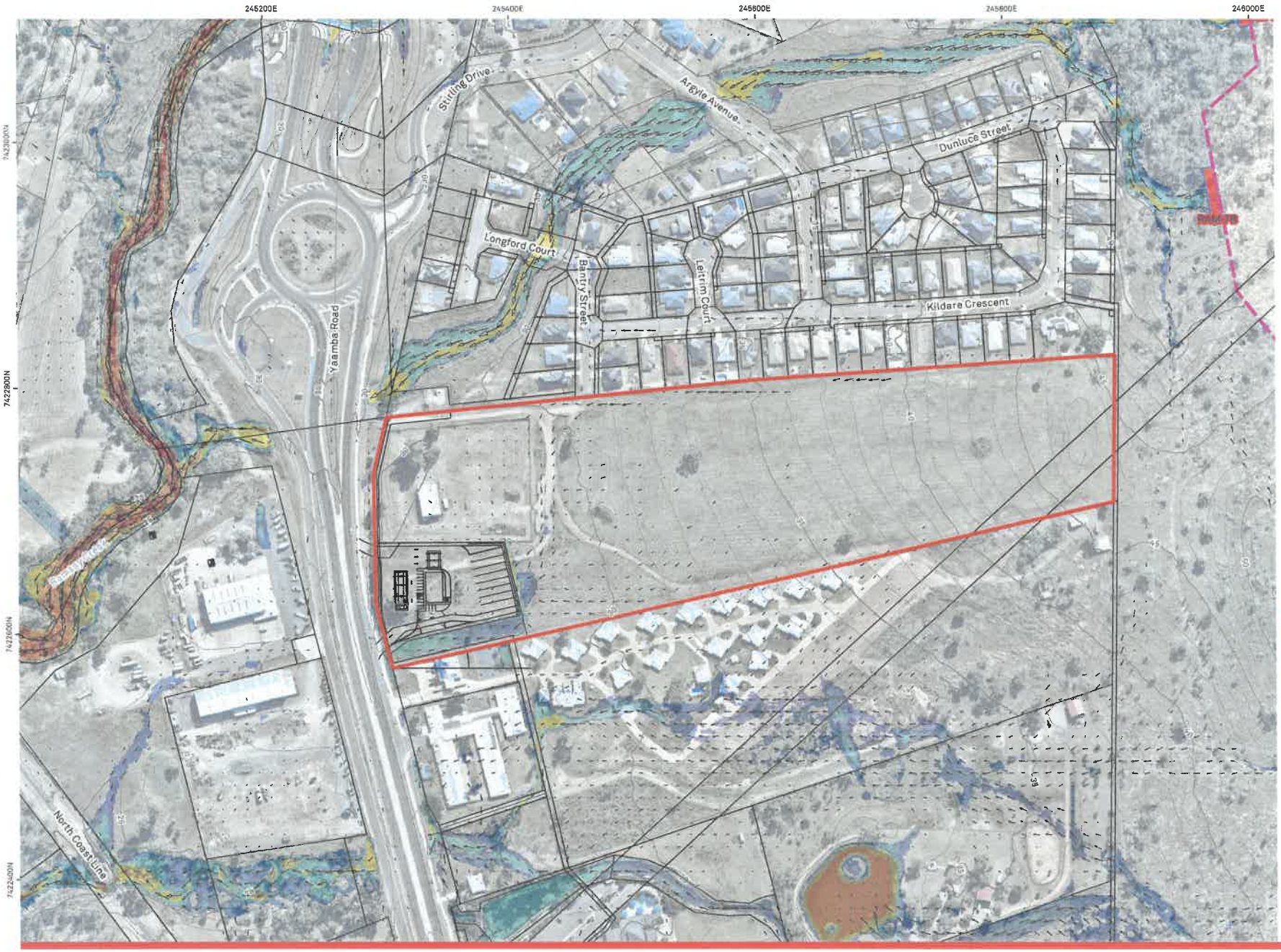
B-3: 18% AEP

B-4: 10% AEP

B-5: 5% AEP

B-6: 2% AEP

B-7: 1% AEP



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DATE 06 March 2023

SIZE A3

REFERENCE J20037

SCALE 1:3,000

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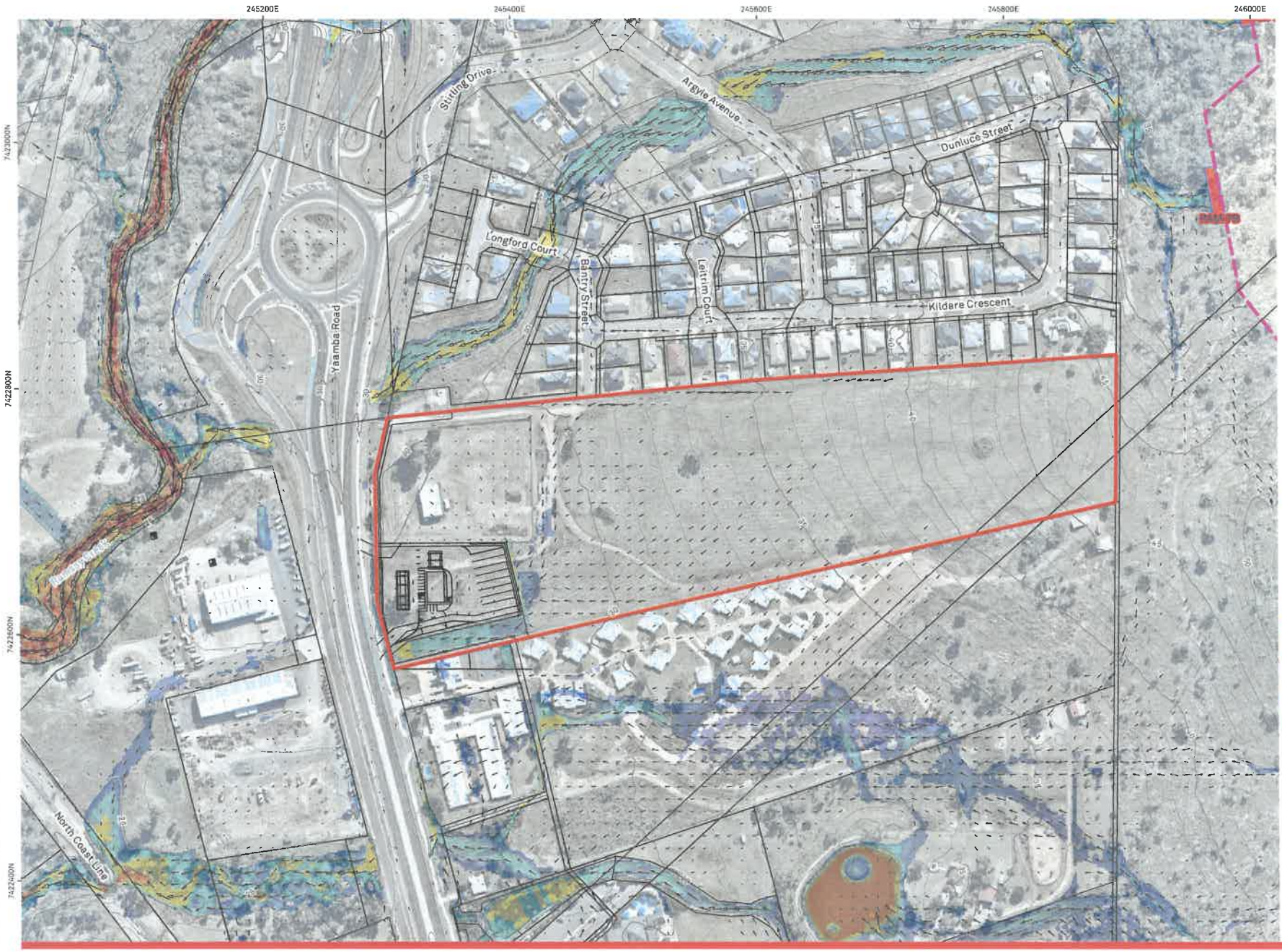
FIGURE B.1.1

LOCAL CATCHMENT 63% AEP FLOOD DEPTH (DE06f)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



N

LEGEND

- Site Boundary
- Cadastre
- Model Extent
- External Inflow Boundary
- 1 m Contour
- 5 m Contour

Depth (m)

- 0.0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.6
- 0.6 - 1.2
- 1.2 - 2.0
- Above 2.0

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DATE 06 March 2023

SIZE A3

REFERENCE J20037

SCALE 1:3,000

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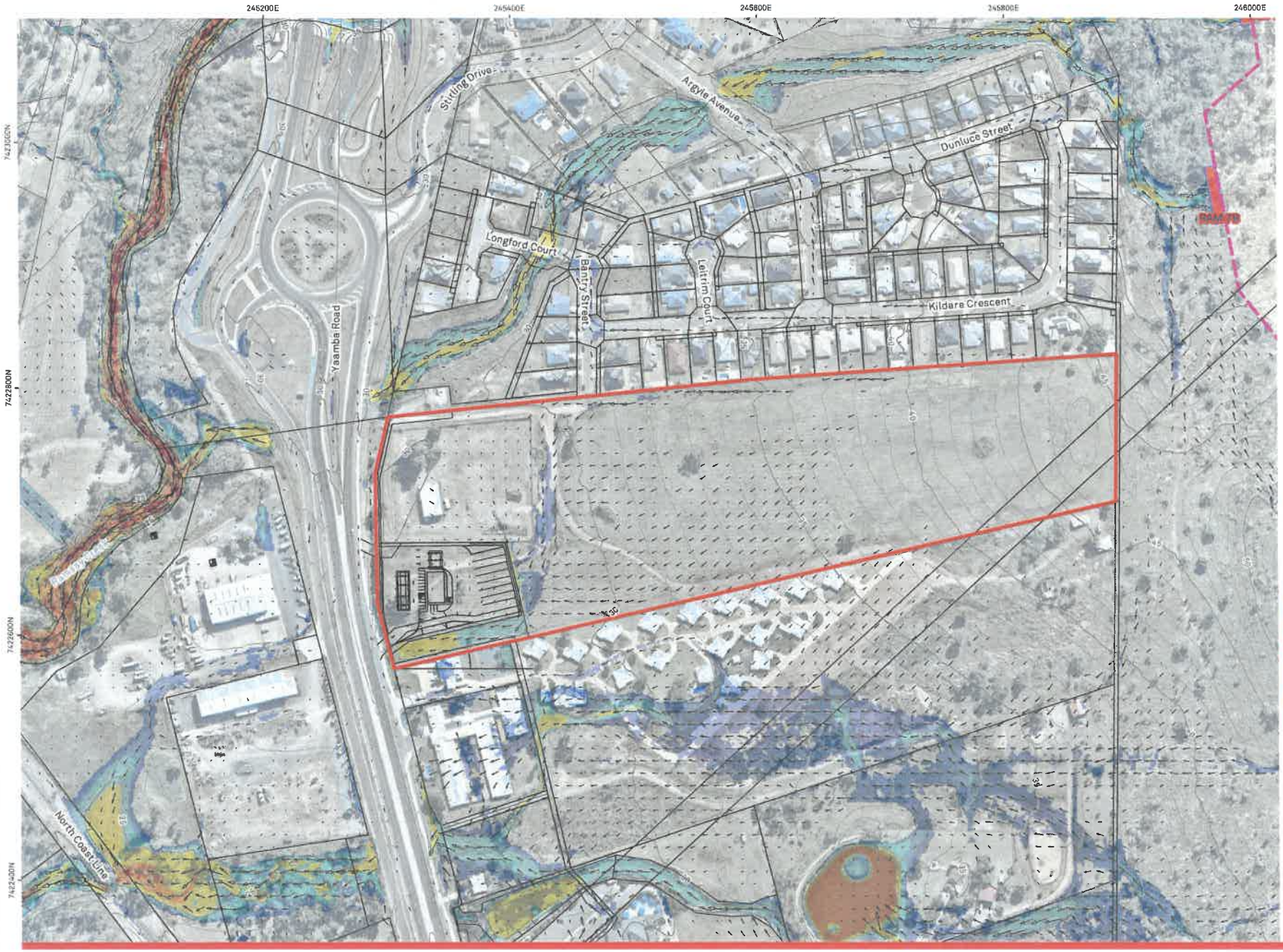
FIGURE B.2.1

LOCAL CATCHMENT 39% AEP FLOOD DEPTH (DE06f)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



N

LEGEND

- Site Boundary
- Cadastre
- Model Extent
- External Inflow Boundary
- 1 m Contour
- 5 m Contour

Depth (m)

- 0.0 - 0.1
- 0.1 - 0.2
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- 0.3 - 0.6
- 0.6 - 1.2
- 1.2 - 2.0
- Above 2.0

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DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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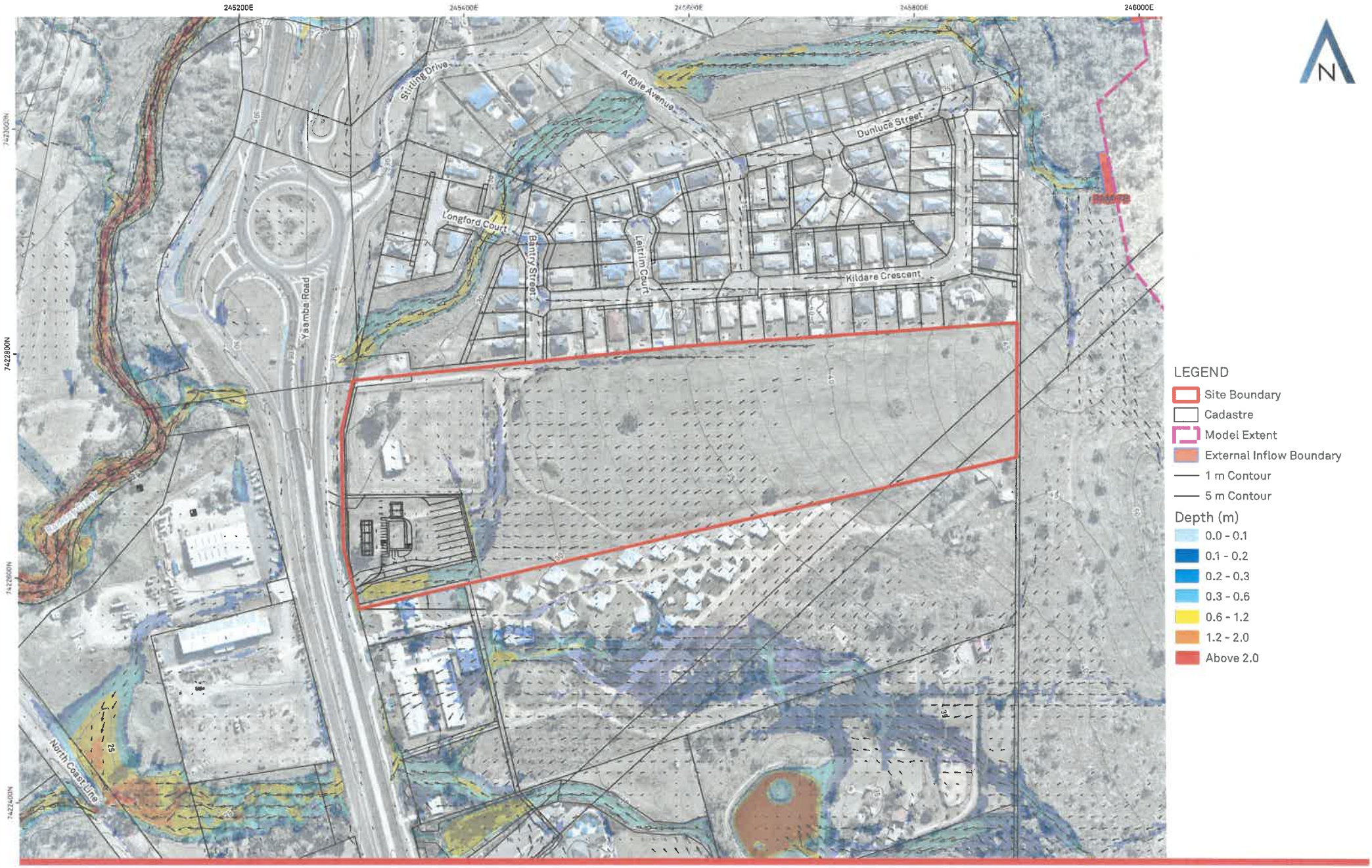
FIGURE B.3.1

LOCAL CATCHMENT 18% AEP FLOOD DEPTH (DE06f)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



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DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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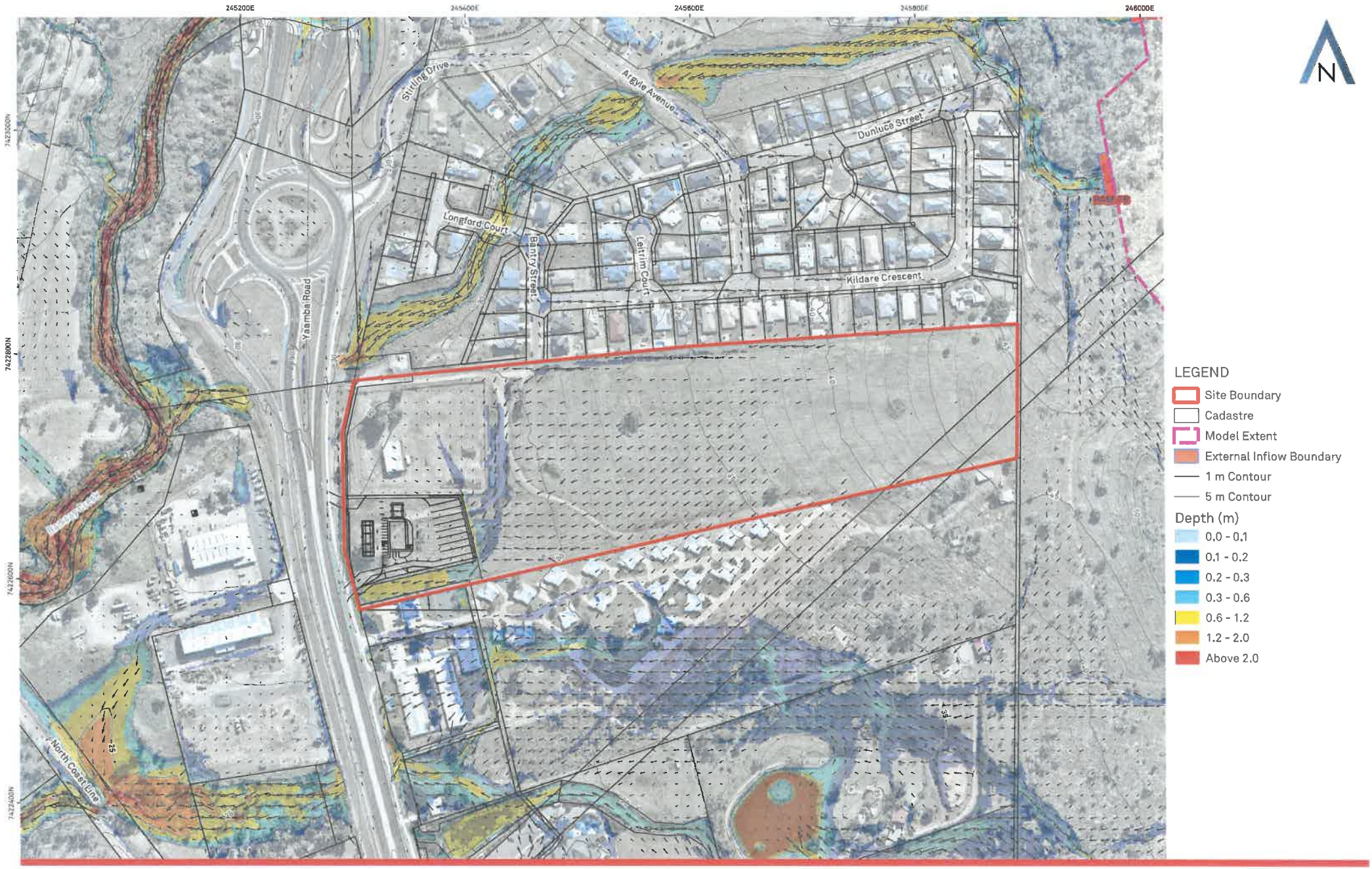
FIGURE B.4.1
LOCAL CATCHMENT 10% AEP FLOOD DEPTH (DE06f)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



McMurtrie Consulting Engineers

DATE 06 March 2023
SIZE A3
REFERENCE J20037
SCALE 1:3,000

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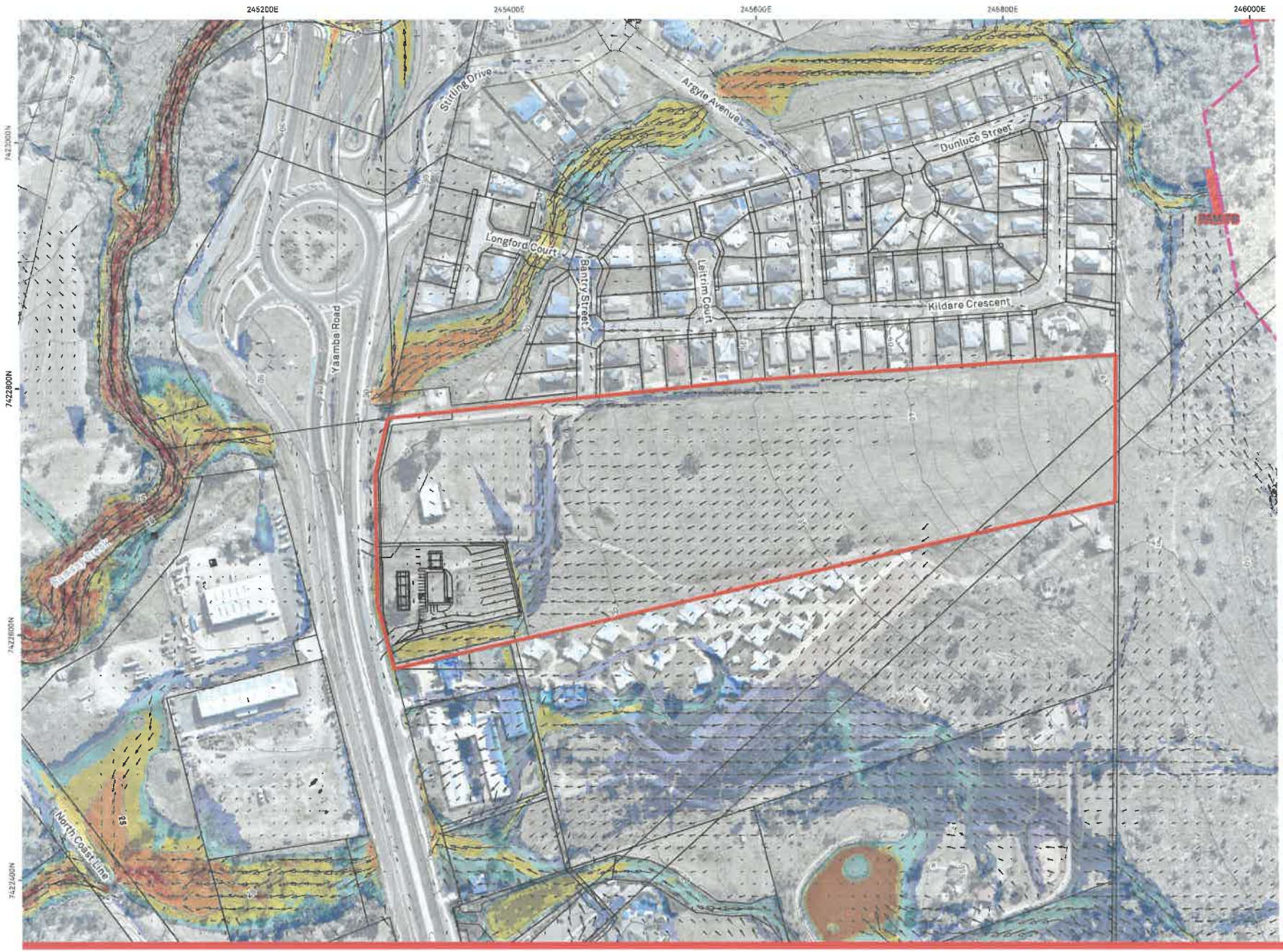
FIGURE B.5.1
LOCAL CATCHMENT 5% AEP FLOOD DEPTH (DE06f)

1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)



McMurtrie Consulting Engineers

DATE 06 March 2023
REFERENCE J20037
SIZE A3
SCALE 1:3,000

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FIGURE B.6.1
LOCAL CATCHMENT 2% AEP FLOOD DEPTH (DE06f)
1018-1038 Yaamba Rd, Parkhurst
Flood Impact Assessment (Local Catchment)

RoadPro ACOUSTICS

Environmental Noise Assessment

Proposed Service Station

1018 Yaamba Road

Parkhurst

Report 1376R1-R0

2 December 2022

Traffic Engineering and Road Safety Specialists www.roadpro.net.au

Document Control

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Version History:

Version	Date	Prepared by	Reviewed by	Description / nature of amendments
Draft 1	21-Oct-22	JC	JC	Initial draft
Revision 0	2-Dec-22	JC	JC	Final report

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Appendix A – Site Plans A-1

Appendix B – Noise Charts B-1

Appendix C – Noise Barriers C-1

1 Introduction

RoadPro Acoustics was engaged by Pearl Investments (Aust) Pty Ltd to assess potential noise impacts from a proposed service station at a site at 1018 Yaamba Road, Parkhurst (the Site). The Site has previously been assessed and approved for a service station, however the current proposal is expanded and includes truckstop facilities. The site location is shown in **Figure 1**, and proposed site layout is shown in **Figure 2**. Plans are provided in **Appendix A**.

Figure 1: Site Location – 1018 Yaamba Road, Parkhurst

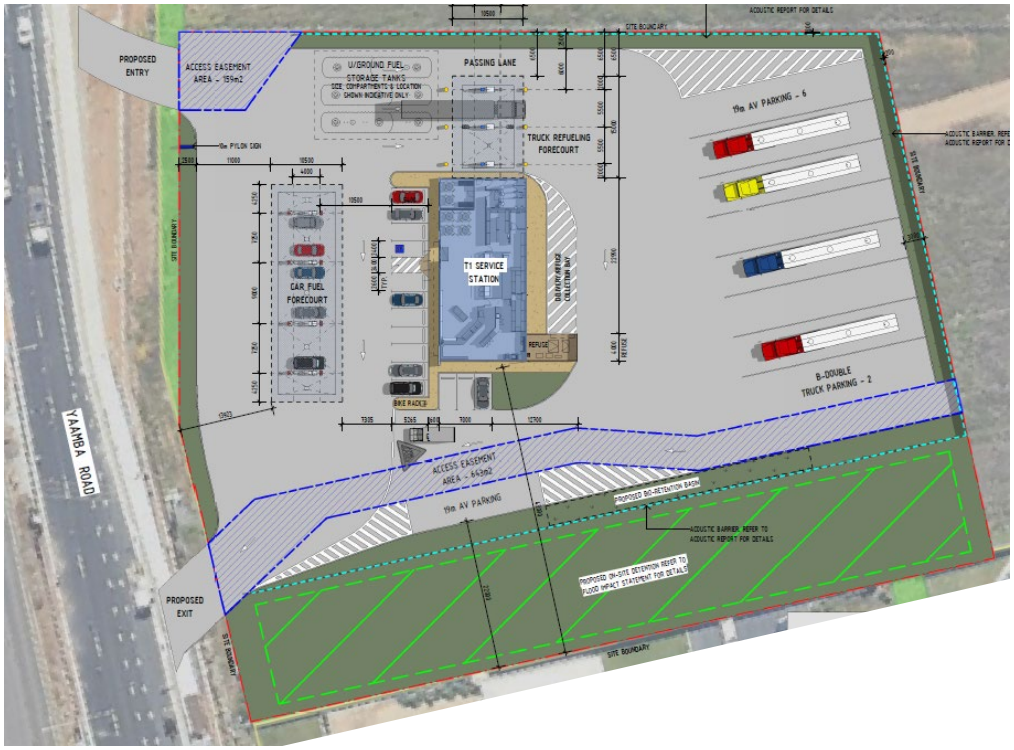


Figure 2: Site layout - 1018 Yaamba Road, Parkhurst

The proposal involves establishing a fuel retail outlet and truckstop at the Site with the following facilities:

- 8 x light vehicle fuel bowsers
- 4 x truck fuel bowsers
- Fuel shop
- 14 x light vehicle carparks
- 9 x truck bays
- Loading area
- Waste and services area
- Associated conveniences (air and water, bike racks etc)

This noise assessment has been carried out generally in accordance with the following:

- Environmental Protection (Noise) Policy 2019;
- Environmental Protection Act 1997;
- *Noise Measurement Manual*, Queensland Government – Environmental Protection Agency, Version 4, August 2013; and
- Australian Standard *AS1055.1–1997 Acoustics – Description and measurement of environmental noise*.

Information used for this assessment included:

- Development plans prepared by Verve;
- Queensland Globe and Google Earth imagery;
- Ausmap LIDAR spot heights; and
- Photographs and general information from a site visit and inspection.

2 Acoustic Terminology

The following is a brief explanation of the acoustic terminology used in this report.

2.1 Sound (Noise) Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols “L” or “L_A” are commonly used to represent Sound Pressure Level.

2.2 “A” Weighted Sound Pressure Level - dB(A)

The overall level of a sound is usually expressed in terms of dB(A), which is measured using a sound level meter with an “A-weighting” filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dB(A) is a good measure of the loudness of that sound. Different sources having the same dB(A) level generally sound about equally as loud.

A change of 1 dB(A) or 2 dB(A) in the level of a sound is difficult for most people to detect, whilst a 3 dB(A) to 5 dB(A) change corresponds to small but noticeable change in loudness. A 10 dB(A) change corresponds to an approximate doubling or halving in loudness.

Table 1 below shows examples of typical noise levels.

Table 1: Typical Noise Levels

Sound Pressure Level (dB(A))	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely
110	Grinding on steel	noisy
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Curbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to
50	General Office	quiet
40	Inside private office	Quiet to very
30	Inside bedroom	quiet
20	Unoccupied recording studio	Almost silent

2.3 Statistical Sound (Noise) Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded by N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

Of particular relevance are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level

L_{Aeq} is the A-weighted equivalent continuous sound pressure level (basically the average sound level). It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

When dealing with numerous days of statistical noise data a method is required to determine the noise descriptors that are representative of a monitoring location for a particular time of day. The method of statistical accumulation provides an appropriate method of determining these noise descriptors.

This method accumulates each value for the days of monitoring and produces an estimate of the “repeatable minimum” L_{A90} noise level over the daytime and night-time measurement periods, as required by the Department of Environment and Heritage Protection. In addition, the method produces mean or “average” levels that are representative of the other descriptors that can be expected on a typical day at each particular site.

3 Background and Ambient Noise

Noise measurements were carried out at the site from Wednesday 18th September to Wednesday 25th September at the location shown in **Figure 3** and **Figure 4**. The location was selected as being representative of background noise levels for the nearest sensitive receivers.

The measurements were carried out using a Rion NL-22 (Serial number 1273964) recording "fast" response "A" frequency weighted sound levels at 15-minute intervals, with the microphone at a height of approximately 1.2 m. The instrument was checked for calibration prior to and post-measurement using a 94 dB acoustic signal at 1000 Hz, and drift in calibration remained within ±0.5 dB.

Weather conditions for the duration of the survey were monitored through the Bureau of Meteorology website and were generally suitable for noise monitoring throughout the measurement period.

Figure 3: Noise Logger Location "ML1" - 1018 Yaamba Road, Parkhurst

Figure 4: Noise Logger

Ambient noise at the Site is dominated by road traffic on Yaamba Road (Bruce Highway).

A summary of the logged data is provided in **Table 2**. The full dataset of the measurements is provided as charts in **Appendix B**.

Table 2: Logger noise measurement results, dB(A)

Day	Period,T	$L_{A90,T}$	$L_{Aeq,T}$	$L_{A10,T}$	$L_{A1,T}$
Wednesday-18-Sep-19	Day	46.9	54.7	57.1	62.5
	Evening	41.1	54.3	58.0	63.4
	Night	27.6	54.3	58.9	63.6
Thursday-19-Sep-19	Day	47.0	54.9	57.4	62.1
	Evening	40.9	54.9	58.0	62.9
	Night	30.4	53.5	57.2	62.9
Friday-20-Sep-19	Day	48.0	55.0	57.6	62.0
	Evening	43.2	53.1	56.1	61.4
	Night	30.5	51.6	54.1	62.3
Saturday-21-Sep-19	Day	44.7	53.7	56.6	61.1
	Evening	40.4	52.2	55.0	62.0
	Night	24.6	50.2	52.7	61.1
Sunday-22-Sep-19	Day	43.7	53.9	54.9	59.9
	Evening	37.5	52.5	55.2	62.3
	Night	31.8	51.9	52.2	61.5
Monday-23-Sep-19	Day	45.5	54.8	56.8	61.5
	Evening	39.0	53.3	55.9	61.9
	Night	30.8	54.1	55.4	63.4
Tuesday-24-Sep-19	Day	47.5	57.3	59.6	63.7
	Evening	46.7	56.9	58.8	63.9
	Night	41.8	54.5	57.4	63.2
Wednesday-25-Sep-19	Day	47.0	55.6	58.2	63.6
Overall RBL and averages	**Day**	47	55	57	62
	Evening	41	54	56	62
	Night	30	53	55	63

The following background noise levels are adopted for the Site for assessment purposes:

Day	47 dB(A)
Evening	41 dB(A)
Night	30 dB(A)

4 Noise Criteria

4.1 Acoustic Quality Objectives - Residences

The *Environmental Protection (Noise) Policy 2019* (EPP(Noise)) is designed to achieve the object of the *Environmental Protection Act 1994*. Relevant extracts are as follows:

The environmental values to be enhanced or protected under this policy are—

(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—

(i) sleep;

(ii) study or learn;

(iii) be involved in recreation, including relaxation and conversation; and

(c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Acoustic Qualify Objectives are specified for residences as shown in **Table 3**.

Table 3: *Environmental Protection (Noise) Policy 2019* Acoustic Quality Objectives

Sensitive receptor	**Time of day**	**Acoustic quality objectives (measured at the receptor) dB(A)**			**Environmental value**
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Dwelling (for outdoors)	Daytime and evening	50	55	65	health and wellbeing
Dwelling (for indoors)	Daytime and evening	35	40	45	health and wellbeing
	Nighttime	30	35	40	health and wellbeing, in relation to the ability to sleep

In order to assess internal sound levels, a 7 dB(A) noise reduction (free-field) through partially opened windows as per the Queensland Ecoaccess Guideline *Planning for Noise Control* (2004) is assumed.

4.2 Background Creep

The EPP(Noise) provides the following regarding *background* creep in **Section 9**. Note that the technical provisions for *background creep* for time-varying (L_{Aeq}) and constant noise (L_{A90}) have been removed from the EPP(Noise) as of 1 September 2019.

(2) To the extent it is reasonable to do so, noise must be dealt with in a way that ensures—

(a)the noise does not have any adverse effect, or potential adverse effect, on an environmental value under this policy; and

(b)background creep in an area or place is prevented or minimised.

The potential for an increase in background noise levels from this proposal is limited to noise from mechanical plant. The criteria specified in the *Environmental Protection Act 1994* is deemed to be appropriate for appropriate control of mechanical plant noise by the Queensland Government.

4.3 Sleep Disturbance

Sleep disturbance criteria from discrete L_{AMax} noise events are not specifically addressed in any current QLD government policies. It is prudent to assess the potential for this to occur for commercial activities that will potentially operate 24-hours by limiting L_{AMax} noise levels to ≤ 60 dB(A).

4.4 Mechanical Plant Noise

The *Environmental Protection Act 1994* specifies criteria for specific mechanical plant, summarised in **Table 5**.

Table 4: Summary of mechanical plant noise criteria from the Queensland *Environmental Protection Act 1994*

Plant	Time Period Start	Time Period Finish	Criterion
Pumps[1]	7am	7pm	Background + 5 dB(A)
	7pm	10pm	Background + 3 dB(A)
	10pm	7am	Inaudible
Air conditioning equipment	7am	10pm	Background + 5 dB(A)
	10pm	7am	Background + 3 dB(A)
Refrigeration plant[2]	7am	10pm	Background + 5 dB(A)
	10pm	7am	Background + 3 dB(A)

Notes:
[1]A pump means an electrical, mechanical or pneumatic pump; and includes a swimming pool pump and a spa blower. Examples — liquid pump, air pump, heat pump.
[2]Criteria for refrigeration plant applies to an occupier of premises at or for which there is plant or equipment for refrigeration (refrigeration equipment); or an owner of refrigeration equipment that is on or in a vehicle, other than a vehicle used or to be used on a railway. "Vehicle" includes a trailer.

Based on progressing interpretation of the above, noise from fuel bowser pumps is included in overall noise emission calculations rather than being assessed as a continuously running pump.

The site-specific criteria for mechanical plant noise considering the measured background noise levels are provided in **Table 6**.

Table 5: Site-specific mechanical plant noise criteria from the Queensland *Environmental Protection Act 1994*

Plant	Time Period Start	Time Period Finish	Criterion
Pumps	7am	6pm	47 + 5 = 52 dBA
	6pm	7pm	41 + 5 = 46 dBA
	7pm	10pm	41 + 3 = 44 dBA
	10pm	7am	30 -10 = 20 dBA[1]
Air conditioning equipment	7am	6pm	47 + 5 = 52 dBA
	6pm	10pm	41 + 5 = 46 dBA
	10pm	7am	30 + 3 = 33 dBA
Refrigeration plant	7am	6pm	47 + 5 = 52 dBA
	6pm	10pm	41 + 5 = 46 dBA
	10pm	7am	30 + 3 = 33 dBA

Notes:
[1]A noise level 10 dB(A) or more below the ambient background noise level is generally adopted for design purposes to represent "inaudibility". Even though a noise level 10 dB(A) below the background noise level may not be imperceptible, the likelihood of disturbance being causes by the source is considered to be negligible.

5 Predicted Noise Emission Levels

5.1 General Methodology

The site was modelled using the PEN3D noise modelling software package. The software allows the site to be modelled in 3-dimensional space and incorporates environmental noise calculation algorithms for point and mobile sources, and attenuation due to distance, barrier and terrain effects, and ground and atmospheric absorption. Weather conditions were assumed to be calm.

Terrain data was derived from LIDAR spot heights at 5 m grid intervals and converted to 0.5 m ground contours.

The nearest potentially affected receivers to the Site are:

- the caretakers' residence for the Casa Nostra motel resort,
- the Casa Nostra resort bungalows and
- The nearest residence in Bantry Street to the north-east of the Site.

A snapshot of the model scenario is shown in **Figure 5**.

Figure 5: Model scenario screenshot

5.2 Mechanical Plant

Refrigeration and AC plant for the fuel shop building have been assumed to be in the services area, with sound power levels of 80 dB(A) and 90 dB(A) respectively.

Refrigerated truck trailers were assumed to be running in the truck stop area. 4 x refrigeration units running with sound power levels of 98 dB(A) each have been assumed.

The predicted noise plant noise levels without additional attenuation are shown in **Table 5**.

Table 6 Calculated mechanical plant noise levels, $L_{Aeq,adj}$ dB(A) – no additional attenuation

Receptor	Noise Level	Complies		
Casa Nostra Residence 2nd Floor	57	No	No	No
Casa Nostra Bungalow 1	59	No	No	No
Casa Nostra Bungalow 2	56	No	No	No
Casa Nostra Bungalow 3	54	No	No	No
Bantry Street	50	Yes	No	No

The results indicate that mechanical plant will require substantial noise attenuation treatment in order to operate throughout the night-time period. The dominant noise sources are truck trailer refrigeration units.

5.3 Vehicles and Refuelling

Vehicle noise for carparking was modelled using the BayFIU method adapted for Australian conditions[1]. The $L_{Aeq(1\ hour)}$ sound power level for a single vehicle movement is 64 dB, and it was assumed a peak hour would have one vehicle stop and leave per car park on average. The method incorporates all noise such as door closures and engine starts. The $L_{A10(1\ hour)}$ and $L_{A1(1\ hour)}$ noise levels are approximately 2 dB(A) and 8 dB(A) greater than the $L_{Aeq(1\ hour)}$ respectively, implying that if the $L_{Aeq(1\ hour)}$ Acoustic Quality Objective is achieved, the $L_{A10(1\ hour)}$ and $L_{A1(1\ hour)}$ Acoustic Quality Objectives will also be achieved.

Vehicles travelling through the Site were modelled as moving point sources. Sound power spectra for vehicles[2] is shown in **Table 7**.

Table 7: Vehicle sound power levels at low speeds, dB

	1/1 Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Light	63	72	73	77	78	78	75	69
Heavy	103	101	99	98	99	96	89	78

L_{Aeq} noise levels from refuelling is a combination of sound from vehicle movements and operation of the bowser pump, including removal/replacement of the nozzle and replacement of fuel caps. The overall synthesized noise level for these activities is 66 dB $L_{Aeq(1\ hour)}$ per light vehicle refuelling, and 70 dB $L_{Aeq(1\ hour)}$ per truck refuelling.

The number of vehicles for a peak hour during each time period are shown in **Table 8**.

Table 8 Peak hour numbers of vehicles

Time period	Total number of light vehicles	Number of vehicles using bowser
Day (peak)	100	100
Evening	75	50
Night	20	10

Table 9 Calculated vehicle noise levels $L_{Aeq,adj}$ dB(A) – no additional attenuation

Receptor	Noise Level			Complies		
	Day	**Evening**	**Night**	**Day**	**Evening**	**Night**
Casa Nostra Residence 2nd Floor	45	44	42	Yes	No	No
Casa Nostra Bungalow 1	40	39	37	Yes	Yes	No
Casa Nostra Bungalow 2	37	36	34	Yes	Yes	Yes
Casa Nostra Bungalow 3	36	35	33	Yes	Yes	Yes
Bantry Street	36	35	33	Yes	Yes	Yes

[1] Laurence Nicol and Paul Johnson, Paper Number 39, Proceedings of ACOUSTICS 2011 (November 2011) "Prediction of parking area noise in Australian conditions"
[2] Emanuel Hammer, Sebastian Egger, Tina Saurer and Erik Bühlmann, 23rd International Congress on Sound and Vibration (July 2016) "Traffic Noise Modelling at Lower Speeds"

Variable noise levels are expected to achieve the criterion at residences during the daytime and evening. However, the Site will require additional attenuation treatment in order to operate during night-time hours.

5.4 Maximum Noise Level Events

Other noise sources expected include relatively infrequent events such as:

- Waste disposal / collection,
- Compressed air stations,
- Fuel deliveries, and
- Shop deliveries.

These sources will generally not be significant for overall $L_{A1(1\ hour)}$ noise levels but have potential to produce disturbing L_{AMax} noise events if they occur at night time.

It is not envisaged that fuel deliveries will occur during the night-time period.

Typical L_{AMax} noise levels from waste disposal are 100 dB(A), while delivery L_{AMax} noise levels are in the order of 88 dB(A). Predicted L_{AMax} noise levels from these activities are shown in **Table 10**.

Table 10 Calculated waste and delivery noise levels $L_{AMax,adj}$ dB(A) – no additional attenuation

Receptor	Noise Level (dB(A))	Complies
Casa Nostra Residence 2nd Floor	56	Yes
Casa Nostra Bungalow 1	53	Yes
Casa Nostra Bungalow 2	50	Yes
Casa Nostra Bungalow 3	48	Yes
Bantry Street	45	Yes

The results indicate that the 60 dB $L_{AMax,adj}$ criterion for the night-time period will be achieved at all residences.

6 Discussion of Results and Attenuation

6.1 Noise Barriers

Noise barrier fences around the Site have been designed as shown in **Appendix C**. The noise barrier design is dictated by the refrigerated trailer noise levels expected and are 5.5m above carpark/driveway level.

Noise barrier fences are required to have the following properties:

- Have a *minimum* surface density of 12.5 kg/m^2.
- Be completely free of gaps, including underneath the fence.

The noise barriers are significant in height, but can be made aesthetically acceptable using techniques including but not limited to:

- Articulation,
- Landscaping, and
- Using different coloured and / or transparent panels.

Some of these techniques are shown in **Figure 6** to **Figure 9**.

Figure 6: 4.5m high acoustic barrier atop 1m high landscaped earth, Benaraby

Figure 7: 4.5m high acoustic barrier atop 1m high landscaped earth (foreground), Benaraby

Figure 8: 4.0m high landscaped acoustic barrier adjoining supermarket loading dock - Coolum

Figure 9: Acoustic barrier with clear panels adjoining service station - Rockhampton

6.2 Mechanical Plant

The resultant $L_{Aeq(1\ hour)}$ noise levels with the noise barriers as designed are shown in **Table 11**.

Table 11 Calculated mechanical plant (including mobile truck refrigeration) noise levels $L_{Aeq,adj}$ dB(A) – with noise barrier attenuation

Receptor	Noise Level	Complies		
	(dB(A))	Day	Evening	Night
Casa Nostra Residence 2nd Floor	47	Yes	No	No
Casa Nostra Bungalow 1	45	Yes	Yes	No
Casa Nostra Bungalow 2	44	Yes	Yes	No
Casa Nostra Bungalow 3	42	Yes	Yes	No
Bantry Street	39	Yes	Yes	No

The calculated noise levels show that with the exception of a marginal exceedance at the 2nd floor level of the Casa Nostra manager's residence, the daytime and evening noise criterion for mechanical plant can be practically achieved. It is not considered that the 1 dB(A) exceedance of the criterion at a single residence is significant, as the calculation methodology is quite conservative.

It is not considered to be reasonably feasible to construct an acoustic barrier to the height required to achieve the night-time noise criterion. Therefore, it is recommended that prohibition signs are used within the Site warning that operation of mobile refrigeration plant is not permitted between 10 pm and 6 am. It is noted that while the night-time period technically ends at 7 am, background noise levels are already elevated well before 6 am, and the criterion as written in the *Environmental Protection Act 1994* will be achieved.

Fixed air conditioning and refrigeration plant noise levels will require further assessment during the detailed design stage of the project to ensure the night-time noise criterion is achieved. Achieving the criteria with small commercial fixed plant is generally readily achievable, and the model indicates that the criteria will likely be achieved with the above noise barriers in place.

6.3 Vehicles and Refuelling

The resultant $L_{Aeq(1\ hour)}$ noise levels with the noise barriers as designed are shown in **Table 12**.

Table 12 Calculated vehicle noise levels $L_{Aeq,adj}$ dB(A) – with noise barrier attenuation

Receptor	Noise Level			Complies		
	Day	Evening	Night	Day	Evening	Night
Casa Nostra Residence 2nd Floor	35	33	31	Yes	Yes	Yes
Casa Nostra Bungalow 1	29	27	24	Yes	Yes	Yes
Casa Nostra Bungalow 2	28	26	23	Yes	Yes	Yes
Casa Nostra Bungalow 3	27	25	22	Yes	Yes	Yes
Bantry Street	24	22	19	Yes	Yes	Yes

The results indicate that with the designed noise barriers, noise as a result of vehicle movements, carparking and refuelling will achieve the criteria for all time periods.

The predicted attenuated noise levels will achieve the indoor *Acoustic Quality Objectives*.

The timing of the noise produced relative to the background noise level is pertinent. Service station business is reliant on being located on major traffic routes, rather than attracting traffic to the business i.e. customers typically will use a service station as a matter of convenience, and as such the vehicle usage of a service station coincides generally with, and to a large extent is a product of, the dominant source of background noise. Mechanical plant aside, noise production from service stations tends to therefore have a natural coincidence with background noise.

6.4 Maximum Noise Level Events

Calculations indicate that the L_{AMax} noise criterion for night-time will be achieved. However, it is suggested that waste collection and fuel delivery activities are limited to between 6:00 am and 9:00 pm for general amenity.

Delivery vehicles to the fuel shop and fast-food outlet can occur at any time.

Compressed air stations should have either adjustable audible signals, or no audible signals at all.

6.5 Future Access via Easements

The designed noise barriers allow for access to the adjoining property at the north-west corner of the Site.

Future access via the south-eastern corner of the Site will necessitate removal of a portion of the noise barrier. While subject to detailed design, it is envisaged that deleting the southern-most truck park to construct a leg in the noise barrier would satisfactorily maintain the amenity of the adjacent motel units, as indicated in **Figure 10**.

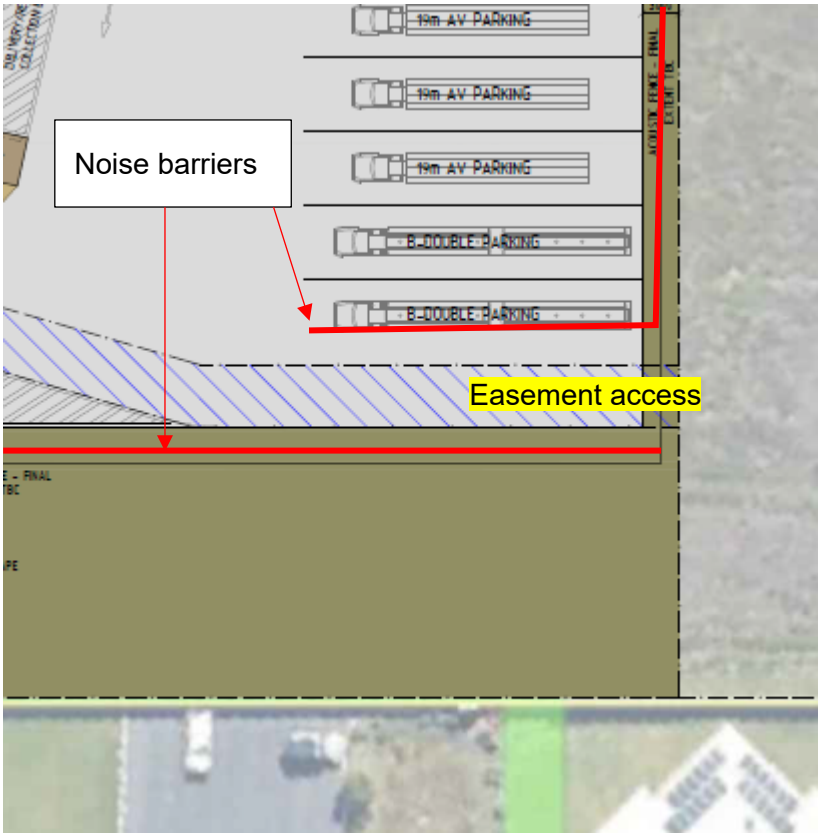


Figure 10 Conceptual alternative barrier design for easement access

7 Conclusion and Summary of Recommendations

RoadPro Acoustics was engaged by Pearl Investments (Aust) Pty Ltd to assess potential noise emissions from a proposed service station and truck stop at 1018 Yaamba Road, Parkhurst.

Acoustic barriers are recommended at various locations within the Site as detailed in **Appendix C**, primarily to mitigate mobile refrigeration noise on truck trailers.

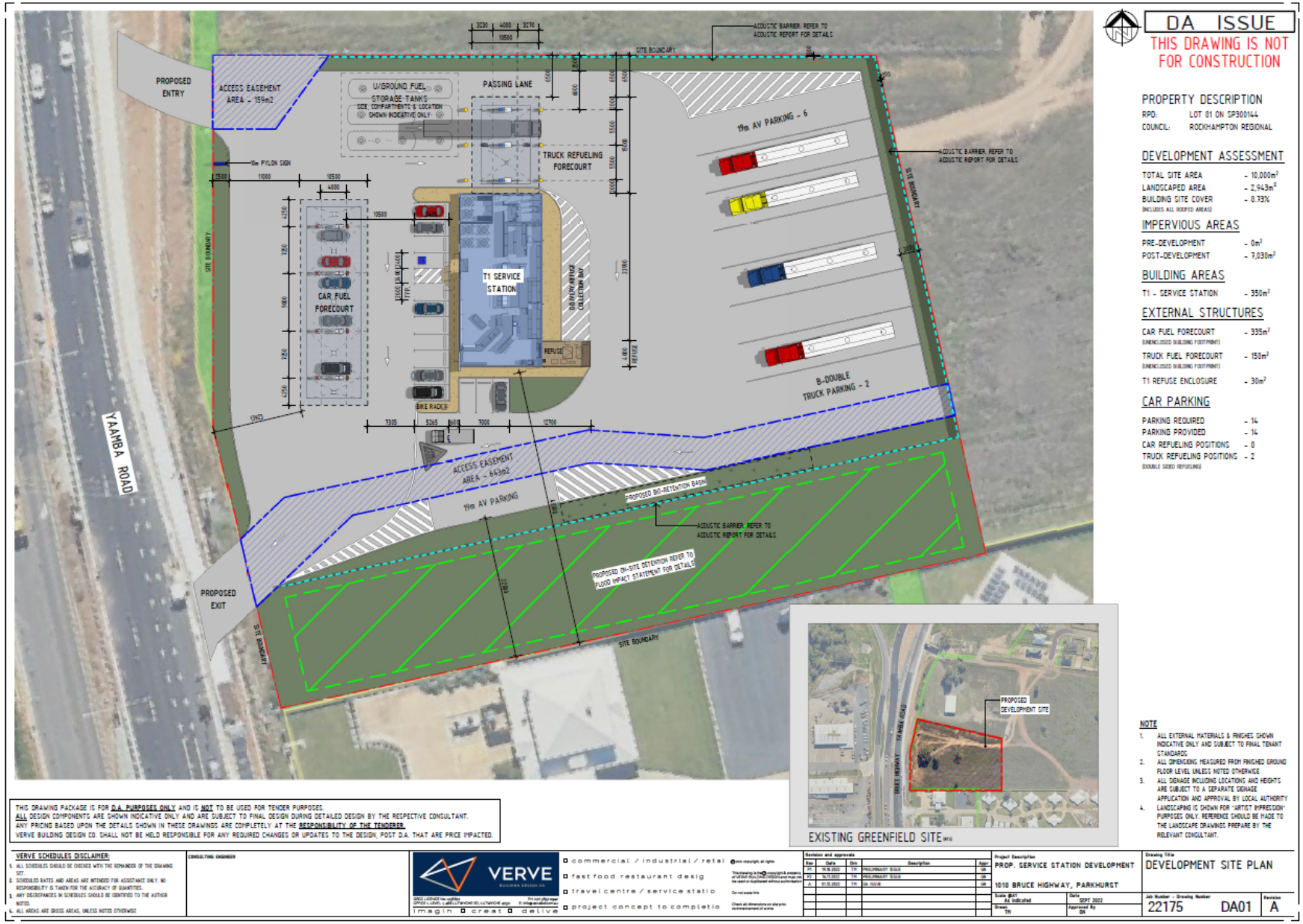
Refrigerated trailers must not be operated at the Site between 10 pm and 6 am.

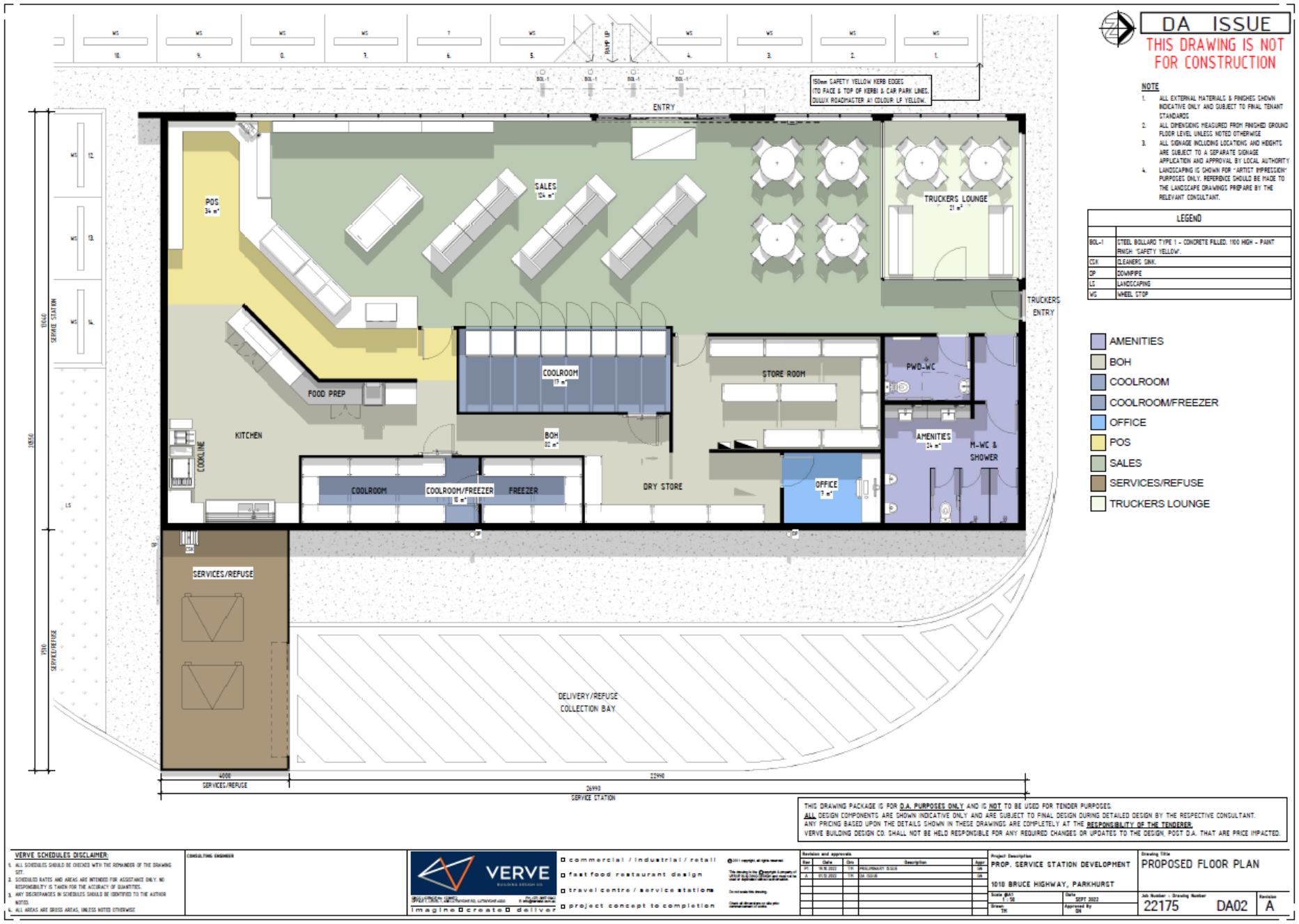
Fixed mechanical plant should be further assessed during the detailed design stage of the project to ensure the noise criteria are achieved.

It was found that the Site design, with inclusion of the recommendations in this report, can achieve the Acoustic Quality Objectives and Background Creep criteria during the day, evening and night.

It is the view of RoadPro Acoustics that the Site is suitable for the proposed use, subject to the recommendations made in this report.

Appendix A – Site Plans





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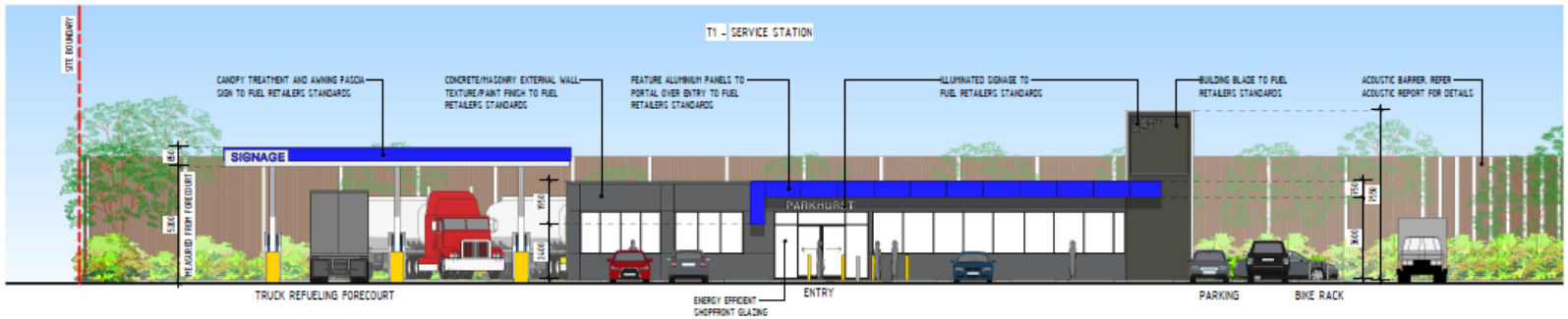

3 ELEVATION WEST - SHOPFRONT
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P1	19.10.2022	TH	PRELIMINARY ISSUE	GN
P2	14.11.2022	TH	PRELIMINARY ISSUE	GN
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Project Description: PROP. SERVICE STATION DEVELOPMENT
1010 BRUCE HIGHWAY, PARKHURST
Scale @A1: As indicated
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Date: SEPT 2022
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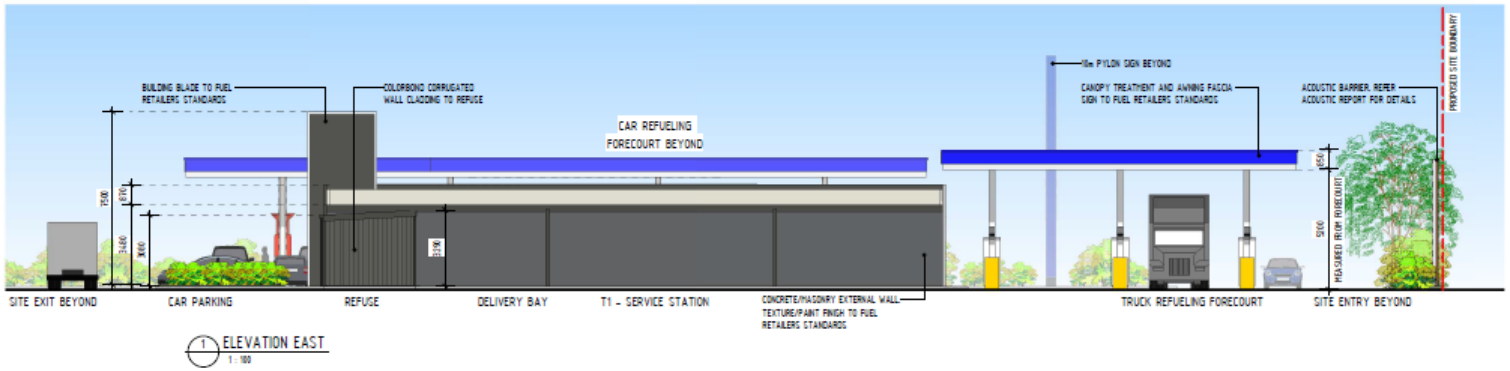
Drawing Title: BUILDING ELEVATIONS & PERSPECTIVES
Job Number - Drawing Number: 22175 DA03
Revision: A



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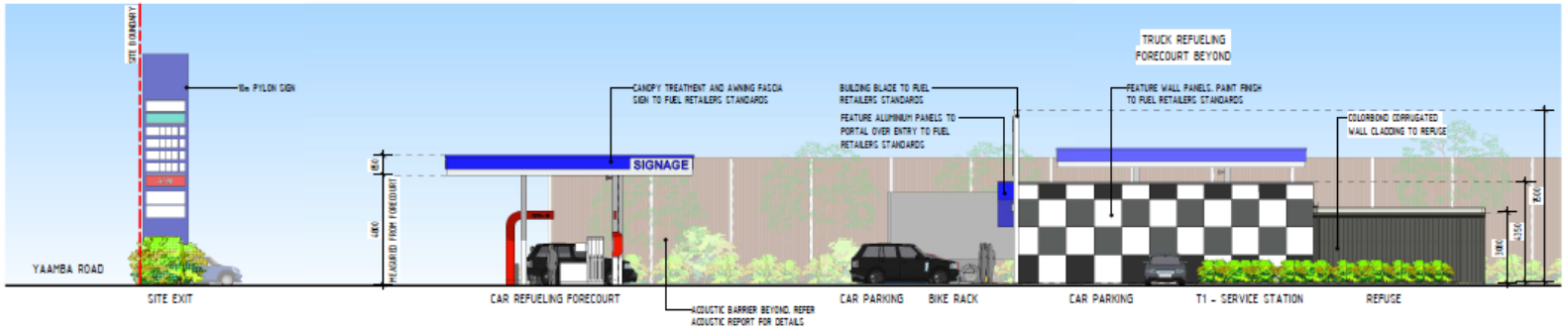

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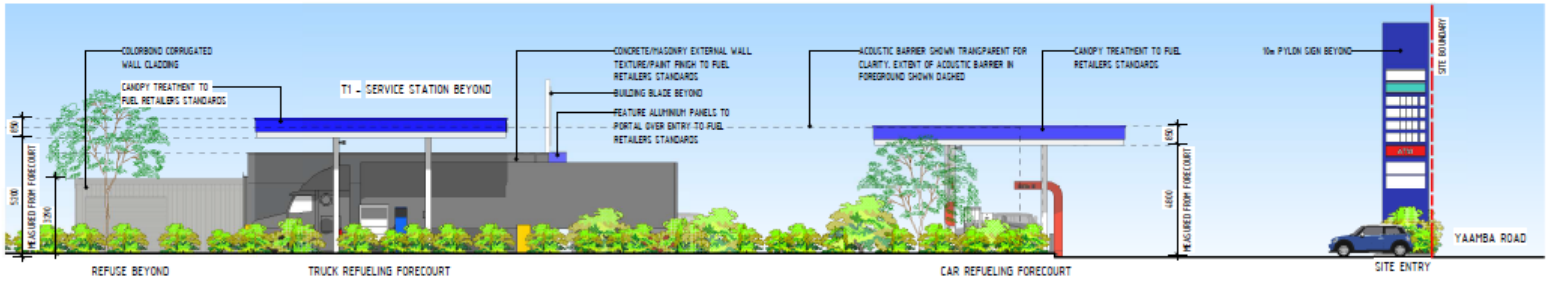

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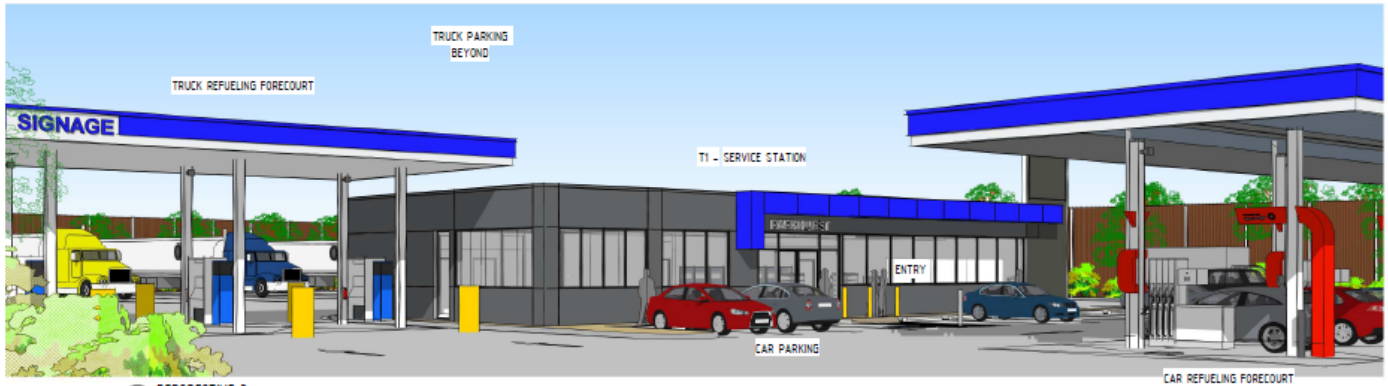
1 PERSPECTIVE 2



2 PERSPECTIVE 3

3 PERSPECTIVE 4

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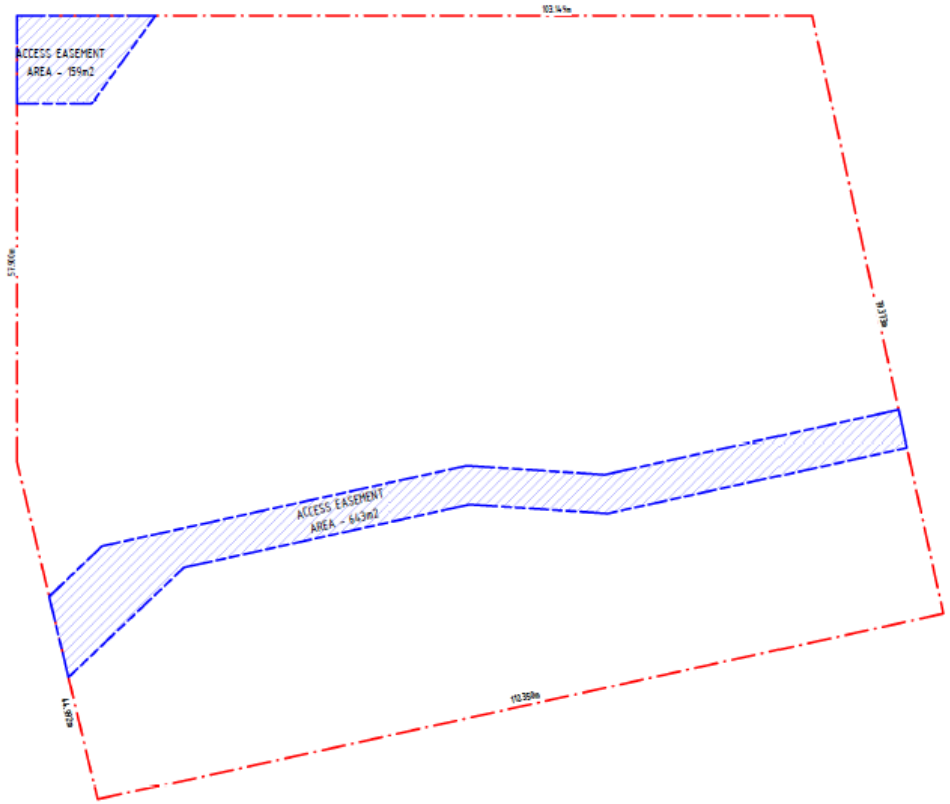

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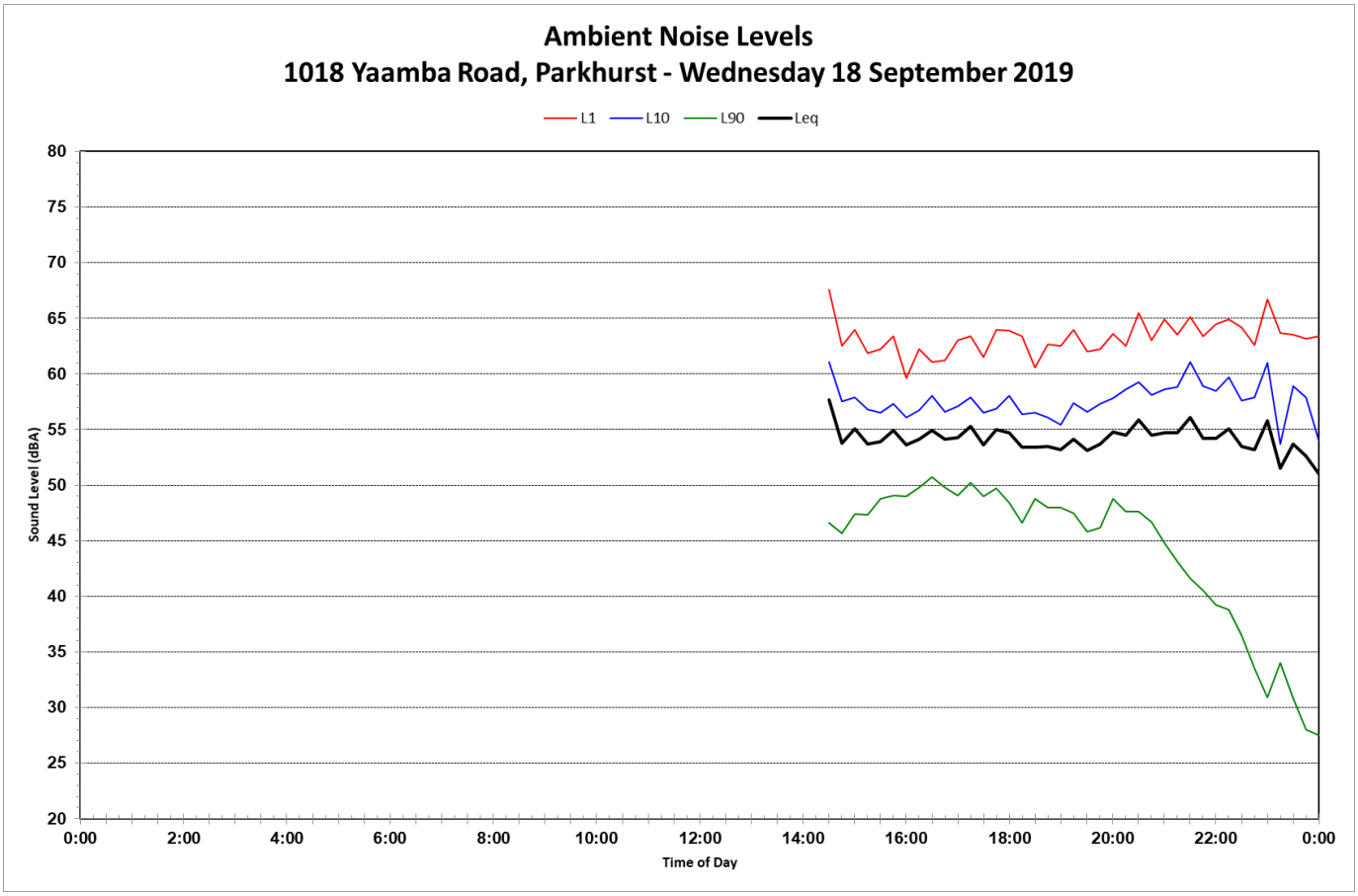
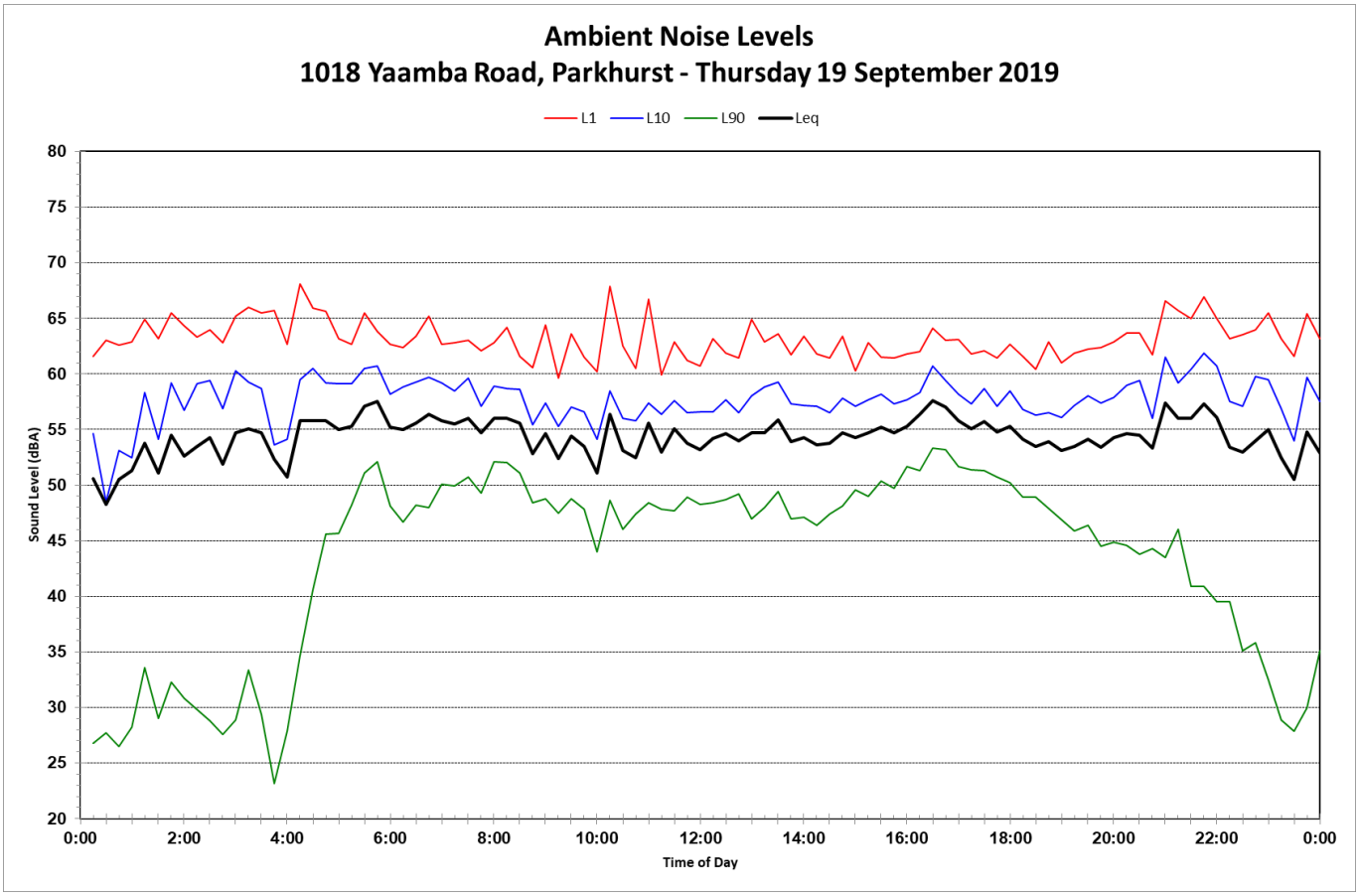
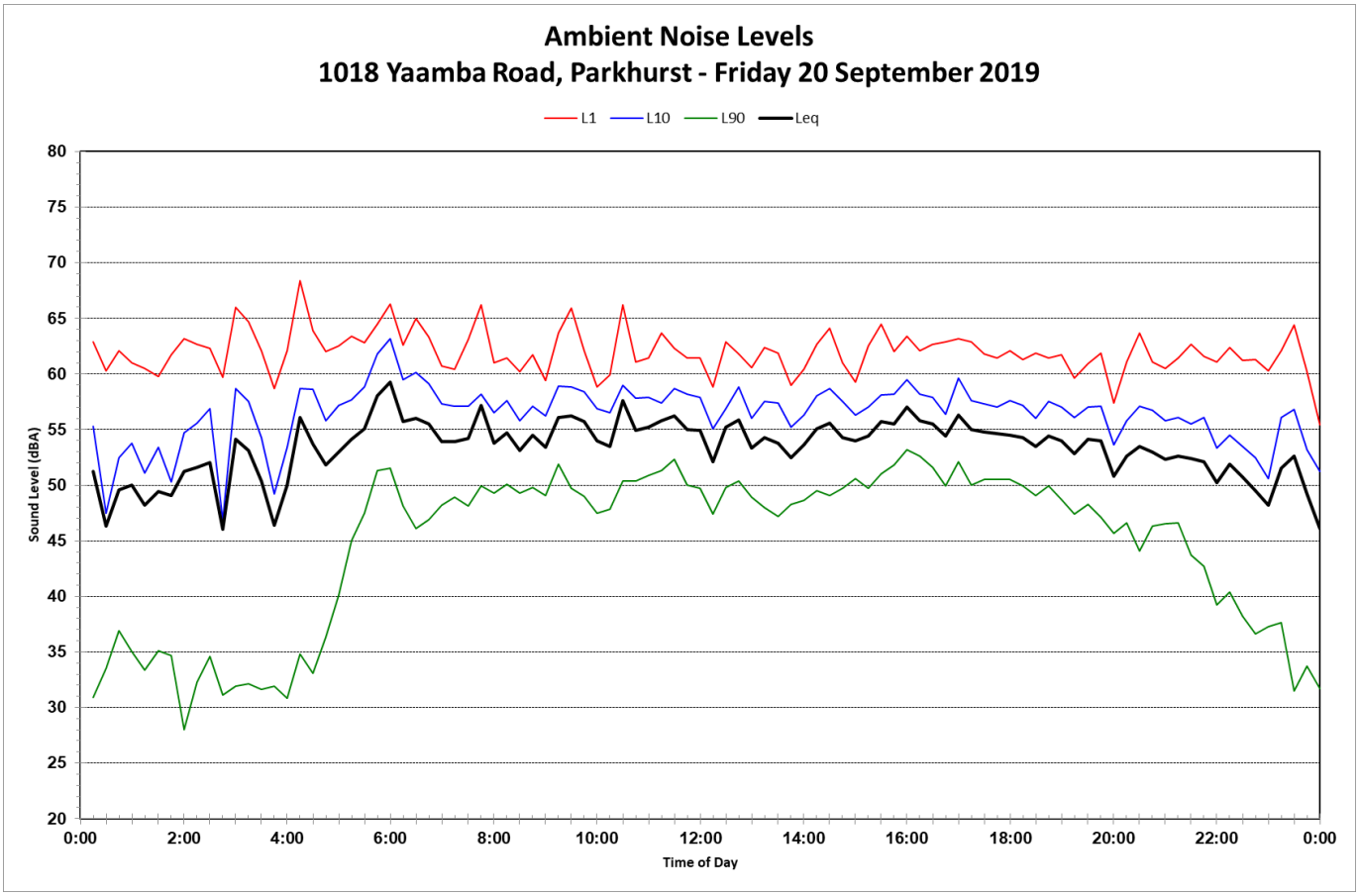
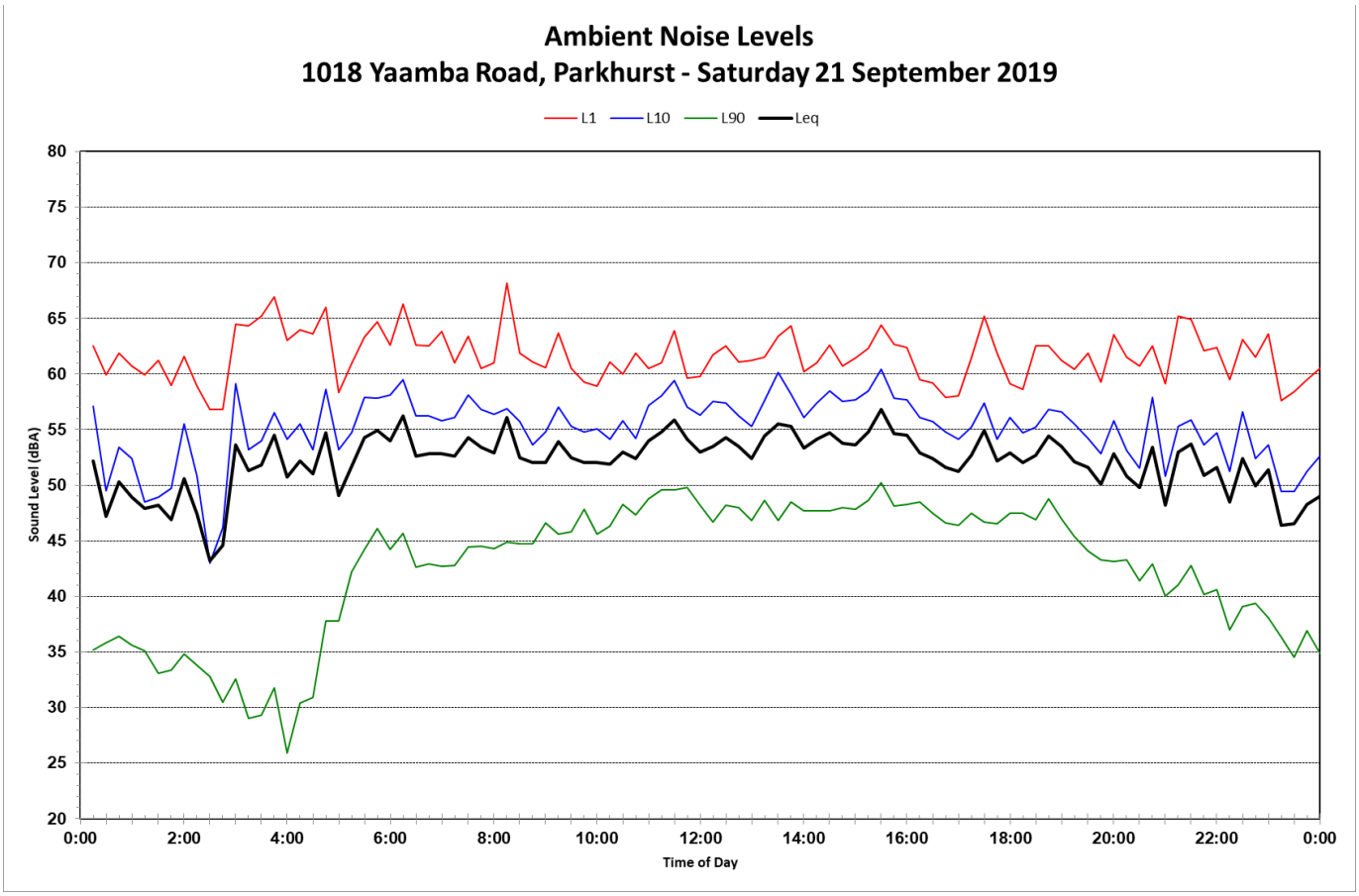
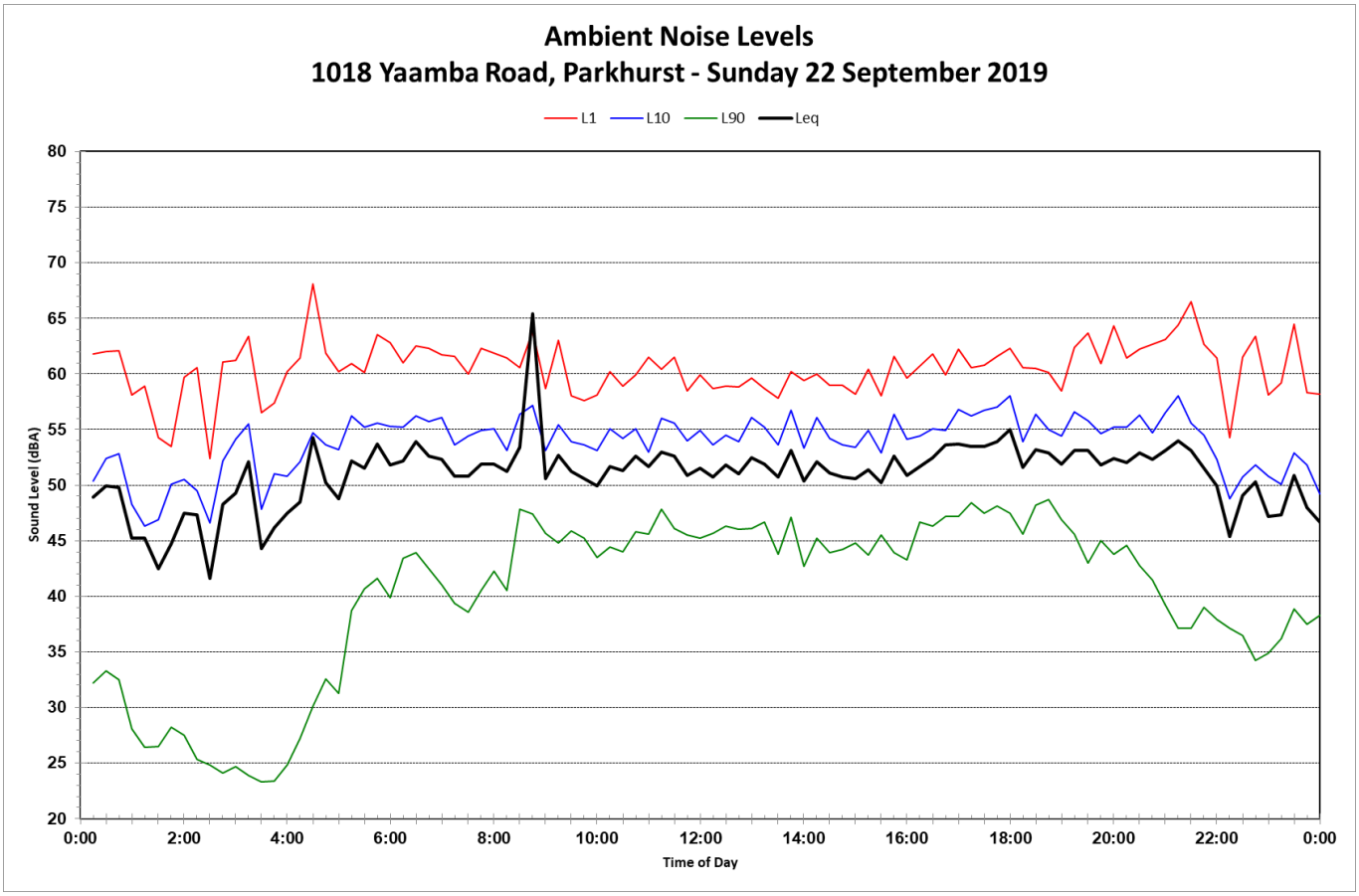
Appendix B – Noise Charts

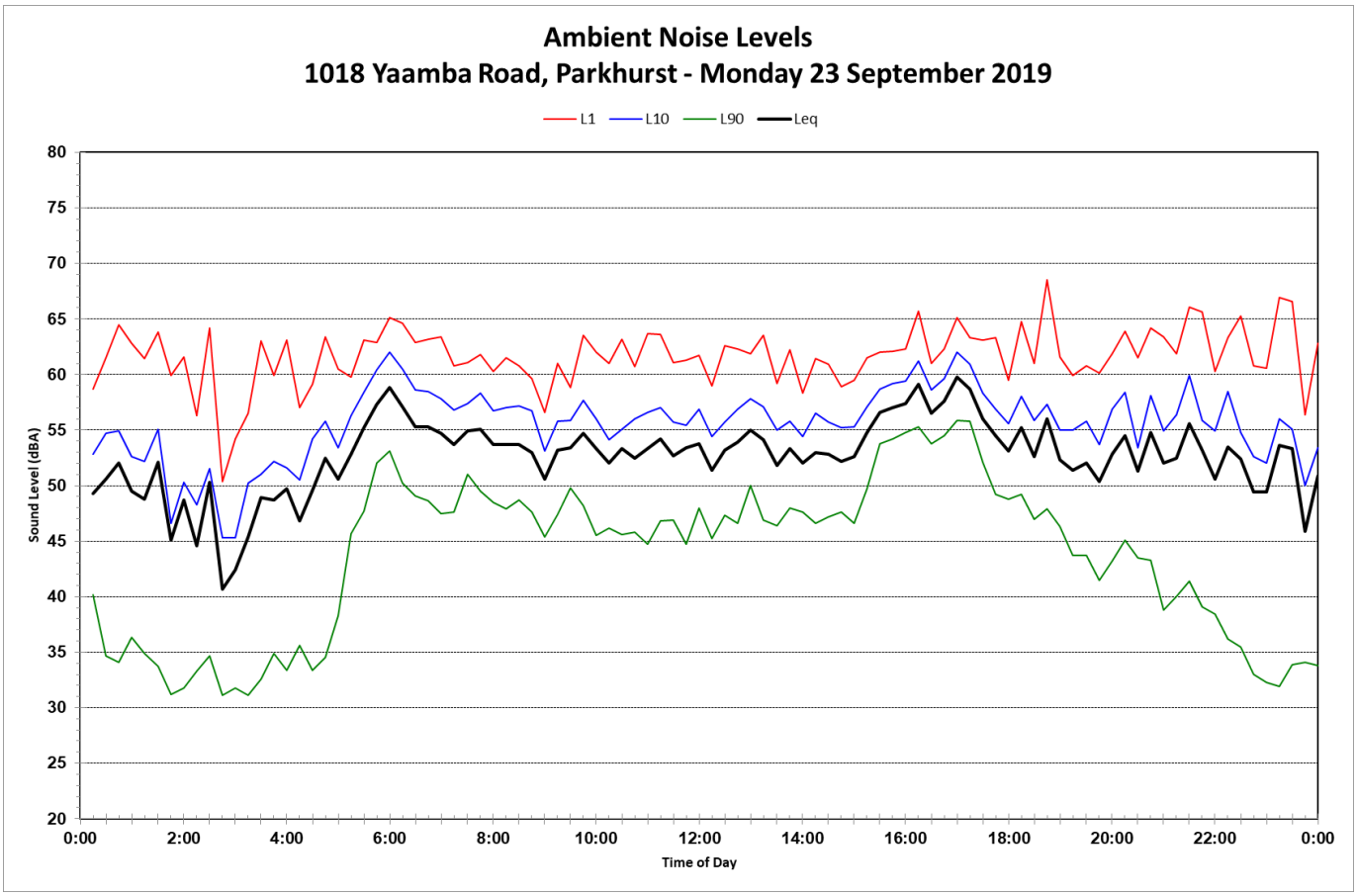


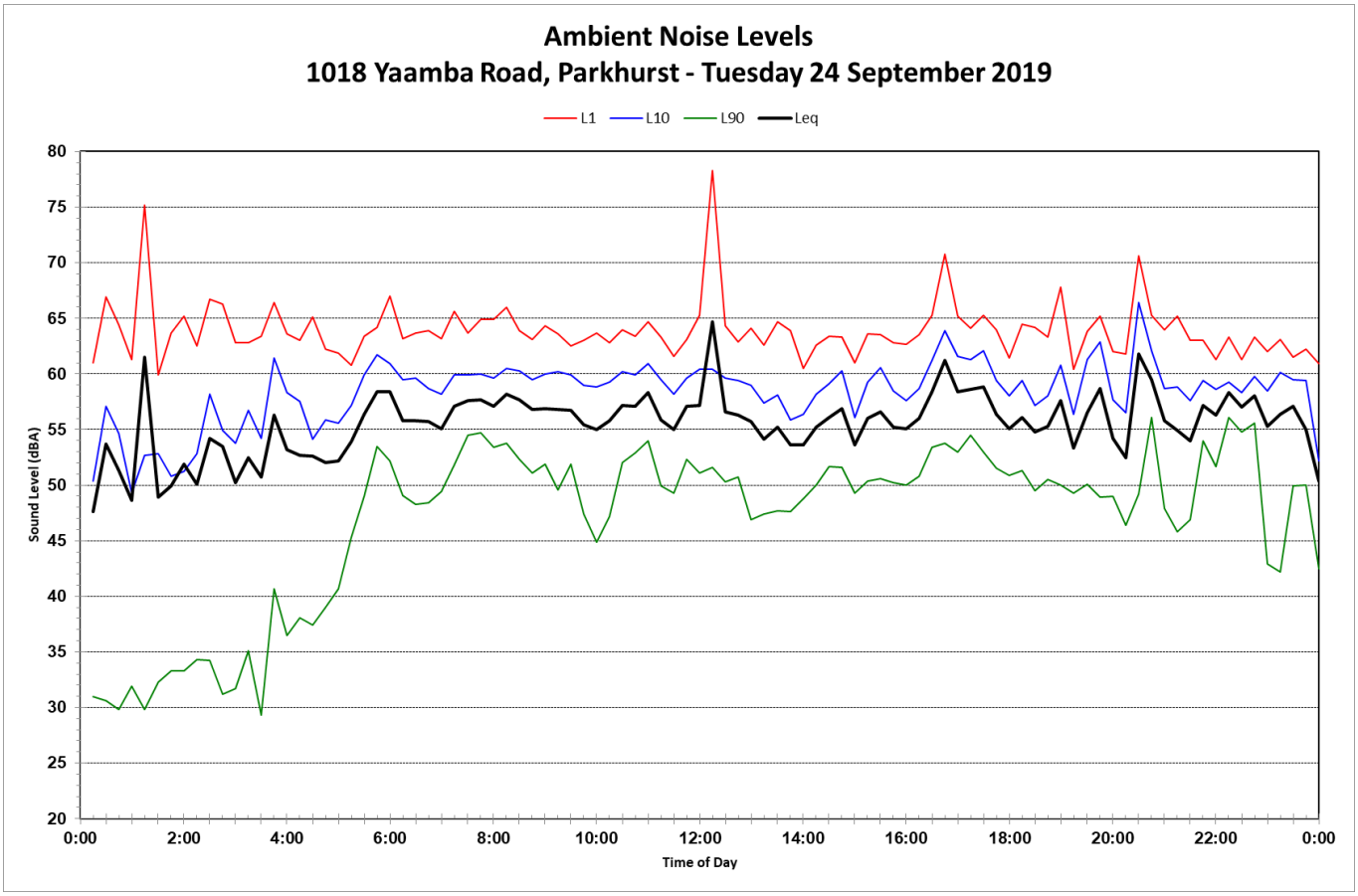


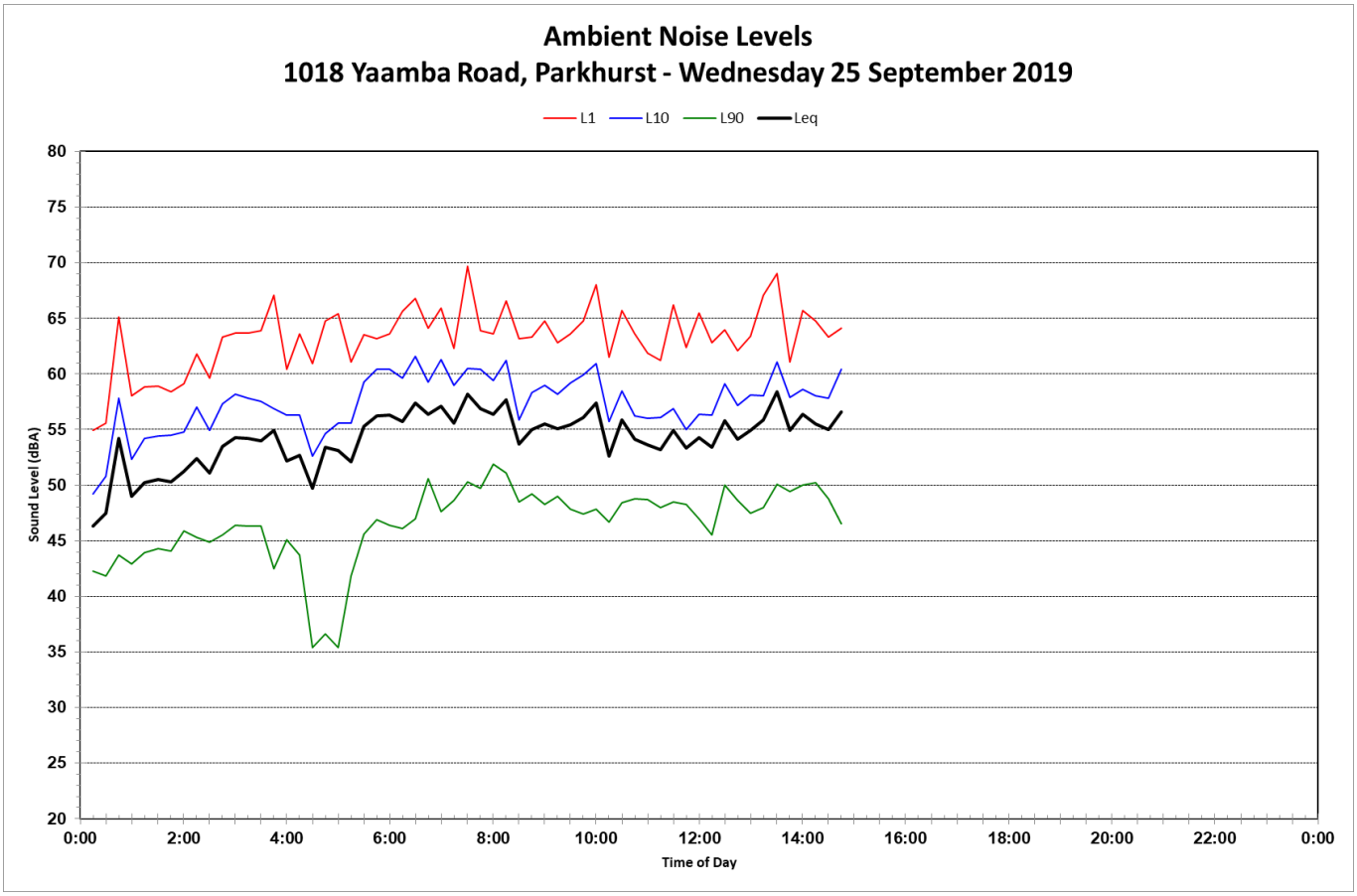




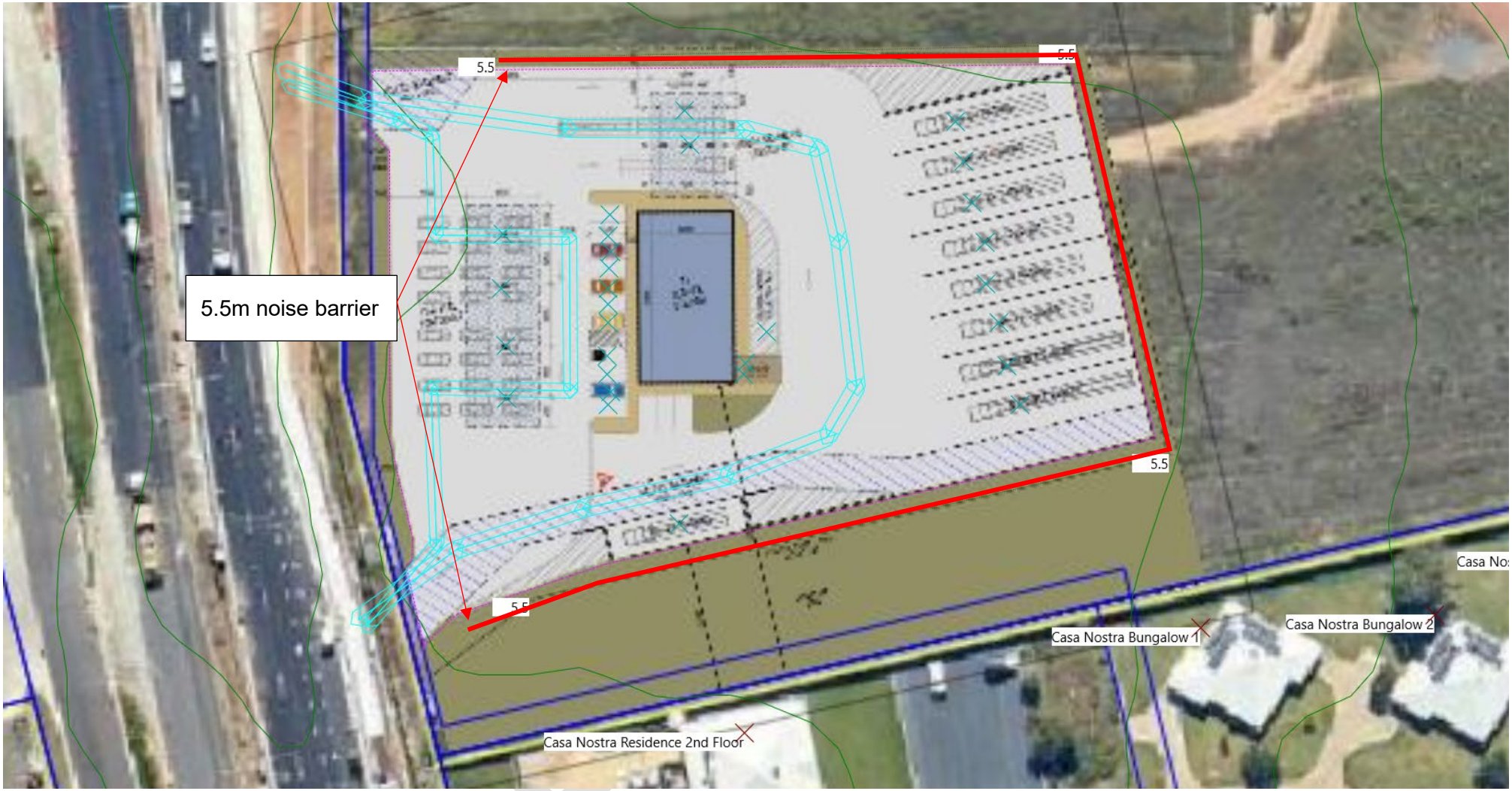








Appendix C – Noise Barriers



DESIGN INTENT:

The proposed landscape works (essentially planting beds with plants) are intended to reflect the site's usage (service station and truck park) and its potential impact on adjacent land uses and the frontage to Yaamba Road (Bruce Highway).

The works will consist of a simple landscape treatment which will enhance the visual amenity of the site when viewed from Yaamba Road and aid in screening/softening the visual impact of the site from within and from adjacent land uses, in particular existing (and future) residential areas.

It is proposed that an acoustic barrier fence be installed along the northern, eastern and southern boundaries of the development site where shown on the plan. The proposed landscape works, consisting of various width planting beds in front of the fence/within the site, will be planted with a simple layer(s) of screening shrubs (to 2.5 metres height approximately) to soften the visual impact of the fence when seen from within the site. Note that the density of this planting is not expected to fully screen the fence but rather only soften its visual impact.

In addition to the shrub layer it is proposed that a single row of taller growing trees (to 6 metres height approximately) be planted in front of the fence to provide a degree of screening above the level of the acoustic fence to soften the visual impact of the development when seem from outside land uses.

A strip of planting along the site frontage with Yaamba Road is also proposed. This planting will contain layers of small shrubs (to 1.5 metres height approximately), groundcovers and accent plants which will retain views into the site and to the pylon sign from Yaamba Road while providing an attractive street frontage to the development site. Tree planting is not proposed within this strip of planting due to an existing sewer main located just within the front boundary and within this strip of planting. Whilst trees may cause damage to this sewer main, the low shrubs (with shallow root systems) will not be an issue if planted over the sewer main.

A bio retention basin is proposed along the southern boundary of the site (inside the acoustic fence line) for the treatment of stormwater flows as identified in the Stormwater Management Report. To assist in filtering stormwater runoff and removing sediments etc, this retention basin is proposed to be planted out with suitable sedges, tufting grasses, trees and palms which will also assist in screening the acoustic fence when seen from within the site.

A large on site detention basin is also proposed where shown on the plan. The design and surface treatments for this basin are subject to detailed engineering design.

Plant species to be used on the development site are shown indicatively on **LA-DA-CP-02** but typically the species used will reflect the different "landscape" zones. The planting strip along the site frontage (Yaamba Road) will generally consist of tropical, colourful plantings (predominantly exotic) while the plantings along the other boundaries (in front of the acoustic fence) will transition to more native, colourful plant species which will require less water and maintenance. Plantings to the bio retention basin will be native plants which are well suited to both a wet and dry soil environment and also their ability to strip and remove nutrients from stormwater runoff flows.

notes -
landscape works shown on this plan are indicative only and may change at detailed design/OP Works stage subject to Council conditions and detailed architectural and engineering designs;
areas of planting are shown for illustrative purposes only and do not necessarily represent plant densities which will be detailed more fully at OP Works stage;
no landscape works are proposed on the Yamba Road road reserve other than to make good any damage to existing features resulting from driveway construction.

PROPOSED SERVICE STATION DEVELOPMENT

1018 Bruce Highway, Parkhurst

Landscape Concept Plan (DA)

dwg. no. **LA-DA-CP-01**

December 2022

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0 2.5 5.0 7.5 10.0 12.5 15.0m 1:250
0 5 10 15 20 25 30m 1:500

PROPOSED PLANT SPECIES LIST

The following list of plant species is intended to indicate the type and style of plants to be used throughout the proposed development. They can be typically described as sub tropical plants (a mix of native and non native species) which are known to grow well in central Queensland's climate and soils provided they are watered adequately during periods of dry weather. The list is not intended to be exhaustive, not all plants listed may be used and other plants of a similar character may be used at the detailed design/OP Works stage. Note that should an irrigation system not be included in the works then less non native (exotic) plants will be used.

YAAMBA STREET FRONTAGE -
Tropical Shrubs (to 1.5m height), Groundcovers, Accent Plants

ACALYPHA species (dwarf)
ACMENA Allyn Magic
ALLAMANDA sunnee
AUSTROMYRTUS dulcis
GARDENIA SPECIES
HIBISCUS species (Roseflake)
IXORA species (Malay Pink, dwarf red/yellow/pink etc)
RAPHIOLEPSIS species (pink)
XANTHESTEMON Little Goldie

GARDENIA radicans
LIRIOPE species (green, white, variegated)
PHILODENDRON xanadu
TRACHELOSPERMUM tricolor

AGAPANTHUS species (blue and white)
CODIAEUM species (crotons)
CORDYLINE species
DIANELLA Silver Border
HYMENOCALIS littoralis
YUCCA desmetiana
STRELITZEA reginae

SIDE BOUNDARIES -
Trees (to 6.0m height, Native Shrubs (to 2.5m height), Accent Plants

GREVILLEA bailyeana*
MILLETIA pinnata
MIMUSOPS elengi
PHYLLANTHUS cuscutifloris
STERCULIA quadrifida
SYZYGIUM species*
XANTHESTEMON chrysanthus*

CALLISTEMON species
LEPTOSPERMUM species
MELALEUCA species
SYZYGIUM species
XANTHESTEMON Fairhill Gold

DIANELLA species
LOMANDRA species
YUCCA desmetiana
STRELITZEA reginae

* denotes tree species used to transition between tropical plants along front boundary to native plants along side boundaries.

BIO RETENTION BASIN PLANTS

DIANELLA caerulea
LOMANDRA hystrix
JUNCUS usitatus
MELALEUCA leucadendra*
MELALEUCA viridiflora*

* denotes paperbark trees suitable for use around bio retention basin for shade and screening.

IRRIGATION SYSTEM:

Subject to budget considerations, it is proposed to install an efficient, water wise, fully automatic, underground and permanent irrigation system to deliver 32mm of water per week to all planting beds shown within the site. It is not proposed that this irrigation system will cover any existing grassed areas on the footpath/road reserve.

Minimum system requirements as follows:
drip irrigation (16mm 'Netafim" techline at 450mm ccs and 50mm soil cover) to all planting beds within the development site;
mainlines at 450mm cover, lateral lines at 300mm cover;
single automatic Controller, of appropriate size, in a lockable and weatherproof meter box fixed to a wall in the Refuse enclosure or other nominated location;
Council approved backflow/RPZV/filter located after the site water meter.

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/25-2020
Dated: 4 July 2023

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PROPOSED SERVICE STATION DEVELOPMENT

1018 Bruce Highway, Parkhurst

Landscape Concept Plan (DA)

dwg. no. **LA-DA-CP-02**
December 2022