42 Fullerton Cove Road Planning Proposal

Proposed amendment to Port Stephens Local Environmental Plan 2013

Rezoning of Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

PORT STEPHENS COUNCIL

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VERSION CONTROL

Version	Date	Details
1	March 2017	Planning proposal (PP) as submitted to Council
2	February 2020	PP updated into Council template
3	April 2020	PP updated to reflect the withdrawal of the Seaside Estate PP and submitted to the Department of Planning, Industry and Environment (DPIE)
4	August 2020	PP revised by Council to address matters raised by DPIE in the adequacy assessment. The main changes include: • Providing further information in Section A – Need for the planning proposal • Updating assessment against the Fern Bay and North Stockton Strategy • Updating assessment against Ministerial Direction 1.1 Business and Industrial Zones • Provided assessment against the Ministerial Direction 2.6 Remediation of Contaminated Land • Providing further information in response to Q9.
5	March 2021	PP revised to address matters listed in the Gateway determination. The main changes include: • Updated explanation of provisions to clarify relationship between proposed additional local clause and clause 5.4(7AA). • Updated to include results of further studies; Biodiversity Development Assessment Report, Flood Impact Assessment, Traffic Impact Assessment, Preliminary Contamination Assessment, Acid Sulfate Soils Study, and Strategic Bushfire Study.
6	January 2022	PP revised by proponent to address matters raised by DPIE relating to an increase in GFA, as well as revised

		to reflect updated BDAR and FIA in response to BCD referral.
7	March 2022	PP updated to reflect Gateway alteration received from DPIE to increase GFA to 5,500m2, in preparation to send for second round of consultation with BCD and TfNSW.
8	April 2022	PP updated to reflect second round of consultation agency feedback, and prepared for public exhibition.

FILE NUMBERS

Council: 58-2017-4-1

Department: PP_2020_PORTS_001_00 / PP-2021-1011

SUMMARY

Purpose: The purpose of this planning proposal is to amend the *Port Stephens Local Environmental Plan 2013* (LEP) to enable the development of a neighbourhood centre with a neighbourhood supermarket in Fullerton Cove to provide day-to-day retail services for the residents in Fern Bay and Fullerton Cove.

Subject land: Lot 14, DP 258848
42 Fullerton Cove Road, Fullerton Cove

Proponent: Monteath & Powys on behalf of Christine Jordan

Proposed changes:

- Rezone part of Lot 14 DP 258848 from RU2 Rural Landscape to C2 Environmental Conservation.
- Rezone part of Lot 14 DP 258848 from RU2 Rural landscape to B1 Neighbourhood Centre.
- Remove Minimum Lot Size requirement of the proposed B1 zone from AB2 20 hectares.
- Introduce a height of building limit of 9 metres to the B1 zone.
- Introduce a new local provision limiting future commercial development to a maximum gross floor area of 5,500 square metres.

Area of land:	~ 6.7 hectares
Jobs created:	~ 60 - 90 ongoing jobs

BACKGROUND

The planning proposal seeks to amend the *Port Stephens Local Environmental Plan 2013* (LEP) to enable the development of a local centre, with a supermarket, at 42 Fullerton Cove Road, Fullerton Cove.

The subject site is currently zoned RU2 Rural Landscape and the planning proposal seeks to rezone approximately 2.5ha to B1 Neighbourhood Centre (expected to translate to E1 Local Centre in future employment zone reforms) with the remaining 4.2ha to be rezoned C2 Environmental Conservation to address the environmental constraints of the site.

The planning proposal seeks to facilitate a supermarket and shops to provide day-to-day retail services to the local community, which is currently underserviced. Submissions received from the local community on the Fern Bay and North Stockton Strategy indicate a strong desire for local retail services within Fern Bay and Fullerton Cove in the immediate future.

At time of Gateway, the nearby land was previously zoned B1 Neighbourhood Centre within Seaside Estate, Fern Bay, identified in **Figure 1**. Due to its location, this land was considered less suitable for the development of a supermarket than the subject site. Landowners at Seaside Estate submitted a planning proposal with Council to rezone the land to R2 Low Density Residential. The planning proposal has since been finalised and the land is now zoned R2 Low Density Residential.

It was previously established that if both sites were to be developed to provide retail services there would have been sufficient demand within the locality to support retail development, and the initial planning proposal allowed for this with a restriction on GFA. Since the rezoning of Seaside Estate, additional studies have been undertaken that justify an increase in GFA of the subject site. A revised Gateway alteration was issued on 23 February 2022 to increase the restriction on commercial floor space area to allow for a full line supermarket and supporting commercial premises (**ATTACHMENT 2**).

As identified in the planning proposal, the following additional investigations have been prepared in accordance with the Gateway determination and provide justification for relevant site-specific matters:

- Addendum to Fern Bay and North Stockton Commercial Lands Study
- Acid Sulfate Soils Study
- Strategic Bushfire Study
- Preliminary Contamination Assessment

- Traffic Impact Assessment
- Revised Biodiversity Development Assessment Report
- Revised Flood Impact Assessment
- Options Analysis

These investigations confirm the proposal is consistent, can be supported and proceed to the next stage. In addition to this, an Aboriginal Cultural Heritage Assessment is currently being prepared to support the planning proposal and any future development application.

SITE

The subject site has an area of approximately 6.7 hectares and is located adjacent to the intersection of Nelson Bay Road and Fullerton Cove Road. **Figure 1** identifies the subject site and local context.

The subject site is currently zoned RU2 Rural Landscape and comprises one lot. The site is currently used for residential purposes and has been largely cleared around the existing dwellings.

The surrounding land use zones are a mixture of rural, residential, and environmental conservation zones. The neighbouring properties consist of residential, retirement village, caravan park, and rural dwellings, rural activities including livestock grazing and a wedding venue with guesthouse at Stanley Park House. The nearest commercial development that offers day-to-day grocery items is Stockton IGA located 8km to the south.

The site was previously the subject of a similar planning proposal which was refused at Gateway in 2013. The following table details how the reasons for refusal have been addressed in this planning proposal.

Table 1 – Reasons for refusal of the previous planning proposal

Reasons for refusal	Addressed in the planning proposal
Inconsistency with strategic framework including the Lower Hunter Regional Strategy (LHRS) and the Port Stephens Planning Strategy (PSPS)	The planning proposal has been updated to demonstrate consistency with the PSPS, the Local Strategic Planning Statement and the Hunter Regional Plan (HRP), which has replaced the LHRS.
Lack of demonstrated site-specific merit.	The planning proposal has been updated to detail the site-specific merit criteria provided by the DPIE *Guide to preparing planning proposals* including reference to the Hill PDA Fern Bay & North Stockton Commercial Lands Study 2017, and a subsequent Addendum, justifying the need for the planning proposal and site suitability (**ATTACHMENT 3 and 4**).

Unable to demonstrate land could be developed.	The Biodiversity Development Assessment Report (BDAR) and Flood Impact Assessment (Flood Study) indicate the land is able to be developed, and this has been confirmed by consultation with Biodiversity Conservation Division (BCD). Other relevant site-specific matters have been adequately addressed as detailed in the planning proposal.
Inconsistent with relevant State Environmental Planning Policies (SEPPs) and Ministerial Directions.	The planning proposal has been updated to address consistency with the relevant SEPPs and Ministerial Directions. Where the planning proposal is inconsistent, the inconsistency is considered minor or justifiable.
No identification of biodiversity offsetting.	The proposed B1 Neighbourhood Centre zone has been reduced since the previous proposal. Offsetting requirements have been informed by the BDAR and can be resolved at development application stage.
Needs to demonstrate community benefit.	**Section C** of the planning proposal details the community benefit of progressing this planning proposal, including support from residents received as submissions during the exhibition of the Fern Bay and North Stockton Strategy.

Figure 1 – Locality



PART 1 – Intended outcome

The intended outcome of the planning proposal is to enable a local centre, with a supermarket, for local day-to-day retail convenience and services within the Fern Bay area while protecting and managing biodiversity values and flood prone land.

The proposal will enable the development of a local centre comprising:

- a full form supermarket,
- neighbourhood shops; and
- associated car parking and landscaping.

PART 2 – Explanation of provisions

The intended outcome of the planning proposal will be achieved by the following amendments to the Port Stephens Local Environmental Plan 2013 (LEP):

- Amend Land Zoning Map Sheet LZN_004A for Lot 14 DP 258848 from RU2 Rural Landscape to part B1 Neighbourhood Centre/E1 Local Centre and part C2 Environmental Conservation.

- Amend Lot Size Map Sheet LSZ_004A from AB2 20 hectares to part AB2 20 hectares and part no specified minimum lot size.

- Amend Height of Building Map Sheet HOB_004A from no height specified to part no height specified and part J 9 metres.

- Introduce a new local provision limiting future commercial development to a maximum gross floor area of 5,500 square metres.

Figures 2, **3** and **4** indicate the proposed changes to the Land Zoning Map, Lot Size Map and Height of Building Map. All maps can be found at (**ATTACHMENT 1**).

It is noted that the proposed boundaries are supported by the findings of the Biodiversity Development Assessment Report (BDAR) and that the planning proposal can proceed to the next stage.

Figure 2 - Existing and proposed land zoning map

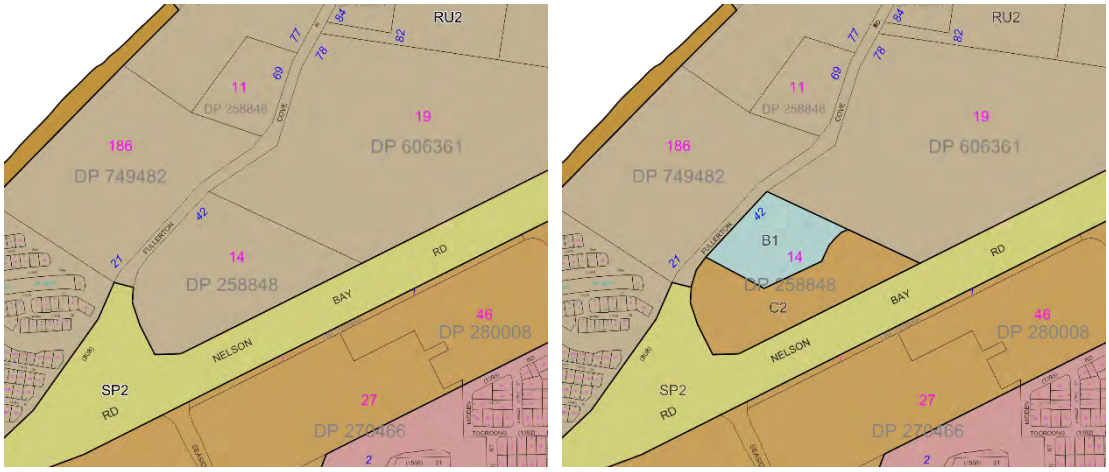


Figure 3 - Existing and proposed lot size map

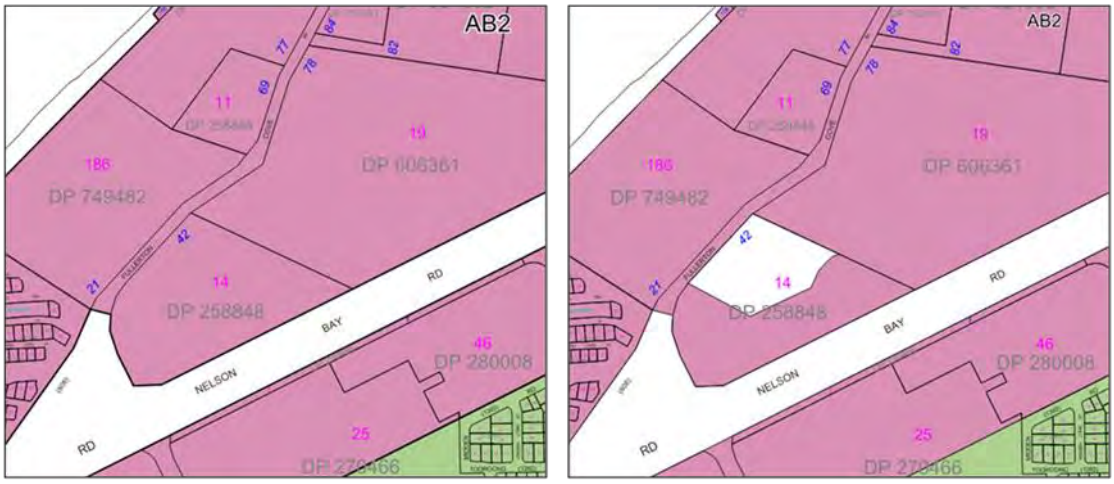
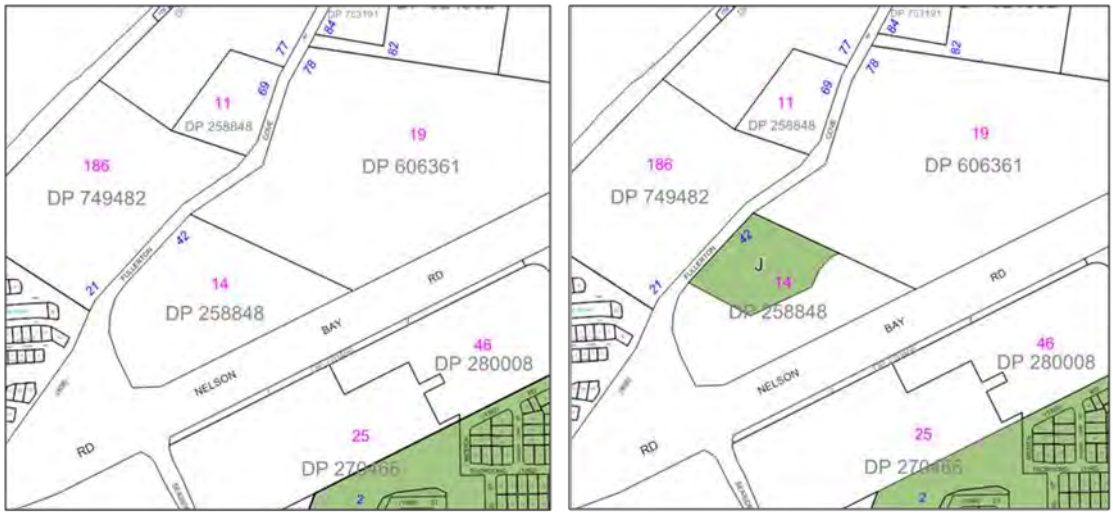


Figure 4 –Existing and proposed height of building map



PART 3 – Justification

Section A – Need for the planning proposal

Q1. Is the planning proposal a result of any strategic study or report?

The planning proposal is the result of the Hill PDA Fern Bay and North Stockton Commercial Lands Study 2017 (the Study) (**ATTACHMENT 3**) prepared for Newcastle City and Port Stephens councils to guide the development of a land use strategy for Fern Bay and North Stockton.

The Hill PDA study identified the subject site as a potential future location for a new town centre. According to the Study, the demand for additional retail floorspace in 2017 was 2,300sqm, indicating the area is currently underserviced. A shopper survey also found 75% of respondents indicated a new retail centre, or expanded retail offer, was a priority for Fern Bay and Stockton.

The Study also identified Stockton Residential Centre to be a preferred option for a town centre. The NSW Department of Communities and Justice have advised Council that they are working with the NSW Department of Planning, Industry and Environment to investigate potential future uses for the Stockton Residential Centre. The site has been deemed surplus to Ageing Disability and Home Care's needs following the relocation of its former residents in 2020. Given the uncertainty of the future of the site, the location and timing of a future town centre remains uncertain.

The subject site can provide a supermarket, to provide day-to-day services for the community. The initial planning proposal limited gross floor area for retail development of 1,500 square metres to allow future viability of commercial development within the area. It was found during further investigations and research including review of the market, and community engagement that 1,500m² would not be commercially viable or support the current needs of the community. As such, a request was made to Hill PDA to review the potential for the future Stockton Commercial Centre and the subject site as a secondary centre to co-exist (**ATTACHMENT 4**). The review noted that if the subject site maintained a GFA of 1,500m² would still enable Stockton as the primary centre to maintain a GFA of 4,500 to 6000m². It was also noted that 1,500m² not be viable in the longer term and recommended that the GFA be reviewed, and alternative non-retail uses pursued in the longer term.

At the time of the Gateway determination there was existing B1 zoned land within Seaside Estate (shown in **Figure 1**) which has subsequently been rezoned to R2 Low Density Residential. Consideration was requested to remove the restriction on floor space area in initial Gateway Determination to support an increased GFA of 5,500m^2 for the subject site enables a full format supermarket and additional retail to support a local centre. This Alteration of Gateway Determination was issues on 23 February 2022 (**ATTACHMENT 2**). The increased GFA allows future diversification of alternate commercial outcomes on either the subject site or for the future Stockton Centre site

depending on market demand, and is supported by an Options Analysis (**ATTACHMENT 11**) and Commercial Lands Addendum (**ATTACHMENT 4**). This increase in floor space area still enables the Stockton site to remain as the primary centre, and allows both centres to be viable short and long term.

Informed by the Hill PDA Study (**ATTACHMENT 3**) and Addendum (**ATTACHMENT 4**) the Fern Bay and North Stockton Strategy (FBNSS) also identified a strong community desire for a neighbourhood centre in the short to medium term to support local residents. In response to the exhibition of the FBNSS, the local community prepared a petition to support and complete this planning proposal. The petition was brought to the attention of councillors during public access on the 26 November 2019 where Councillors supported the idea of a neighbourhood supermarket at this location. The planning proposal will enable an outcome from the FBNSS by facilitating the development of a local centre in the Fern Bay and Fullerton Cove area.

Q2. Is the planning proposal the best means of achieving the intended outcome, or is there a better way?

In order to achieve the intended outcome, the following options were considered:

a. **Develop land already zoned B1 Neighbourhood Centre/E1 Local Centre** – Rather than rezone the subject site, the land at Seaside Estate that is already zoned B1 Neighbourhood Centre could be developed to facilitate a small neighbourhood centre, with a neighbourhood supermarket.

At the time of Gateway determination there was an existing B1 zoned land within Seaside Estate, which has subsequently rezoned to R2 Low Density Residential. This is no longer an option.

b. **Rezone the Stockton Residential Centre for a new town centre** – Develop the land at Stockton Residential Centre and create a single town centre.

The Hill PDA Study found the existing Stockton Residential Centre to be the preferred location for a new town centre. The redevelopment of the Stockton Residential Centre is uncertain and there is an immediate need to service residents. The future town centre requires further strategic planning, rezoning and significant investment in order to provide an expanded retail offering. As outlined in **Section A**, this proposal will not prevent the future use of the Stockton Residential Centre for a town centre as envisioned by the FBNSS. This proposal will facilitate a neighbourhood centre to service residents in the immediate future that will complement the future town centre.

c. **Rezone the subject site and back zone land at Seaside Estate** – Rezone 42 Fullerton Cove Road, Fullerton Cove from RU2 Rural Landscape to B1 Neighbourhood Centre and back zone land at Seaside Estate from B1 Neighbourhood Centre to R2 Low Density Residential.

Council initially considered rezoning both sites and effectively move the existing B1 zoned land at Seaside Estate to 42 Fullerton Cove Road, Fullerton Cove. Due to the existing and growing demand for retail services in the locality, at the time of Gateway Determination it was considered there was sufficient demand for both local centres to service the area. Since then, a planning proposal to rezone land at Seaside Estate from B1 Neighbourhood Centre to R2 Low Density Residential was finalised in October 2021. This outcome further reinforces the merit and need for the Fullerton Cove planning proposal.

Section B – Relationship to strategic planning framework

Q3. Will the planning proposal give effect to the objectives and actions of the Hunter Regional Plan or Greater Newcastle Metropolitan Plan (or any exhibited draft plans that have been prepared to replace these)?

a) Does the proposal have strategic merit?

Hunter Regional Plan 2036

The *Hunter Regional Plan 2036* (HRP) applies to the Port Stephens local government area (LGA) and is an applicable consideration for this planning proposal.

The HRP does not directly address Fullerton Cove but does identify the adjacent suburb of Fern Bay as a centre of local significance.

The HRP identifies a regional priority for Port Stephens to “leverage proximity to major global gateways – and its attractive and valuable natural environment and coastal and rural communities – to generate economic growth and diversity”.

The planning proposal will support this priority by enabling the development of a neighbourhood centre that will generate economic growth and diversity within the Fern Bay and Fullerton Cove localities and increase expenditure in the Port Stephens LGA.

The most relevant direction from the HRP is:

- *Direction 6 – Grow the economy of Midcoast and Port Stephens*

The planning proposal will lead to short-term jobs during construction and long-term jobs once businesses are established as a result of the zoning

change. Approximately 60 – 90 ongoing jobs may be provided through the development of a supermarket and shops. The new retail services will also increase local expenditure by allowing locals to purchase day-to-day necessities within their own LGA instead of travelling to higher order centres in neighbouring LGAs.

The planning proposal is also consistent with:

- *Direction 8 – Promote innovative small business and growth in the service sectors* as it will provide local commercial opportunities for small businesses;
- *Direction 14 – Protect and connect natural areas* as it will rezone 4.5ha of RU2 Rural Landscape zoned land within the Watagan to Stockton Link to E2 Environmental Conservation and focus development on disturbed areas of the site;
- *Direction 16 – Increase resilience to hazards and climate change* as a Flood Study and response letter to Biodiversity Conservation Division (BCD) initial consultation (**ATTACHMENT 6**) was prepared to address resilience to hazards and climate change, and found that development of the site is not expected to result in a significant adverse impact on the site or neighbouring sites resilience to hazards and climate change;
- *Direction 17 – Create healthy built environments through good design* as the neighbourhood centre would be in walking distance and cycling distance for residents of The Cove Village and Seaside Estate. While the total walkable catchment is low, there are limited alternative locations to provide these essential services;
- *Direction 21 – Create a compact settlement* as the site is centrally located between existing residential neighbourhoods and will provide significant social benefits for residents; and
- *Direction 26 – Deliver infrastructure to support growth* and *communities* as development of the site will provide the growing community with day-to-day retail services including a neighbourhood supermarket.

The planning proposal is consistent with the HRP, as it will assist in growing the Port Stephens economy, provide opportunities for small businesses, provide retail facilities that support the growing community and will protect the natural environment.

<u>Greater Newcastle Metropolitan Plan 2036</u>

The *Greater Newcastle Metropolitan Plan 2036* (GNMP) applies to part of the Port Stephens LGA, including Fullerton Cove and Fern Bay.

The GNMP does not directly address Fullerton Cove but does identify the adjacent suburbs of Fern Bay and Stockton as areas “where housing and infrastructure opportunities should be maximised while protecting the transport connection between the Newcastle Airport and Newcastle Port”.

The most relevant strategy from the GNMP is:

- *Strategy 8 – Address changing retail consumer demand.*

Changing shopper habits has led to increased demand for fresh produce, dairy, baked goods, and prepared food being purchased on a more frequent basis. The planning proposal will facilitate a local neighbourhood centre that would allow Fern Bay and Fullerton Cove residents to access grocery items and other necessities within close proximity of their homes instead of outside the local area (e.g. Raymond Terrace, Stockton, Mayfield). Given the recent impacts of COVID-19 on shopper habits, there may be further demand for smaller local services over larger shopping centres.

The planning proposal is also consistent with:

- *Strategy 9 – Plan for jobs closer to the Metro frame* as it will provide additional jobs within the Metro frame (**Figure 5**);
- *Strategy 10 – Create better buildings and great places* as future commercial development would be subject to design objectives of the Port Stephens Development Control Plan 2014;
- *Strategy 11 – Create more great public spaces where people come together* as it will facilitate the development of a neighbourhood centre where people can come together; and
- *Strategy 13 – Protect rural amenity outside urban areas* as the site is surrounded by low density urban development including The Cove Village, Bayway Village, Palm Lake Resort and Seaside Estate (**Figure 1**, page 7)
- *Strategy 14 – Improve resilience to natural hazards* a revised Flood Study determined that development of the subject site is not expected to result in significant adverse impact on the side or adjacent properties in their resilience to natural hazards.

The planning proposal is consistent, or justifiably inconsistent, with the GNMP as it will address changing retail needs, provide jobs, and create great places where people can come together.

Figure 5 - Identification of the subject site in the Greater Newcastle Metropolitan Plan (page 10)



b) Does the proposal have site-specific merit, having regard to the following?

Natural Environment

A Biodiversity Development Assessment Report was completed by Kleinfelder (**ATTACHMENT 9**). In respect to threatened flora the following was determined:

- The site does not contain any Area of Outstanding Biodiversity Value (AOBV).
- Four Plant Community Types (PCTs) identified and mapped in Figure 3 of the Kleinfelder report. PCT 1646 contained areas of both moderate and degraded formations. PCT 1717 contained areas of both degraded and good, although only degraded vegetation exists within the development site. PCT 1728 and 1737 are both Endangered Ecological Communities (EECs), both being moderate vegetation.
- The site surveys confirmed that the majority of the threatened flora previously recorded, identified or determined to be assessed by the BAM were not detected and deemed unlikely to occur onsite.
- All of the moderate formations are located within the proposed C2 Environmental Conservation Zone and will remain protected.

In respect to fauna the following was determined:

- There was limited habitat that was deemed suitable for threatened fauna.
- There 14 habitat trees all identified outside of the development site (located with the proposed C2 Zone).
- The trees showed small to medium hollows, within only 1 large hollow found.
- None of the trees showed evidence of fauna occupation.

The potential impacts to Koalas from the proposed are considered negligible. Existing data pertaining to Koala habitat was ground-truthed onsite and assessed against the criterion in accordance with the Port Stephens Comprehensive Koala Plan of Management. The result of the assessment determined there were no preferred habitat or defined habitat buffers mapped within the development site or study area. The defined development area limits potential impacts on existing supplementary habitat of *Eucalyptus robusta to one* individual tree. The location of the development area will not significantly increase the fragmentation of Koala habitat or impede Koala movement.

The report confirms that the boundaries proposed for the rezoning are consistent in minimising impact on threatened species and will not generate any serious or irreversible impacts and is subject to the relevant Biodiversity Offset credits.

Land Uses

The proposal will not conflict with the current land uses surrounding the subject site as the proposed zoning maintains ecological values and development will complement the residential needs of the area.

The majority of the site is proposed to be zoned C2 Environmental Conservation consistent with environmental zoning at Seaside Estate. The remainder of the site is proposed to be zoned B1 Neighbourhood Centre/E1 Local Centre to meet the needs of the local community and provide necessary retail services.

The subject site is suitable for a local centre, to contain a supermarket and other retail, as it has good exposure to a major arterial road, is centrally located and accessible for local residents and passing trade along Nelson Bay Road.

Fern Bay is expected to experience continued population growth where demand for retail services will continue to grow. The proposal will facilitate day-to-day retail convenience for these residents as well as provide greater employment opportunities for the local area on land that is underutilised.

Services and Infrastructure

All relevant infrastructure and services are available within the area and will be connected at the time of development. The sewer capacity has recently

been upgraded. Local augmentation of sewer, water, drainage, and other infrastructure services can be undertaken as the site adjoins an existing urban area.

A Traffic Impact Assessment was completed by SCT Consulting, in consultation with Transport for NSW, to determine the impact a full-size supermarket on the development site would have on the existing infrastructure. The results of the assessment determined the following:

- The planning proposal is positively aligned with strategic planning and transport policy in the Hunter and Newcastle regions including the Hunter Regional Plan 2036, Greater Newcastle Metropolitan Plan 2036 and Port Stephens Local Strategic Planning Statement 2040. The development will promote economic activity and provide services closer to residential precincts in the area.
- The planning proposal aligns with the active transport initiatives proposed by Hunter Regional Plan 2036 and the Port Stephens Pathways Plan 2016. The proximity of the planning proposal to residential dwellings promotes the opportunity for active transport by providing a destination accessible by walking and cycling.
- Bus stops are provided within walking distance to the site on Fullerton Cove Road and Nelson Bay Road. However, the services at these stops are infrequent and would underservice the future public transport demand generated by the site. More frequent services and better bus stop amenities would greatly benefit residents travelling to and from the site and promote local mode shift onto public transport.
- The planning proposal is estimated to generate 507 vehicle trips in the PM peak and 672 vehicle trips in the weekend peak from the 5,500m2 GFA development.
- Without infrastructure upgrades, the road network will have sufficient capacity to accommodate these additional trips alongside the cumulative impacts of nearby planning proposals and proposed developments.
- Future patrons of the neighbourhood centre would benefit from a footpath connection between the centre and existing footpath network along Fullerton Cove Road.

The study concluded that the impacts of the planning proposal are at a level able to be accommodated by the existing and planned infrastructure.

Q4. Will the planning proposal give effect to a council's endorsed local strategic planning statement, or another local strategy or strategic plan?

Responses to the most relevant local strategies are provided below.

<u>Port Stephens Local Strategic Planning Statement</u>

Council adopted the Port Stephens Local Strategic Planning Statement (LSPS) on 14 July 2020. The LSPS identifies the 20-year vision for land use

in Port Stephens and sets out social, economic, and environmental planning priorities for the future.

The planning proposal is consistent with the following planning priorities from the LSPS:

- *Planning Priority 2 Make business growth easier* as the proposal will provide new business opportunities;
- *Planning Priority 6 Plan infrastructure to support communities* as the proposal will permit retail and commercial premises and community facilities to support the community;
- *Planning Priority 7 Conserve biodiversity values and corridors* as the proposed E2 zoning will conserve the environmental values of the site.
- *Planning Priority 8 Improve resilience to hazards and climate change* as the revised Flood Study determined that development of the subject site is not expected to result in significant adverse impact on the side or adjacent properties in their resilience to hazards and climate change;
- *Planning Priority 9 Protect and preserve productive agricultural land* as the land, while rural, is not productive agricultural land; and
- *Planning Priority 10 Create people friendly spaces in our local centres where people can come together* as the commercial development can provide a place for people to come together in close proximity to housing.

The planning proposal is consistent with the LSPS as it will provide business opportunities and services for the community, conserves the biodiversity values of the site, works to achieve a number of the liveability priorities identified for the area in Council's place based planning outcomes, and create a great space for people to come together.

Fern Bay and North Stockton Strategy

The Fern Bay and North Stockton Strategy (FBNSS) has been developed by Port Stephens Council and the City of Newcastle to guide future development and ensure sufficient community infrastructure is provided for the growing community. The City of Newcastle and Port Stephens Council adopted the FBNSS on the 24 March 2020 and 14 April 2020, respectively. The subject site is located within Precinct 6 and identified in **Figure 6**.

Fern Bay has experienced rapid population growth over the last 15 years. This has resulted in a number of disconnected residential developments with limited essential community services. Planning proposals for additional residential land is expected to further increase demand for services within the area.

The FBNSS sets out goals for the area as informed by community aspirations. One of the town centres goals to allow a local centre with a neighbourhood supermarket to service the day-to-day needs of the residents. The planning proposal can facilitate this local centre and provide a supermarket for the residents. The FBNSS included an action to:

Undertake a detailed assessment of the 'Request to Amend the Port Stephens Local Environmental Plan' submitted for 2 Seaside Estate, Fern Bay

This assessment was undertaken and the land at Seaside Estate was rezoned in October last year, achieving this outcome. As provided throughout this planning proposal, there is considered sufficient demand for retail floor space within the surrounding areas to support a Local Centre with a gross floor area of this size.

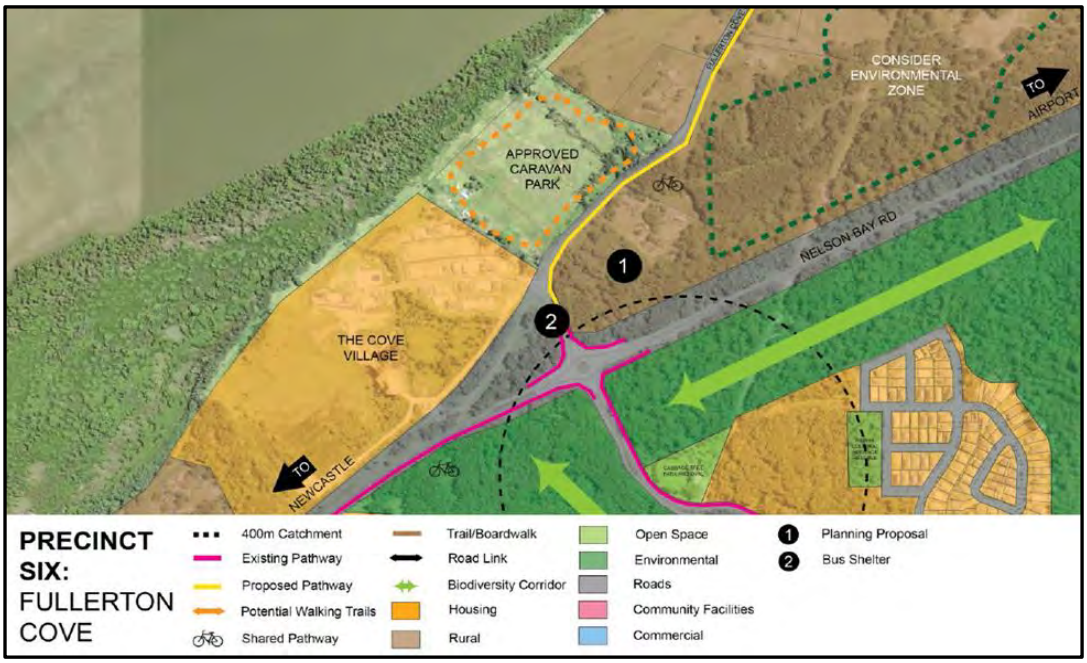
The Commercial Lands Study has been updated to give specific consideration to the planning proposal and the maximum allowable floor space area without having impact on the future primary centre (Stockton). The updated study provides further justification the planning proposal and any inconsistency with Ministerial Direction 1.1 Business and Industrial Zones.

Additionally, the planning proposal is consistent with the following planning principles:

- *Environment Planning principle – Protect important environmental assets and enhance biodiversity connections* as it seeks to rezone 4.5ha of land with high environmental value to C2 Environmental Conservation. Rezoning this land will provide better protection of the Swamp Oak Forest located on site.
- *Overall Structure Plan Outcome – Support the development of a neighbourhood centre in Fern Bay* as it seeks to facilitate the development of a local centre, with a supermarket, in the Fern Bay area.
- *Precinct 6 Outcome – Consider rezoning land mapped as containing an endangered ecological community to an environmental zone* as it seeks to rezone the referenced land to C2 Environmental Conservation.
- *Precinct 6 Outcome – Undertake a detailed assessment of the 'Request to Amend the Port Stephens Local Environmental Plan' submitted for 42 Fullerton Cove Road, Fullerton Cove* as this has been undertaken during the progression of this planning proposal, and further studies have justified the proposal.

The planning proposal is consistent with the FBNSS as it seeks to protect environmentally significant land as well as facilitate a neighbourhood centre in the Fern Bay area.

Figure 6 - Identification of the subject site within the Fern Bay and North Stockton Strategy (page 31).



Q5. Is the planning proposal consistent with applicable State Environmental Planning Policies (SEPPs)?

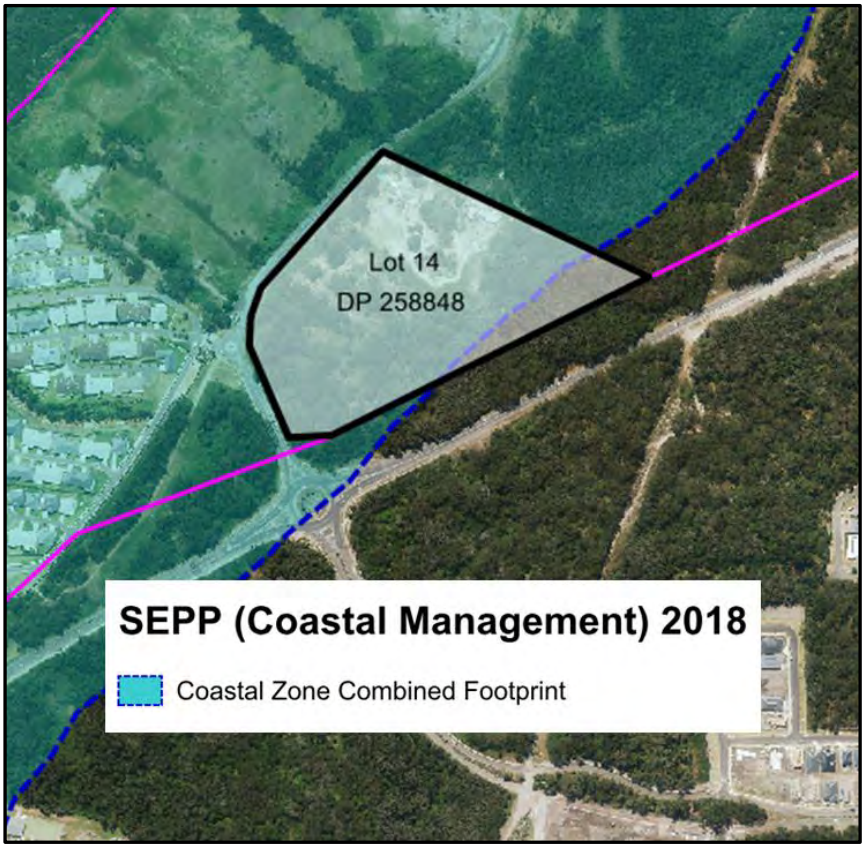
An assessment of relevant State Environmental Planning Policies (SEPPs) against the planning proposal is provided in the table below.

Table 2 – Relevant State Environmental Planning Policies

SEPP	Consistency and Implications
SEPP – Koala Habitat Protection 2020	The Port Stephens Comprehensive Koala Plan of Management (CKPoM) has been prepared in accordance with Part 3 of the Koala Habitat Protection SEPP, and is applicable in the Port Stephens LGA. In accordance with Appendix 6 of the Port Stephens CKPoM, the Koala Habitat was assessed using vegetation surveys to ground-truth the Port Stephens Koala Habitat Mapping in the BDAR (**ATTACHMENT 9**) prepared by Kleinfelder. Appendix 2 of the CKPoM sets out the performance criteria for planning proposals, which have been addressed below. *a) Not result in development within areas of preferred koala habitat;* No areas of preferred koala habitat or defined habitat buffers are mapped within the development site or within the study area (**Figure 7**).

	b) Allow only for low impact development within areas of Supplementary Koala Habitat and Habitat Linking Areas; The proposed B1 Neighbourhood Centre contains a small portion of supplementary habitat (**Figure 7**). *c) Minimise the removal of any individual preferred koala food trees, where ever they occur on the site;* There are no preferred koala feed trees within the proposed B1/E1 zone. No preferred koala feed trees will be removed as a result of this rezoning. The design of the proposed development footprint aims at avoiding large areas of supplementary habitat. *d) Not result in development which would sever koala movement across the site generally and for minimising the likelihood of impediments to safe/unrestricted koala movement.* Development of the site would not sever koala movement across the site. Fullerton Cove Road and Nelson Bay Road currently form significant barriers that limit koala movements through the site. Additionally, no roads or parts of the development are designed to create habitat fragmentation for Koalas. The BDAR of the site found that potential impacts to koalas from the proposed rezoning are considered to be negligible. **Figure 7 Ground-truthed Koala Habitat Map (CKPoM)**

	 **The planning proposal is consistent with this SEPP.**
SEPP – Coastal Management 2018 This SEPP applies to land within the coastal zone.	The Coastal SEPP provides that the coastal zone land within one or more of the following coastal management areas: *(a) the coastal wetlands and littoral rainforests area,* *(b) the coastal vulnerability area,* *(c) the coastal environment area,* *(d) the coastal use area.* The Coastal SEPP is applicable as the subject site is mapped within the NSW Coastal Zone Combined Footprint as a coastal environment area (**Figure 8**). The site does not have direct frontage to the coastal foreshore and is not part of the coastal use area. The planning proposal is not

	likely to cause increased risk of coastal hazards. The proposal will have no direct impact on the amenity of the coastal foreshore. The proposal will not exacerbate potential impact of coastal processes and coastal hazards. The Flood Impact Assessment by Northrop confirms the water quality of nearby coastal bodies will not be impacted by future development on the site. Further assessment of the planning proposals consistency with the SEPP is provided in response to Ministerial Direction 2.2. **Figure 8 - Coastal management mapping**  **The planning proposal is consistent with this SEPP.**
SEPP – Infrastructure 2007	The Infrastructure SEPP applies to the subject site; however, there is sufficient infrastructure capacity in the existing networks to support the proposal, confirmed by the Traffic Impact Assessment. The Traffic and Transport Impact Assessment by SCT Consulting (**ATTACHMENT 13**) confirms that there is sufficient capacity in the existing road network to cater for the expected increase of 507 vehicle trips in the PM Peak and 672 vehicles in the weekend peak. No upgrades are required for the intended redevelopment of the site. **The planning proposal is consistent with this SEPP.**

SEPP – Primary Production and Rural Development 2019 This SEPP aims to facilitate the orderly economic use of rural lands, protect important agricultural lands and reduce land use conflict.	The Primary Production and Rural Development SEPP applies because the subject site is currently zoned RU2 Rural Landscape and located within proximity of oyster leases in Fullerton Cove. The subject site, while zoned rural, is not used for agricultural purposes. Due to the environmental constraints of the site, the land is unsuitable for primary production. The site would benefit from a rezoning to C2 Environmental Conservation. The remaining land could be better utilised to provide a Local centre with a supermarket for the residents of Fullerton Cove and Fern Bay. The proposal has considered the effects of the proposal on the water quality of Fullerton Cove and potential impacts on oyster aquaculture. It is considered that redevelopment of the site is not likely to impact water quality or impact on future oyster aquaculture within the area. **Any inconsistency of the planning proposal with this SEPP is considered of minor significance**

Q6. Is the planning proposal consistent with applicable Ministerial Directions?

An assessment of relevant Ministerial Directions against the planning proposal is provided in the table below.

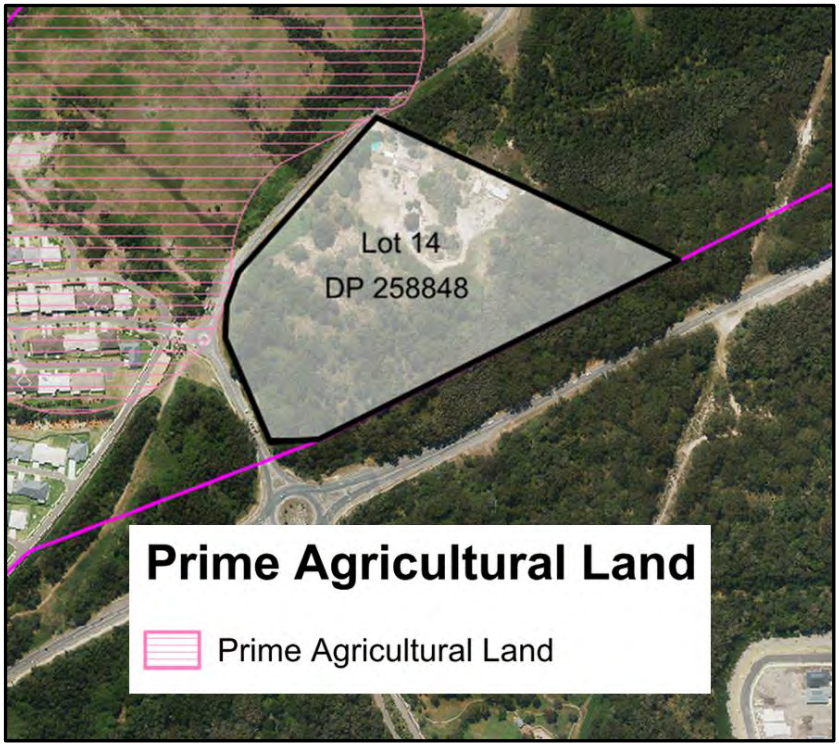
Table 3 – Relevant Ministerial Directions

Ministerial Direction	Consistency and Implications
1. Employment and Resources	
1.1 Business and Industrial Zones The objectives of this direction are to: encourage employment growth in suitable locations; protect employment land in business and industrial zones; and support the viability of identified centres.	This direction applies because the planning proposal will affect land within a proposed business zone. A planning proposal must: *(a) give effect to the objectives of this direction* The planning proposal will provide additional employment land in close proximity to residential neighbourhoods. The proposal should not undermine employment opportunities in the area or the viability of a future town centre, as provided in the Commercial Lands Addendum (**ATTACHMENT 8**). *(b) retain the areas and locations of existing business and industrial zones* The planning proposal does not propose removing any existing business or industrial zones. *(c) not reduce the total potential floor space area for employment uses and related public services in business zones* The planning proposal seeks to provide an additional business zone and will not reduce the total potential floor space for existing or proposed business zones. The Commercial Lands Addendum confirms feasibility of a local centre at Fullerton Cove. *(d) not reduce the total potential floor space area for industrial uses in industrial zones* The planning proposal will not impact on the potential floor space area of industrial zones.

	(e) ensure that proposed new employment areas are in accordance with a strategy that is approved by the Secretary of the Department of Planning and Environment As identified in **Section B**, the planning proposal is consistent with the HRP and the GNMP. A planning proposal may be inconsistent with this direction if the proposal is justified by a study which gives consideration to the objectives of this direction. The planning proposal is consistent with the GNMP, which gives consideration to the objectives of this direction. **The planning proposal is justifiably inconsistent with this direction.**
1.2 Rural Zones The objective of this direction is to protect the agricultural production value of rural land.	This direction applies because the proposal will affect land within an existing rural zone. A planning proposal must: (a) *not rezone land from a rural zone to residential, business, industrial, village or tourist zone* (b) *not contain provisions that will increase the permissible density of land within a rural zone (other than land within an existing town or village)* The planning proposal seeks to rezone rural land to B1 Neighbourhood Centre/E1 Local Centre and increase the permissible density. The subject site, however, is currently used for residential purposes and is within proximity of low-density residential housing located on rural zoned land. The redevelopment of this site would be in keeping with the nearby developments and would support the neighbouring residents of Fullerton Cove and Fern Bay. A planning proposal may be inconsistent with this direction if the proposal is in accordance with the HRP or GNMP. The planning proposal is consistent with the GNMP, which gives consideration to the objectives of this direction. **The planning proposal is justifiably inconsistent with this direction.**
1.4 Oyster Aquaculture	This direction does not apply as the planning proposal does not affect land in proximity to a Priority Oyster Aquaculture Area. While there are current oyster leases in the area there are no operating oyster farms.

1.5 Rural Lands The objectives of this direction are to: protect the agricultural production value of rural land; facilitate the orderly and economic use and development of rural lands for rural and related purposes; assist in the proper management, development and protection of rural land to promote the social, economic and environmental welfare of the State; minimise the potential for land fragmentation and land use conflict in rural areas, particularly between residential and other rural land uses; encourage sustainable land use practices and ensure the ongoing viability of agriculture on rural land; and support the delivery of the actions outlined in the New South Wales Right to Farm Policy.	This direction applies because the proposal seeks to rezone rural land. A planning proposal must: *(a) be consistent with any applicable strategic plan, including regional and district plans endorsed by the Secretary of the Department of Planning and Environment, and any applicable local strategic planning statement* The planning proposal is consistent with the HRP and the GNMP, which has considered the objectives of this direction. The proposal is also consistent with the LSPS. *(b) consider the significance of agriculture and primary production to the State and rural communities* The planning proposal will not result in the fragmentation of agriculture and primary production lands or impact on the industry as the site is used for residential purposes. *(c) identify and protect environmental values, including but not limited to, maintaining biodiversity, the protection of native vegetation, cultural heritage, and the importance of water resources* The planning proposal seeks to rezone the majority of the site from RU2 Rural Landscape to C2 Environmental Conservation to protect the environmental values of the site. *(d) consider the natural and physical constraints of the land, including but not limited to, topography, size, location, water availability and ground and soil conditions* The subject site is constrained by flood prone land and high environmental values, making it unsuitable for agricultural activities. The less constrained parts of the site where clearing and development has occurred is suitable for an intensification of land use through the provision of a neighbourhood centre to support surrounding residential communities. *(e) promote opportunities for investment in productive, diversified, innovative and sustainable rural economic activities*

	The subject site is currently used for residential purposes and is not suitable for primary production. Rezoning the land will not impact on rural economic activities. *(f) support farmers in exercising their right to farm* The planning proposal will not impact on the rights of neighbouring rural properties as it will facilitate non-residential uses. *(g) prioritise efforts and consider measures to minimise the fragmentation of rural land and reduce the risk of land use conflict, particularly between residential land uses and other rural land uses* The proposal will not result in the fragmentation of rural land as the subject site is not currently used for rural land uses. The proposal will complement the neighbouring residential and urban uses. *(h) consider State significant agricultural land identified in State Environmental Planning Policy (Primary Production and Rural Development) 2019 for the purpose of ensuring the ongoing viability of this land* The land is not State significant agricultural land and is not mapped as prime agricultural land (**Figure 9**). Additionally, the subject site is not identified in the recently released draft State Significant Agricultural Land Mapping. *(i) consider the social, economic, and environmental interests of the community.* The planning proposal will provide positive social, economic, and environmental outcomes for the community. The rezoning will provide additional employment and retail services for the community, boost the local economy, and will protect the environmental values of the site through C2 Environmental Conservation zoning. Additionally, the community has indicated strong support for a local supermarket at this location. A planning proposal may be inconsistent with this direction if the proposal is in accordance with the HRP or GNMP. The planning proposal is consistent with the GNMP which gives consideration to the objectives of this direction.

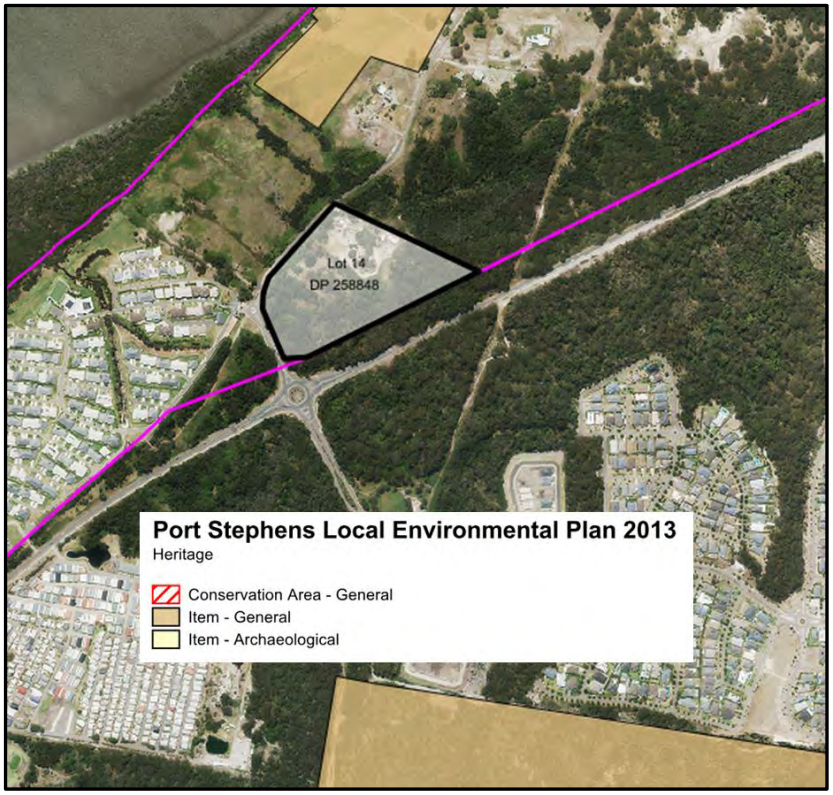
	Figure 8 Prime agricultural land mapping  **The planning proposal is justifiably inconsistent with this direction.**
2. Environment and Heritage	
2.1 Environmental Protection Zones The objective of this direction is to protect and conserve environmentally sensitive areas, by ensuring that planning proposals do not reduce the environmental protection standards applying to such land unless it is suitably justified by a relevant strategy or study or is of minor significance.	This direction applies because the planning proposal seeks to rezone part of the subject site to C2 Environmental Conservation. *(4) A planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas.* The planning proposal seeks to protect the environmental values of the site by zoning approximately 4.2ha of land to C2 Environmental Conservation. The proposed boundary of the C2 zone has been informed by a BDAR (**ATTACHMENT 9**) taking into consideration the existing disturbed land, ecologically endangered communities, and koala habitat. The planning proposal does not include any environmentally sensitive areas. The BDAR and Strategic Bushfire Study informed the final zone boundaries; the proposed development site has been selected to limit direct impacts to areas of intact native vegetation and is within a previously managed portion of the site that is mostly dominated by planted and exotic vegetation.

	Consultation with Biodiversity Conservation Division was undertaken to assess the suitability of the C2 zone boundaries, and confirms consistency with this direction. **The planning proposal is consistent with this direction, and has been confirmed by consultation with the Biodiversity Conservation Division.**
2.2 Coastal Management The objective of this direction is to protect and manage coastal areas of NSW.	This direction applies because the land is mapped within the NSW Coastal Zone Combined Footprint (**Figure 8** page 21). A planning proposal must: *4) include provisions that give effect to and are consistent with:* *a) the objects of the Coastal Management Act 2016 and the objectives of the relevant coastal management areas;* The objects of the Coastal Management Act 2016 include protecting and supporting natural coastal processes and environmental/social/economic values, facilitating ecologically sustainable development and mitigating coastal hazard risks. Although the site is mapped within the coastal environment area, the site does not have direct frontage to the coastal foreshore and is unlikely to result in any adverse impacts on the coastal environment. *b) the NSW Coastal Management Manual and associated Toolkit;* The manual and toolkit provide direction for councils preparing Coastal Management Programs (CMP). Port Stephens Council is currently preparing a CMP and the planning proposal is unlikely to be inconsistent. *c) NSW Coastal Design Guidelines 2003; and* Fullerton Cove is likely to be defined as 'Coastal Village', and the planning proposal is likely to result in development consistent with these guidelines. The scale and location of future development is consistent with the NSW Coastal Design Guidelines. Consideration of

	relationship to the environment, visual sensitivity, access to water and natural areas is provided throughout this planning proposal including in response to Questions 7-9. *d) any relevant Coastal Management Program that has been certified by the Minister, or any Coastal Zone Management Plan under the Coastal Protection Act 1979 that continues to have effect under clause 4 of Schedule 3 to the Coastal Management Act 2016, that applies to the land.* Port Stephens Council is currently preparing a CMP and the planning proposal is unlikely to be inconsistent. *5) not rezone land which would enable increased development or more intensive land-use on land:* • *within a coastal vulnerability area identified by the State Environmental Planning Policy (Coastal Management) 2018; or* • *that has been identified as land affected by a current or future coastal hazard in a local environmental plan or development control plan, or a study or assessment undertaken:* *(i) by or on behalf of the relevant planning authority and the planning proposal authority, or* *(ii) by or on behalf of a public authority and provided to the relevant planning authority and the planning proposal authority.* The land is not within a coastal vulnerability area or affected by a coastal hazard. *6) not rezone land which would enable increased development or more intensive land-use on land within a coastal wetlands and littoral rainforests area identified by the State Environmental Planning Policy (Coastal Management) 2018.* The land is not within a coastal wetland or littoral rainforest area.

	The direction provides that a planning proposal must not rezone land which would enable increased development or more intensive land use on land that has been identified as land affected by a current or future coastal hazard in a local environmental plan or development control plan. The site does not have direct access to the coastal foreshore. The planning proposal is unlikely to cause an increased risk of coastal hazards or exacerbate potential impact of coastal processes. The site is identified as flood prone. The Flood Study determined that the planning proposal will not cause an increased risk of coastal hazards or exacerbate potential impact of coastal processes. Flooding is addressed separately in the response to Direction 4.3 Flood Prone Land. **The planning proposal is consistent with this direction.**
2.3 Heritage Conservation The objective of this direction is to conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.	The direction applies to all planning proposals. A planning proposal must contain provisions that facilitate the conservation of: *(a) items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance to an area, in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, area, object or place, identified in a study of the environmental heritage of thearea,* *(b) Aboriginal objects or Aboriginal places that are protected under the National Parks and Wildlife Act 1974, and* *(c) Aboriginal areas, Aboriginal objects, Aboriginal places or landscapes identified by an Aboriginal heritage survey prepared by or on behalf of an Aboriginal Land Council, Aboriginal body or public authority and provided to the relevant planning authority, which identifies the area, object, place or landscape as being of heritage significance to Aboriginal culture and people.*

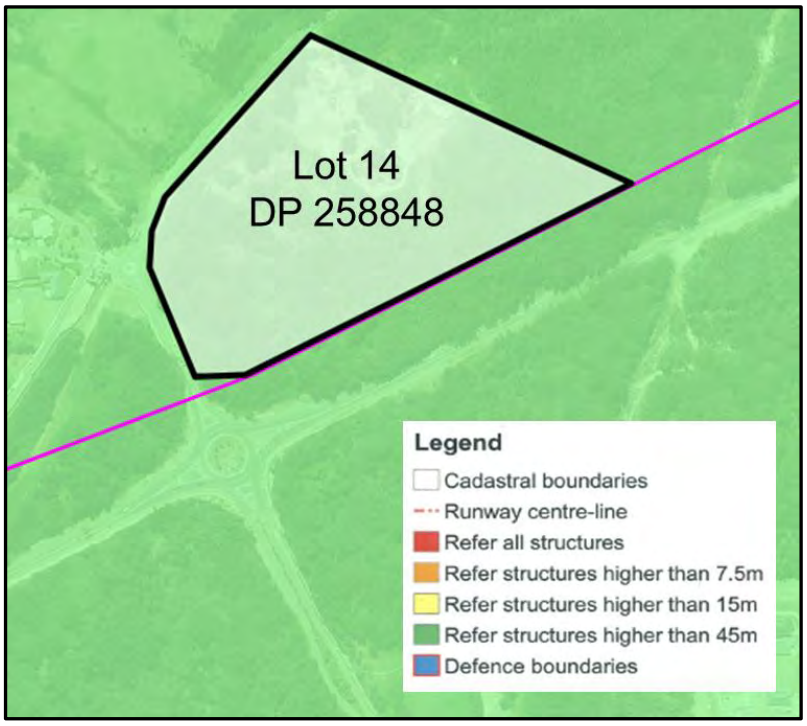
	The site does not contain any listed items of heritage significance listed in the LEP. The site is not identified as an area of potential archaeological value. There are however listed conservation items within the locality of the site (**Figure 9**). Stanley Park House is located to the north of the subject site. To the south and east is the Stockton Beach Dune System which includes Aboriginal sites, shell middens, shipwrecks, WWII ramparts, tank traps, proofing range, rifle range and tin huts. A search of the AHIMS database was undertaken. Some items of Aboriginal heritage were identified as being recorded in the locality including within the Stockton Beach Dune System. Consultation was undertaken with the Worimi Local Aboriginal Land Council as per the Gateway Determination, as well as other Registered Aboriginal Parties (RAPs). This consultation was in the form of a site walkover, the RAPs advised of potential items of cultural heritage being on the site. The RAPs advised they are accepting of the proposal subject to an Aboriginal Cultural Heritage Assessment (ACHA), which is currently being undertaken by NGH Consulting and will be addressed prior to finalisation of the planning proposal. At this time, consultation will be undertaken with Biodiversity Conservation Division – Heritage. The ACHA will inform any future development application on the site.

	Figure 9 – Heritage conservation items map  **The consistency of the planning proposal with this direction can be confirmed by the ACHA currently being undertaken.**
2.6 Remediation of Contaminated Land The objective of this direction is to reduce the risk of harm to human health and the environment by ensuring that contamination and remediation are considered by planning proposal authorities.	This direction applies as the site is mapped within the broader PFAS Management Zone. A planning proposal must not permit a change of zoning on potentially contaminated land unless: *(a) the planning proposal authority has considered whether the land is contaminated, and* *(b) if the land is contaminated, the planning proposal authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes for which land in the zone concerned is permitted to be used, and* *(c) if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning proposal authority is satisfied that the land will be so remediated before the land is used for that purpose.* A Preliminary Contamination Assessment (**ATTACHMENT 11**) has been prepared by Qualtest. This

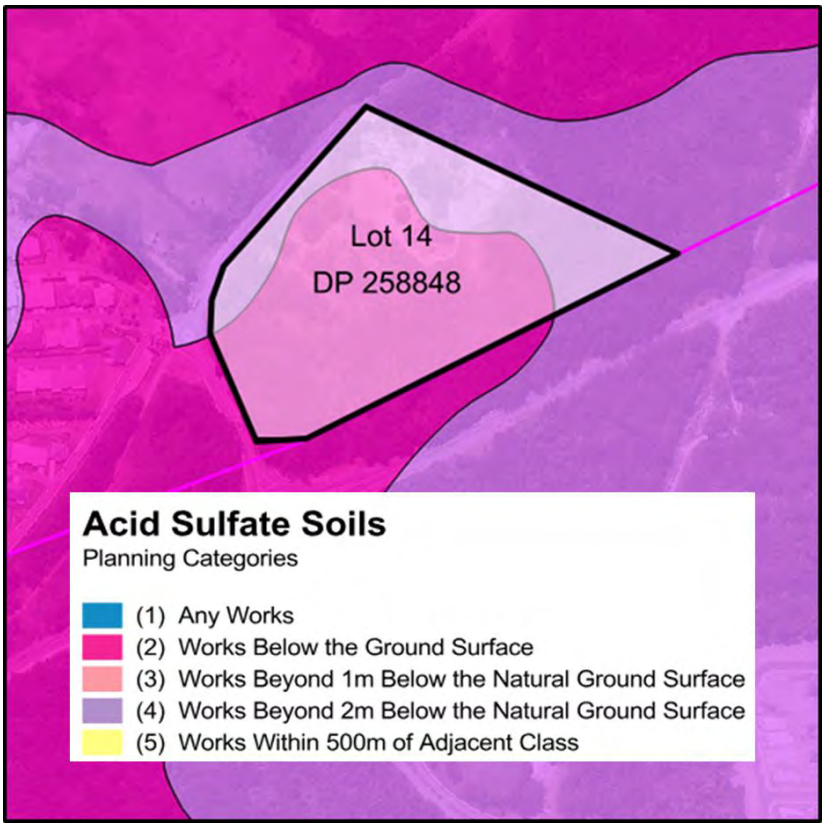
	assessment found that the site had a history of sandmining, and indicated that further testing will be required as part of future development application to include surface soil sampling under and adjacent to the existing structures and machinery. A Hazardous Material Survey to be completed for the existing structures prior to demolition. The above testing is to be carried out under a Contaminated Land Management plan associated with the demolition of the existing structures as part of the redevelopment of the site. The above matters can be satisfied at development application stage. This will ensure that the land is remediated and made suitable for development of a neighbourhood centre. **The planning proposal is consistent with this direction.**
3. Housing, Infrastructure and urban Development	
3.4 Integrating Land Use and Transport The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the sustainable transport objectives.	This direction applies because the planning proposal will create a business zone. The planning proposal is consistent with the aims, objectives, and principles of *Improving Transport Choice – Guidelines for planning and development (DUAP 2001)* and *The Right Place for Business and Services – Planning Policy (DUAP 2001)* as detailed below. <u>Improving Transport Choice</u> The planning proposal is consistent with the following development principles of *Improving Transport Choice*: *1. Concentrate in centres* – The subject site is located within the Fern Bay area, and within walking distance of the nearby residences. The nearest bus stop is located less than 200m from the proposed neighbourhood centre ensuring the site is accessible. *2. Mix uses in centres* – The planning proposal will provide essential retail services for the surrounding residential neighbourhoods that are currently underserviced. The site will be in walking distance of a bus stop and residences. *3. Align centres within corridors* – The site is located adjacent to Nelson Bay Road and within walking distance of existing bus stops. The development of a

	neighbourhood centre could boost the effectiveness of the existing bus service. *4. Link public transport with land use strategies* – The planning proposal is consistent with the FBNSS which has considered and established goals for public transport in Fern Bay. *5. Connect streets* – The site is located adjacent to an existing bus stop and will provide a connecting pathway to the bus stop in line with the Port Stephens Development Control Plan 2014 (DCP). *6. Improve pedestrian access* – The subject site is located within walking distance of existing residences. To comply with the DCP pathways will be provided that connect to adjacent bus stop and existing pathways on site as well as connection to the future shared pathway identified in the Port Stephens Pathways Plan. *7. Improve cycle access* – The subject site is located within cycling distance of several existing residential neighbourhoods. Cycling facilities will be provided to comply with the DCP. A future shared pathway has been identified in the Port Stephens Pathways Plan along Fullerton Cove Road and Nelson Bay Road in proximity of the subject site. *8. Manage parking supply* – Appropriate parking will be provided during the development application stage. *9. Improve road management* – The development will utilise the access from Fullerton Cove Road avoiding Nelson Bay Road, a classified road. *10. Implement good design* – The needs of pedestrians, cyclists and public transport users will be further considered during the development application stage. <u>The Right Place for Business and Services</u> The planning proposal is consistent with the following strategies from *The Right Place for Business and Services*: *1. The right location* – The planning proposal seeks to provide a neighbourhood centre at a site located centrally to the Fern Bay and Fullerton Cove area. The site is within walking distance of residents of The Cove and

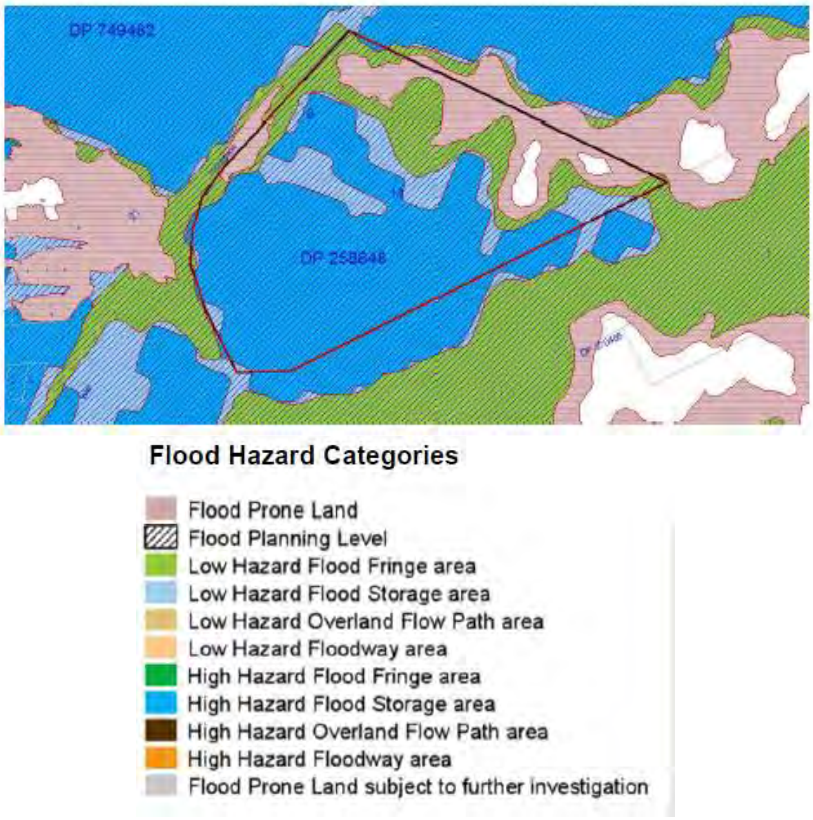
	future residents of Seaside Estate. The site will provide the only retail services in the immediate area. *2. The right centre* – The planning proposal seeks to provide a neighbourhood centre to cater for the day to day retail needs of the surrounding community. The area is currently underserviced and this proposal will meet those needs. **The planning proposal is consistent with this direction.**
3.5 Development Near Regulated Airports and Defence Airfields The objectives of this direction are to: ensure the effective and safe operation of regulated airports and defence airfields; ensure that their operation is not compromised by development that constitutes an obstruction, hazard or potential hazard to aircraft flying in the vicinity; and ensure development, if situated on noise sensitive land, incorporates appropriate mitigation measures so that the development is not adversely affected by aircraft noise.	This direction applies because the site is mapped within the RAAF Base Obstacle Limitations or Operations Surface Map and Height Trigger Map (**Figure 11**). The site is mapped within the range requiring structures higher than 45m to be referred to the Commonwealth Department of Defence. In the preparation of a planning proposal that sets controls for the development of land near a defence airfield, the relevant planning authority must: *(a) consult with the Department of Defence if:* (i) *the planning proposal seeks to exceed the height provisions contained in the Defence Regulations 2016 – Defence Aviation Areas for that airfield; or* (ii) *no height provisions exist in the Defence Regulations 2016 – Defence Aviation Areas for the airfield and the proposal is within 15km of the airfield.* The planning proposal seeks to introduce a building height limit of 9m and will not exceed height provisions. (b) *for land affected by the operational airspace, prepare appropriate development standards, such as height controls.* The subject land is affected by the RAAF Base Weapons Range Height Trigger restricting structures over 45m (**Figure 11**). The planning proposal seeks to introduce a building height limit of 9m. (c) *not allow development types that are incompatible with the current and future operation of that airfield.* The subject site is located 7km from Newcastle Airport and RAFF Base Williamtown. A neighbourhood centre at

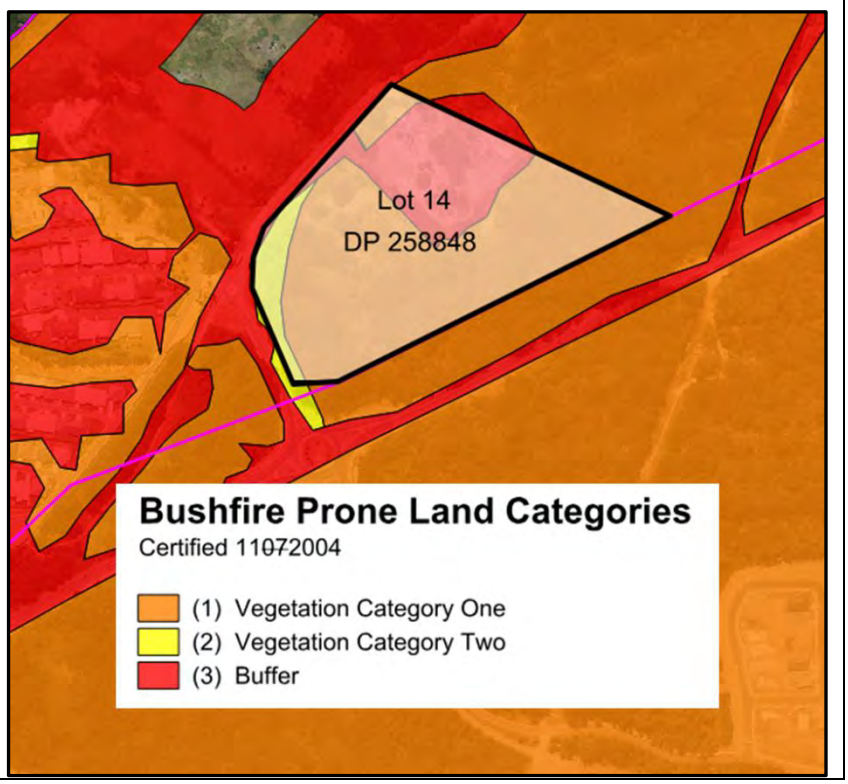
	this location would not be incompatible with the current and future use of the airfields. While not required, consultation was undertaken the Department of Defence and Newcastle Airport who had no objections to the proposal. **Figure 10 – RAAF Base Williamtown and Salt Ash Air Weapons Range Height Trigger Map**  **The planning proposal is consistent with this direction.**
4. Hazard and Risk	
4.1 Acid Sulfate Soils The objective of this direction is to avoid significant adverse environmental impacts from the use of land that has a probability of containing acid sulfate soils.	This direction applies because the site is mapped as containing Class 2 and Class 4 acid sulfate soils (**Figure 11**). What Council must do if this direction applies: *(4) The relevant planning authority must consider the Acid Sulfate Soils Planning Guidelines adopted by the Director-General of the Department of Planning when preparing a planning proposal that applies to any land identified on the Acid Sulfate Soils Planning Maps as having a probability of acid sulfate soils being present.* *(5) When a relevant planning authority is preparing a planning proposal to introduce provisions to regulate*

	works in acid sulfate soils, those provisions must be consistent with: *(a) the Acid Sulfate Soils Model LEP in the Acid Sulfate Soils Planning Guidelines adopted by the Director-General, or* *(b) such other provisions provided by the Director-General of the Department of Planning that are consistent with the Acid Sulfate Soils Planning Guidelines* *(6) A relevant planning authority must not prepare a planning proposal that proposes an intensification of land uses on land identified as having a probability of containing acid sulfate soils on the Acid Sulfate Soils Planning Maps unless the relevant planning authority has considered an acid sulfate soils study assessing the appropriateness of the change of land use given the presence of acid sulfate soils. The relevant planning authority must provide a copy of any such study to the DirectorGeneral prior to undertaking community consultation in satisfaction of section 57 of the Act.* *(7) Where provisions referred to under paragraph (5) of this direction have not been introduced and the relevant planning authority is preparing a planning proposal that proposes an intensification of land uses on land identified as having a probability of acid sulfate soils on the Acid Sulfate Soils Planning Maps, the planning proposal must contain provisions consistent with paragraph (5).* An Acid Sulfate Soil (ASS) Study (**ATTACHMENT 10**) was completed by Qualtest in accordance with the ASSMAC (1998) Acid Sulfate Soil Manual and the relevant National ASS Guidance. The ASS Study confirms that ASS were not considered to be present in the soils on the site to a depth of 2m below ground surface. This information negates the requirement for an ASS management plan for the development of the site, and confirms consistency with this direction.

	Figure 11 – Acid sulfate soil mapping  **The planning proposal is consistent with this direction.**
4.3 Flood Prone Land The objectives of this direction are to ensure that development of flood prone land is consistent with the NSW Government's Flood Policy and the principles of the Floodplain Development Manual 2005 and to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes	This direction applies as the subject site is identified as flood prone land within the flood planning area (**Figure 12**). The land proposed to be zoned B1 Neighbourhood Centre is predominantly Low Hazard Flood Fringe (green), Low Hazard Flood Storage (light blue) or High Hazard Flood Storage (blue), with a small amount of Flood Prone Land (pink). *(4) A planning proposal must include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005.* The provisions of Clause 5.21 *Flood Planning* of the LEP and Chapter B5 *Flooding* of the Port Stephens Development Control Plan will apply to any future development. Both of these are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005.

consideration of the potential flood impacts both on and off the subject land.	*(5) A planning proposal must not rezone land within the flood planning areas from Special Use, Special Purpose, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial, Special Use or Special Purpose Zone.* While the planning proposal is inconsistent with this term, as it seeks to rezone a Rural zone to a Business zone, the proposal does seek to zone the majority of the flood affected area to and Environmental zone. *(6) A planning proposal must not contain provisions that apply to the flood planning areas which:* *(a) permit development in floodway areas* The planning proposal consistent with this term. The site is identified as Low Hazard Fringe, Low Hazard Storage, Flood Prone Land, High Hazard Storage, and Flood Prone Land, but is not identified as a floodway area (**Figure 12**). *(b) permit development that will result in significant flood impacts to other properties* The Flood Study completed by Northrop (**ATTACHMENT 10**) confirms that the proposal will not result in any significant flood impacts on other properties within the locality or downstream. *(c) permit a significant increase in the development of that land* The planning proposal is inconsistent with this term but it is considered to be of minor significance as the associated risk of commercial development on the site would be commensurate with the existing and recent development on flood prone land. *(d) are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure of services* The planning proposal is unlikely to require additional government spending on flood mitigation measures. *(e) permit development to be carried out without development consent except for the purposes of agriculture, roads or exempt development*

	Future development of the site would require development consent. The investigations confirm that the hazards relating to the site, the proposed land uses and impacts on and off the site are consistent with the relevant guidelines and policies and can proceed to the next stage. A planning proposal may be inconsistent with the terms of this direction if the provisions of the planning proposal that are inconsistent are of minor significance. The planning proposal is inconsistent with this direction but it is considered to be of minor significance due to the social and economic benefits of the proposal and community feedback detailed in **Section C**. **Figure 12 – Port Stephens flood hazard mapping**  **Any inconsistency of the planning proposal with this direction is considered of minor significance.**
4.4 Planning for Bushfire Protection The objectives of this direction are:	This direction applies because the subject site is identified as bushfire prone land (**Figure 13**). Consultation with the Commissioner of the NSW Rural Fire Service was undertaken, and no objections were raised.

to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas; and to encourage sound management of bush fire prone areas.	A planning proposal must: *a) have regard to Planning for Bushfire Protection 2006,* *b) introduce controls that avoid placing inappropriate developments in hazardous areas, and* *c) ensure that bushfire hazard reduction is not prohibited within the APZ* The planning proposal has considered the planning principles detailed in Planning for Bushfire Protection. The Strategic Bushfire Study (**ATTACHMENT 13**) completed by Bushfire Planning Australia confirms the proposed land use is appropriate with the site posing a medium risk. The following will require consideration as part of any future development application: • Access and egress to the site • Details of the development the Local Emergency Management Committee • Asset protection zones to be located within the property boundary • A vegetation management plan. Consultation was undertaken with the NSW Rural Fire Service as per the Gateway Determination, and they supported the proposal on the basis of the outcomes and recommendations of the Strategic Bushfire Study. **Figure 13 – Bushfire prone land mapping** 

	The planning proposal is consistent with this direction.
5. Regional Planning	
5.10 Implementation of Regional Plans The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional plans.	This direction applies because the subject site is located within the boundaries of the Hunter Regional Plan (HRP). As detailed under **Section B**, the planning proposal is consistent with the HRP as it will enable the development of a neighbourhood centre that will generate economic growth and diversity within the Fern Bay and Fullerton Cove locality and increase expenditure in the Port Stephens local government area. **The planning proposal is consistent with this direction.**

Section C – Environmental, social, and economic impact

Q7. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

An Biodiversity Development Assessment Report (BDAR) was completed for the site (**ATTACHMENT 10**), examining the likelihood of significant impact upon any threatened species, populations or ecological communities listed within the *Biodiversity Conservation Act 2016 (NSW), SEPP (Koala Habitat Protection) 2019* and the threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act).

The BDAR was undertaken in 2020 and 2021 to determine the biodiversity offset requirements. The findings of the assessment are detailed below.

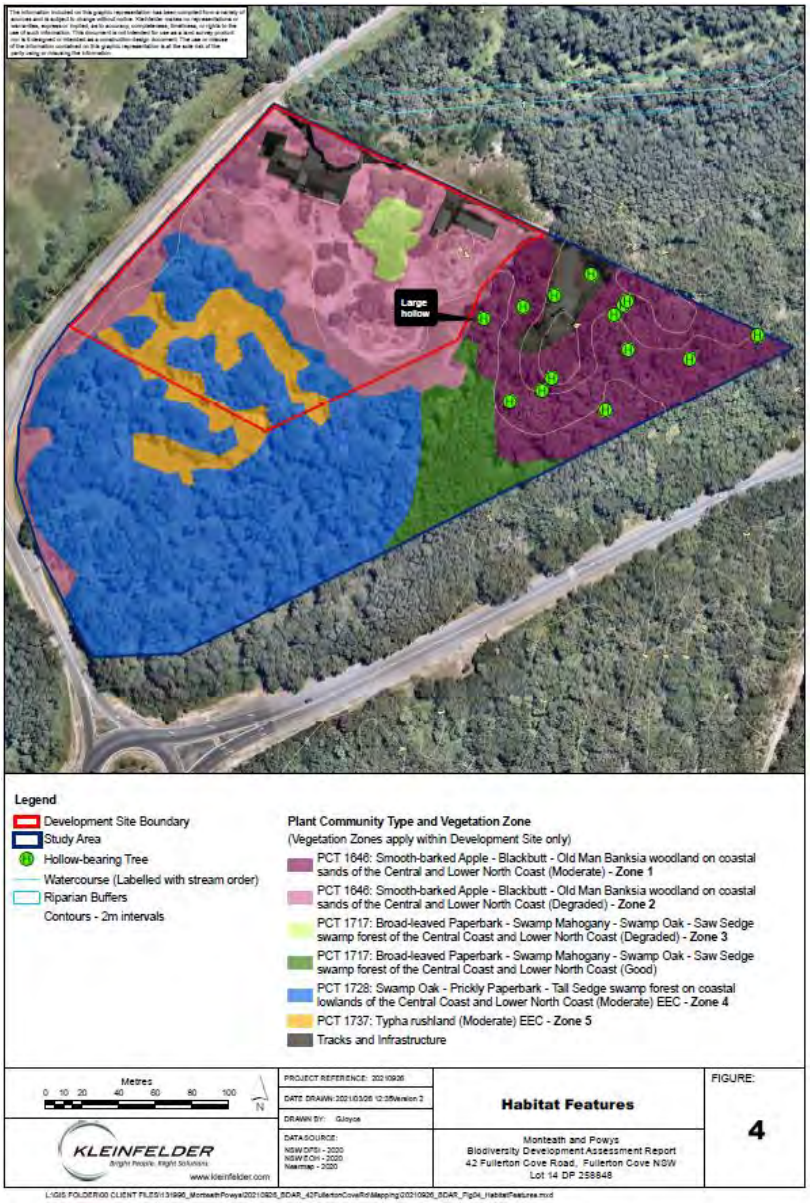
Field investigations confirmed that no threatened flora were present onsite however six threatened fauna species including the Eastern False Pipistrelle, Little Bent-winged Bat, Eastern Coastal Free-tailed Bat, Powerful Owl, Southern Myotis, Powerful Owl and the Yellow-bellied Sheathtail Bat. There were two Endangered Ecological Communities (EECs) listed under the *Biodiversity Conservation Act 2016 (NSW);* PCT 1728: comprising Swamp Oak – Prickly Paperbark – Tall Sledge swap forest on coastal lowlands of the Central Coast and Lower North Coast, and PCT 1737: Typha rushland. Both EECs were in moderate condition.

The BDAR found the planning proposal will not adversely impact on threatened flora or fauna populations or matters of national environmental significance however it is anticipated to have the following ecological impacts:

- Direct removal of PCT's 1646, 1717 and part of 1728 and 1737 within the B1 zone; and
- Indirect impacts to retained vegetation including parts of the listed 1728 and 1737.

The BDAR indicates that the vegetation within the B1/E1 Zone is mainly degraded with minor impacts on moderate vegetation within the area. The removal of this vegetation, not being important to the threatened species that move throughout the site thus confirming the location of the proposed B1 Neighbourhood Centre/E1 Local Centre zone boundary will not create any serious or irreversible impacts (SAII).

Figure 7 - Environmental Constraints mapping (ATTACHMENT 9, page 39).



Q8. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The subject site is identified as flood prone, however it is not susceptible to inundation from a flood event. A preliminary flooding and stormwater study was undertaken to determine the feasibility of developing the site so as to comply with Council policies. The study found that Council policies regarding water quality and detention for the hypothetical development can be achieved. It is expected the proposed filling for development of approximately 2.5ha will not have a significant impact on flood levels. Riparian corridors are not expected to be a constraint for the proposed development, however liaison with the Biodiversity Conservation Division – Water (BCD) during the development application phase should be undertaken to confirm this.

The Flood Study and a response letter based on comments from BCD (**ATTACHMENT 10**) by Northrop confirmed the outcome of this preliminary study. The detailed study also determined that the water quality of nearby coastal bodies will not be impacted by future development on the site, and that development of the subject site is not expected to result in significant adverse impact on the site or adjacent properties in their resilience to natural hazards.

After initial consultation with BCD, additional sensitivity modelling has been completed by Northrop to ensure that BCD's suggestions have been appropriately considered. The response letter by Northrop provides justification and demonstrates that the results of the original flood assessment are not expected to significantly change. The study investigated the downstream impact of the proposed cut and fill, and it was considered of minor significance. Environmental effects such as stormwater quality can be managed at development application stage.

Q9. Has the planning proposal adequately addressed any social and economic effects?

The population of Fern Bay and Fullerton Cove increased by 103% between 2006 and 2016. This growth has increased demand for additional retail services in the area. During the exhibition of the FBNSS, many submissions were received that supported the outcomes of this planning proposal to enable a local supermarket. Additionally, a petition of 634 signatures in support of this proposal was provided to Council during public access on the 26 November 2019. In response to community demand, the FBNSS was amended to include an action to undertake a detailed assessment of this planning proposal.

The Fern Bay and Fullerton residents currently have limited supermarket options with large travel distances. The nearest supermarket is an IGA (8km) that provides local convenience for the Stockton Area. The nearest large supermarkets for Fern Bay and Fullerton Cove residents are Mayfield Aldi (13km), Mayfield Woolworths (13.2km), or Warabrook Woolworths (13.5km).

These supermarkets each take over 15 minutes to reach by car, or up to 45 minutes by bus. A supermarket on the subject site, would provide a significantly more convenient option for the areas approximate 3,500 residents.

The planning proposal is intended to complement the existing business zones. As confirmed by the Commercial Lands Addendum (**ATTACHMENT 8**) the proposal will not have an impact on the economic viability of the existing Stockton centre or a future town centre at the Stockton Residential Centre.

In addition to facilitating the community desire for a local supermarket the proposal will also result in the following significant positive social and economic effects:

- Increased employment opportunities in the Port Stephens LGA and Hunter Region through construction jobs to carry out building works, as well as ongoing employment through retail and transport jobs to service the future commercial development;
- Increased commercial opportunities for businesses within the Port Stephens LGA;
- Increased expenditure within the Port Stephens LGA;
- A place for the community to come together;
- Increased provision of day-to-day retail services including a supermarket and specialty retail; and
- Reduced travel times for Fern Bay and Fullerton Cove residents to access everyday essentials such as groceries and in turn reduced carbon emissions and air pollution.

The residents of the local area have demonstrated a clear desire for this planning proposal to be progressed to facilitate a local supermarket. A neighbourhood centre would create a public space for people as well as deliver necessary retail services to support the community. It would provide a convenient and accessible location for residents to purchase everyday necessities as well as provide additional business and employment opportunities. The liveability of the Fullerton Cove and Fern Bay residents will be significantly improved through the provision of a local centre, with a supermarket and supporting retail, at this location.

Given the clear desire of the community, the proposal is considered to have an overall positive impact on the community.

Section D – State and Commonwealth interests

Q10. Is there adequate public infrastructure for the planning proposal?

All relevant infrastructure and services are available within the area and will be connected as part of the future development of the land.

There is sufficient infrastructure capacity in the existing road networks to support the proposal. The Traffic Impact Assessment (**ATTACHMENT 13**) was prepared to consider the impact of development on the local road network, and determined that without infrastructure upgrades, the road network will have sufficient capacity to accommodate the additional trips alongside the cumulative impacts of nearby planning proposals and proposed developments.

Local augmentation of sewer, water, drainage, and other infrastructure services can be undertaken as the site adjoins an existing urban area.

Q11. What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway determination?

Consultation with relevant State and Commonwealth agencies has been undertaken following Gateway determination, prior to community consultation. The following agencies have been consulted with:

- NSW Rural Fire Service
- Department of Primary Industries – Agriculture
- Commonwealth Department of Defence
- Newcastle Airport
- Transport for NSW
- Biodiversity Conservation Division
- Worimi Aboriginal Land Council

A second round of consultation was undertaken with BCD and TfNSW prior to community consultation, as a result of initial consultation resulting in a revised TIA, BDAR, and Flood Study to adequately address agency comments. These additional comments have been included in the below table. There are no outstanding comments from agencies.

In addition, pending the preparation of the revised ACHA, Biodiversity Conservation Division – Heritage will be consulted with to confirm consistency with Ministerial Direction 2.3 prior to finalisation of the planning proposal in order to inform any future development application on the site.

The table below summarises the key issues raised by each agency and provides a response to each issue raised:

Table 4 – Consultation with Agencies

Author of Referral	Recommendation	Council Response
Biodiversity Conservation Division (BCD)	The planning proposal should be amended to be consistent with the BDAR and clearly identify the Threatened Ecological Communities found on site.	The planning proposal has been updated to be consistent with the BDAR.

	Further surveys should be undertaken for the Wallum froglet, green and golden bell frog and Mahony's toadlet to satisfy relevant frog survey guidelines.	Kleinfelder has since updated the BDAR to address these comments. 4 nights of targeted surveys have now been completed in accordance with survey guidelines, and this information is provided in Table 9 of the BDAR.
	The BDAR should be amended to include all components required by Table 25 of the BAM.	This has been address in the revised BDAR.
	The species polygon for southern myotis should be amended to include PCT 1737 and the species credit calculations are adjusted accordingly.	This has been addressed in the revised BDAR.
	The steps taken to avoid and minimise impacts of the development on the two TECs should be included in the BDAR.	This has been addressed in the revised BDAR.
	The proponent should review the adopted hydraulic roughness values used for the flood assessment.	Northrop have undertaken a sensitivity analysis to test the potential impacts of increasing the mannings roughness (in-line with Council's flood studies).
	The hydraulic model should be revised so that Bellbird Ct is included in the TUFLOW hydraulic model and flood impact assessment should be reassessed accordingly.	Northrop have updated the roughness in the Bellbird Ct drainage channel as part of the sensitivity assessment.
	The proponent should review the size and need for on-site detention and review capacity of the receiving 450mm pipe.	Northrop have run an additional sensitivity test to show the potential impacts of a future development without the use of OSD. The sensitivity test has indicated that the requirement for OSD may not be necessary, however would be reliant on a more detailed assessment of what is accurately being proposed on the site and its impacts to the downstream drainage facilities at future DA stage.
Transport for NSW (TfNSW)	The referral notes that cumulative traffic impact from	Council facilitated a meeting between the proponent, SCT

	surrounding future development (including remaining lot yield from nearby Fern Bay Seaside Village and the Stockton Rifle Range), the TIA concludes that the intersection performance of the roundabout at Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard is reduced to a Level of Service (LoS) D in the PM peak and creates a unacceptable delay on the network.	consulting, and TfNSW on 9 September 2021 to discuss an update to the TIA and revised modelling. It was noted that the existing modelling used contained additional traffic numbers providing a worst-case scenario. It was expressed and noted that the modelling for 1,500m² indicates an LoS of 'D' for the roundabout which is not deemed acceptable, LoS of C or better is required.
	The referral recommends Council consider the anticipated traffic impact on the classified (State) road network and require that the proponent investigate mitigation measures to address the adverse impacts of the development at the intersection of Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard.	A revised TIA was undertaken by SCT Consulting, with revised modelling in consultation with TfNSW and an updated increased floor space area. The revised TIA addresses these concerns and concludes that the impacts of the planning proposal are at a level able to be accommodated by the existing and planned infrastructure.
	The referral requests that Council establish an 88B Instrument by means of access restriction on the site across the boundaries marked by blue colour as per Attachment 1. The 88B will protect the State road corridor and intersection from any future development of Main Road (MR108) wanting direct access points. The authority to vary, revoke and/or rescind the restriction will be Council however, not without the concurrence of TfNSW.	This request can be addressed at DA stage.
NSW Rural Fire Service	The proposal is supported on the basis of the outcomes and recommendations of the Strategic Bushfire Study, prepared by Bushfire Planning Australia dated February 2021.	Noted.

	Future development shall reflect the principles and recommendations of the study.	
Worimi Local Aboriginal Land Council	A site walkover was requested by Worimi, following identification of potential significant Shell Deposits on the site by Council staff.	A site visit was conducted with Council officers, Worimi LALC and other Registered Aboriginal Parties (RAPs) on 9 June 2021. Shell material was observed on many areas of the site, with a sandy ridgeline having potential to be a burial site. It was deemed an Aboriginal Cultural Heritage Assessment (ACHA) was necessary to determine mitigation and management measures. NGH Consulting has been commissioned to undertake a Aboriginal Cultural Heritage Assessment of the site. Worimi and other RAPs will be consulted with as part of this process.

PART 4 – Mapping

The proposed map layer amendments are included as **ATTACHMENT 1** to the planning proposal in the following order:

a) Current Zoning Map LZN_004A
b) Proposed Zoning Map – Map Amendment to Land Zoning Map – Sheet LZN_004A from RU2 Rural Landscape to part B1 Neighbourhood Centre and part E2 Environmental Conservation Zone
c) Current Lot Size Map LSZ_004A
d) Proposed Lot Size Plan – Map Amendment to Lot Size Map – Sheet LSZ_004A from AB2 20 hectares to part AB2 20 hectares and part no specified minimum lot size
e) Current Height of Building Map Sheet HOB_004A
f) Proposed Height of Buildings Map – Map amendment to Height of Buildings Map – Sheet HOB_004A from no specified height to part no specified height and part J 9 metres

PART 5 – Community consultation

External consultation has been undertaken during the preparation of the Fern Bay and North Stockton Strategy. During the exhibition period, a petition in support of this proposal was provided to Council. After consideration of the petition and submissions received, the FBNSS was amended to address the community desire for a neighbourhood centre with a neighbourhood supermarket to be located within the Fern Bay area.

Community consultation for the planning proposal will be undertaken in accordance with the Gateway determination, which requires the planning proposal to be publicly exhibited for a period of 28 days.

Port Stephens Council is authorised as the local plan-making authority.

Notice of the public exhibition period will be placed in the local newspaper, The Examiner, and notification in writing to affected and adjoining landowners. The exhibition material will be available on Council's website.

During exhibition, the planning proposal and Gateway determination will be able to be viewed:

At Council's Administration Building in Raymond Terrace, libraries, and online www.portstephens.nsw.gov.au under "Public exhibitions", or via the NSW Department of Planning's Planning Portal.

Submissions are invited and can be lodged in writing to the General Manager at Port Stephens Council until 5pm 9 June 2022:

- Mail: PO Box 42, Raymond Terrace NSW 2324
- Email: rezoning@portstephens.nsw.gov.au

After the public exhibition period, all submissions will be considered and the proposal will be reported to Council with a response to each submission included.

PART 6 – Project timeline

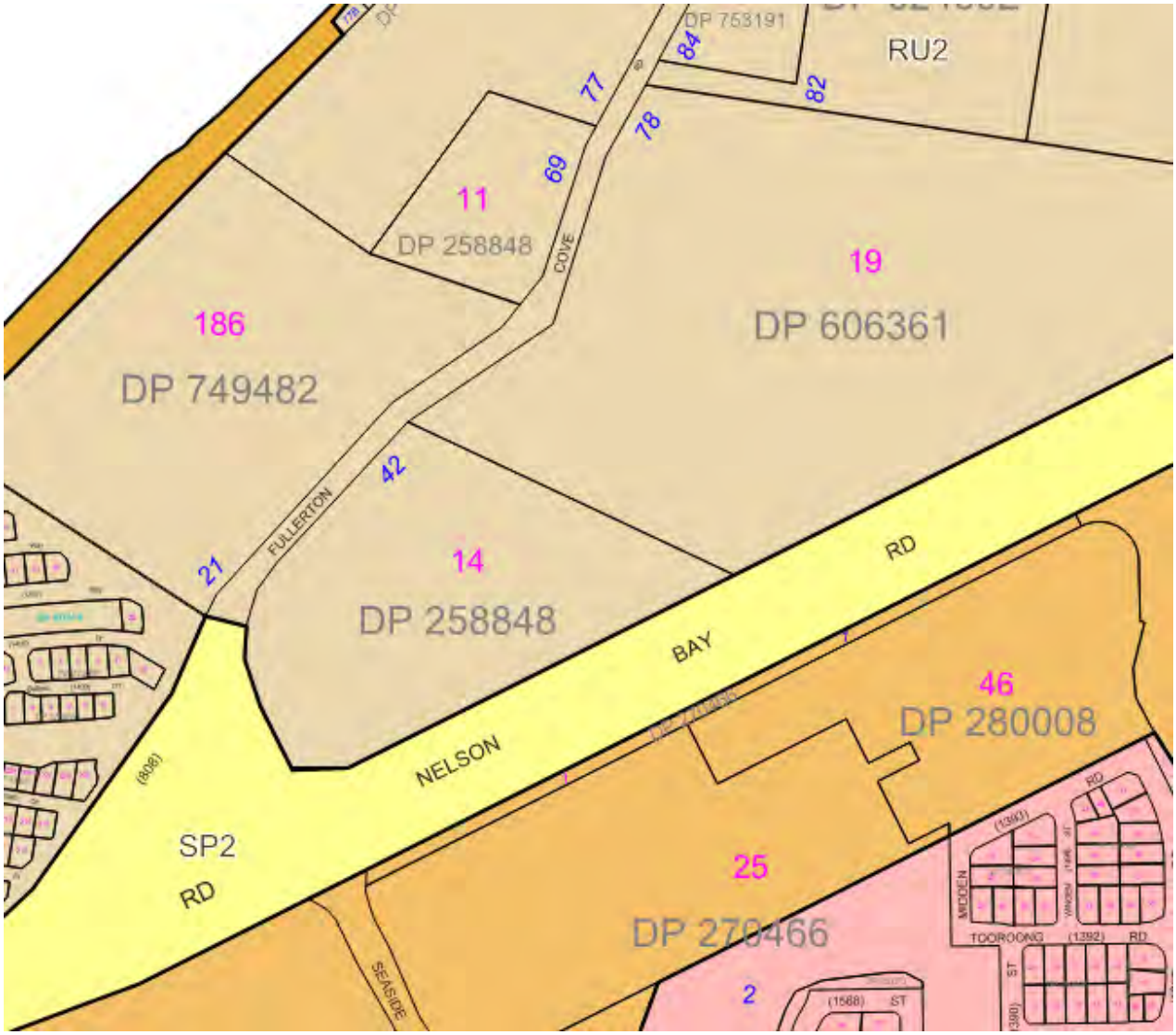
The additional technical information, studies and investigations identified in the planning proposal have been completed and after agency consultation, the planning proposal will be placed on public exhibition.

The planning proposal is expected to be reported to Council following the completion of the public exhibition period. The following timetable is proposed:

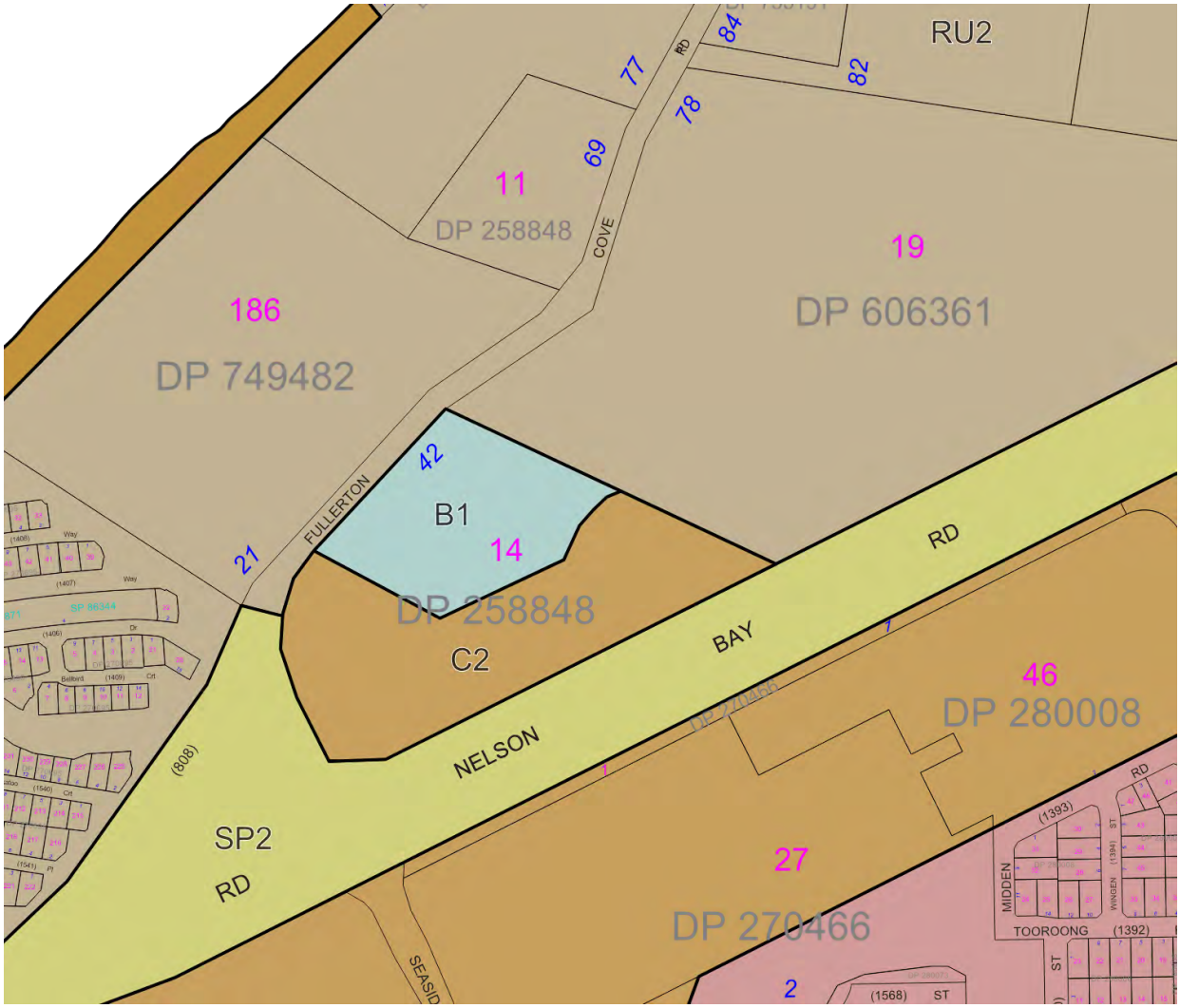
X – indicates second round of studies undertaken from initial consultation

	Q 4 2020	Q 1 2021	Q 2 2021	Q 3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022
Gateway Determination								
Further Studies				X				
Internal Reviews								
Agency Consultation								
Public Exhibition								
Review of Submissions								
Council Report								
Parliamentary Counsel								

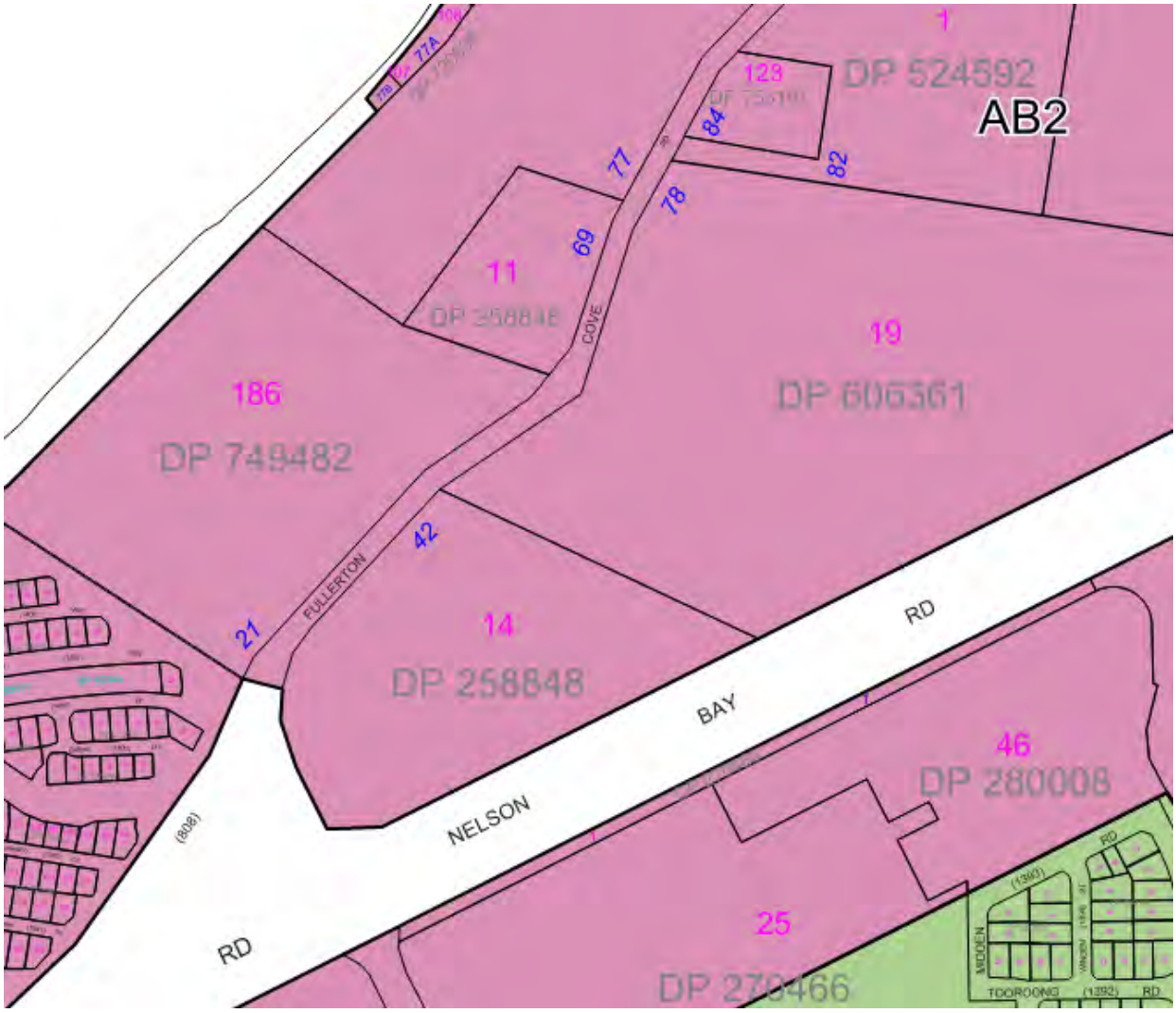
ATTACHMENT 1a – Current Land Zoning Map



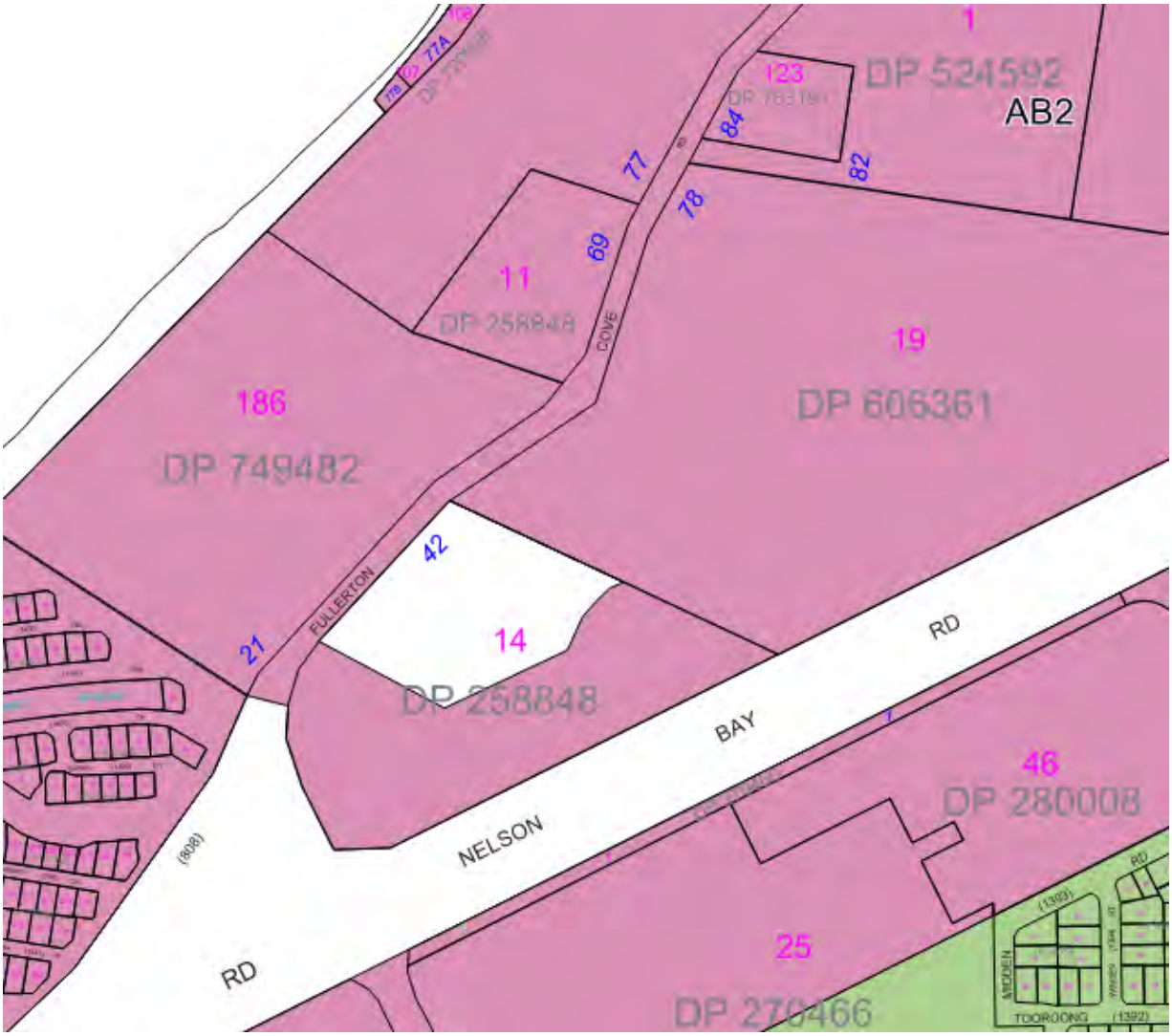
ATTACHMENT 1b – Proposed Land Zoning Map



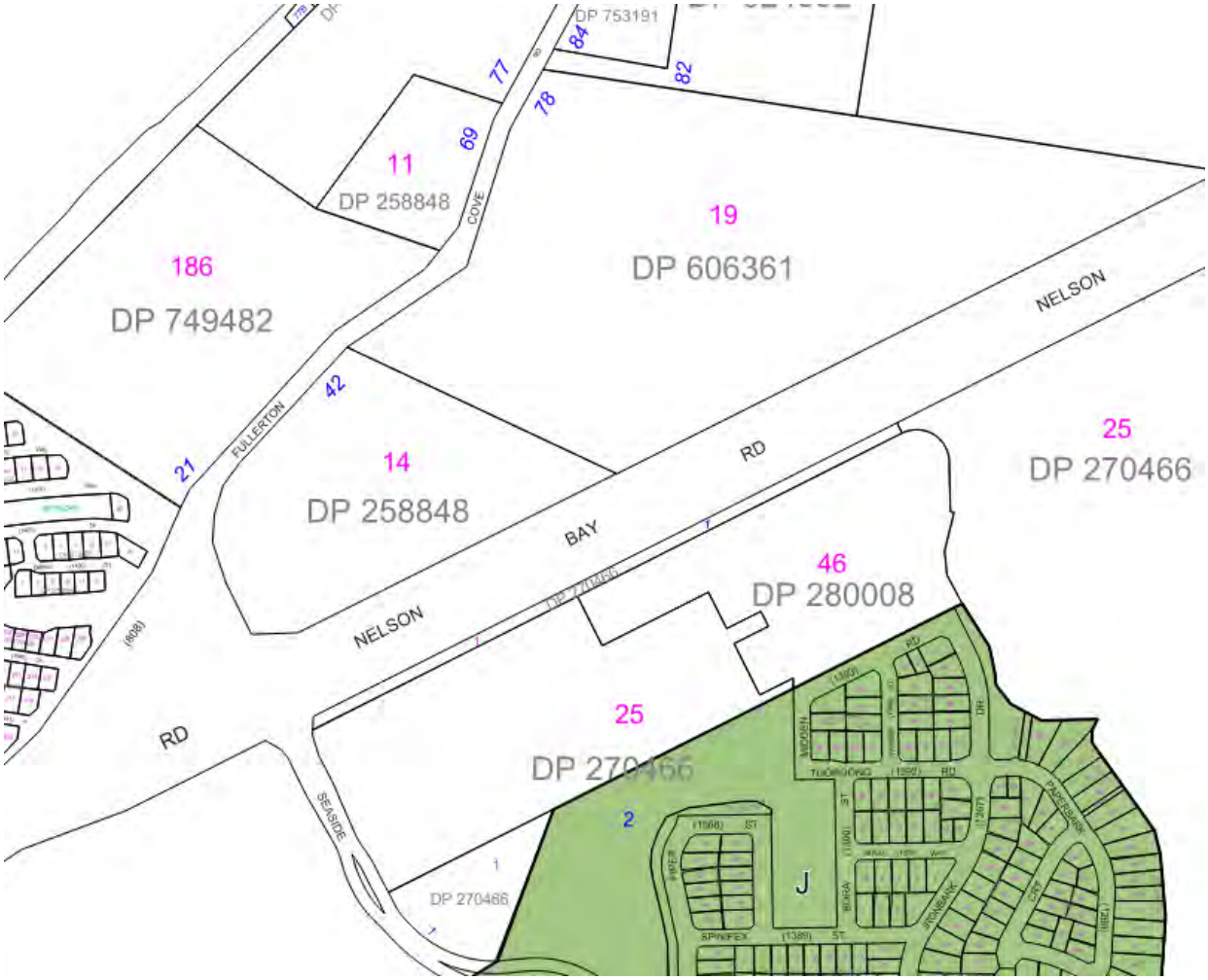
ATTACHMENT 1c – Current Lot Size Map



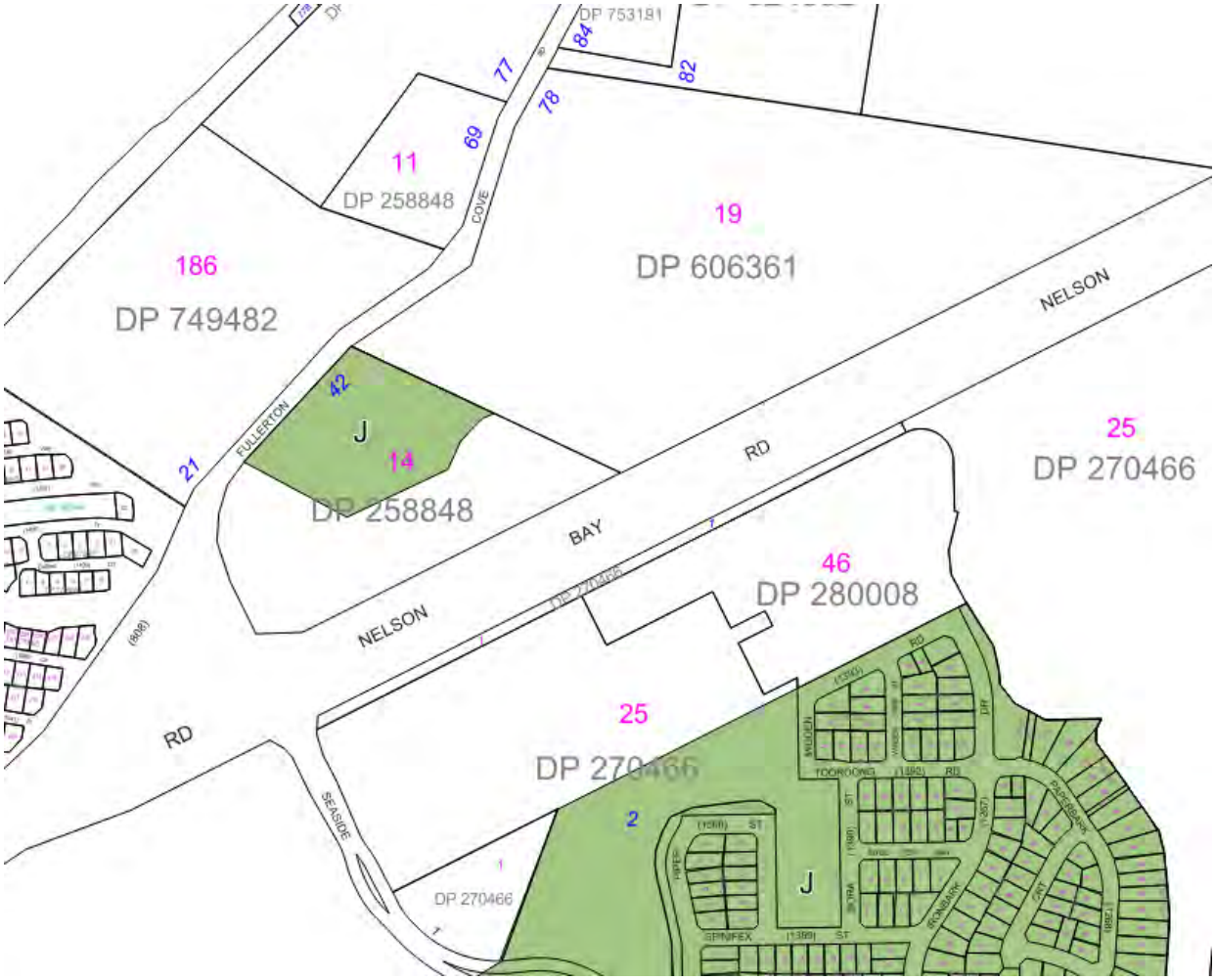
ATTACHMENT 1d – Proposed Lot Size Map



ATTACHMENT 1e – Current Height of Building Map



ATTACHMENT 1f – Proposed Height of Building Map



ATTACHMENT 2 – Gateway Determinations

Gateway Determination

***Planning proposal (Department Ref: PP_2020_PORTS_001_00)**: to rezone the site to enable the creation of a neighbourhood supermarket and centre.*

I, the Director, Central Coast and Hunter Region, as delegate of the Minister for Planning and Public Spaces, have determined under section 3.34(2) of the *Environmental Planning and Assessment Act 1979* (the Act) that an amendment to the *Port Stephens Local Environmental Plan 2013* to rezone the site from RU2 Rural Landscape to B1 Neighbourhood Centre and E2 Environmental Conservation to enable the creation of a neighbourhood supermarket and centre should proceed subject to the following conditions:

1. The planning proposal should be made available for community consultation for a minimum of 28 days.
2. Prior to public exhibition, the planning proposal should be updated to identify if the proposed local provision limiting the retail gross floor area intends to refer to the 'neighbourhood supermarket' definition under clause 5.4 of the *Port Stephens Local Environment Plan 2013*.
3. Update the planning proposal to include:
    a. biodiversity development assessment report;
    b. traffic impact assessment;
    c. acid sulfate soils study;
    d. bushfire risk assessment; and
    e. flood and drainage study to assess the impact of the proposed fill on flood heights and characteristics in the flood catchment and potential impacts on the Hunter Wetlands National Park.
4. Public exhibition is required under section 3.34(2)(c) and schedule 1 clause 4 of the Act as follows:
    (a) the planning proposal must be made publicly available for a minimum of **28 days**; and
    (b) the planning proposal authority must comply with the notice requirements for public exhibition of planning proposals and the specifications for material that must be made publicly available along with planning proposals as identified in section 6.5.2 of *A guide to preparing local environmental plans* (Department of Planning and Environment, 2018).
5. Consultation is required with the following public authorities/organisations under section 3.34(2)(d) of the Act and to comply with the requirements of relevant section 9.1 Directions:
    - NSW Rural Fire Service;

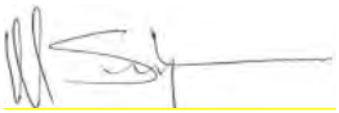
- Department of Primary Industries;
- Transport for NSW;
- Biodiversity Conservation Division; and
- Worimi Aboriginal Land Council.

Each public authority/organisation is to be provided with a copy of the planning proposal and any relevant supporting material and given at least 21 days to comment on the proposal.

6. A public hearing is not required to be held into the matter by any person or body under section 3.34(2)(e) of the Act. This does not discharge Council from any obligation it may otherwise have to conduct a public hearing (for example, in response to a submission or if reclassifying land).

7. The time frame for completing the LEP is to be **24 months** following the date of the Gateway determination.

Dated 12th day of October 2020.



Dan Simpkins
Director, Central Coast and Hunter Region
Planning and Assessment
Department of Planning, Industry and Environment

Delegate of the Minister for Planning and Public Spaces

Department of Planning and Environment

Alteration of Gateway Determination

Planning proposal (Department Ref: PP-2021-1011)

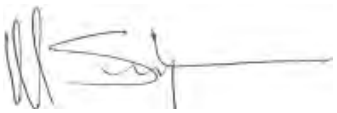
I, Director, Central Coast and Hunter at the Department of Planning and Environment, as delegate of the Minister for Planning and Homes, have determined under section 3.34(7) of the *Environmental Planning and Assessment Act 1979* to alter the Gateway determination dated 12 October 2020 for the proposed amendment to the *Port Stephens Local Environmental Plan 2013* as follows:

1. Delete: “condition 2”

   and replace with:

   new condition 2: The gross floor area for the proposed neighbourhood supermarket or commercial premises is to be limited to 5,500 square metres.

Dated 23rd day of February 2022.



Dan Simpkins
Director, Central Coast and Hunter Region
Planning and Assessment
Department of Planning and Environment

Delegate of the Minister for Planning and Homes

ATTACHMENT 3 – Fern Bay and North Stockton Commercial Lands Study

PORT STEPHENS COUNCIL

The City of Newcastle

Commercial lands study:

Fern Bay and North Stockton



council@portstephens.nsw.gov.au | (02) 4988 0255 | **PORTSTEPHENS.NSW.GOV.AU**

HillPDA CONSULTING

FERN BAY & NORTH STOCKTON

Commercial Lands Study







Prepared for Newcastle City & Port Stephens Councils

December 2017

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Quality Assurance

Report Contacts

Aneta Ramos

Senior Consultant

Bachelors of Psyc (Hons) and Commerce (Economics), AHPRA)

Aneta.Ramos@hillpda.com

Supervisor

Adrian Hack

Principal, Urban and Retail Economics

M. Land Econ. B.Town Planning (Hons). MPIA

Adrian.Hack@hillpda.com

Quality Control

This document is for discussion purposes only unless signed and dated by a Principal of HillPDA.

Reviewer			
Signature		Dated	22 December 2017

Report Details

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File Name	Fern Bay & North Stockton Commercial Lands Study
Date Printed	22 December 2017

EXECUTIVE SUMMARY

The Fern Bay and Stockton Commercial Lands Study (the Study) was prepared by HillPDA for Port Stephens and Newcastle Councils (Councils). This study summarises the findings from the retail demand analysis and the impacts of a new centre on the surrounding retail hierarchy. An assessment of preferred locations to accommodate a new centre is also undertaken as part of this Study. The findings will help to inform the development of a land use strategy for Fern Bay and North Stockton.

Study Area

The Study Area comprises the three suburbs of Fern Bay, Stockton and Fullerton Cove which are generally situated to the north and east of the Hunter River. Fern Bay and Fullerton Cove form part of Port Stephens Local Government Area (LGA), while Stockton is situated in the Newcastle LGA.

Contextual Review

Regional plans and strategies suggest that strong population growth is expected to occur, particularly within the Port Stephens LGA. Moreover, the strategies promote increasing dwelling and employment opportunities. This growth will stimulate the economy and generate further demand for retail services within the area.

A new retail centre within the Study Area will increase employment and contribute to meeting these employment targets, whilst providing a convenient destination retail centre for the regular shopping needs of local residents. This is aligned with Council's vision for the area and is largely consistent with both the Port Stephens and Hunter Regional Strategy's directions.

Existing Retail Supply

Stockton Town Centre which extends some 350m along Mitchell Street provides the largest retail offer within the locality. Stockton provides around 6,500sqm of shopfront floorspace (Net Leaseable Area) (NLA) of which 3,500sqm is occupied by retailers.

The IGA provides a mini-major anchoring role at the northern end of the centre, with the Hardware store anchoring the southern end. The centre provides a further 2,250sqm of retail specialty floorspace which is largely convenience based (i.e. chemist, butcher, personal services, etc). Non-retail commercial floorspace represents 34% (2,200sqm) of the total shopfront floorspace, which is high relative to other similar sized centres. An above-representation of non-retail occupiers in town centres reflects lower rents and hence lower retail trading levels.

Of this shop front space around 668sqm is currently vacant, which equates to 10% of total shopfront space. Although a small provision of vacant floorspace of up to 5% is considered healthy for a town centre as it allows new retailers to locate to the area or existing stores to relocate or up/down size within the same locality, Stockton Town Centre's vacancy rate of 10% is considered high and suggests the centre is underperforming.

In addition to Stockton Town Centre a small provision of retail is provided along the Stockton beachfront and Fern Bay along Nelson Bay Road.

Retail Demand Assessment

As of 2017 the Study Area contained a population of around 7,450 residents. HillPDA has considered three population growth scenarios for the retail demand assessment as follows:

Low Growth Scenario: This scenario assumes a more conservative growth rate of 1.3% per annum which is generally in line the broader LGA growth rate as sourced from the Department of Planning. This scenario assumes many of the Planning Proposals within the locality that have been lodged with Council do not proceed. On this basis the population is projected to increase by 1,470 persons to 8,920 persons by 2031.

Medium Growth Scenario: This scenario adopts a higher growth rate of 2.5% per annum which is generally in line with Port Stephens Planning Strategy. This scenario assumes all of the Planning Proposals[1] within the locality that are currently lodged with Council are realised. The population is projected to increase by 3,070 persons to 10,520 persons by 2031.

High Growth Scenario: This scenario adopts a substantial higher growth rate of 3.6% per annum. This scenario assumes all of the Planning Proposals within the locality are realised and allows for a further 1,000 dwellings on the Stockton Residential Centre site. The population is projected to increase by 4,770 persons to 12,220 persons by 2031.

Based on existing population and expenditure levels, the Study Area could support around 6,285sqm of retail floorspace as of 2017, increasing to almost 7,850sqm in 2031 under the low growth scenario, 9,250sqm under the medium growth scenario and 10,750sqm under the high growth scenario due to population and expenditure growth. With approximately 4,000sqm of retail floorspace provided in the Study Area there is currently an undersupply of retail floorspace of almost 2,300sqm, with this expected to increase to 3,845qm by 2031 under low growth scenario, 5,253sqm under the medium growth scenario and 6,748sqm under the high growth scenario.

Based on the above assertion there are several opportunities to meet the retail needs of the local residents. These are:

- **Development of a new Local Centre** of 4,000 – 6,500sqm within the Study Area. Potential trading levels, retail mix and sites for a new centre are explored in more detail in Chapters 5 and 6;
- **The attraction of a large format full-line supermarket** of around 2,800-3,200sqm would retain a large proportion of expenditure that is currently escaping the study area;
- **Tourism** – the centre could leverage its natural surroundings to increase tourism. This would likely increase retail expenditure captured within the centre; and
- **Increase the resident population** within the Study Area. Strong population growth would generate more expenditure and would in turn increase the demand for, and viability of, retail services. There may be potential for mixed use development, however the market's preference for medium to high density living may not be strong enough and the feasibility of such development would need to be assessed.

Review of Sites

Based on discussions with Council five sites were identified for investigation as potential sites for a new retail centre. These being:

- 42 Fullerton Cove Road, Fullerton Cove
- 69 Fullerton Cove Road, Fullerton Cove
- 2 Seaside Boulevard, Fern Bay

[1] Planning proposal include the Fort Wallace Masterplan (~100 dwellings); The Cove (a further 140 dwellings); The Former Rifle Range Site (200 dwellings), Newcastle Golf Course Masterplan (~120 dwellings); Seaside Estate (~310 dwellings); and 50 dwellings from smaller scale developments. In the medium growth scenario we have also allowed for an additional 300 dwellings in the locality. Source: Cordell, consultation with estate managers, Google Earth.

- Former Rifle Range, Popplewell Rd, Fern Bay
- Newcastle Golf Club, Vardon Rd, Fern Bay
- Stockton Residential Centre, Stockton.

Based on a preliminary assessment of the sites, the existing Stockton Residential Centre was found to be the preferred location for a new local retail centre due to its central and high profile location with minimal environmental constraints. The main issue associated with this site relates to heritage considerations and any redevelopment would need to work with this.

Impact Analysis

An assessment of the impacts of a new retail centre at the Stockton Residential Centre site on existing retail network found that the only centre likely to experience a moderately strong or significant impact is Stockton with around 14% to 15% loss in trade. All other centres will experience impacts that are considered insignificant or low – that is less than 5% loss in trade.

Over time these impacts will lessen as a result of population and expenditure growth in the locality with all the surrounding centres including Stockton expected to enjoy some growth over the period to 2026. This would suggest the Study Area could support a new centre of some 5,000sqm with minimal impact on the surrounding retail network.

A new retail centre will meet the needs of the local (and future) residents in the area which are currently underserviced and having to travel outside of Stockton and Fern Bay for higher order retail services.

Furthermore, an improved range of shops and services should help to reduce the number of journeys made by local residents to surrounding centres. This supports a reduction in vehicle emissions and improves transport safety. Fewer and/or shorter journeys via cars also contributes to reducing the cost of living (through reduced petrol and car maintenance costs), allowing resident's disposable income to be directed to other goods and services.

INTRODUCTION

1.0 INTRODUCTION

The Fern Bay and Stockton Commercial Lands Study (the Study) was prepared by HillPDA for Port Stephens and Newcastle Councils (Councils). The findings of this Study will help to inform the development of a land use strategy for Fern Bay and North Stockton.

The purpose of this study is to address some key developments and trends that have occurred in the locality in recent times:

- **Significant population growth:** Fern Bay has experienced significant growth over the last 10 years, with most of this growth being approved under Part 3A (repealed) of the *Environmental Planning and Assessment Act 1997* and *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004*. The resulting rapid residential growth has outpaced development or planning of services required to cater for the growing resident population.
- **Community feedback:** Residents within the locality have expressed a desire for the development of a commercial centre within Fern Bay. This centre would provide local services and daily shopping/grocery needs for the local community. Fern Bay currently contains appropriately land zoned, for the development of a neighbourhood centre, however it is understood that Port Stephens Council has received a planning proposal seeking its rezoning. This rezoning would allow the development of residential uses with no supportive retail space. As such, a new appropriate location is required to be identified that will cater for the daily needs of residents within Fern Bay and North Stockton.
- **Influx of planning proposals:** Port Stephens Council has recently received a number of planning proposals seeking to rezone land within the Fern Bay locality. These proposals would further increase the resident population, placing greater importance on identifying an appropriate location for a new retail centre to serve these future residents as well as determining an appropriate size and retail mix for this centre. Given the close proximity of Stockton Town Centre any recommendations would need to complement this existing centre and not detract away from it economic viability or status within the local hierarchy.

Specifically, the objectives of the Study are to:

1. Forecast the scale and type of retail needed to support the current and future population of Fern Bay and Stockton.
2. Identify an appropriate location for this retail centre and any appropriate controls that would support/encourage the desired development outcome.
3. Assess the impacts on the retail hierarchy.

1.1 The Study Area and Stockton Town Centre

The Study Area comprises the suburbs of Fern Bay, Stockton and Fullerton Cove (Figure 1). The Study Area is north of Hunter River and to the east of the north arm of the Hunter River at the entrance to Fullerton Cove. The Study Area falls within two local government areas, with both Fern Bay and Fullerton Cove forming part of Port Stephens Local Government Area (LGA) and Stockton within the Newcastle LGA.

Part of the Study focuses on Stockton Town Centre (located within the southern end of the Study Area) which extends approximately 350m along Mitchell Street and includes a 900sqm IGA supermarket coupled with strip retailing. The retail offer is discussed in more detail in chapter 3.

Figure 1: Study Area



Source: HillPDA

1.2 Study Structure and Approach

To address the requirements of the brief, the Study has been set out as follows:

Chapter 2 | Contextual review: provides an assessment of previous studies and existing government strategies that are of relevance to the Study.

Chapter 3 | Retail supply analysis: reviews Stockton and Fern Bay's existing retail provision. As part of this review, the community's feedback on the local retail offer is also considered. A SWAT analysis of the main retail offer in the locality (i.e. Stockton Town Centre) is also undertaken to better understand the constraints, opportunities and threats relating to the current retail offer.

Chapter 4 | Retail demand analysis: reviews the current and future demand for retail floorspace within the Study Area making allowances for the existing supply of retail floorspace within the Study Area.

Chapter 5 | Preferred site location: provides a preliminary assessment of the suitability of potential sites within the Study Area to accommodate a new retail development.

Chapter 6 | Impact Analysis: This section assesses the impacts of a new retail centre within the Study Area on the existing retail network.

CONTEXTUAL REVIEW

2.0 CONTEXTUAL REVIEW

This Chapter reviews key regional planning polices and strategies with a specific focus on commercial and retail objectives relevant to the study area.

2.1 Hunter Regional Plan 2036 (2016)

The Hunter Regional Plan 2036 is a 20-year blueprint for the future of the Hunter which includes the closely connected urban areas of Cessnock, Lake Macquarie, Maitland, Newcastle and Port Stephens LGAs.

The Plan seeks to achieve the following overarching outcomes for the Hunter region:

- A leading regional economy in Australia;
- A biodiversity-rich natural environment;
- Thriving communities; and
- Greater housing choice and jobs.

By 2036, the population of the Hunter is forecast to grow to 862,250 residents, an increase of almost 130,000 residents from 2016, with 14% (18,550 persons) of this growth anticipated to occur in Port Stephens.

Although both Fern Bay and Stockton have not been identified as strategic centres within the Plan, the following directions are of relevance to this Study:

Direction 23: *Grow centres and renewal corridors:* Although the Plan identifies regionally significant centres known as strategic centres it also acknowledges these centres and other smaller local centres operate as part of a network with each centre providing a different service, role and/ or function in the region. Fern Bay was identified as a centre of local significance and earmarked as an area to deliver future housing and urban renewal opportunities.

Direction 6: *Grow the economy of MidCoast and Port Stephens:* The plan promotes the provision of regionally significant retail, and supports growth and diversification of other employment and economic activities within the area.

Direction 1: *Connect strategic centres in Greater Newcastle:* The Regional Plan sets a target of 95 per cent of people to be living within 30 minutes of a strategic centre by 2036, thus Fern Bay and Stockton will be prime locations for further housing development which will in turn generate demand for further shops, dining, entertainment and services in the immediate area.

2.2 Newcastle Employment Lands Strategy (2013)

The Newcastle Employment Lands Strategy was prepared by HillPDA in 2013 to inform the draft Local Planning Strategy. The Strategy draws together existing research and data with revised population forecasts and trend analysis to better understand the demand for a range of employment generating uses across the city comparative to supply. The strategy also seeks to promote economic growth to meet the needs of a growing population.

The Strategy promotes reinforcing the Commercial Centres Hierarchy (with Stockton identified as a Local Centre Minor), discouraging out-of-centre development as it has significant impacts on the structure and dynamics of centres. The Strategy recommends that any out-of-centre development or expansion of a commercial zone must be supported by an Economic Impact Assessment and Sequential Impact Assessment with the analysis clearly demonstrating that there are no suitable sites within existing centres or at the edge of

existing centres and it will need to be demonstrated that there is a net community benefit in establishing a new commercial/retail site.

Notwithstanding the strategic direction above, the Strategy acknowledges new neighbourhood centres should be considered where located within 400m of underserviced residential areas including within new urban release area of North Stockton.

2.3 Newcastle Planning Strategy (2015)

The Local Planning Strategy is a comprehensive land use strategy which helps to inform future growth and development of Newcastle. The Strategy implements the land use directions from the Newcastle 2030 Community Strategic Plan. The Strategy also reflects the outcomes of the Council's other strategies as they relate to land use.

The Planning Strategy acknowledges the need for a new neighbourhood centre for the new urban release area North Stockton which is currently underserviced. The Strategy describes Stockton as having a small commercial strip along Mitchell Street which supplies smaller scale retail, business, entertainment and community uses for people who live, work and visit the area, however residents are having to travel outside the suburb for higher order services.

Further a key objective for Stockton as defined in the Strategy is to encourage development that is sympathetic to the existing character of Stockton and facilitate redevelopment of the commercial centre that both improves local services and attracts visitors.

Direction 3.2.5 of the Strategy provides the recommended development controls across the centre hierarchy. These recommendations help to reinforce the retail hierarchy and are summarised in the extract below:

Table 1: Relationship between Local Planning Strategy centres hierarchy and LEP land use zones.

LPS Hierarchy	LEP Zone	Floor Space Ratios (FSR)	Heights of Building
Neighbourhood Centre	B1 Neighbourhood Centre	Low (Typically 1.5:1)	Low (Typically 11m)
Local Centre (Minor)	B2 Local Centre	Low-Moderate (Typically 1.5:1)	Low-Moderate (Typically 11m)
Local Centre (Major)	B2 Local Centre	Moderate-High (Typically 2:1 unless place based controls established)	Moderate-High (Typically 14m unless place based controls established)
Commercial Core	B3 Commercial Core	High (Place based controls)	High (Place based controls)

Source: Newcastle Planning Strategy 2015

2.4 Port Stephens Planning Strategy (2011)

The Port Stephens Planning Strategy was adopted by Council on 20 December 2011. It incorporates the findings of the Port Stephens Commercial and Industrial Land Study (CILS), the Port Stephens Rural Lands Study and Port Stephens Rural Strategy.

The Strategy promotes Raymond Terrace as a regional centre, with Fern Bay remaining as a Smaller Village Centre (i.e. a strip or cluster of shops in a mostly residential area with a smaller range of products or services and a smaller catchment than a village centre).

The Strategy assumes significant new residential development will occur at Seaside Fern Bay with population projections indicating population will increase from 1,906 people in 2009 to 5,211 people in 2031. The Strategy recognises this will increase demand for more retail in the area. At the time of the Strategy a small area of commercially zoned land was proposed within the new Seaside estate via a clause in LEP 2000 with the final location of site has not yet determined by the developer. The Strategy acknowledged the amount of commercial land may need to be increased to accommodate increased demand and identifies the site with the existing general store and the adjacent site on the corner of Vardon Road (which contains a house) as site for investigation for commercial zoning.

In terms of opportunities and demand arising for additional commercial/retail activity the Strategy maintains the location will need to support the existing identified commercial areas as per the established Commercial Hierarchy.

2.5 Summary

The aforementioned regional plans and strategies suggest that Port Stephens in particular is expected to experience strong population growth. The strategies promote increasing dwelling and employment opportunities. This growth will generate demand for retail services. A new retail centre within the Study Area will increase employment and provide convenience retail for the day to day needs of surrounding residents, which is aligned with Council's vision for the area and largely consistent with the directions outlined in the Port Stephens and Hunter Regional Strategies.

RETAIL SUPPLY ANALYSIS

3.0 RETAIL SUPPLY ANALYSIS

This chapter reviews Stockton and Fern Bay's existing retail provision. As part of this review, the community's feedback on the local retail offer is also considered. A SWAT analysis of the main retail offer in the locality (i.e. Stockton Town Centre) is also undertaken to better understand the constraints, opportunities and threats with the existing retail offer. A more detailed assessment of the land zoned for a neighbourhood centre at 2 Seaside Boulevard in Fern Bay is provided in Chapter 5.

3.1 Existing Retail Supply

3.1.1 Stockton Town Centre

Stockton Town Centre which extends some 350m along Mitchell Street provides the largest retail offer within the locality. A recent land use survey of Stockton Town Centre[2] revealed that the centre provides 13,250sqm of Net Leasable Area (NLA). Of this total, approximately 6,400sqm was attributed to ground floor shopfront floorspace space[3].

The IGA supermarket provides a mini major anchoring role at the northern end of the centre, with the Hardware store anchoring the centre to the south. The centre provides a further 2,261sqm of retail specialty floorspace which is largely convenience based (i.e. chemist, butcher, and personal services). Non-retail commercial floorspace represents 34% (2,200sqm) of the total shopfront floorspace, which is high relative to other similar sized centres. An above-representation of non-retail occupiers in town centres reflects lower rents and hence lower retail trading levels.

Almost 670sqm of the total shop front floorspace was vacant at the time of the survey, which equates to 10%. Although a small provision of vacant floorspace of up to 5% is considered healthy for a town centre as it allows new retailers to locate to the area or existing stores to relocate or up/down size within the same locality, Stockton Town Centre's vacancy rate of 10% is considered high and suggests the centre is underperforming.

The Stockton Town Centre also contains a number of detached residential dwellings and as such may reduce redevelopment opportunities.

The table below outlines the provision of floorspace within Stockton Town Centre by commercial category.

Table 2: Stockton Town Centre by commercial category (NLA)

Commercial Category	Total Number (#)	Ground floor NLA (sqm)	Above Ground NLA (sqm)	Total
Supermarket	1	900		900
Specialty Food	5	543		543
Specialty Non-food	2	260		260
Restaurants	1	93		93
Take away/ Café	2	156		156
Chemist/pharmacy	1	240		240
Apparel	2	581		581
Personal Services	6	388		388

[2] Land use survey of all buildings and lots located within the area zoned B2- Local Centre in Stockton was undertaken by HillPDA on the 8th of September 2017

[3] This includes retail uses, non-retail commercial uses and vacant floorspace

Hardware/homeware	1	365		365
Commercial – Financial services	2	136		136
Commercial – Real estate	2	136		136
Commercial – Services	4	1,446		1,446
Commercial – Medical	5	482		482
Vacant Shop front	7	668		668
Total Shopfront	41	6,392		6,392
Hotel/pubs	2	1,050	1,050	2,101
Residential	18	2,158	2,606	4,764
Total	**61**	**9,601**	**3,656**	**13,257**

Source: Land use survey undertaken by HillPDA (2017)

The following figure provides a visual representation of where the vacant shop fronts are located within the town centre.

Figure 2: Location of vacant floorspace in Stockton Town Centre



Source: HillPDA

3.1.2 Other retail in Stockton and Fern Bay

There is a small provision of retail (approximately 400sqm) within Stockton located beyond the town centre, including the beachfront café Lexie's on the Beach and Gavo and Tashes Takeaway and Tackle on Fullerton Street.

The retail offer within the suburb of Fern Bay is underwhelming, with very limited provision of floorspace including a food outlet on Nelson Bay Road.

3.2 Fern Bay and North Stockton Shopper Survey

The Fern Bay and North Stockton Shopper Survey was conducted by Port Stephens Council and asked respondents a series of questions relating to their primary shopping destination as well as strengths and opportunities they identify for Fern Bay. 204 respondents were surveyed over the period of August to September in 2017. The vast majority of survey respondents were residents of Fern Bay. It should also be noted that Stockton was not included in the strategy area or targeted for consultation within this survey. Despite this a number of the responses received through the survey were from Stockton residents.

The key findings of the survey which relate to the retail offer and are of relevance to the Study are as follows:

- A large proportion of residents are travelling outside of Stockton and Fern Bay for retail services including food and grocery shopping;
- Only 12% (or 25 respondents) indicated Stockton Town Centre was their main shopping centre destination, with a further 25% using the centre for 'top-up' shopping (i.e. serving as a secondary centre);
- Newcastle was the most popular shopping destination amongst respondents (34%), followed by Mayfield (33%) and Medowie (32%);
- A small proportion of retail expenditure is also escaping the locality and being directed to Raymond Terrace, Waratah and to a lesser extent Salamander Bay and Warabrook;
- Of those respondents who do not shop at Stockton Town Centre, the main reasons given were over-pricing due to limited price competition and limited retail offer. Anti-social behaviour (or perceived) was also a major deterrence;
- A large proportion of respondents were undertaking their major shop at higher order/ larger centres near their place of work, with a small proportion indicated they shop online (4 respondents); and
- Three quarters of the respondents indicated a new retail centre or expanded retail offer was a priority for Fern Bay and Stockton in the next 10 years.

3.3 Stockton Town Centre SWOT analysis

This next section analyses the strengths, weaknesses, opportunities and threats to the future performance of Stockton Town centre which as discussed above is the main retail destination within the Study area. The results of this assessment are presented in the table below.

Strengths	Weaknesses
■ Compact and walkable retail core, with flat topography and minimal fall ■ Anchor tenant located at the northern end of centre (i.e. entry point) ■ Well served by public carparks and street parking ■ Proximity to strong amenities including schools and medical services which encourage dual purpose visits ■ Well served by buses services ■ Close proximity to natural assets, open space, beaches, leisure centre (swimming pool) ■ Proximity to touristic accommodation i.e. Stockton Beach Holiday Park	■ Limited retail offer and scale, with significant leakage to higher order centres ■ High vacancy rate ■ Lacks provision for a vibrant evening/night time economy ■ Presence of detached dwellings within town centre ■ Poor appearance and condition of larger peripheral buildings ■ Lack of pedestrian footfall ■ The town centre is located at the southern end of the peninsula (some distance from the peninsula entry point), making it an inconvenient location for residents to the north

■ Existence of adaptive reuse opportunities ■ Strong projected population growth in the locality	
Opportunities	**Threats**
■ Improve and expand retail offer ■ Include a stronger anchor tenant ■ Increase residential densities ■ Raise the tourism profile of the area ■ Implement competitive pricing strategies ■ Address reputation and safety/anti-social behaviour concerns surrounding the centre. Potentially through increased surveillance	■ Anti-social stigma ■ Stockton is characterised by a less affluent demographic ■ Increased competition from a new retail centre within the Fern Bay/Stockton locality ■ Lack of retailer demand ■ Further stagnation, reducing viability of planned urban-edge extensions

RETAIL DEMAND ANALYSIS

4.0 RETAIL DEMAND ANALYSIS

This Chapter considers the competitive landscape for a retail facility located within the Study Area (i.e. the suburbs of Stockton, Fern Bay and Fullerton Cove). The demand for retail floor space within the Study Area is subsequently assessed using a combination of population forecasts within the Study Area and estimated total household retail expenditure expected to be retained within the Study Area as well as applying industry target turnover rates.

4.1 Surrounding Competing Centres[4]

The following provides an assessment of surrounding retail centres that would compete with the proposed development in terms of retail expenditure capture. Pipeline retail developments within the immediate area are also considered.

4.1.1 Charleston Square

Charlestown Square provides 76,700sqm of retail floorspace and is located along Pearson Street in Charleston, some 23km south of the Study Area. The regional shopping centre is anchored by a Myer department store (11,500sqm), Target (7,750sqm) and Big W (5,590sqm) discount department stores, and Coles (4,320sqm) and Woolworths (4,800sqm) supermarkets. The centre contains several mini-major tenants of the likes of H&M (recent addition), Dan Murphy's, Rebel Sport, JB Hi-Fi and City Beach, as well as around 245 specialty retailers. The centre reported an MAT of $545.2m in 2016/17, or $7,043/sqm ranking it 39nd out of 89 similar sized centres (slightly above the benchmark average of $6,925/sqm for similar sized centres).

4.1.2 Kotara

A strong retail offer is provided in Kotara which includes the Westfield Kotara regional shopping centre, some 17km south of the Study Area. Westfield Kotara includes 65,057sqm of retail floorspace and is anchored by a David Jones (15,445sqm), Kmart (6,979sqm), Target (6,350sqm) as well as Coles (3,106sqm) and Woolworths (4,116sqm) supermarkets. The centre contains mini-majors such as Toys 'R' Us, First Choice Liquor and Lincraft as well as well as around 215 specialty retail stores and a new cinema complex/dining precinct. The centre reported an MAT of $504.2m in 2016/17, or $7,924/sqm ranking it 17th out of 89 similar sized centres (14% above the benchmark average of $6,925/sqm for similar sized centres).

The Kotara Homemaker Centre immediately to the north of Westfield is one of the largest bulky goods precincts in NSW, containing around 58,000 sq.m of retail floorspace, including major tenants such as Bunnings Warehouse, Domayne, Freedom Furniture, Trade Secret and The Good Guys, as well as around 35 – 40 other retailers including an Aldi supermarket.

4.1.3 Stockland Jesmond

This Sub-regional centre contains 20,129sqm of retail floorspace and is anchored by a Big W (7,944sqm) and Woolworths (3,053sqm) and Aldi (1,500sqm) supermarkets. The centre reported an MAT of $154.9m which equates to $8,713/sqm ranking it 19th from 95 centres or 21% above the benchmark average for similar sized centres. The centre is 14km south west of the Study Area.

[4] Sources: various sources including Shopping Centre Directory, Big Guns 2017, Little Guns 2016 and Mini Guns 2016, desktop analysis

4.1.4 Salamander Bay Shopping Centre

Salamander Bay is a strong performing regional shopping centre some 42.4km north of the Study Area. The centre contains 23,091sqm of retail floospace and is anchored by Kmart (4,998sqm), Target (1,243sqm) as well as Coles (3,962sqm), Woolworths (3,899sqm) and Aldi (1,351sqm) supermarkets. Around 73 speciality stores are also provided over one level. The centre reported an MAT of $217.7m in 2016/17, or $9,861/sqm ranking it 11th out of 96 similar sized centres (36% above the benchmark average of $7,223/sqm for similar sized centres).

4.1.5 Inner City Newcastle

Newcastle West provides higher order retail, commercial, health and business services and serves the greater Newcastle metropolitan area and the southern end of the Port Stephens LGA. Retail is largely focused within Marketown Shopping Centre located on the corner of National Park and Parry Streets, some 15km south of Stockton/Fern Bay (20minute drivetime). This enclosed shopping centre provides almost 26,000sqm of retail floorspace, including a Big W (6,567sqm) and Woolworths (3,872sqm) and Coles (3,050sqm) supermarket as well as 61 specialty stores over one level. There is estimated 30,000sqm of strip retailing generally oriented around Hunter Street/King Street also provided with Newcastle CBD, which generally consists of a mix of cafes, restaurants, take-away shops, some convenience retailers and lower quality/discount retailers.

4.1.6 Raymond Terrace

A strong provision of retail is provided within the strategic centre Raymond Terrace, some 25km north-west of the Study Area. Raymond Terrace comprises of two major shopping centres described as follows:

- MarketPlace: Located along William Street, this 14,800sqm sub-regional centre is anchored by a Big W (6,775sqm) and Woolworths (4,117sqm) as well as 37 specialty stores. The centre has an estimated turnover of $92.3m[5] as of 2016.
- Raymond Terrace Shopping Centre: this 7,000sqm supermarket-based centre is anchored by a Woolworths (4,090sqm). The centre is situated on the corner of Sturgeon and Glenelg Streets.
- A small provision of retail (some 2,000sqm) is provided along William and Port Stephens Streets.

4.1.7 Local and Neighbourhood centres

There are number of local and neighbourhood centres within the vicinity of the Study Area including:

- **Medowie:** located some 20km north of the Study Area and is oriented around Ferodale and Peppertree Roads. The precinct provides approximately 10,000sqm of retail floorspace and includes free standing Woolworths (4,000 sqm) and Coles (2,500sqm) supermarkets and 15 specialty stores. There was only one vacancy at the time of survey indicating the centre is performing well.
- **Warabrook:** is located some 10km south of the Study Area along Angophone Drive. This convenience based centre provides approximately 5,000sqm of retail floorspace and includes full-line Woolworths supermarket and nine speciality stores.
- **Mayfield:** is predominately a street/strip precinct generally oriented around Maitland Drive/Pacific Highway, some 10.7km from the Study Area. The precinct provides approximately 15,000 sqm of retail floorspace, as well as a range of business/commercial floorspace and medical centres. This precinct includes a large Woolworths supermarket of around 4,900 sq.m and an Aldi supermarket (1,500sqm).
- **Waratah Village:** some 12.4km south of the Study Area, the centre provides 12,000sqm of retail floorspace and contains a full-line Coles supermarket (of around 3,500 sq.m), a larger Kmart store

[5] Shopping Centre Directory 2016

(which trades 24 hours a day), as well as around 20 specialty stores including pad-sites such as Kmart Tyre and Auto and Red Rooster.

4.1.8 Proposed retail developments

There are two major pipeline developments proposed in the vicinity of the Study Area of relevance including:

- The Hunter Street Mall: A redevelopment of the area around the Hunter Street could potentially yield around 4,900sqm of retail floorspace and include a metro-style supermarket, convenience related retail, (e.g. newsagent, pharmacy, hairdressers) as well as non-food discretionary retailers. A further 2,700 sq.m of commercial space is planned.
- A new Coles supermarket of 4,380sqm plus 200sqm Liquorland outlet is soon to be developed at the intersection of Maitland Road and Havelock Street in Mayfield. There is preliminary approval for a further 1,500 sq.m of specialty floorspace on the ground/lower level, with tenancies subject to specific development applications.

4.1.9 Competition from Online Shopping

Online shopping has been well received by many Australians – particularly those living remotely or in areas with limited access to conventional bricks-and-mortar stores. E-commerce research[6] reveals that the online shopping industry continues to grow domestically, with buyers in remote regional locations and tourist towns shopping online the most.

In 2016, Australian's spent $22b shopping online (this includes both physical goods and digital services) an increase of 10.4% compared to 2015. Physical goods represented 82% (or $18b) of the total online spend, with department and variety store items the most popular online purchases (30% of all online purchases), followed by fashion (22%)[7].

It should be noted that although growth in online spending significantly outperformed bricks-and-mortar retail by 6.9% over the last year, traditional retail is still a substantially larger industry in Australia, bringing in $261b in 2016 compared to online retail's $18b in physical goods. Although online shopping has made some impact, there is still strong demand for traditional retail[8].

In terms of the online grocery market, recent research[9] has consistently found that although almost 30% indicated they would consider grocery shopping online in the next 12 months, only around 3% actually do so in any given four-week period. In the recent Fern Bay and North Stockton Shopper Survey discussed in Chapter 3, only 2% of the survey respondents indicated (unprompted) that they shop online. Woolworths customers, are marginally more likely to do their grocery shopping online (4.2% doing so in an average four weeks) than those Coles (4.0%), ALDI (1.4%) and IGA (1.2%) customers[10]. So despite positive sentiment surrounding online grocery shopping, it still remains quite a niche market in Australia.

Online grocery sales in Australia are expected to increase to $5.8b in 2020 from their current value of $2.6b, however this only represents 4% of total grocery sales again reinforcing the importance of traditional grocery retail[11]. Thus online shopping will not significantly compete with the new retail centre in Stockton/Fern Bay in the foreseeable short to medium term.

[6] Inside Australian Online Shopping, eCommerce Industry Paper, Australia Post and Startrack, 2017
[7] Inside Australian Online Shopping, eCommerce Industry Paper, Australia Post and Startrack, 2017
[8] Inside Australian Online Shopping, eCommerce Industry Paper, Australia Post and Startrack, 2017
[9] Roy Morgan Research, Can Australia's supermarkets stand up to AmazonFresh?, 2017
[10] Roy Morgan Research, Can Australia's supermarkets stand up to AmazonFresh?, 2017
[11] Australia's online grocery market set to double, Retail World, 2016

4.2 Study Area's Population Forecasts

As of 2017 the Study Area contained a population of around 7,450 residents as per the ABS census data. HillPDA have considered two population growth scenarios as follows:

- **Low Growth Scenario:** This scenario assumes a more conservative growth rate of 1.3% per annum which is generally in line the broader LGA growth rate as sourced from the Department of Planning. This scenario assumes many of the Planning Proposals within the locality that have been lodged with Council do not proceed. On this basis the population is projected to increase by 1,470 persons to 8,920 persons by 2031.
- **Medium Growth Scenario:** This scenario adopts a higher growth rate of 2.5% per annum which is generally in line with Port Stephens Planning Strategy. This scenario assumes all of the Planning Proposals[12] within the locality that currently lodged with Council are realised. The population is projected to increase by 3,070 persons to 10,520 persons by 2031.
- **High Growth Scenario:** This scenario adopts a substantial higher growth rate of 3.6% per annum. This scenario assumes all of the Planning Proposals within the locality are realised and allows for a further 1,000 dwellings on the Stockton Residential Centre site. The population is projected to increase by 4,770 persons to 12,220 persons by 2031.

Table 3: Study Area Forecast Population

	2017	2021	2026	2031	Growth	Annual compound growth
Low Growth	7,450	7,930	8,450	8,920	1,470	1.3%
Medium Growth	7,450	8,350	9,460	10,520	3,070	2.5%
High Growth	7,450	8,840	10,550	12,220	4,770	3.6%

Source: 2017 Census ABS, Forecasts population is based on a combination of Department of Planning Population Projections for the Port Stephens and City of Newcastle LGAs (2016), Anysite 2017 population projection data (2017), Port Stephen Planning Strategy, as well as review of pipeline residential developments - sourced from Cordell and Port Stephen Council.

4.3 Forecast Household Expenditure

This section examines the projected growth in household retail expenditure within the Study Area between 2017 and 2031. Household expenditure was sourced from:

- ABS Household Expenditure Survey 2003-04 which provides household expenditure by broad commodity type by household income quintile
- AnySite 2017 data which is generated by combining and updating data from the Population Census and the ABS Household Expenditure Survey (HES) using microsimulation modelling techniques.

AnySite combines the data from the Census, HES and other sources to derive total household expenditure by commodity type.

[12] Planning proposal include the Fort Wallace Masterplan (~100 dwellings); The Cove (a further 140 dwellings); The Former Rifle Range Site (200 dwellings), Newcastle Golf Course Masterplan (~120 dwellings); Seaside Estate (~310 dwellings); and 50 dwellings from smaller scale developments. In the medium growth scenario we have also allowed for an additional 300 dwellings in the locality. Source: Cordell, consultation with estate managers, Google Earth.

As of 2017 residents within the Study Area spent $92.8m on retail expenditure. Of the total retail expenditure approximately in 2017, $29.3 million, or about 32%, was spent in supermarkets and grocery stores. Over the period to 2031 total retail expenditure is forecast to increase to $124.2 million as a result of population and expenditure growth under low growth scenario, $146.5m under the medium growth scenario and $170.2m under the high growth scenario. Household expenditure data is shown in the table below.

Table 4: Study Area retail expenditure to 2031 ($m2017)

Store Type	2017	2021	2026	2031
Low Growth Scenario				
Supermarkets & Grocery Stores	29.3	32.2	35.7	39.2
Take-away Liquor Stores	5.5	6.1	6.7	7.4
Specialty Food Stores	3.3	3.6	4.0	4.4
Fast-Food Stores	4.3	4.7	5.3	5.8
Restaurants, Hotels and Clubs*	8.4	9.2	10.2	11.2
Department Stores	6.1	6.7	7.4	8.2
Apparel Stores	6.4	7.0	7.8	8.6
Bulky Goods Stores	13.4	14.7	16.4	18.0
Other Personal & Household Goods Retailing	12.9	14.2	15.8	17.3
Selected Personal Services**	3.1	3.4	3.8	4.2
Total Retailing	**92.8**	**102.0**	**113.1**	**124.2**
Medium Growth Scenario				
Supermarkets & Grocery Stores	29.3	33.9	40.0	46.2
Take-away Liquor Stores	5.5	6.4	7.6	8.7
Specialty Food Stores	3.3	3.8	4.5	5.2
Fast-Food Stores	4.3	5.0	5.9	6.8
Restaurants, Hotels and Clubs*	8.4	9.7	11.4	13.2
Department Stores	6.1	7.1	8.3	9.6
Apparel Stores	6.4	7.4	8.7	10.1
Bulky Goods Stores	13.4	15.5	18.3	21.2
Other Personal & Household Goods Retailing	12.9	15.0	17.6	20.4
Selected Personal Services**	3.1	3.6	4.3	4.9
Total Retailing	**92.8**	**107.4**	**126.6**	**146.5**
High Growth Scenario				
Supermarkets & Grocery Stores	29.3	35.9	44.6	53.7
Take-away Liquor Stores	5.5	6.8	8.4	10.2
Specialty Food Stores	3.3	4.1	5.0	6.1
Fast-Food Stores	4.3	5.3	6.6	7.9
Restaurants, Hotels and Clubs*	8.4	10.2	12.7	15.3
Department Stores	6.1	7.5	9.3	11.2
Apparel Stores	6.4	7.9	9.8	11.8
Bulky Goods Stores	13.4	16.4	20.4	24.6
Other Personal & Household Goods Retailing	12.9	15.8	19.7	23.7
Selected Personal Services**	3.1	3.8	4.7	5.7
Total Retailing	**92.8**	**113.7**	**141.2**	**170.2**

Source: Pitney Bowes (AnySite 2016) and HillPDA

Note: Forecasts allow for growth in real spend per capita of 0.8% per annum from 2017 onwards in line with the historic trend since 1986 (HillPDA estimate based on ABS Retail Sales, CPI and population data).

* Turnover relating only to consumption of food and liquor (excludes all other types of revenue such as accommodation, gaming and gambling).

** Selected Personal Services includes hair and beauty, laundry, clothing hire and alterations, shoe repair, optical dispensing and photo processing.

4.4 Retail capture rates by broad store type

The above analysis identified the total volume of retail expenditure in the Study Area, however not all of this expenditure will be captured by retail facilities within the Study Area. Reasons for this include:

- The proximity of competing facilities at Newcastle and Medowie which provides a greater range and quantum of retail floorspace;
- More limited retail offer within the Study Area;
- Residents leaving the locality to, predominantly, undertake discretionary shopping (in department stores, apparel stores and bulky goods stores elsewhere);
- Working residents spending a portion of annual retail expenditure close to their place of work (approximately 15-25%); and
- Expenditure from residents who are on holidays / business trips or are away for other reasons for any extended period. This is counterbalanced to some extent by residents from outside the Study Area visiting the new retail centre as they visit the area.

Capture rates (i.e., the proportion of expenditure captured by the new retail centre) have been adopted, considering the above factors and have been assumed to remain consistent across both the low and high growth scenario. These market share assumptions from residents within the Study Area are outlined in the following table.

Table 5: Target capture rates

	Study Area
Supermarkets & Grocery Stores	80%
Take-away Liquor Stores	80%
Specialty Food Stores	70%
Fast-Food Stores	70%
Restaurants, Hotels and Clubs*	50%
Department Stores	0%
Apparel Stores	5%
Bulky Goods Stores	0%
Other Personal & Household Goods Retailing	25%
Selected Personal Services**	60%
Total Retail	53%

Source HillPDA,*we have assumed an additional 5% of expenditure would be captured from beyond the Trade Area (which includes tourists).

However at the same token, a new centre within the Study Area is also likely to capture expenditure from passing traffic and residents from motorists travelling to and from outlying areas such as Williamtown Airport, Medowie, Anna Bay and Fisherman's Bay. Some 1,640 to 1,690 vehicles travel along Nelson Bay Road per hour (two-way) in the weekday afternoon peak period and 1,130 to 1,210 per hour (two-way) on Saturday. On this basis it is assumed some 15% of expenditure would be generated from beyond the trade area.

On balance however, the net effect of this is that there is likely to be substantial net loss of retail spending escaping the Study Area.

4.5 Retail expenditure captured within the Study Area

Applying the above capture rates, a new centre within the Study Area has the potential to capture a total of $49.2m in 2017, increasing to $65.9m in 2031 under the low growth scenario, $77.7m under the medium growth scenario and $90.3m under the high growth scenario.

The retail expenditure that is potentially captured by the new retail centre, over the years between 2017 and 2031, is shown in Table 6 below.

Table 6: Study Area retail expenditure captured by Retail Facility within Study Area

YEAR	2017	2021	2026	2031
Low Growth Scenario				
Supermarkets & Grocery Stores	26.9	29.6	32.8	36.1
Take-away Liquor Stores	5.1	5.6	6.2	6.8
Specialty Food Stores	2.7	2.9	3.3	3.6
Fast-Food Stores	3.5	3.8	4.2	4.7
Restaurants, Hotels and Clubs*	4.8	5.3	5.9	6.4
Department Stores	-	-	-	-
Apparel Stores	0.4	0.4	0.4	0.5
Bulky Goods Stores	-	-	-	-
Other Personal & Household Goods Stores	3.7	4.1	4.5	5.0
Selected Personal Services**	2.1	2.4	2.6	2.9
Total Retailing	**49.2**	**54.1**	**60.0**	**65.9**
Medium Growth Scenario				
Supermarkets & Grocery Stores	26.9	31.2	36.8	42.5
Take-away Liquor Stores	5.1	5.9	6.9	8.0
Specialty Food Stores	2.7	3.1	3.6	4.2
Fast-Food Stores	3.5	4.0	4.7	5.5
Restaurants, Hotels and Clubs*	4.8	5.6	6.6	7.6
Department Stores	-	-	-	-
Apparel Stores	0.4	0.4	0.5	0.6
Bulky Goods Stores	-	-	-	-
Other Personal & Household Goods Stores	3.7	4.3	5.1	5.9
Selected Personal Services**	2.1	2.5	2.9	3.4
Total Retailing	**49.2**	**57.0**	**67.2**	**77.7**
High Growth Scenario				
Supermarkets & Grocery Stores	26.9	33.0	41.0	49.4
Take-away Liquor Stores	5.1	6.2	7.7	9.3
Specialty Food Stores	2.7	3.3	4.1	4.9
Fast-Food Stores	3.5	4.3	5.3	6.4
Restaurants, Hotels and Clubs*	4.8	5.9	7.3	8.8
Department Stores	-	-	-	-
Apparel Stores	0.4	0.5	0.6	0.7
Bulky Goods Stores	-	-	-	-
Other Personal & Household Goods Stores	3.7	4.6	5.7	6.8
Selected Personal Services**	2.1	2.6	3.3	3.9
Total Retailing	**49.2**	**60.3**	**74.9**	**90.3**

Source: Pitney Bowes (AnySite) and HillPDA

Note: Forecasts allow for growth in real spend per capita of 1% per annum from 2016 onwards in line with the historic trend since 1986 (HillPDA estimate based on ABS Retail Sales, CPI and population data).

* Turnover relating only to consumption of food and liquor (excludes all other types of revenue such as accommodation, gaming and gambling).

** Selected Personal Services includes hair and beauty, laundry, clothing hire and alterations, shoe repair, optical dispensing and photo processing.

4.6 Demand for Retail Floorspace

In order to determine the demand for retail floorspace within the Study Area, target turnover rates ($/sqm of retail floorspace, and otherwise known as Retail Turnover Densities (RTDs) have been applied to projected retail expenditure within the Study Area. These RTD rates broadly represent industry averages.

Table 7: Study Area shop front floorspace demand (GLA)

YEAR	Target Rate*	RTD growth**	2017	2021	2026	2031
Low Growth Scenario						
Supermarkets & Grocery Stores	10,000	0.50%	2,694.8	2,902.8	3,139.6	3,364.0
Take-away Liquor Stores	12,000	0.50%	424.4	457.2	494.5	529.8
Specialty Food Stores	8,000	0.50%	333.5	359.2	388.5	416.3
Fast-Food Stores	8,000	0.50%	434.9	468.5	506.7	542.9
Restaurants, Hotels and Clubs	5,000	0.50%	962.2	1,036.5	1,121.1	1,201.2
Department Stores	3,600	0.50%	-	-	-	-
Clothing Stores	6,000	0.50%	61.4	66.2	71.6	76.7
Bulky Goods Stores	3,700	0.50%	-	-	-	-
Other Personal & Household Goods	4,900	0.50%	759.1	817.7	884.4	947.6
Selected Personal Services	3,500	0.50%	614.3	661.7	715.7	766.8
Total Retailing	**7,835**	**0.50%**	**6,284.7**	**6,769.8**	**7,322.0**	**7,845.4**
Medium Growth Scenario						
Supermarkets & Grocery Stores	10,000	0.50%	2,694.8	3,056.6	3,514.9	3,967.4
Take-away Liquor Stores	12,000	0.50%	424.4	481.4	553.6	624.8
Specialty Food Stores	8,000	0.50%	333.5	378.3	435.0	491.0
Fast-Food Stores	8,000	0.50%	434.9	493.3	567.3	640.3
Restaurants, Hotels and Clubs	5,000	0.50%	962.2	1,091.4	1,255.0	1,416.6
Department Stores	3,600	0.50%	-	-	-	-
Clothing Stores	6,000	0.50%	61.4	69.7	80.1	90.4
Bulky Goods Stores	3,700	0.50%	-	-	-	-
Other Personal & Household Goods	4,900	0.50%	759.1	861.0	990.1	1,117.6
Selected Personal Services	3,500	0.50%	614.3	696.7	801.2	904.4
Total Retailing	**7,835**	**0.50%**	**6,284.7**	**7,128.4**	**8,197.2**	**9,252.6**
High Growth Scenario						
Supermarkets & Grocery Stores	10,000	0.50%	2,694.8	3,235.9	3,919.9	4,608.5
Take-away Liquor Stores	12,000	0.50%	424.4	509.6	617.4	725.8
Specialty Food Stores	8,000	0.50%	333.5	400.5	485.1	570.3
Fast-Food Stores	8,000	0.50%	434.9	522.3	632.6	743.8
Restaurants, Hotels and Clubs	5,000	0.50%	962.2	1,155.4	1,399.7	1,645.6
Department Stores	3,600	0.50%	-	-	-	-
Clothing Stores	6,000	0.50%	61.4	73.8	89.4	105.1
Bulky Goods Stores	3,700	0.50%	-	-	-	-
Other Personal & Household Goods	4,900	0.50%	759.1	911.5	1,104.2	1,298.2
Selected Personal Services	3,500	0.50%	614.3	737.6	893.5	1,050.5
Total Retailing	**7,835**	**0.50%**	**6,284.7**	**7,546.7**	**9,141.7**	**10,747.8**

* Sources: ABS Retail Survey 1998-99 (escalated to 2007 dollars), JHD Retail Averages, Shopping Centre News, HillPDA and various consultancy studies ** An Allowance for Real Growth in Retail Store Turnover per annum

By applying the above RTDs the Study Area could support around 6,285sqm of retail floorspace as of 2017, increasing to almost 7,850sqm in 2031 under the low growth scenario, 9,250sqm under medium growth scenario and 10,750sqm under high growth scenario. Some further shop front floorspace would be occupied by commercial uses, such as, real estate agents, doctors and financial services. Assuming a further 20% of commercial uses, demand would increase the demand to around 9,400sqm in 2031 under the low growth scenario and 11,100sqm under high growth scenario.

4.7 Retail Demand

The below table compares the demand for retail floorspace in the Study Area against the existing supply. As demonstrated below, there is currently an undersupply of retail floorspace within the Study Area of almost 2,300sqm based on the aspirational capture rates outlined above. This is expected to increase to 3,845qm by 2031 under low growth scenario and 5,253sqm under the high growth scenario.

Table 8: Demand and Supply Analysis

	2016	2021	2026	2031
Demand for retail floorspace (low growth scenario)	6,284.7	6,769.8	7,322.0	7,845.4
Demand for retail space (medium growth scenario)	6,284.7	7,128.4	8,197.2	9,252.6
Demand for retail floorspace (high growth scenario)	6,284.7	7,546.7	9,141.7	10,747.8
Supply of retail floorspace	4,000.0	4,000.0	4,000.0	4,000.0
Net demand of retail floorspace (low growth scenario)	2,284.7	2,769.8	3,322.0	3,845.4
Net demand of retail space (medium growth scenario)	2,284.7	3,128.4	4,197.2	5,252.6
Net demand of retail floorspace (high growth scenario)	2,284.7	3,546.7	5,141.7	6,747.8

4.8 The Way Forward

Based on the above assessment there are several opportunities and initiatives that can be implemented to meet the retail needs of the local residents. These are:

- **Development of a new Local Centre** of 4,000 – 6,500sqm in the Study Area. Potential turnover, retail mix and sites for a new centre are explored in more detail in the Chapter 6.
- **The attraction of a large format supermarket** of around 2,800-3,200sqm with complementary specialty floorspace and personal services would be beneficial to the area and has the potential to reduce current levels of escape expenditure. Increased customers attracted to the supermarket would also be beneficial to the surrounding retailers as they would develop a nexus relationship with the supermarket (anchor tenant).
- **Tourism** – the centre could leverage from its natural surroundings to increase tourism. This would likely increase retail expenditure captured within the centre.
- **Increase the resident population** within the Study Area. Strong population growth would generate more expenditure and would in turn increase the demand and viability of retail services. There may be potential for mixed use given recent housing trends, however the market's preference for medium/high density living within this location couple with the feasibility of such development would need to be tested.

PREFERRED SITE LOCATION

5.0 PREFERRED SITE LOCATION

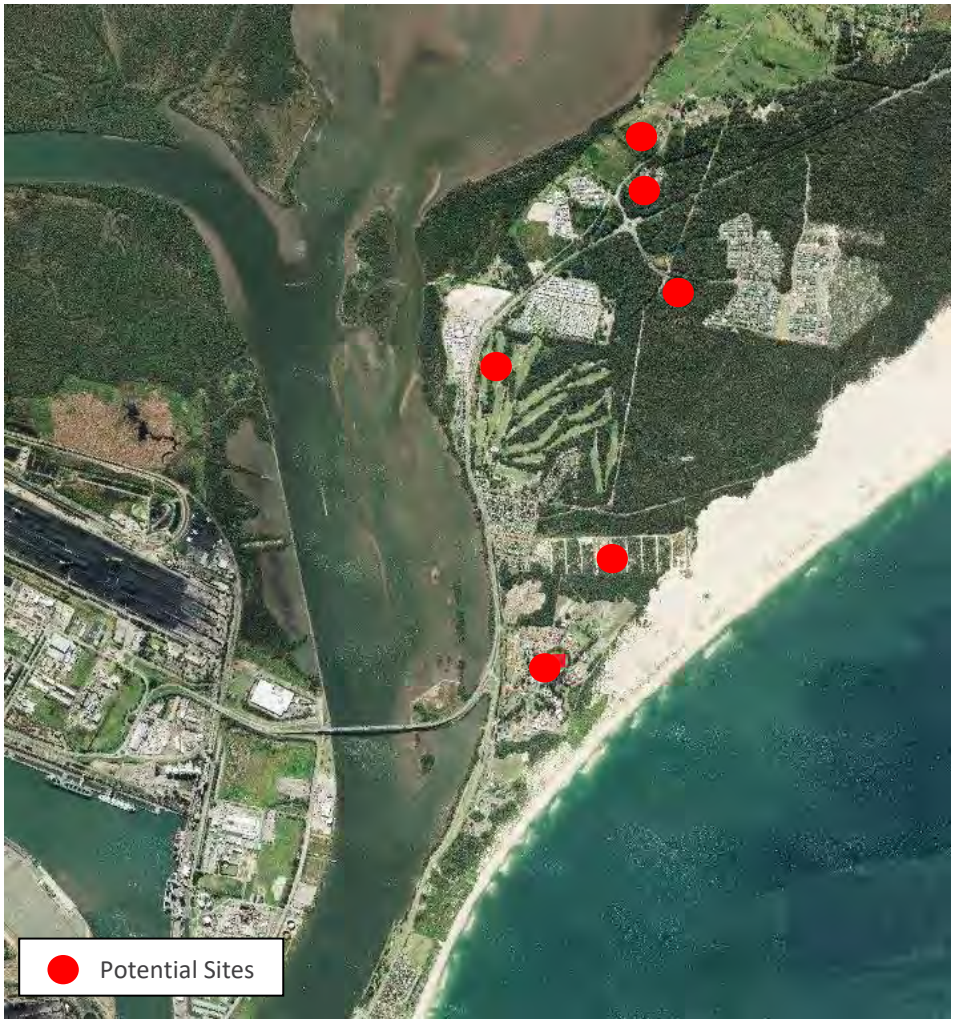
This Chapter provides a preliminary assessment of the suitability of potential sites to accommodate a new retail development within the Study Area.

5.1 Potential Sites

Based on discussions with Council six sites were identified for investigation as potential sites for a new retail centre (as shown in the below figure), including:

- 42 Fullerton Cove Road, Fullerton Cove;
- 69 Fullerton Cove Road, Fullerton Cove;
- 2 Seaside Boulevard, Fern Bay;
- Former Rifle Range, Popplewell Road, Fern Bay;
- Newcastle Golf Club, Vardon Road, Fern Bay; and
- Stockton Residential Centre, Oval Drive Stockton.

Figure 3: 42 Fullerton Cove Road, Fullerton Cove



Source: Six Maps

This next section considers the suitability of these sites for a new retail centre in more detail. More specifically, each of the identified sites is assessed against a set of criteria and assigned a score ranging from 1 being very poor to 5 being very strong (as shown in table below).

Table 9: Scoring Weights

Description	Score
Very Poor	1
Poor	2
Neutral	3
Strong	4
Very Strong	5

Source: HillPDA

The criteria the sites have been assessed against relating to economic considerations, include:

- **Development Area:** An adequate provision of developable land is required to accommodate the centre. The centre could be provided over multiple levels with basement car parking to reduce the centre's building footprint however this will increase costs and may have implications on the feasibility of the development. On that basis a centre 5,000sqm-6,000sqm provided over one level with at grade parking to reduce costs) would require approximately 2Ha of developable land.
- **Location:** A supermarket based centre is largely a local population serving centre, meeting the day to day shopping needs of local residents. Thus the location of a centre, in terms of its convenience for the vast majority of residents of which it serves is key to the success of a retail facility and meeting the local communities need.
- **Exposure:** The success of a retail centre is largely influenced by its visibility and ability to attract business from passing traffic. Thus retail greatly benefits from being located on a high profile location (i.e. a main arterial road or precinct with strong pedestrian traffic).
- **Accessibility:** With people becoming increasing 'time poor' convenience and accessibility increases the attractiveness and visitation of a centre.
- **Walkable Catchment:** There has been a government led movement towards creating walkable communities as this brings significant economic and social benefits (reduced vehicle emissions, reduced petrol costs, improved traffic safety, health benefits etc). Walkable communities are also increasingly becoming more accepted by the community. This coupled with changing shopping behaviours (i.e. increase of top up shopping) has resulted in an increase of people travelling to retail facilities by foot. A retail centre with a substantial walkable catchment would be favourable outcome for the community.

In addition to the above criteria we have also considered a series of environmental factors such as whether the land is bushfire or flood prone as development of retail centre on such land possesses potential risks to the community. Whether development on the site will endanger any ecological communities is also considered.

5.2 42 Fullerton Cove Road, Fullerton Cove

Figure 4: 42 Fullerton Cove Road, Fullerton Cove



Source: Planning Proposal 42 Fullerton Cove Rd, Fullerton Cove, Monteath & Powys, 2017

Table 10: 42 Fullerton Cove Road, Fullerton Cove Site Assessment

Criteria	Commentary	Score
Developable Area	2Ha of land is available for development. This can accommodate a centre of 5,000sqm on a single level with at grade car parking.	5
Location	A retail centre on this site is more conveniently located for residents and tourists of Fern Bay rather than Stockton which is located some 7km from the site. This may result in continued expenditure leakage to centres closer to work particularly for Stockton residents.	3
Exposure	The retail development should receive adequate building exposure to Fullerton Cove Road traffic. With suitably located directional signage from Nelson Bay Road the site is likely to benefit from passing trade from motorists along Nelson Bay Road.	4
Accessibility	Access to the site will be provided via a constructed road (Fullerton Cove Road) which connects to Nelson Bay Road. Nelson Bay Road is a major arterial road, thus providing excellent local and regional accessibility into the site, particularly in the adjacent residential, tourist and seniors developments of Fern Bay.	5
Walkable Catchment*	The site is generally within walking distance of the Cove Village. This residential estate plans to accommodate 250 dwellings upon completion with approximately 80 dwellings built to date. Assuming an occupancy rate of 2 suggest only 500 to 600 residents will be within walking distance of the site. As such the site as a relatively small walking catchment.	2
Bushfire Prone	The site is identified as being bushfire affected. A Bush Fire Management Plan will need to be implemented.	2
Flood Prone	The site is located in a flood prone area however is deemed to not be susceptible to inundation from a flood event. Stormwater infrastructure will need to be built to mitigate risks.	2
Vegetation and Ecology	Implementing the proposed development will require some removal of an area of Swamp Oak Floodplain Forest.	2
Total Score	The site enjoys excellent accessibility and visibility, however there are a number of environmental constraints associated with the site and it is less convenient for Stockton residents.	**25**

*The walkable catchment generally includes the area within 800m of the Site

5.3 69 Fullerton Cove Road, Fullerton Cove

Figure 5: 69 Fullerton Cove Road, Fullerton Cove



Source: Six Maps

Table 11: 69 Fullerton Cove Road, Fullerton Cove Site Assessment

Criteria	Commentary	Score
Developable Area	2Ha of land is available for development. This can accommodate a centre of 5,000sqm on a single level with at grade car parking.	5
Location	The centre is more conveniently located for residents and tourists of Fern Bay rather than Stockton which is located some 7.5km from the site. This may result in continued leakage to centres closer to work particularly for Stockton residents.	3
Exposure	The site is not located on a major arterial road and thus will not benefit from direct building exposure. However the site is located some 500m from the intersection with Nelson Bay Road, with suitably located directional signage, a new centre on this site has the potential to attract some passing trade from Nelson Bay Road.	2
Accessibility	Access to the site will be provided via Fullerton Cove Road which connects to Nelson Bay Road some 500m from the site. Nelson Bay Road is a major arterial road, thus providing reasonably good local and regional accessibility into the site.	3
Walkable Catchment	The Site is generally within walking distance of the northern end of Cove Village. Approximately only 100 and 150 of the existing and future dwellings are estimated to be within walking distance of the site. Thus the site has a confined walking catchment of some 200-300 residents.	2
Bushfire Prone	The site is identified as being bushfire affected. A Bush Fire Management Plan will need to be implemented.	2
Flood Prone	The site is located in a flood prone area. Stormwater infrastructure will need to be built to mitigate risks.	2
Vegetation and Ecology	The site and the area to the north has largely been cleared, with minimal vegetation. The site has not been identified to contain endangered ecological communities.	5
Total Score	The site enjoys good accessibility, however there are a number of environmental constraints associated with the Site and it is less convenient for Stockton residents. Further the site is does not benefit from direct exposure to passing traffic along Nelson Bays Road.	**24**

*The walkable catchment generally includes the area within 800m of the Site

5.4 2 Seaside Boulevard, Fern Bay

Figure 6: 2 Seaside Boulevard, Fern Bay



Source: Planning Proposal 2 Seaside Boulevard, Fern Bay 2017

Table 12: 2 Seaside Boulevard, Fern Bay Site Assessment

	Commentary	Score
Developable Area	9,740sqm of appropriately zoned land is available. A centre of 5,000sqm with at-grade parking would typically require 1.5Ha, thus the size of the lot may restrict the scale and design of the centre.	2
Location	The centre is more conveniently located for residents of Seaside Fern Bay estate with Stockton residents located over 6km from the centre. Again this may result in continued leakage to centres closer to work particularly for Stockton residents affecting the viability of the centre.	2
Exposure	The site does not have exposure to a major arterial road with limited opportunities to attract passing trade. The site also has no exposure to inward traffic due to existing vegetated lane separation.	1
Accessibility	The site does not have direct access to a major road with the area accessed via a single entry/exit via Seaside Boulevard, with restricted right turn access into the site.	1
Walkable Catchment	The Site is generally within walking distance of the west end of Fern Bay Seaside Village. Approximately some 300 to 400 of the existing and future dwellings are estimated to be within walking distance of the site. Thus the site has a relatively small walking catchment of some 600-800 residents.	2
Bushfire Prone	The site is identified as being bushfire affected. A Bush Fire Management Assessment has been undertaken previously allowing urban development.	3
Flood Prone	Flood studies have been undertaken with the Project Approval. Stormwater infrastructure will need to be built to mitigate risks.	3
Vegetation and Ecology	The site is heavily vegetated. As the site is already zoned B1 previous assessments have considered the impacts and how to address the vegetation and ecology of the site as such the impact on existing conservation or habitat area has been approved.	3
Total Score	Reduced accessibility and visibility may impact the viability of a retail centre on this Site. The Site is also affected by various environmental constraints making this an unattractive site for a retail facility.	**17**

*The walkable catchment generally includes the area within 800m of the Site

5.5 Former Rifle Range, Popplewell Road, Fern Bay

Figure 7: 42 Former Rifle Range, Popplewell Road, Fern Bay



Source: Planning Proposal Former Rifle Range, Popplewell Rd, Fern Bay, Architectus Group, 2017

Table 13: Former Rifle Range, Popplewell Rd, Fern Bay Site Assessment

	Commentary	Score
Developable Area	19Ha of land is available and can certainly accommodate a centre of 5,000sqm on a single level with at grade car parking.	5
Location	The centre is centrally located to both Fern Bay and Stockton residents and tourist.	5
Exposure	The site does not have exposure to a major arterial road with limited opportunities to attract passing trade.	1
Accessibility	The site does not have direct access to a major road. Significant upgrades to the road network will be required to improve access into the site.	1
Walkable Catchment	The site is generally within walking distance of the west end of Fern Bay Seaside Village. Approximately some 300 to 400 of the existing and future dwellings are estimated to be within walking distance of the Site. Thus the Site has a relatively small walking catchment of some 600-800 residents.	2
Bushfire Prone	Parts of the site are identified as being bushfire affected. A Bush Fire Management Plan will need to be implemented.	2
Flood Prone	The site is not identified as flood prone land under the Port Stephens LEP 2013.	5
Vegetation and Ecology	The site has minimal vegetation and has not been identified to contain endangered ecological communities.	5
Total Score	Accessibility and lack of exposure to passing motorist may affect the performance of a retail centre on this site and makes this a less desirable for such uses. Heritage items will need to be investigated further.	**26**

*The walkable catchment generally includes the area within 800m of the Site. This estimate includes the 200 dwelling planned on site as provided in the masterplan as sourced from Planning Proposal Former Rifle Range, Popplewell Rd, Fern Bay, Architectus Group, 2017

5.6 Newcastle Golf Club, Vardon Road, Fern Bay

Figure 8: Newcastle Golf Club



Source: Newcastle Golf Course Masterplan, E/E Architects 2017

Table 14: 2 Newcastle Golf Club Site Assessment

	Commentary	Score
Developable Area	8.6Ha of land is available and can accommodate a centre of 5,000sqm on a single level with at grade car parking.	5
Location	The site is more conveniently located for residents and tourists of Fern Bay rather than Stockton - located 5km to the south. This may result in continued leakage to centres closer to work particularly for Stockton residents.	2
Exposure	As per the masterplan lodged with Council, the retail development will be provided on the northern end of site fronting Nelson bay Road. Thus the centre is within a high profile location with excellent exposure to Nelson Bay Road Traffic. This site is likely to benefit from passing trade from motorist.	5
Accessibility	As per masterplan the retail development will have direct access to Nelson Bay Road (subject to RMS approval), providing excellent regional and local accessibility. Right turns may be problematic.	4
Walkable Catchment	The site is generally within walking distance of various residential estates including Palm Lake Resort Fern Bay and Bayway Village estates. There is currently some 1,300 residents living within walking distance of the Site. A further 150 dwellings or 300 to 400 people are forecasted within this area. Thus 1,600 to 1,700 residents are estimated to be within walking distance of the site which is considered reasonable. A greater walking catchment has the potential to reduce the amount of trips to the centre via car and in turn reduce CO2 emissions and reduce cost of living.	4
Bushfire Prone	The site is identified as being bushfire prone. A Bush Fire Management Plan will need to be implemented.	2
Flood Prone	The vast majority of the site is flood prone. Stormwater infrastructure will need to be built to mitigate risks.	2
Vegetation and Ecology	The site has minimal vegetation. The vast majority of the site has not been identified to contain endangered ecological communities.	5
Total Score	The site has excellent accessibility and exposure to passing motorist along Nelson Bay Road. However the site is several kilometres to the north of the main route to and from Newcastle for Stockton residents. It is also affected by environmental constraints including flooding and bushfire risk.	**29**

5.7 Stockton Residential Centre, Oval Dr Stockton

Figure 9: Stockton Residential Centre, Oval Drive Stockton



Source: Six Maps

As identified in the map above an appropriate location for a new retail centre would be near the Nelson Bay Road Fullerton Road intersection/roundabout. The identified site provides the centre with excellent exposure to passing motorists along Nelson Bay Road provides ample land for development. Further the building to the south is currently vacant minimising any disruptions to current operations and opposition from residents currently at the centre. For the purpose of this below assessment we have assumed the new retail centre would locate in the identified site.

Table 15: Stockton Residential Centre, Oval Drive Stockton Site Assessment

Criteria	Commentary	Score
Developable Area	With over 3Ha of land available in the identified site a large scale shopping centre can be easily accommodated.	5
Location	The centre is centrally located to both Fern Bay and Stockton residents, with many residents likely to pass the Site on their way to and from work, making this an extremely convenient location for the vast majority of residents within the locality.	5
Exposure	The identified site benefits from exposure to motorists travelling along Nelson Bay Road/ Fullerton Road.	5
Accessibility	Access to Site is likely to be provided from Fullerton Road and Nelson Bay Road via Fullerton Road. Direct access to Nelson Bay Road would improve accessibility further and potentially attract more passing trade from motorists.	4
Walkable Catchment	There are currently some 200 residents living within walking distance of the Site. We would anticipate that residential uses will also be incorporated as part of the redevelopment of the Site. Assuming 25 dwelling per hectare and 40 hectares of developable land there is potential for some 1,000 dwellings to be provided at the existing Stockton Residential Centre site. Thus a substantial 2,500 to 3,000 residents are estimated to be within walking distance of the site. If medium to high density development were also to be included as part of the masterplan there is potential for the site to serve an even greater walking population.	5
Bushfire Prone	The vast majority of developable area on the site is not prone to bushfires.	5
Flood Prone	The site is not identified as flood prone land under the Newcastle LEP 2012.	5
Vegetation and Ecology	The site has minimal vegetation. The site has not been identified to contain endangered ecological communities.	5
Total Score	The central and relatively high profile location with minimal environmental constraints makes this suitable site for a retail centre. Redevelopment will need to work with the heritage items / further investigation required.	**39**

5.8 Summary of Findings

Based on the above assessment, the existing Stockton Residential Centre is the preferred location for a new local retail centre. Given the significant competitive advantages the site offers over the other potential sites. Further investigation of the site and master planning is recommended, with the retail centre to form part of one of the initial stages. The retail centre will increase the desirability and liveability of the locality and help to service residents within the wider Study Area which are currently under provided for. The development can be staged to minimise any conflict with surrounding uses.

In the event, development is prohibited on the Stockton Residential Centre site we recommend that retail centre is provided on one of the alternate sites since residents of the Study Area are currently under-serviced (as established in the demand analysis) with the strong population growth anticipated in the area likely to exacerbate this further. The Newcastle Golf Club site, would be next most preferred location for a retail development given the site's accessibility and exposure to passing motorists along Nelson Bay Road. The site also has the largest walking catchment (after Stockton Residential Centre) which meets many of the objectives of state and local government policies.

5.9 Planning Considerations for Stockton Residential Centre

As established in the preceding chapter a centre of up to 5,000sqm could be supported on the Stockton Residential Centre site based on market demand and future population growth. A centre of this scale would require some 2-3ha of developable land if designed with ground level car parking.

A new retail centre on the Stockton Residential Centre site will also require the site to be rezoned from SP2 Infrastructure to an appropriate zone which accommodates a village centre.

Whilst a B2 Local Centre would accommodate a village centre, a more appropriate zone may be B4 to allow shop top housing.

The Newcastle Local Planning Strategy provides suitable development controls to help reinforce the retail hierarchy. It is recommended that the development controls for a Local Centre (minor) are adopted for the new retail centre on the Stockton Residential Centre site, described as follows:

- Floorspace ratios: low to moderate (1.5:1); and
- Heights of building: low to moderate (11m).

In addition to the above, to improve the viability of the centre and capitalise on the vast land available on the Stockton Residential Centre site, it would be beneficial to rezone the remaining parcels of land to allow for medium density residential pending on market demand for this type of residential housing stock. The retail centre should not be considered in isolation and a masterplan should be developed for the Stockton Residential Centre site to reflect the different land uses which can be supported on the site factoring in any constraints of the land and market appraisal.

In this respect it is more appropriate to develop a masterplan based on place making, new urbanism principles, etc and use this to form the planning controls rather than visa versa.

IMPACT ANALYSIS

6.0 IMPACT ANALYSIS

This section assesses the impacts of a new retail centre at the Stockton Residential Centre site on existing retail network.

6.1 Estimated Turnover of Proposal

For the purpose of the impact assessment we have assumed that the new retail centre will have 5,000sqm of occupied retail space trading at close to industry benchmark levels by 2026. We have assessed the impacts under the low population growth and medium population growth scenarios only. It's not necessary to measure the impact under the high growth scenario as growth in wider area results in a positive shift in trading levels over time in all centres even under the low growth scenario (shown in the tables below).

For the purpose of the assessment we have assumed the following retail mix:

- 65% allocated towards food, groceries and take-away liquor
- 15% to restaurants and fast foods
- 20% to other.

Based on assumed target turnover rates, HillPDA has estimated that retailers in the new centre would achieve retail sales of around $43m in 2026 ($8,500/sqm).

6.2 Redirection of Turnover from Existing Centres

In order to quantify the redirection of trade from competing centres HillPDA prepared a bespoke gravity impact model. For the purpose of the assessment it has been assumed that the first year of trading will be in 2026.

The gravity model was designed on the premise that the level of redirected expenditure from a competing centre is directly proportional to the turnover of that centre and indirectly proportional to the distance from new centre. The results are presented in the following table.

Table 16: Impact on Surrounding Centres Low Growth Scenario ($m)

1	2	3	4	5	6	7	8	9	10
Retail Centre	Travel Time from Subject Site (min)	Approx. Retail Floor Space	Turnover in 2017	Turnover in 2026 without Proposal	Turnover in 2026 with Proposal	Immediate Shift in Turnover	% Shift in Turnover in 2026	Shift in turnover from 2017 to 2026	% Shift in turnover from 2017 to 2026
Charlestown Square	33.0	76,700	545.2	617.9	614.1	-3.8	-0.6%	68.9	12.6%
Kotara Westfield	29.0	65,050	504.2	597.3	593.3	-4.0	-0.7%	89.1	17.7%
Stockland Jesmond	22.0	20,150	154.9	183.5	181.8	-1.7	-0.9%	26.9	17.3%
Salamander S.C.	37.0	23,100	217.7	262.5	260.7	-1.8	-0.7%	42.9	19.7%
Inner City Newcastle	22.0	50,000	340.4	403.2	397.0	-6.2	-1.5%	56.6	16.6%
Raymond Terrace	25.0	23,800	166.5	200.7	198.6	-2.2	-1.1%	32.1	19.3%
Medowie	20.0	10,000	88.7	106.9	104.0	-2.9	-2.7%	15.3	17.3%
Warabrook	14.0	5,000	45.1	53.4	51.4	-2.0	-3.8%	6.3	14.0%
Mayfield	15.0	15,000	124.4	147.4	141.6	-5.8	-3.9%	17.2	13.8%
Waratah	20.0	12,000	84.0	99.5	98.0	-1.5	-1.5%	14.0	16.7%
Stockton	6.0	4,500	26.0	31.3	27.1	-4.3	-13.6%	1.1	4.2%
Other Localities						-6.4			
TOTAL		**305,300**	**2307.1**	**2703.6**	**2710.0**	**0.0**	**0.2%**	**403.0**	**17.5%**

Source: Column 1: The main competing retail centres in the main trade area or just beyond.
Column 2: Shortest Distance from Stockland Centre (minutes both directions)
Column 3: Various sources including Shopping Centre News (SCN), PCA Shopping Centres Directory and HillPDA surveys
Column 4: Estimated turnover ($) in 2016. Various sources including SCN, PCA and HillPDA estimate
Column 5: HillPDA estimate having allowed for population growth
Column 6: Turnover in 2026 after new centre is trading
Column 7: The difference between Column 6 and 5
Column 8: Calculated as Column 7 divided by Column 5
Column 9: Calculated as Column 6 minus Column 4
Column 10: Calculated as Column 9 divided by column 4 (allows for growth over time)

Table 17: Impact on Surrounding Centres Medium Growth Scenario ($m)

1	2	3	4	5	6	7	8	9	10
Retail Centre	Travel Time from Subject Site (min)	Approx. Retail Floor Space	Turnover in 2017	Turnover in 2026 without Proposal	Turnover in 2026 with Proposal	Immediate Shift in Turnover	% Shift in Turnover in 2026	Shift in turnover from 2017 to 2026	% Shift in turnover from 2017 to 2026
Charlestown Square	33.0	76,700	545.2	617.9	615.7	-2.2	-0.4%	70.5	12.9%
Kotara Westfield	29.0	65,050	504.2	597.3	594.9	-2.3	-0.4%	90.7	18.0%
Stockland Jesmond	22.0	20,150	154.9	183.5	182.2	-1.3	-0.7%	27.3	17.6%
Salamander S.C.	37.0	23,100	217.7	291.6	290.1	-1.5	-0.5%	72.4	33.3%
Inner City Newcastle	22.0	50,000	340.4	403.2	396.0	-7.2	-1.8%	55.6	16.3%
Raymond Terrace	25.0	23,800	166.5	223.0	220.2	-2.8	-1.2%	53.7	32.3%
Medowie	20.0	10,000	88.7	118.8	115.1	-3.8	-3.2%	26.4	29.7%
Warabrook	14.0	5,000	45.1	53.4	51.9	-1.4	-2.7%	6.9	15.3%
Mayfield	15.0	15,000	124.4	147.4	140.7	-6.6	-4.5%	16.3	13.1%
Waratah	20.0	12,000	84.0	99.5	98.0	-1.5	-1.5%	14.0	16.6%
Stockton	6.0	4,500	26.0	34.8	29.3	-5.5	-15.7%	3.3	12.8%
Other Localities						-6.4			
TOTAL		**305,300**	**2307.1**	**2770.3**	**2776.7**	**0.0**	**0.2%**	**469.7**	**20.4%**

Source: Column 1: The main competing retail centres in the main trade area or just beyond.
Column 2: Shortest Distance from SOP (Central) by road
Column 3: Various sources including Shopping Centre News (SCN), PCA Shopping Centres Directory and HillPDA surveys
Column 4: Estimated turnover ($) in 2016. Various sources including SCN, PCA and HillPDA estimate
Column 5: HillPDA estimate having allowed for population growth
Column 6: Turnover following expansion of retail space in SOP. HillPDA estimate using gravity theorem
Column 7: The difference between Column 6 and 5
Column 8: Calculated as Column 7 divided by Column 5
Column 9: Calculated as Column 6 minus Column 4
Column 10: Calculated as Column 9 divided by column 4 (allows for growth over time)

The above tables show that in absolute dollar terms the largest impacts will be on Newcastle CBD and Mayfield (between $6m and $7m loss in turnover for each centre). However in percentage terms it represents less than 2% of Newcastle's trade and less than 5% of Mayfield's trade.

There are no universal measures of significance of economic impact. There are references in various consultancy reports and statements in the Land and Environment Court which suggest that a loss of trade below 5% is considered insignificant, 5% to 10% is low to moderate, 10% to 15% is moderate to high and above 15% is a strong or significant impact.

On this basis the only centre likely to experience a moderately strong or significant impact is Stockton with around 14% to 15% loss in trade. All other centres will experience impacts that are considered insignificant to low, that is less than 5%.

Furthermore, these are immediate impacts in 2026. Over time these impacts will lessen as a result of population and expenditure growth in the locality. As shown in the final column in the above table all of the centres are expected to enjoy some growth over this period. This would suggest the Study Area could support a new centre of some 5,000sqm with minimal impact on the surrounding retail network. As discussed above, the high population growth scenario would result in even lower impacts on the surrounding retail network.

There is a risk that IGA at Stockton Town Centre would close if its trading levels were to fall to unsustainable levels. If this were to happen it would have stronger impacts that suggested in the above table. The IGA is the anchor tenant and the other specialities are likely to experience a stronger impact due to the nexus relationship they have with the anchor tenant. This is a near worst case scenario which is possible but it's very difficult to put a probability on the event occurring. In Section 6.4 below we include a number of recommendations to mitigate these risks.

A new retail centre will meet the needs of the local (and future) residents in the area which are currently underserviced and having to travel outside of Stockton and Fern Bay for higher order retail services. Furthermore, an improved range of shops and services on the Stockton Residential Centre site should help to reduce the number of journeys made by local residents to surrounding centres. This supports a reduction in vehicle emissions and improves transport safety. Fewer and/or shorter journeys via cars also contributes to reducing the cost of living (through reduced petrol and car maintenance costs), allowing people's disposable income to be directed other goods and services.

Other benefits that may result from a new centre include:

- Where a significant property investment decision has been made it is generally viewed as a strong positive commitment for the local area. Such an investment can in turn stimulate and attract further investment to the immediate area;
- Creation of new jobs and employment opportunities; and
- Greater competition between retailers to drive lower grocery prices for consumers currently estimated to be paying more than 18%-28% more for basic food items than other industrialised nations.

6.3 Planning Context Considerations

The following analyses the proposed development in term of its economic impact upon surrounding centres, its locational attributes and whether a new centre on the Stockton Residential Centre site would 'make good' for any in the locality.

6.3.1 What are the relevant Matters for Consideration in terms of Economic Impacts?

The Land and Environment Court (LEC) judgements have provided guidance on relevant matters in relation to economic and social impacts of proposed retail developments upon existing facilities.

The LEC has stated that Councils should not be concerned about competition between individual stores as this is a matter of fair trading. But it should concern itself with impact on established retail centres. The impact on competing stores and businesses is only relevant if it affects the viability of the centre as a whole.

In this case the only centre that is likely to experience a strong impact is Stockton. However this centre currently has a very limited retail offer which is being used by the vast majority of local residents only for "top-up" shopping.

6.3.2 Is the Stockton Residential Centre an Appropriate Location for the Proposal?

Apart from economic impacts, location is a further relevant matter for consideration under Section 79C of the EPA Act. This principle was considered by Justice Cowdroy in Terrace Tower Holdings Pty Ltd v Sutherland Shire Council [2002] NSWLEC 150 where the LEC refused a bulky goods centre partly because its location was inappropriate in relation to public transport services and existing retail facilities notwithstanding that the zoning of the land permitted the proposed use.

Stockton Residential Centre is centrally located at the intersection of Nelson Bay Road and Fullerton Street. It is centrally located on the peninsula but is also at the main entry point when driving from Newcastle across the North Channel Hunter River.

6.3.3 Does the Proposal make good for the loss?

The proposed development would benefit the local community by providing a much stronger retail offer potentially with a full-line supermarket in the trade area providing more choice and price competition for consumers.

If the existing shopping centre in Stockton is trading strongly due to undersupply then it can sustain the impacts, and more price competition should be welcomed. If the centre is trading mundanely (which from observation and the shopper survey results suggests that that is the case) then this is evidence in itself that this centre is failing to meet the needs of the local community. This is why residents are driving to Newcastle, Maitland, Medowie and other centres to undertake the bulk of their FGL shopping.

The proposed development would allow residents the opportunity to acquire a wider range of items closer to home. There are also economic and environmental benefits with travel time and cost savings that would be made by locating a full line supermarket on the subject site.

We therefore conclude that there are economic losses but the benefits of the proposal outweigh those losses.

6.4 Recommendations for Stockton Town Centre

There are a number of initiatives that can be explored to improve the performance of Stockton Town Centre and allow it to coexist with a new and nearby retail centre. These are:

- **Local eat street** to serve the local area and tourists. There is currently an under provision of restaurants and cafes within the Study Area. Thus there is an opportunity for Stockton Town Centre to diversify its retail offer and become renowned for its restaurant and café culture, thereby not competing directly with the new convenience based retail centre through providing a different range of retail. Encouraging and increasing the capacity for outdoor dining would be crucial for this initiative.

- **Tourism** – In addition to leverage from its natural surroundings, events (such as Sunday Markets, Cultural events, Exhibitions) near Stockton Town Centre (open space to south, St Peter's Primary School, Library) can be held to increase visitation and tourism into the centre. This in turn would likely increase retail expenditure captured within the centre.
- **Increase the resident population** surrounding the town centre. Strong population growth would generate more expenditure and would in turn increase the demand and viability of retail services. There may be potential for mixed use given recent housing trends, however the market's preference for medium/high density living within this location couple with the feasibility of such development would need to be tested.

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SYDNEY

Level 3, 234 George Street
Sydney NSW 2000
GPO Box 2748 Sydney NSW 2001
t: +61 2 9252 8777
f: +61 2 9252 6077
e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street
Docklands VIC 3008
t: +61 3 9629 1842
f: +61 3 9629 6315
e: melbourne@hillpda.com

WWW.HILLPDA.COM

The City of Newcastle

PORT STEPHENS COUNCIL

116 Adelaide Street | PO Box 42
Raymond Terrace NSW 2324

PORTSTEPHENS.NSW.GOV.AU

ATTACHMENT 4 – Fern Bay and North Stockton Commercial Lands Addendum

HillPDA CONSULTING

Level 3, 234 George St
Sydney NSW 2000
02 9252 8777
sydney@hillpda.com
hillpda.com

ABN 52 003 963 755

HillPDA CONSULTING

Addendum

16 June 2021

Company: Port Stephens Council
Address: 116 Adelaide Street
Raymond Terrace NSW 2324

Att: Mia Gallaway and
Brett Gardiner

Addendum to the Fern Bay and North Stockton Commercial Lands Study

Background

Port Stephens Council has received a planning proposal to rezone the land at 42 Fullerton Cove to facilitate the development of a centre of 1,500sqm (referred to as the secondary centre hereafter). Given the secondary centre's proximity to the Stockton Residential Centre, which was identified as the preferred location to accommodate a larger new town centre (of 4,000-6,500sqm) in the Fern Bay and North Stockton Commercial Lands Study prepared by HillPDA in 2017 (the 2017 Study), this addendum (the Addendum) has been sought by Council to understand whether there is potential for both centres to co-exist. This addendum, includes an in-depth analysis of an appropriate level of floorspace which can be supported at the secondary centre location that will not undermine the viability of the new town centre (referred to as the primary centre hereafter).

More specifically this Addendum provides:

1. An updated 'Retail Demand Analysis' (Chapter 4.0), taking into consideration the most recently available population forecasts and new development proposals not included in the 2017 Study
2. Recommendations on the viability of the projected retail floor space across two sites (primary and secondary centres) in the study area to cater for demand within the short and long term
3. Recommendations on the maximum allowable retail floor space on the secondary centre, so as not to undermine the viability of a primary centre in the preferred location at Stockton Residential Centre.

To address objective two in the above list, this Addendum has adopted a longer term view and analyses the data over the period of 2019 to 2041 (compared to the 2017 to 2031 period examined in the 2017 Study). It also relates to the study area defined in the 2017 Study (shown in the figure below) which comprises Stockton, Fern Bay and Fullerton Cove.

Figure 1: Study Area



Source: HillPDA

To ensure consistency we have applied the same methodology as the 2017 Study to assess demand for retail floorspace across the study area. On this basis, this Addendum has been structured as follows:

- Trade areas identification: trade areas are defined for the primary and secondary centres, with the respective population projections established for each of the trade areas
- Retail demand assessment: reviews the current and future demand for retail floorspace at each of the two sites, with consideration given to their co-existence as well as the existing retail floorspace provision within the study area (i.e. Stockton Town Centre). Commentary on the amount of supportable retail floorspace at each of the sites is provided.
- Impact analysis: Considers the impact the secondary centre could have on the future primary centre and existing Stockton centre, with commentary on a suitable level of floorspace which can provided at the secondary site to not undermine the viability of a primary centre at the preferred site.

Trade area identification

The following considerations have been made in defining a trade area for the primary and secondary centres:

- Competitive retail centres, particularly their proximity to the centre and respective sizes, retail offer and attraction
- The location and accessibility of the centre, including the available road and public transport network and travel times
- The presence or absence of physical barriers, such as waterways, national parks and freeways.

Based on the above considerations, a *main trade area (MTA) for the primary centre* has been defined which dissevers the study area into two sub-trade precincts as follows (and shown in Figure 2):

- A primary trade area (PTA) – this area predominantly consists of suburbs Stockton and Fern Bay.
- A secondary trade area (STA) – extends north of Lorikeet Cct to encompass the suburb of Fullerton Cove and also includes the Seaside Estate in Fern Bay.

  Note the key change in the trade area composition from the 2017 Study is that study area has been split into two sub-precincts. This is to account for the lower capture rates anticipated in the STA (i.e. due to competition from the secondary centre which is more conveniently located for this population).

Figure 2: Trade Area



Source: Google Maps, HillPDA

Given the smaller scale and nature of secondary centre the main trade area for the smaller secondary centre is confined to the secondary trade area only.

Population forecasts

The forecasted population for the trade areas have been sourced from:

- The Fern Bay and North Stockton Strategy
- Remplan 2018 Demographic and Population Statistics
- ABS Regional Population 2019-2020
- Forecast.ID
- Cordell Connect
- Historical and current aerial photography acquired from Nearmaps.

To project out the future population in the trade areas an average occupancy rate of 2.3 persons per dwelling has been assumed.

Two growth scenarios have been developed as follows (refer to table below):

- Revised low growth: this scenario assumes a more conservative growth rate of 1.6% per annum which is broadly in line with the Remplan (2018) and Forecast.id forecasts. This scenario assumes most of the planning proposals within the locality that have been lodged with Council to date or earmarked for development as per the Fern Bay and North Stockton Strategy[1] will proceed. On this basis the population for the main trade area is projected to increase from 8,600 persons in 2019 to 12,200 by 2041 (3,600 additional residents).
  Revised high growth: This scenario adopts a higher growth rate of 2.2% per annum which is generally in line with the Fern Bay and North Stockton Strategy. This scenario assumes all the proposals within the locality that currently lodged with Council and identified in the Fern Bay and North Stockton Strategy are realised by 2041. The population is projected to increase by 8,600 persons to 13,700 persons by 2041.

Note the secondary trade area which the Fullerton Cove developments and the Seaside Estate is consistent across both scenarios.

Table 1: Main Trade Area Population

Trade Area	2019	2026*	2031*	2036*	2041*
Secondary TA	2,200 [1]	2,900	3,200	3,200	3,200
Balance low growth	6,393	6,700	7,200	8,100	9,000
Balance high growth	6,393	7,100	7,900	9,100	10,500
MTA low growth	8,593[2]	9,600	10,400	11,300	12,200
MTA high growth[2]	8,593[2]	10,000	11,100	12,300	13,700

Source: [1]Historical and current aerial photography acquired from Nearmaps; [2] ABS Regional Population 2019/20; *Port Stephens Retail Strategy, Remplan 2018, Forecast.ID and Cordell Connect

[1] Proposals as sourced from the Fern Bay and North Stockton Strategy and Cordell include: 145 dwellings on the western side of Fullerton Cove Rd, south of Stanley Park; 947 dwellings at Seaside Estate (with some 700 dwellings completed to date); 300 dwellings at 14 Popplewell Rd Fern Bay, 150 dwelling at the existing Newcastle Golf Course site, 300 dwelling at Rifle Range site; 110 dwellings at Fort Wallace, 2% infill dwellings; and 750 dwelling at the Stockton Residential Centre. Of the total ~2100 dwellings proposed this scenario assumes 1,500 dwellings are completed by 2041.

Retail demand analysis primary centre

This section examines the demand for retail floorspace within the study area between 2019 and 2041 and considers the amount of floorspace which can be accommodated at the Residential Stockton Centre. The analysis assumes a secondary centre is operational by 2026 at 42 Fullerton Cove.

The demand for retail floor space within the MTA is subsequently estimated from a combination of population forecasts within the trade area (defined above) and the level of estimated total household retail expenditure expected to be retained within the main trade area.

Household expenditure was sourced from the ABS Retail Trade 2021 and ABS Household Expenditure Survey 2015-16 which provides household expenditure by broad commodity type by household income quintile.

As of 2019 residents within the MTA spent $112.9m on retail expenditure. Of the total retail expenditure approximately in 2019, $38.7m, or about 34%, was spent in supermarkets and grocery stores. Over the period to 2041 total retail expenditure is forecast to increase to $187.7m as a result of population and expenditure growth under the revised low growth scenario, and $210.8m under the revised high growth scenario. Household expenditure data is shown in the table below.

Table 2: MTA household expenditure

Year	2019	2026	2031	2036	2041
Supermarkets and grocery stores	38.7	48.3	56.3	65.6	76.8
Specialised food stores	7.7	9.3	10.6	12.1	13.8
Bulky goods stores	17.9	21.6	24.6	27.9	31.9
Department stores	7.1	8.2	8.9	9.8	10.8
Apparel stores	10.3	12.4	14.1	16.0	18.3
Other non-food stores	14.1	17.0	19.3	22.0	25.1
Restaurants and fast food services	13.2	16.7	19.6	23.1	27.3
Personal services	3.9	4.7	5.4	6.1	7.0
Total	**112.9**	**138.1**	**158.9**	**182.5**	**210.8**

Source: ABS retail trade table 11, HES Survey 2015-16, HillPDA

The above analysis identified the total volume of retail expenditure in the MTA, however not all of this expenditure will be captured by retail facilities within the MTA. Reasons for this include:

- The proximity of competing facilities at Newcastle and Medowie which provides a greater range and quantum of retail floorspace;
- Secondary centre re-directing trade from primary centre and Stockton Town Centre
- Residents leaving the locality to, predominantly, undertake discretionary shopping (in department stores, apparel stores and bulky goods stores elsewhere)
- Working residents spending a portion of annual retail expenditure close to their place of work and
- Expenditure from residents who are on holidays / business trips or are away for other reasons for any extended period. This is counterbalanced to some extent by residents from outside the Study Area visiting the new retail centre as they visit the area.

Capture rates (i.e., the proportion of expenditure captured by the primary retail centre and Stockton Town Centre) have been adopted, considering the above factors and have been assumed to remain consistent across both the revised low and high growth scenario. These market share assumptions from residents within the MTA are outlined in the following table.

Table 3: Primary centre and Stockton town centre capture rates

Retail store type	Primary trade area	Secondary trade area
Supermarkets and grocery stores	85.0%	65.0%
Specialised food stores	85.0%	65.0%
Bulky goods stores	-	-
Department stores	-	-
Apparel stores	5.0%	5.0%
Other non-food stores	35.0%	30.0%
Restaurants and fast food services	60.0%	50.0%
Personal services	65.0%	55.0%
Total	**49.0%**	**38.7%**

Source: HillPDA reseach

However at the same token, a new centre within the MTA is also likely to capture expenditure from passing traffic and residents from motorists travelling to and from outlying areas such as Williamtown Airport, Medowie, Anna Bay and Fisherman's Bay. The centre is also likely to attract trade from visitors. On this basis it is assumed some 15% of expenditure would be generated from beyond the trade area.

Applying the above capture rates, the primary centre and existing Stockton town centre have the potential to capture a total of $70.9m in 2026, increasing to $104.0m in 2041 under the revised low growth scenario, and $117.6m under the revised high growth scenario.

The retail expenditure that is potentially captured by the new retail centre, over the years between 2019 and 2041, is shown in below table.

Table 4: Total potential sales of the primary centre and Stockton town centre

	2019	2026	2031	2036	2041
Revised low growth					
Supermarkets and grocery stores	35.5	42.1	47.8	55.0	62.7
Specialised food stores	7.1	8.1	9.0	10.1	11.3
Bulky goods stores	0.0	0.0	0.0	0.0	0.0
Department stores	0.0	0.0	0.0	0.0	0.0
Apparel stores	0.6	0.7	0.8	0.8	0.9
Other non-food stores	5.5	6.3	7.0	7.8	8.7
Restaurants and fast food services	8.7	10.5	12.0	13.9	16.0
Personal services	2.8	3.2	3.6	4.0	4.5
Total	**60.2**	**70.9**	**80.2**	**91.7**	**104.0**
Revised high growth					
Supermarkets and grocery stores	35.5	44.0	51.3	60.2	70.9
Specialised food stores	7.1	8.5	9.7	11.1	12.7
Bulky goods stores	0.0	0.0	0.0	0.0	0.0
Department stores	0.0	0.0	0.0	0.0	0.0
Apparel stores	0.6	0.7	0.8	0.9	1.0
Other non-food stores	5.5	6.6	7.5	8.5	9.8
Restaurants and fast food services	8.7	10.9	12.9	15.2	18.1
Personal services	2.8	3.4	3.9	4.4	5.0
Total	**60.2**	**74.0**	**86.0**	**100.3**	**117.6**

Source: ABS retail trade table 11, HES Survey 2015-16, HillPDA

In order to determine the demand for retail floorspace within the MTA, target turnover rates ($/sqm of retail floorspace, and otherwise known as Retail Turnover Densities (RTDs) have been applied to potential retail sales within the Study Area. The RTD rates adopted in the table below broadly represent industry averages in non-metropolitan NSW.

Based on this method we estimate that the MTA could support around 6,900sqm of retail floorspace as of 2019, increasing to almost 11,800sqm in 2041 under the revised low growth scenario or 13,400sqm under the revised high growth scenario.

Table 5: MTA Retail demand

Retail store type	RTD	2019	2026	2031	2036	2041
Revised low growth						
Supermarkets and grocery stores	11,000	3,230	3,824	4,348	4,996	5,699
Specialised food stores	10,500	678	775	860	964	1,072
Bulky goods stores	4,000	-	-	-	-	-
Department stores	3,500	-	-	-	-	-
Apparel stores	6,500	91	105	117	130	144
Other non-food stores	6,500	841	966	1,072	1,199	1,331
Restaurants and fast foods	6,000	1,450	1,747	2,007	2,325	2,674
Personal services	5,000	565	648	719	805	894
Total		**6,855**	**8,065**	**9,122**	**10,418**	**11,814**
Revised high growth						
Supermarkets & grocery stores	11,000	3,230	3,996	4,663	5,470	6,446
Specialised food stores	10,500	678	810	922	1,055	1,213
Bulky goods stores	4,000	-	-	-	-	-
Department stores	3,500	-	-	-	-	-
Apparel stores	6,500	91	109	124	141	162
Other non-food stores	6,500	841	,008	1,147	1,309	1,501
Restaurants and fast foods	6,000	1,450	1,824	2,149	2,541	3,018
Personal services	5,000	565	677	770	879	1,008
Total		**6,855**	**8,423**	**9,777**	**11,396**	**13,348**

Source: ABS retail trade table 11, HES Survey 2015-16, HillPDA

There is approximately 4,000sqm currently provided in Stockton Town Centre. This suggests a current undersupply of retail floorspace in the Study Area of almost 2,800sqm. This is expected to increase to 5,100qm by 2031 under revised low growth scenario and 5,800sqm under the revised high growth scenario.

Table 6: Undersupply of retail floorspace in MTA

Undersupply of retail floorspace	2019	2026	2031	2036	2041
Revised low growth scenario	2,855	4,065	5,122	6,418	7,814
Revised high growth scenario	2,855	4,423	5,777	7,396	9,348

Source: HillPDA Research and HillPDA 2017 Study

The revised retail demand analysis which includes the latest population forecasts and accounts for the secondary centre at Fullerton Road, maintains that the Stockton Residential Centre site could accommodate 4,500sqm to 6,000sqm of retail floorspace by 2031 notwithstanding the increased competition from the secondary centre.

Retail demand analysis secondary centre

This next section considers the amount of retail floorspace that can be supported on the secondary centre site between 2019 and 2041, such that it does not compromise the viability the primary centre at the Residential Stockton Centre.

The total retail expenditure for the STA has been previously calculated and is shown in the table below.

Table 7: Secondary trade area household expenditure

Year	2019	2026	2031	2036	2041
Supermarkets and grocery stores	9.9	14.0	16.2	17.0	17.9
Specialised food stores	2.0	2.7	3.1	3.1	3.2
Bulky goods stores	4.6	6.2	7.1	7.2	7.4
Department stores	1.8	2.4	2.6	2.5	2.5
Apparel stores	2.6	3.6	4.1	4.2	4.3
Other non-food stores	3.6	4.9	5.6	5.7	5.8
Restaurants and fast foods	3.4	4.8	5.6	6.0	6.4
Personal services	1.0	1.4	1.5	1.6	1.6
Total	**28.9**	**40.0**	**45.7**	**47.4**	**49.1**

The capture rates for the secondary centre would be substantially lower given the centre's smaller scale and offer (shown in the table below) and are assumed to fall considerably from 2031 as the more attractive primary centre come into operation and matures. Given the secondary centre is better positioned to attract workers traveling to Medowie and Williamtown[2] via Nelson Bay Road it is assumed the centre will attract a higher rate of 25% of trade from beyond.

Table 8: Secondary centre capture rates

Retail store type	2019	From 2031
Supermarkets and grocery stores	35.0%	20.0%
Specialised food stores	35.0%	20.0%
Bulky goods stores	-	-
Department stores	-	-
Apparel stores	-	-
Other non-food stores	25.0%	10.0%
Restaurants and fast food services	25.0%	15.0%
Personal services	25.0%	15.0%
Total	21.3%	12.0%

Applying the above capture rates, the secondary centre has the potential to capture a total of $10.8m in 2026. Assuming a centre of 1,500sqm would suggest that the centre could achieve total retail sales of around $7,200/sqm which is considered healthy for a neighbourhood centre. Sales for secondary centre are projected to fall considerably to around $7.5m 2031, with the opening of the primary centre. This equates to around $5,000/sqm. Although these trading levels are at a sustainable level, there is some risk that the fall in trading levels could be more substantial which may lead to the closure of the secondary centre over time.

[2] With strong employment growth anticipated in Williamtown as a result of the future Aviation Newcastle Airport submission which is proposed to provide 4.400 jobs as well as the Williamtown SAP

The above analysis suggests that the MTA could support both a secondary centre of 1,500sqm over the short term and a primary centre of around 5,000sqm (+/- 1,000sqm) opening longer term (say 2031).

Impact analysis

This next section considers the impacts of secondary centre on the primary centre. For the purpose of the impact assessment we have assumed that the secondary retail centre will have 1,500sqm of occupied retail space trading at close to industry benchmark levels by 2031. The impacts have been assessed under the low population growth. For the purpose of the impact assessment we have assumed that retailers in the secondary centre would achieve retail sales of around $9.0m in 2031 ($6,000/sqm[3]) which is optimistic for the secondary centre but would demonstrate a near worst case scenario for the primary centre.

In order to quantify the redirection of trade from competing centres HillPDA prepared a bespoke gravity impact model. For the purpose of the assessment it has been assumed that the primary centre's first year of trading will be in 2031. The gravity model was designed on the premise that the level of redirected expenditure from a competing centre is directly proportional to the turnover of that centre and indirectly proportional to the distance from new centre. The results are presented in the following table.

Table 9: Impact of secondary centre on surrounding retail network

1	2	3	4	5	6	7	8	9	10
Retail Centre	Travel Time from Subject Site (min)	Approx. Retail Floor Space	Turnover in 2019	Turnover in 2031 without Proposal	Turnover in 2031 with Proposal	Immediate Shift in Turnover	% Shift in Turnover in 2031	Shift in turnover from 2019 to 2031	% Shift in turnover from 2019 to 2031
Inner City Newcastle	18.4	50,000	340.4	426.6	424.6	-2.1	-0.5%	84.2	24.7%
Medowie	16.1	10,000	88.7	131.0	130.6	-0.4	-0.3%	41.9	47.2%
Stockton	8.0	4,500	26.2	33.2	32.1	-1.2	-3.5%	5.9	22.4%
Fern Bay Primary Centre	4.6	5,000	51.8	69.7	64.7	-4.9	-7.1%	12.9	24.9%
Other Localities						-0.5			
TOTAL		**310,300**	**2359.1**	**3015.7**	**3016.2**	**0.0**	**0.0%**	**657.1**	**27.9%**

Columns:

1. Retail Centre Name (includes strip shops)
2. Distance in kilometres from subject site (source: Googlemaps).
3. Various including Shopping Centre News, PCA Shopping Centres Directory, Hill PDA Floorspace Surveys.
4. Various including Shopping Centre News, PCA Shopping Centres Directory, Shopping Centre Annual Reports, Urbis Retail Averages, Other Consultancy Reports and Hill PDA Estimate.
5. Allows for population growth (variable for each centre) and real growth in retail spend per capita of 1.0% per annum in line with the historic trend since 1986 (Hill PDA Calculation from ABS Retail Sales, population estimates and CPI indexes).
6. The turnover of centres following the proposed development. The forecast turnover of the proposed development is redirected from the existing centres based on distance and size.
7. Immediate shift in turnover. This is difference between the development and the do nothing options (i.e. Column 4 minus Column 5).
8. Immediate percentage shift in turnover divided by the turnover in 2031 without the development (ie Column 6 - Column 5)
9. This is the shift in turnover from 2019 to 2031 after the opening of the new development (Column 6 minus Column 4)
10. This is shift in turnover from 2019 to 2031 divided by the base turnover in 2019

[3] We have assumed a higher rate of $6,000/sqm compared to the $5,000 achieved through the capture rates applied in retail demand analysis. The higher rate of $6,000 is in line with industry standards and tests the impact that a stronger performing secondary centre will have on the primary centre of 5,000sqm.

The above tables show that in absolute dollar terms the largest impacts will be on the primary centre (~$4.9m loss in turnover). However in percentage terms it represents only 7% of the primary centre's potential turnover.

There are no universal measures of significance of economic impact. There are references in various consultancy reports and statements in the Land and Environment Court which suggest that a loss of trade below 5% is considered insignificant, 5% to 10% is low to moderate, 10% to 15% is moderate to high and above 15% is a strong or significant impact. On this basis the impact on the primary centre is considered to be low. All other centres will experience impacts that are considered insignificant, that is less than 5%. Furthermore, these are immediate impacts in 2031. Over time these impacts will lessen due to population and expenditure growth in the locality. As shown in the final column in the above table all of the centres are expected to enjoy some growth over this period. The revised high population growth scenario would result in even lower impacts on the surrounding retail network.

The above impact analysis would suggest that the opening of the secondary centre would have minimal impact on the primary centre and surrounding retail network. However, as discussed above there is a risk that the secondary centre's trading levels could fall to unsustainable with the opening of the primary centre which will offer a stronger retail offer. This would be a worst case scenario which is a possible but it's very difficult to put a probability on the event occurring.

In the conclusion, the retail and impact analysis would suggest that the trade area (which coincides with the former study area) could support a neighbourhood centre of 1,500sqm over the short term (with the existing community which are currently underprovided for, benefiting from the increased local retail provision), and a second larger primary centre of 5,000sqm (+/- 1,000sqm) in the longer term as the residential release areas are developed (i.e. from 2031). The co-existence of both the primary and secondary centres is expected to pose minimal risk to the viability of the primary centre. There is some risk to the secondary centre of 1,500sqm not being able to operate at sustainable levels when the larger scale primary centre opens as trade is re-directed to the primary centre. If this scenario were to occur, the centre owner would need to consider options for the future of the centre – reduced size of retail and/or introduce some non-retail businesses or other solutions.

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Level 3, 234 George St
Sydney NSW 2000
02 9252 8777
sydney@hillpda.com
hillpda.com

ABN 52 003 963 755

SYDNEY

Level 3, 234 George Street
Sydney NSW 2000
GPO Box 2748 Sydney NSW 2001
t: +61 2 9252 8777
f: +61 2 9252 6077
e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street
Docklands VIC 3008
t: +61 3 9629 1842
f: +61 3 9629 6315
e: melbourne@hillpda.com

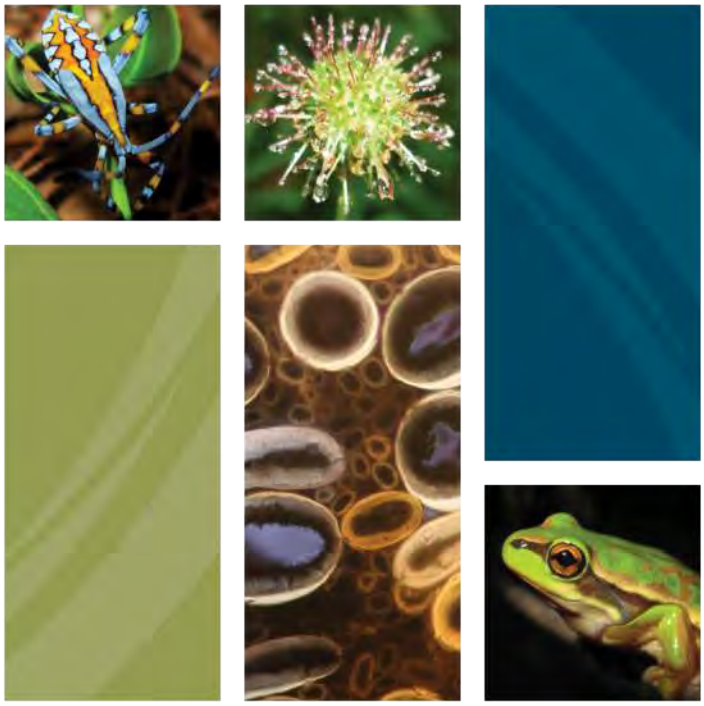
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ATTACHMENT 5 – Biodiversity Development Assessment Report

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Biodiversity Development Assessment Report



Monteath and Powys

Proposed Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318

24 December 2021

Biodiversity Development Assessment Report

Proposed Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318

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Prepared for:

MONTEATH AND POWYS

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Kleinfelder Australia Pty Ltd
Suite 3
240-244 Pacific Highway
Charlestown NSW 2290
Phone: (02) 4949 5200
ABN: 23 146 082 500

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1. INTRODUCTION

1.1 SCOPE

Kleinfelder was engaged by Monteath and Powys to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318 (**Figure 1**). This assessment has been undertaken in accordance with the NSW Biodiversity Assessment Method (BAM) (OEH, 2017) under the *Biodiversity Conservation Act 2016* (BC Act).

The following terms are used throughout this report to describe geographical areas:

- Study Area – Lot 14 DP 258848, 42 Fullerton Cove Road, Fullerton Cove NSW 2318 (**Figure 1**).
- Development Site – areas of the Study Area proposed for development.
- Retained Area – areas within Lot 14 DP 258848 that will be retained during the development phase.
- Locality – land within a 5-kilometre radius of the Study Area (**Figure 2**).

This report identifies flora, fauna and threatened species present, or likely to occur within the Study Area based on species and/or habitats detected during field surveys and threatened flora and fauna records from the locality. An assessment of the likely impacts on identified threatened species, habitat features, wildlife corridors and vegetation communities as a result of the development proposal is also undertaken.

1.2 LOCAL CONTEXT

The Study Area occurs within the Port Stephens Local Government Area (LGA). The Development Site and adjoining land to the north are zoned *RU2: Rural Landscape* while the adjoining land to the south (Fullerton Cove Road and Nelson Bay Road) is zoned *SP2: Infrastructure* under the Port Stephens Local Environmental Plan (2013).

The Study Area is approximately 6.7 ha and consists largely of existing vegetation with cleared areas, existing access tracks and a residential dwelling to the north (**Figure 1**). Access to the

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residential dwelling is at the northern end of the Study Area adjacent to Fullerton Cove Road. The land to the north and west of the Study Area has historically been cleared for residential development while land to the east and south exists as bush land. A 50-metre strip of bush land adjoins the south-eastern border of the Study Area to Nelson Bay Road.

One first order stream occurs approximately 50 metres to the north of the Study Area and drains into Fullerton Cove to the north-west (**Figure 1**).

1.3 PROPOSED DEVELOPMENT

The proposed development aims to re-zone the current *RU2: Rural Landscape* zoning that exists within the Study Area to part *B1: Neighbourhood Centre* (approximately 2.5 ha) and Part *E3: Environmental Management* (approximately 4.3 ha). The proposed rezoning of 2.5 ha to *B1: Neighbourhood Centre* specifically relates to the Development Site.

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DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020
NSW OEH - 2020
Nearmap - 2020

Development Site and Study Area

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

1

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Legend

- Development Site Boundary
- Study Area
- Landscape Assessment - 1500m Buffer

Landscape Assessment

- Native Veg
- Water

Biodiversity Values (V9)

- Coastal Management Act - Wetlands
- Core Habitat within an approved Koala Plan of Management (SEPP 44)
- Ramsar Wetlands
- IBRA Sub-region Boundary (V7)
- Study Area
- Mitchell Landscapes Boundary (V3)
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Arterial Road
- Local Road
- Track

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NSW DFSI - 2020
NSW EOH - 2020
Nearmap - 2020

Site Location

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

2

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1.4 INFORMATION SOURCES

Knowledge from existing literature pertaining to the Study Area and broader locality was used to inform the BDAR. The following information sources were utilised:

- The NSW OEH BioNet Vegetation Classification (https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx).
- The NSW OEH BioNet Atlas of NSW (http://www.bionet.nsw.gov.au/).
- The NSW OEH Threatened Biodiversity Data Collection (part of BioNet).
- Relevant published literature (see **Section 0**).

1.5 LEGISLATIVE CONTEXT

- Commonwealth Legislation:
  - *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  - *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regulations)
- State Legislation:
  - Biodiversity Assessment Method (BAM) (OEH, 2017)
  - *Biodiversity Conservation Act 2016* (NSW) (BC Act)
  - *Biodiversity Conservation Regulation 2017* (NSW) (BC Regulation)
  - *National Parks and Wildlife Act 1974* (NP&W Act)
  - *Environmental Planning and Assessment Act 1979* (EP&A Act)
  - *Biosecurity Act 2015* (NSW)
  - *Water Management Act 2000* (WM Act)
  - *Local Land Services Act 2013* (LLS Act)
  - *Coastal Management Act 2016*
  - *State Environmental Planning Policy - Koala Habitat Protection (2019)*
  - *State Environment Planning Policy (Coastal Management) 2018*
- Environmental Planning Instruments:
  - Port Stephens Development Control Plan 2014 (Port Stephens DCP 2014)
  - Port Stephens Local Environmental Plan 2013 (Port Stephens LEP 2013)
  - Port Stephens Council Comprehensive Koala Plan of Management 2002 (Port Stephens CKPoM)

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1.5.1 Biodiversity Conservation Act 2016 (NSW)

1.5.1.1 Biodiversity Assessment Pathway

As per Part 7.7 of the BC Act, all applications for development consent under Part 4 of the EP&A Act are to be accompanied by a BDAR if the proposed development is likely to significantly affect threatened species. Part 7.2 of the BC Act states that a development is *likely to significantly affect threatened species* if it:

1. Is likely to significantly affect threatened species or ecological communities, or their habitat, according to the test in section 7.3 (5-part test), or
2. Exceeds the Biodiversity Offset Scheme (BOS) thresholds, which includes:
   a) Clearing of native vegetation, or undertaking a prescribed activity, on land mapped on the NSW Biodiversity Vales Map (BV Map), or
   b) Clearing of native vegetation of an area declared by clause 7.2 of the BC Regulation as exceeding the threshold.
3. Is carried out within an area of Outstanding Biodiversity Value

Item (1) – Significant Impact

All threatened species assessed as being affected by the proposal were assessed, as per the 5-part test. No threatened species, ecological communities, or their habitats were assessed as being significantly impacted on due to the proposal (**Section 4.1.3**). Therefore, the proposal was not assessed as being *likely to significantly affect threatened species.*

Item (2) – NPS thresholds

The NSW Biodiversity Values Map was reviewed on 09/07/2020. No areas of mapped biodiversity value occur within the Development Site or within the Study Area. The closest areas of mapped biodiversity occur more than 250 meters to the south and to the west of the Study Area.

Additionally, the follow triggers under the BC Regulation have been assessed in relation to the proposed development:

- *Clearing of Native Vegetation:* the proposal will impact on approximately 2.27 ha of native vegetation.
- Prescribed Impacts:
  - *The impacts of development on the following habitat of threatened species or ecological communities; karst, caves, crevices, cliffs and other geological features of*

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significance; rocks, human made structures, non-native vegetation: none of these features occur within the Study Area.

- *The impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range:* the proposal will not impact on the functionality of movement corridors or habitats that maintain connectivity (**Section 5**).
- *The impacts of development on movement of threatened species that maintains their lifecycle:* the proposal will not cause, or exacerbate, the isolation or fragmentation of habitat (**Section 5**).
- *The impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)*: the proposal has the potential to indirectly impact on hydrological processes given the relationship of the Development Site to forested wetland areas. Additionally, there is high potential for Groundwater Dependant Ecosystems (GDE) to occur within the Study Area. Direct and Indirect impacts are discussed in **Section 5**.
- *The impacts of wind turbine strikes on protected animals:* not applicable to this proposal.
- *The impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community:* It is unlikely that the proposal will significantly increase vehicle movements in the locality (**Section 5**).

In accordance with the BC Regulation, the vegetation clearing threshold for the site (minimum Lot size – 20 ha) is 0.5 ha. As such, the proposed development will exceed the BOS thresholds set out under Section 7.2 of the BC Regulation. Exceedance of this threshold triggers entry into the NSW Biodiversity Offset Scheme (BOS); hence a BDAR is required to support the Development Application (DA).

Item (3) – Area of Outstanding Biodiversity Value

The proposed development does not occur within an Area of Outstanding Biodiversity Value (AOBV).

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1.5.2 Biodiversity Assessment Method

The Project has been assessed in accordance with the BAM (OEH, 2017). The Biodiversity Accredited Assessor System (BAAS). The case number for the Project is 00021991/BAAS18041/20/00021992.

1.5.3 SEPP (Koala Habitat Protection) 2019

The Koala SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

Where a Koala Plan of Management (KPoM) applies to the land, Clause 8 of the Koala SEPP applies to the development. The proposed development must be consistent with the approved KPoM that applies to the land.

The Port Stephens Council has in place an approved Koala Plan of Management (Port Stephens CKPoM (2002) - see **Section 1.5.4**) and therefore, the development must be consistent with the guidelines of that Koala Plan of Management.

1.5.4 Port Stephens Council Comprehensive Koala Plan of Management 2002

The Port Stephens Council Comprehensive Koala Plan of Management (Port Stephens CKPoM) has been prepared in accordance with the SEPP (Koala Habitat Protection) 2019. The principal aim of the Port Stephens CKPoM is identical to that of the SEPP (Koala Habitat Protection) 2019: *"…to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline."*

The Port Stephens CKPoM supersedes the requirements of the SEPP (Koala Habitat Protection) 2019 on the land to which the Port Stephens CKPoM applies (Port Stephens LGA). See **Section 6.3** for discussion of impacts to Koala habitat within the Study Area.

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1.5.5 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act assessment an approval is required for actions that are likely to have a significant impact on matters of national environmental significance. An action includes a project, development, undertaking, activity, or series of activities. When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for the Environment. The Act identifies nine matters of national environmental significance:

1. World Heritage properties.
2. National heritage places.
3. Wetlands of international importance (Ramsar Convention).
4. Listed threatened species and communities.
5. Migratory species listed under international agreements.
6. Great Barrier Reef Marine Park.
7. Commonwealth marine areas.
8. Nuclear actions.
9. Water resources in respect to CSG and large coal mines.

Points 3, 4 and 5 are relevant to the proposed development.

1.5.6 *Biosecurity Act 2015* (NSW)

Under the *Biosecurity Act 2015* (NSW) all plants are regulated with a general biosecurity duty "*to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*" Under the act a biosecurity impact "*is an adverse effect on the economy, environment, or the community that arises, or has the potential to arise, from a biosecurity matter."*

1.5.7 State Environmental Planning Policy (Coastal Management) 2018

The *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP), aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*, including the management objectives for each coastal management area, by:

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a) managing development in the coastal zone and protecting the environmental assets of the coast;
b) establishing a framework for land use planning to guide decision-making in the coastal zone; and
c) mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the *Coastal Management Act 2016*.

The Study Area is within the *Coastal Environment Area* and *Land Application Map* as mapped under the Coastal Management SEPP. The guidelines for development on land within these areas as stated in the Coastal Management SEPP are outlined below:

> ***13 Development on land within the coastal environment area***
>
> *(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—*
>
> > *(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*
> >
> > *(b) coastal environmental values and natural coastal processes,*
> >
> > *(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*
> >
> > *(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*
> >
> > *(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*
> >
> > *(f) Aboriginal cultural heritage, practices and places,*
> >
> > *(g) the use of the surf zone.*
>
> *(2) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—*
>
> > *(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or*
> >
> > *(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or*

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(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

The above guidelines have been considered in the preparation of this BDAR, as reflected in the assessment of impacts on the ecological environment, and impact avoidance and mitigation measures outlined throughout this report.

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2. LANDSCAPE CONTEXT

2.1 LANDSCAPE FEATURES

The landscape features and site context detailed in Section 4 of the BAM (OEH, 2017) are described in **Table 1**. These landscape features are also shown on **Figure 2**.

Table 1: Landscape features of the Development Site.

Landscape Features	Development Site
Interim Biogeographic Regionalisation for Australia (**IBRA**) bioregion	**North Coast.** The Study Area occurs within the North Coast IBRA Region.
IBRA subregion	**Karuah - Manning.** The Study Area occurs within the Karuah - Manning IBRA sub-region.
LGA	The Study Area occurs within the **Port Stephens LGA**
Mitchell Landscapes	**Sydney – Newcastle Barriers and Beaches** This landscape is described as: Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. Distinct changes in vegetative structure is typical of this landscape when transitioning from coastal beach areas to inland dunes, which often support complex forests containing Blackbutt (*Eucalyptus pilularis*) and Red Bloodwood (*Corymbia maculata*).
Rivers, streams and estuaries	No streams, rivers or estuaries exist within the Development Site or within the Study Area. A first order stream exists to the north of the Study Area. This stream drains directly to Fullerton Cove (**Figure 1**) which is approximately 400 metres to the north-west of the proposed development. Fullerton Cove occurs as a tidal estuary and exists as part of the Hunter River system.
Wetlands	A small portion of Study Area, south-west of the Development Site, contains areas of ephemeral forested wetland supporting a *Casuarina glauca* (Swamp Oak) community and a more permanent wetland community dominated by *Typha orientalis* (Broad-leaved Cumbungi). Areas dominated by *T. orientalis* lack open water due to the density of vegetation. These communities are discussed further in **Section 3.2.1**. No parts of the Study Area exist within areas mapped as coastal wetlands or mapped in proximity to coastal wetlands according to the SEPP Coastal Management (2018). Majority of the Study Area, including the Development Site, are mapped under the Coastal Use Area Map according to the SEPP Coastal Management Act (2018).
Connectivity of different areas of habitat	Historically, areas of Fullerton Cove extending north-east to Williamtown have been cleared of vegetation and now contain pastureland. Most of the land to the south-east and east of Fullerton Cove, which extends to Stockton sand dunes, remain heavily vegetated. The Development Site occurs on the boundary of these areas. The Study Area is connected to larger portions of vegetation to the east and south-east, while It borders Fullerton Cove Road and cleared land to the north-west (**Figure 1**).

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Landscape Features	Development Site
Areas of geological significance and soil hazard features	The Study Area is not located with an area identified as having any particular geological significance. The Development Site contains land classified as Class 2 and Class 4 Acid Sulphate Soils as per the Acid Sulphate Soils Map under the Port Stephens Local Environmental Plan (2013).
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value mapped within the Development Site or Study Area.

2.2 SITE CONTEXT

Details of the landscape assessment for the Development Site, according to the BAM (OEH, 2017) using the site-based assessment methodology and determined by remote sensing and GIS, are provided below.

2.2.1 Native Vegetation Cover

Native vegetation cover was assessed as per Section 4.3.2 of the BAM (OEH, 2017). Whereby, the native vegetation cover is assessed on the Development Site and within a 1,500 m buffer area surrounding the outside edge of the boundary of the Development Site. This 1,500 m site buffer has an area of 812 ha which has a native vegetation cover 330 ha or 41% which classes the vegetation cover within >30 – 70%. Within the 1,500 buffer, most of the native vegetation occurs to the east, south and west of the Study Area. Large areas of cleared land occur to the north.

2.3 GEOLOGY AND SOILS

The geology of the Study Area pertains to the Sydney – Newcastle Barriers and Beaches landscape as described by Mitchell (2002). This consists of Beaches and inland dunes made up of quartz sand deposits derived from the Quaternary Period.

One Soil Landscape, known as the Lower Pindimar, mapped by the NSW Soil and Landscape Information System (DPIE, 2020a) occurs within the Study Area. The soils within this landscape that are characteristic of those within the Study Area occur on the poorly drained flats. These consist of a brownish – black loamy sand topsoil overlying poorly drained Siliceous sands. The Lower Pindimar Soil Landscape is often associated with Acid Sulphate Soils at

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depth, seasonal waterlogging, localised permanent waterlogging, high water-tables and non-cohesive soils. Low-lying areas are prone to localised minor flooding.

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3. NATIVE VEGETATION

3.1 METHODOLOGY

Native vegetation across the Study Area was assessed in accordance with Section 5 of the BAM (OEH, 2017).

3.1.1 Vegetation Surveys

Vegetation Mapping and Surveys

Vegetation plots in accordance with the BAM were conducted across the Study Area over one field day (12/08/2020). Previous vegetation mapping conducted by Ecobiological (2011) was confirmed through mapping of the ecotonal boundaries using a combination of rapid data points (RDPs), vegetation boundary polygons, aerial photo interpretation and GIS mapping. The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries.

Linework and Attribution

RDPs and plots were classified and tagged with a Plant Community Type (PCT) by field surveyors. Polygons produced from the API work adopted the PCT of the sample point that they intersected.

Vegetation Zones

Five vegetation zones were identified and delineated within the Development Site in accordance with Section 5.3 of the BAM (OEH, 2017). A vegetation zone is defined in the BAM (OEH, 2017) as a relatively homogenous area that is the same vegetation type and broad condition.

Plant Community Type Determination

Vegetation communities identified within the Study Area was assigned to the closest equivalent Plant Community Type (PCT) from those listed in the BioNet Vegetation Classification database. The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot / transect data collected from the site. In addition to floristic and structural similarity, the landscape position,

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soil type and other diagnostic features of the vegetation communities on the sites were also compared to the descriptions in the database in order to determine the most suitable PCT. Threatened ecological communities (TECs) as defined under the BC Act and EPBC Act were also identified if present.

Assessing Vegetation Integrity (Site Condition)

Following stratification of the Study Area into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in **Table 2** in accordance with Section 5.3 of the BAM (OEH, 2017). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.

Table 2: Composition, Structure and Function components of vegetation integrity

Growth form groups used to assess composition (species richness) and structure (percent foliage cover)	Function attributes
• Tree (TG) • Shrub (SG) • Grass and grass-like (GG) • Forb (FG) • Fern (EG) • Other (OG)	• Number of large trees • Tree regeneration (presence/absence) • Tree stem size class (presence/absence) • Total length of fallen logs • Litter cover • High threat exotic vegetation cover (HTE) • Hollow-bearing trees (HBT)

The number of plots/transects undertaken across the Study Area meets the minimum number of transects required for each vegetation zone area as detailed in Section 5.3.4, Table 4 of the BAM (OEH, 2017). The locations of the plots/transects undertaken on the Development Site are shown on **Figure 3** in the following section.

A survey of trees within the Study Area was undertaken to locate hollow bearing trees, dead standing stags and trees containing nests. The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS device. For trees with hollows the number hollows, type of hollow, height of hollow entrance from the ground and width/length of hollow entrance was recorded. Hollow size was classified as either small (< 5 cm diameter), medium (5 – 20 cm diameter) or large (> 20 cm diameter) based on the size of the hollow entrance.

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Floristic Identification and Nomenclature

Floristic identification and nomenclature is based on classification by Royal Botanic Gardens and Domain Trust, Sydney, published on PlantNET (the NSW Plant Information Network System http://plantnet.rbgsyd.nsw.gov.au).

For use in the BAM Calculator, native species were assigned to growth forms as per their classification in BioNet, and High Threat Weeds were classified as per the list published by The Biodiversity Conservation Division (BCD, formerly known as the Office of Environment and Heritage or OEH).

3.2 ASSESSMENT RESULTS

3.2.1 Vegetation Description and Vegetation Zones

Four (4) PCTs, as defined in the BioNet Vegetation Classification database, were identified within the Development Site.

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast.
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast.
- PCT 1737: Typha rushland.

Vegetation within PCT 1646 has been classified into two vegetation classes: Moderate (Vegetation Zone 1) and – Degraded(Vegetation Zone 2). This forest vegetation belongs to the Dry Sclerophyll Forests (Shrubby sub-formation) and occupies the more elevated and better drained areas of the Development Site.

Vegetation within PCT 1717 is homogenous within the Development Site. This community occurs within a small, low-lying depression amongst the Smooth-bark Apple – Blackbutt (PCT 1646) community. This community is characterised by the dominance of *Melaleuca quinquenervia*. Two condition states for this PCT exist within the study area (Degraded and Good); however, only Degraded vegetation (Vegetation Zone 3) occurs within the Development Site.

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Vegetation within PCT 1728 is homogenous throughout the Development Site and is characterised one vegetation zone (Vegetation Zone 4). This forested wetland community occurs in the lower-lying south-western portion of the site which is subject to periodic inundation.

Vegetation within PCT 1737 is homogenous throughout the Study Area and therefore, only one vegetation zone has been assigned to this PCT (Vegetation Zone 5). This vegetation community belongs to the freshwater wetland formation. Within the Study Area, this PCT intersects parts of the Swamp Oak dominated community of the Study Area.

Details on the vegetation zones (including vegetation condition class and area) defined within the Development Site are outlined in **Table 3**. Descriptions of the vegetation zones are provided in the following sub-sections. **Figure 3** shows the distribution of the PCTs within the Study Area.

Table 3: Plant Community Types and other areas within the Development Site

PCT	Vegetation Formation	Vegetation Class	Development Site (ha)	Outside Development Site (ha)	Total (ha)
PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast. (**Degraded**)	Dry Sclerophyll Forests (Shrubby sub-formation)	Coastal Dune Dry Sclerophyll Forests	1.42	0.20	1.62
PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast. (**Moderate**)	Dry Sclerophyll Forests (Shrubby sub-formation)	Coastal Dune Dry Sclerophyll Forests	0.01	1.07	1.08
PCT 1717 Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast. (**Degraded**)	Forested Wetlands	Coastal Swamp Forests	0.10	0.37	0.47

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PCT	Vegetation Formation	Vegetation Class	Development Site (ha)	Outside Development Site (ha)	Total (ha)
PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (**Moderate**)	Forested Wetlands	Coastal Floodplain Wetlands	0.45	2.30	2.75
PCT 1737: Typha rushland (**Moderate**)	Freshwater Wetlands	Coastal Freshwater Lagoons	0.30	0.15	0.45
Tracks and Infrastructure	N/A	N/A	0.19	0.15	0.34
		Total Areas	**2.47**	**4.24**	**6.71**

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream
- Riparian Buffers
- Contours - 2m intervals

Threatened Ecological Communities

- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

- Plot Transects

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

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PROJECT REFERENCE: 20210926

DATE DRAWN: 2021/12/23 12:44 Version 3

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020
NSW EOH - 2020
Nearmap - 2021

Vegetation Zones, Plant Community Types, Plot Transects and Threatened Ecological Communities

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:
3

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig03_PCT_VegZone_PlotTransects.mxd

3.2.1.1 Vegetation Zone 1



Plate 1: **PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate).**

PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.	
Vegetation Formation & Class	Dry Sclerophyll Forests (Shrubby sub-formation) Coastal Dune Dry Sclerophyll Forests **(Moderate)**
Area within Development Site	0.01 ha.
Survey Effort	**Required:** 1 plot/transects. Total area <2 ha within Study Area.
	Conducted: 1 plot/transects (Q1).
Floristic description	This coastal dune forest community is represented by large eucalypt trees with a shrubby midstorey. The dominant eucalypt species is *Eucalyptus pilularis* (Blackbutt) with *Eucalyptus piperita* (Sydney Peppermint) occurring less frequently. *Banksia serrata* (Old Man Banksia) was also present as an overstorey species. No clear dominance was seen between the midstorey species, and a mixture of species such as *Monotoca elliptica* (Tree Broom-heath), *Pittosporum undulatum* (Sweet Pittosporum) and *Alphitonia excelsa* (Red Ash) were present. The dominant shrub encountered was *Breynia oblongifolia* (Coffee Bush) with less frequent occurrences of moist forest shrub species such as *Homalanthus populifolius* (Bleeding Heart),

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PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.	
	small individuals of *Glochidion ferdinandi* (Cheese Tree) and *Clerodendrum tomentosum* (Hairy Clerodendrum). Heathy species such as *Persoonia levis* (Broad-leaved Geebung) and *Platysace lanceolata* (Shrubby Platysace) were also present within the shrub layer. Native ground cover species included one species of grass, *Imperator cylindrica* (Blady Grass), small shrubs such as *Hibbertia linearis*, forbs such as *Dianella revoluta* (Blue Flax-lily) and the rush, *Lomandra longifolia* (Spiny-headed mat-rush). Native vines and climbers were abundant within this community. The most dominant species being *Cassytha glabella*, with other notable species including *Pandorea pandorana* (Wong Wonga Vine), *Kennedia rubicunda* (Dusky Coral Pea), *Geitonoplesium cymosum* (Scrambling Lily) and *Sarcopetalum harveyanum* (Pearl Vine). Infestations of weeds were present. The most dominant being *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana). A high proportion of the ground cover was comprised of exotic grass species such as *Megathyrsus maximus* (Guinea Grass).
Condition within Development Site	The vegetation zone is degraded by weed encroachment. The most prevalent species being Bitou Bush, Lantana and Guinea Grass. These three species contribute to roughly 80% of the foliage cover of the ground layer, with the remaining exotic species contributing to approximately 1% of the cover. Due to this level of weed encroachment the condition of this vegetation community within the Development Site is moderate.
Justification for PCT selection	This community is commensurate with the PCT 1646 (BioNet Vegetation classification) due to a number of descriptive attributes. The vegetation community within this zone is represented by a tall (20m+) open - closed Eucalypt forest dominated by *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus piperita* (Sydney Peppermint) with an influence of *Banksia serrata* (Old Man Banksia). A shrubby understorey comprised of wet-forest species and heathy species, while the ground cover consisted of scattered herbs, vines and one native grass species *Imperator cylindrica* (Blady Grass). This vegetation community occurs on costal sands derived from the Quaternary period and occurs within the North Coast IBRA region and Karuah-Manning sub-IBRA region. Additionally, diagnostic species as *Banksia serrata* and *Monotoca elliptica* were present within the community. While only a small portion of this community extends into the Development Site, the largest portion occurs within the Study Area, outside of the development zone. These areas contained *Angophora costata* (Smooth-bark Apple) within the canopy layer in conjunction with *Eucalyptus pilularis* (Blackbutt). Topography also changes through this community and higher areas are typically support a drier vegetation community with a more open canopy cover while lower-lying areas, such as the area within the Development Site, have influences of wet-forest species and generally have a higher canopy cover.
Status	**BC Act:** Not listed
	EPBC Act: Not Listed.
PCT % Cleared	45.00% (from BioNet Vegetation Classification database).

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3.2.1.2 Vegetation Zone 2



Plate 2: **PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded).**

PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.	
Vegetation Formation & Class	Dry Sclerophyll Forests (Shrubby sub-formation) Coastal Dune Dry Sclerophyll Forests **(Degraded)**
Area within Development Site	1.42 ha.
Survey Effort	**Required:** 2 plot/transect.
	Conducted: 2 plot/transect (Q4, Q5).
Floristic description	This vegetation class occurs in a heavily modified state and floristics are considerably different to those within the low-moderate vegetation class for this PCT. Typically, the upper stratum which usually contains large eucalypt trees are absent from this zone. Trees which occur in this vegetation zone are scattered and generally consist of exotic species (presumably planted), such as *Pinus elliottii* (Slash Pine). Native midstorey species within this zone included *Monotoca elliptica* (Tree Broom-heath) while the native shrub layer consisted of *Acacia longifolia*. The most dominant native ground cover in this zone was *Cynodon dactylon* (Couch) with a small amount of *Panicum effusum* (Hairy Panic).

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PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.	
	Dense areas of *Pteridium esculentum* (Bracken Fern) occur within this zone (mainly in the less-managed areas which border the Swamp Sclerophyll and Typha rushland areas).
Condition within Development Site	This vegetation zone exists in a highly modified state. The upper stratum is mostly dominated by a mixture of exotic tree species which occur mostly around the existing dwelling. A large portion of the ground cover species are exotic, with species such as *Hydrocotyle bonariensis* and *Eragrostis curvula* dominating. Around the existing dwelling, vegetation is consistently managed and lacks native species. Therefore, the overall condition of this vegetation zone is managed (poor).
Justification for PCT selection	While the vegetation in this zone is highly modified and key diagnostic species are absent, making it difficult to assign a PCT, the topography and soil within the zone align most with that of the PCT 1646. Soil within this zone is sandy and somewhat permeable, remaining relatively dry and lacking the depressions where the soils tend to be saturated and support Swamp Sclerophyll and Typha wetland vegetation. Therefore, this vegetation zone is once likely to have supported the vegetation which occurs within PCT 1646.
Status	**BC Act:** Not listed
	EPBC Act: Not Listed.
PCT % Cleared	45.00% (from BioNet Vegetation Classification database).

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3.2.1.3 Vegetation Zone 3



Plate 3: **PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded).**

PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast.	
Vegetation Formation & Class	Forested Wetlands Coastal Swamp Forests **(Degraded)**
Area within Development Site	0.10 ha.
Survey Effort	**Required:** 1 plot/transect.
	Conducted: 1 plot/transect (Q6).
Floristic description	This vegetation community is dominated by remnant *Melaleuca quinquenervia* (Broad-leaved Paperbark) in the overstorey, which occur as large mature trees. Both *Livistona australis* (Cabbage Palm) and *Glochidion ferdinandi* (Cheese Tree) are present within the midstorey layer. Limited native ground cover exists within this area. *Cynodon dactylon* (Couch) is the dominant native grass species, while forbs such as *Dichondra repens* (Kidney Weed), *Oxalis perennans* and *Hydrocotyle sidthorpioides* were present. A low abundance of the vine *Cayratia clematidea* (Native Grape) and the fern *Telmatoblechnum indicum* (Swamp Water Fern) were also present.

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PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast.	
	A large portion of the ground cover is dominated by exotic species. The most dominant being *Stenotaphrum secundatum* (Buffalo Grass), *Richardia humistrata*, *Paronychia brasiliana* (Brazilian Witlow) and *Hypochaeris radicata* (Catsear).
Condition within Development Site	This vegetation zone exists in a highly modified state and is regularly managed. The ground cover is dominated by exotic grass and herbs. Various exotic ornamental plants also occur throughout this community. The upper stratum is still dominated by remnant *Melaleuca quinquenervia* which is characteristic of this community. Exotic species account for more than 60% of the total cover of this community. Due to the low native species diversity and high exotic species diversity and cover, this community is considered to exist in a degraded state.
Justification for PCT selection	The community identified within the Development Site is dominated by *Melaleuca quinquenervia* and contains a lower abundance of *Livistona australis* and *Glochidion ferdinandi.* PCT 1717 is characterised by the dominance of *Melaleuca quinquenervia*, *Eucalyptus robusta, Livistona australis* and *Casuarina glauca*. The absence of *E. robusta* and *C. glauca* within the community is likely a result of previous land management. Additionally, a larger area of this PCT with good vegetation integrity occurs within the Study Area and is dominated by *M. quinquenervia* and *E. robusta* with a small influence of *C. glauca.* PCT 1717 is also characterised by various forbs, grasses and sedges. The community within the Development Site lacked these native species, however it is likely a result of previous land management. This community occurs on sandy soil in a poorly-drained depression in proximity to Fullerton Cove. These are similar to the descriptive attributes to PCT 1717, which occur on poorly-drained lowlands and coastal floodplains between the Central Coast and Failford (Mid North Coast). The community within the Development Site is similar in floristic composition to PCT 1230 and PCT 1724. However, PCT 1230 contains dominant upper stratum species such as *Lophostemon suaveolens* and *Corymbia intermedia*, both of which are typically north coast species, where this PCT occurs. The Karuah – Manning subregion is likely its southernmost occurrence. PCT 1724 is more consistent in floristics to the community within the Development Site than PCT 1230 and is very similar to that of PCT 1717. Both PCT 1717 and 1724 occur in low-lying coastal areas and are associated with the Sydney – Newcastle Barriers and Beaches landscapes. The main difference is the occurrence of PCT 1724 over Sandstone substrates, while PCT 1717 is not listed to occur over Sandstone. Typical soils and lithology of the Fullerton Cove area include sandy loams and alluvial soils overlying estuarine sediments. While the vegetation is highly managed and contains numerous exotic species, the dominant floristic composition, landscape position and soil profiles are most commensurate with characteristics of PCT 1717.
Status	**BC Act:** Not listed
	EPBC Act: Not Listed.
PCT % Cleared	68.00% (from BioNet Vegetation Classification database).

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3.2.1.4 Vegetation Zone 4



Plate 4: **PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate).**

PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast.	
Vegetation Formation & Class	Forested Wetlands Coastal Floodplain Wetlands **(Moderate Condition)**
Area within Development Site	0.45 ha.
Survey Effort	**Required:** 1 plot/transect.
	Conducted: 1 plot/transect (Q2).
Floristic description	This vegetation has the characteristics of a wetland community. The overstorey within this community is dominated by both *Casuarina glauca* (Swamp Oak) and *Melaleuca quinquenervia* (Broad-leaved Paperbark). The midstorey was absent within areas of this community (no midstorey species recorded within the BAM plot), while the ground cover consisted of mainly aquatic species i.e. *Triglochin procerum* (Water Ribbons), *Cyclosorus interrupta*, *Alternanthera denticulata* (Lesser Joyweed) and *Typha orientalis* (Broadleaf Cumbungi). Vines, such as *Parsonsia straminea* (Common Silkpod) were evident within this community.

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PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast.	
Condition within Development Site	This community contains an open canopy of medium – large trees and a relatively non-diverse ground layer. Areas of open, unvegetated water occur within the area. Majority of the species identified were native, while a low cover of exotic species (*Hydrocotyle bonariensis, Ipomoea indica* (Morning Glory) and *Alternanthera philoxeroides* (Alligator Weed) occurred scattered throughout the vegetation zone. The relatively low species diversity may be attributed to inundation caused by recent heavy rainfall events resulting in large areas of open water throughout this zone. As such, the vegetation community is regarded to be in a moderate condition.
Justification for PCT selection	PCT 1728 was deemed an appropriate representation of this vegetation community within the Development Site due to the overstorey dominated by *Casuarina glauca* and scattered occurrences of *Melaleuca quinquenervia* and *M. styphelioides.* The ground-layer consists of forbs, including the diagnostic species *Baumea articulata*, and presence of climbers such as *Parsonsia straminea* (Monkey Rope). This community is represented within the New South Wales North Coast Bioregion and Karuah – Manning subregion and is typically located on poorly drained sites. This community borders and transitions into the PCT 1717 within the Study Area and has similar floristics associated with the community. The main difference between the two communities is PCT 1717 is represented largely by the dominance of *Eucalyptus robusta* and *Melaleuca quinquenervia*, while PCT 1728 is dominated by *C. glauca*. This is evident within the community and may be attributed to the level of periodic inundation from heavy rainfall. *E. robusta* are absent from areas that are almost permanently inundated. Similarly, the abundance of *M. quinquenervia* is considerably less in PCT 1728 compared to its presence in PCT 1717. PCT 1728 contains a Myrtaceous mid-stratum of *Melaleuca styphelioides* and *Melaleuca nodosa*, both of which were present throughout this community, especially within the south-western portions of the Study Area.
Status	**BC Act:** Swamp Oak Floodplain Forest of New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
	EPBC Act: Not Listed.
PCT % Cleared	81.00% (from BioNet Vegetation Classification database).

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3.2.1.5 Vegetation Zone 5



Plate 4: PCT 1737: Typha rushland (Moderate).

PCT 1737: Typha rushland	
Vegetation Formation & Class	Freshwater Wetlands Coastal Freshwater Lagoons **(Moderate Condition)**
Area within Development Site	0.30 ha.
Survey Effort	**Required:** 1 plot/transect.
	Conducted: 1 plot/transect (Q3).
Floristic description	This vegetation community is largely dominated by the rush *Typha orientalis* (Broadleaf Cumbungi). Most areas of PCT 1737 lack open water due to the density of *Typha orientalis*. The freshwater fern, *Cyclosorus interruptus,* was scattered throughout this community. Some forbs and sedges, such as *Persicaria strigosa* (Spotted Knotweed) and *Machaerina articulata* (Jointed Twig-rush) were also present. Typically, an overstorey was not present in this community. However, trees such as *Melaleuca quinquenervia* and *Casuarina glauca* from the adjoining Swamp Mahogany swamp forest encroach and overhang on the edges of this community. Some exotic weed species were present such as *Ipomoea indica* (Morning Glory), *Stenotaphrum secundatum* (Buffalo Grass) on the edge of the community which transitions to PCT 1646, and *Rubus fruticosus* (Blackberry).

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PCT 1737: Typha rushland	
Condition within Development Site	Only a small portion of this community occurs within the development site. Typically, it is influenced by exotic weed species as it transitions into the degraded PCT 1646. The Typha rushland community is considered to exist in a moderate condition within the development area.
Justification for PCT selection	PCT 1737 was considered an appropriate fit for the vegetation community due to its dominance of *Typha orientalis* and due to the lack of an overstorey. Both *Typha orientalis* and *Persicaria strigosa* were common within the community and are diagnostic species. The community was confined to small low-lying patches between forested areas of *Casuarina glauca* and *Melaleuca quinquenervia*. This PCT occurs within the New South Wales North Coast Bioregion and within the Karuah – Manning subregion.
Status	**BC Act:** Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.
	EPBC Act: Not Listed.
PCT % Cleared	70.00% (from BioNet Vegetation Classification database).

3.2.2 Assessment of Patch Size

Four of five vegetation zones (Vegetation Zone 1-4) are considered to have a patch size of >100 ha due to their connectivity to other areas of intact native vegetation (gaps of ≤100m between areas of woody vegetation and ≤30m for non-woody vegetation). Vegetation zone 5 (PCT 1737) is considered to have a patch size of less than 5 ha.

3.2.3 Vegetation Integrity Score

The current vegetation integrity score of each vegetation zone within the Development Site is outlined in **Table 4**.

Table 4: Current vegetation integrity score for the vegetation zones

Zone	PCT	Condition class	Area within Development Site (ha)	Condition scores (Current Score)			Vegetation integrity score
				Composition	Structure	Function	
1	1646	Moderate	0.01	58.5	43.3	68.5	55.8
2	1646	Degraded	1.42	17.7	7.2	13.8	12
3	1717	Degraded	0.10	32.5	37.3	21.8	29.8
4	1728	Moderate	0.45	31.5	22	65	35.6
5	1737	Moderate	0.30	39.9	40.3	0	40.1

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4. THREATENED SPECIES

4.1 ASSESSING HABITAT SUITABILITY

To inform the assessment of suitable habitat for threatened species and populations within the Development Site, a database search of the NSW DPIE BioNet Atlas was conducted. The results are provided in **Appendix 1**.

4.1.1 Flora Habitat

Habitat for majority of the threatened flora species was generally unsuitable in managed/degraded areas of the Development Site. More suitable habitat for threatened flora species occurred within areas containing forest vegetation (Zones 1 and 4) and areas outside of the Development Site.

The majority of the threatened flora species previously recorded within the locality or returned by the BAM as “candidate species for further assessment” are cryptic species that were not detected during the assessment. Based on the survey effort conducted, these species are deemed to be unlikely to occur within the Development Site (see **Appendix 1** for an assessment of “likelihood of occurrence”).

4.1.2 Fauna Habitat

Habitat Assessment

Suitable habitat for threatened fauna species is limited within the Development Site due to the condition of the vegetation e.g. degraded and cleared areas of Smooth-barked Apple - Blackbutt - Old Man Banksia woodland and existing dwellings/infrastructure.

Habitat Tree Survey

A total of 14 habitat trees, containing hollows, were identified within the Study Area. All habitat trees are located outside the Development Site within the Smooth-bark Apple – Blackbutt community (PCT 1646) and the Coastal Swamp Forest community (**Figure 4**). Habitat trees predominantly contained a variety of small (up to 5cm) and medium (5-20cm) hollows, with one large hollow (30cm). None of the trees showed any clear evidence of occupation by fauna.

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Koala Habitat

Habitat within the Development Site is considered largely unsuitable for Koalas, given the majority of cleared and managed vegetation, planted and exotic tree species and portions of the Development Site periodically inundated with water. One *Eucalyptus robusta*, listed as a preferred Koala food tree under the Port Stephens CKPoM, occurs within the Development Site. One small individual is disjunct from other vegetation and is largely surrounded by cleared land.

Part of the Study Area, outside of the Development Site, contains largely undisturbed and intact Swamp Sclerophyll vegetation in which *Eucalyptus robusta* is a co-dominant overstorey species. Impacts to Koala habitat within the Development Site and, to an extent, the Study Area is discussed in **Section 6.3**.

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Legend

- Development Site Boundary
- Study Area
- Hollow-bearing Tree
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

N

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PROJECT REFERENCE: 20210926

DATE DRAWN: 2021/03/26 12:35Version 2

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020
NSW EOH - 2020
Nearmap - 2020

Habitat Features

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

4

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4.1.3 Ecosystem Credit Species

The following assessment of habitat suitability for Ecosystem Credit species was conducted in accordance with Section 6.2 of the BAM (OEH, 2017).

Step 1: Identify threatened species for assessment.

A list of predicted ecosystem credit species for the Development Site was reviewed within the BAM Calculator and assessed according to species specific habitat requirements. The predicted species report is provided in **Appendix 4**.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified Ecosystem Credit species predicted to occur within the Development Site was assessed according to specific habitat requirements detailed below (**Table 5**). No Ecosystem Credit species were excluded.

Table 5 Assessment of Ecosystem Credit species within the Development Site.

Scientific Name	Common Name	Confirmed predicted species	Justification
Anseranas semipalmata	Magpie Goose	Yes	-
Anthochaera phrygia	Regent Honeyeater	Yes	-
Botaurus poiciloptilus	Australasian Bittern	Yes	-
Calidris ferruginea	Curlew Sandpiper (Foraging)	Yes	-
Calidris tenuirostris	Great Knot (Foraging)	Yes	-
Callocephalon fimbriatum	Gang-gang Cockatoo	Yes	-
Calyptorhynchus lathami	Glossy Black-Cockatoo	Yes	-
Chthonicola sagittata	Speckled Warbler	Yes	-
Circus assimilis	Spotted Harrier	Yes	-
Daphoenositta chrysoptera	Varied Sittella	Yes	-
Dasyurus maculatus	Spotted-tailed Quoll	Yes	-
Ephippiorhynchus asiaticus	Black-necked Stork	Yes	-
Epthianura albifrons	White-fronted Chat	Yes	-
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Yes	-
Glossopsitta pusilla	Little Lorikeet	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	Yes	-
Hieraaetus morphnoides	Little Eagle	Yes	-
Hirundapus caudacutus	White-throated Needletail	Yes	-
Irediparra gallinacea	Comb-crested Jacana	Yes	-

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Scientific Name	Common Name	Confirmed predicted species	Justification
Ixobrychus flavicollis	Black Bittern	Yes	-
Lathamus discolor	Swift Parrot (foraging)	Yes	-
Limicola falcinellus	Broad-billed Sandpiper (Foraging)	Yes	-
Limosa limosa	Black-tailed Godwit (Foraging)	Yes	-
Lophoictinia isura	Square-tailed Kite (foraging)	Yes	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Yes	-
Miniopterus australis	Little Bent-winged Bat	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat	Yes	-
Neophema pulchella	Turquoise Parrot	Yes	-
Ninox connivens	Barking Owl (foraging)	Yes	-
Ninox strenua	Powerful Owl (foraging)	Yes	-
Pandion cristatus	Eastern Osprey	Yes	-
Petaurus australis	Yellow-bellied Glider	Yes	-
Phascolarctos cinereus	Koala (foraging)	Yes	-
Phoniscus papuensis	Golden-tipped Bat	Yes	
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Yes	-
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox (foraging)	Yes	-
Rostratula australis	Australian Painted Snipe	Yes	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Yes	-
Scoteanax rueppellii	Greater Broad-nosed Bat	Yes	-
Stictonetta naevosa	Freckled Duck	Yes	-
Syconycteris australis	Common Blossom-bat	Yes	-
Tyto longimembris	Eastern Grass Owl	Yes	-
Tyto novaehollandiae	Masked Owl	Yes	-
Xenus cinereus	Terek Sandpiper	Yes	-

4.1.4 Species Credit Species

The following assessment of habitat suitability for Species Credit species was conducted in accordance with Section 6.3 of the BAM (OEH, 2017).

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Step 1: Identify threatened species for assessment

A list of candidate Species Credit species for the Development Site was reviewed in the BAM calculator and is provided in **Appendix 4.**

Step 2: Assessment of the habitat constrains and vagrant species on the subject land & Step 3: Identify candidate species credit species for further assessment

A number of Species Credit species were excluded from the assessment as candidate species based on geographic constraints or the lack of specific habitat constraints within the Development Site (**Table 6**).

Table 6 List of Species Credit Species and their justification for further assessment.

Scientific Name	Common Name	Confirmed candidate species	Justification
Flora			
Allocasuarina simulans	Nabiac Casuarina	Yes	-
Angophora inopina	Charmhaven Apple	Yes	-
Asperula asthenes	Trailing Woodruff	Yes	-
Callistemon linearifolius	Netted Bottle Brush	Yes	-
Corybas dowlingii	Red Helmet Orchid	Yes	-
Cryptostylis hunteriana	Leafless Tongue Orchid	Yes	-
Diuris arenaria	Sand Doubletail	Yes	-
Diuris praecox	Rough Doubletail	Yes	-
Eucalyptus camfieldii	Camfield's Stringybark	Yes	-
Eucalyptus parramattensis subsp. decadens	-	Yes	-
Eucalyptus seeana - endangered population	Eucalyptus seeana population in the Greater Taree local government area	No	Geographical limitation – Site outside Greater Taree LGA
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Yes	-
Lindernia alsinoides	Noah's False Chickweed	Yes	-
Maundia triglochinoides	-	Yes	-
Melaleuca biconvexa	Biconvex Paperbark	Yes	-
Melaleuca groveana	Grove's Paperbark	Yes	-
Persicaria elatior	Tall Knotweed	Yes	-
Prostanthera densa	Villous Mint-bush	Yes	-
Pterostylis chaetophora	Taree Rustyhood	Yes	-
Rhizanthella slateri	Eastern Australian Underground Orchid	Yes	-
Tetratheca juncea	Black-eyed Susan	Yes	-

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Scientific Name	Common Name	Confirmed candidate species	Justification
Thesium australe	Austral Toadflax	Yes	-
Zannichellia palustris	-	Yes	-
Mammals			
Cercartetus nanus	Eastern Pygmy-possum	Yes	-
Chalinolobus dwyeri	Large-eared Pied Bat	No	Habitat constraints – no potential breeding habitat within 2km
Miniopterus australis (Breeding)	Little Bent-winged Bat	No	Habitat constraints – no potential breeding habitat on site
Miniopterus orianae oceanensis (Breeding)	Large Bent-winged Bat	No	Habitat constraints – no potential breeding habitat on site
Myotis macropus	Southern Myotis	Yes	-
Petauroides volans	Greater Glider	Yes	-
Petaurus norfolcensis	Squirrel Glider	Yes	-
Petrogale penicillata	Brush-tailed Rock-wallaby	No	Habitat constraints – site not within 1km of rocky escarpments and gorges
Phascogale tapoatafa	Brush-tailed Phascogale	Yes	-
Phascolarctos cinereus (Breeding)	Koala	Yes	-
Phascolarctos cinereus - endangered population	Koala, Hawks Nest and Tea Gardens population	Yes	-
Planigale maculata	Common Planigale	Yes	-
Potorous tridactylus	Long-nosed Potoroo	Yes	-
Pteropus poliocephalus (Breeding)	Grey-headed Flying-fox	Yes	-
Vespadelus troughtoni	Eastern Cave Bat	Yes	-
Birds			
Anthochaera phrygia (Breeding)	Regent Honeyeater	Yes	-
Burhinus grallarius	Bush Stone-curlew	Yes	-
Calidris ferruginea	Curlew Sandpiper (Foraging)	Yes	-
Calidris tenuirostris	Great Knot (Foraging)	Yes	-
Callocephalon fimbriatum (Breeding)	Gang-gang Cockatoo	Yes	-
Calyptorhynchus lathami (Breeding)	Glossy Black-Cockatoo	Yes	-

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Scientific Name	Common Name	Confirmed candidate species	Justification
Dromaius novaehollandiae - endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	Yes	-
Hieraaetus morphnoides	Little Eagle	Yes	-
Lathamus discolor (Breeding)	Swift Parrot	Yes	-
Limicola falcinellus	Broad-billed Sandpiper (Breeding)	Yes	-
Limosa limosa	Black-tailed Godwit (Breeding)	Yes	-
Lophoictinia isura (Breeding)	Square-tailed Kite	Yes	-
Ninox connivens	Barking Owl	Yes	-
Ninox strenua	Powerful Owl	Yes	-
Pandion cristatus	Eastern Osprey	Yes	-
Turnix maculosus	Red-backed Button-quail	Yes	-
Tyto novaehollandiae (Breeding)	Masked Owl	Yes	-
Xenus cinereus	Terek Sandpiper	Yes	-
Amphibians			
Crinia tinnula	Wallum Froglet	Yes	-
Litoria aurea	Green and Golden Bell Frog	Yes	-
Litoria brevipalmata	Green-thighed Frog	Yes	-
Uperoleia Mahony	Mahony's Toadlet	Yes	-
Insects			
Petalura gigantea	Giant Dragonfly	Yes	-
Reptiles			
Hoplocephalus bitorquatus	Pale-headed Snake	Yes	-

The following species were considered unlikely to occur within the Development Site due to habitat constraints being present, geographic restrictions or habitat degradation:

- *Chalinolobus dwyeri* (Large-eared Pied Bat) - Development Site/Study Area does not contain cliffs, nor is it within two kilometres of rocky areas that contain caves, overhangs, escarpments of outcrops. The Development Site is not within two kilometres of old mines or tunnels.
- *Eucalyptus seeana* (Narrow-leaved Red Gum) Endangered population – Development Site/Study Area is not within the Greater Taree LGA.

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- *Miniopterus australis* (Little Bent-winged Bat) (Breeding) - Development Site/Study Area does not contain caves, tunnels, mines or culverts.
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat) (Breeding) - Development Site/Study Area does not contain caves, tunnels, mines or culverts.
- *Petrogale penicillata* (Brush-tailed Rock-wallaby) - Development Site/Study Area is not within one kilometre of rocky escarpments, gorges, steep slopes, boulder piles, outcrops or cliff-lines.

4.2 THREATENED SPECIES SURVEYS

Step 4: Determine presence or absence of candidate species credit species

4.2.2 Candidate Threatened Flora

4.2.2.1 Survey Methodology

The candidate threatened flora species were surveyed in accordance with the *BAM 2020 survey guidelines* (DPIE, 2020b). Flora surveys comprised of parallel transects at widths of five metres and 10 metres (depending on the species growth form and density of vegetation in which surveys are conducted) within the Development Site and Study Area (**Figure 5, 6, 7, 8** and **9**). Surveys also included six (6) vegetation plots within the Development Site.

Survey Timing

The following candidate threatened flora species (**Table 7**) were surveyed across the Study Area by suitably qualified ecologists.

Table 7: Survey of requirements and timing conducted for candidate threatened flora species.

Scientific name	Common name	Seasonal Requirements	Survey Timing
Flora			
Allocasuarina simulans	Nabiac Casuarina	All year	August 19th, 2020
Angophora inopina	Charmhaven Apple	All year	August 19th, 2020
Asperula asthenes	Trailing Woodruff	October – December	November 17th, 2020
Callistemon linearifolius	Netted Bottle Brush	October - January	November 17th, 2020
Corybas dowlingii	Red Helmet Orchid	June - July	July 8th, 2020
Cryptostylis hunteriana	Leafless Tongue Orchid	November - January	November 17th, 2020

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Scientific name	Common name	Seasonal Requirements	Survey Timing
Diuris arenaria	Sand Doubletail	September	September 22nd, 2020
Diuris praecox	Rough Doubletail	August	August 19th, 2020
Eucalyptus camfieldii	Camfield's Stringybark	All year	August 19th, 2020
Eucalyptus parramattensis subsp. *decadens*	-	All year	August 19th, 2020
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	August - November	August 19th, 2020
Lindernia alsinoides	Noah's False Chickweed	November – February	November 17th, 2020
Maundia triglochinoides	-	November - March	November 17th, 2020
Melaleuca biconvexa	Biconvex Paperbark	All year	August 19th, 2020
Melaleuca groveana	Grove's Paperbark	All year	August 19th, 2020
Persicaria elatior	Tall Knotweed	December - January	December 10th, 2020
Prostanthera densa	Villous Mint-bush	All year	August 19th, 2020
Pterostylis chaetophora	-	September – November	September 22nd, 2020
Rhizanthella slateri	Eastern Underground Orchid	September – November	September 22nd, 2020
Tetratheca juncea	Black-eyed Susan	September - October	September 22nd, 2020
Thesium australe	Austral Toadflax	November – February	November 17th, 2020
Zannichellia palustris	-	October – January	November 17th, 2020

Additionally, some of the threatened candidate species listed in **Table 7**have short flowering periods and therefore a narrow survey window. Reference populations for these threatened species were visited to confirm the species was in flower, allowing surveys to be conducted at times that give the best chance of detection. **Table 8**lists the threatened candidate species which had reference populations visited to confirm flowering.

Table 8: Threatened flora species with short flowering periods assessed as part of the BDAR.

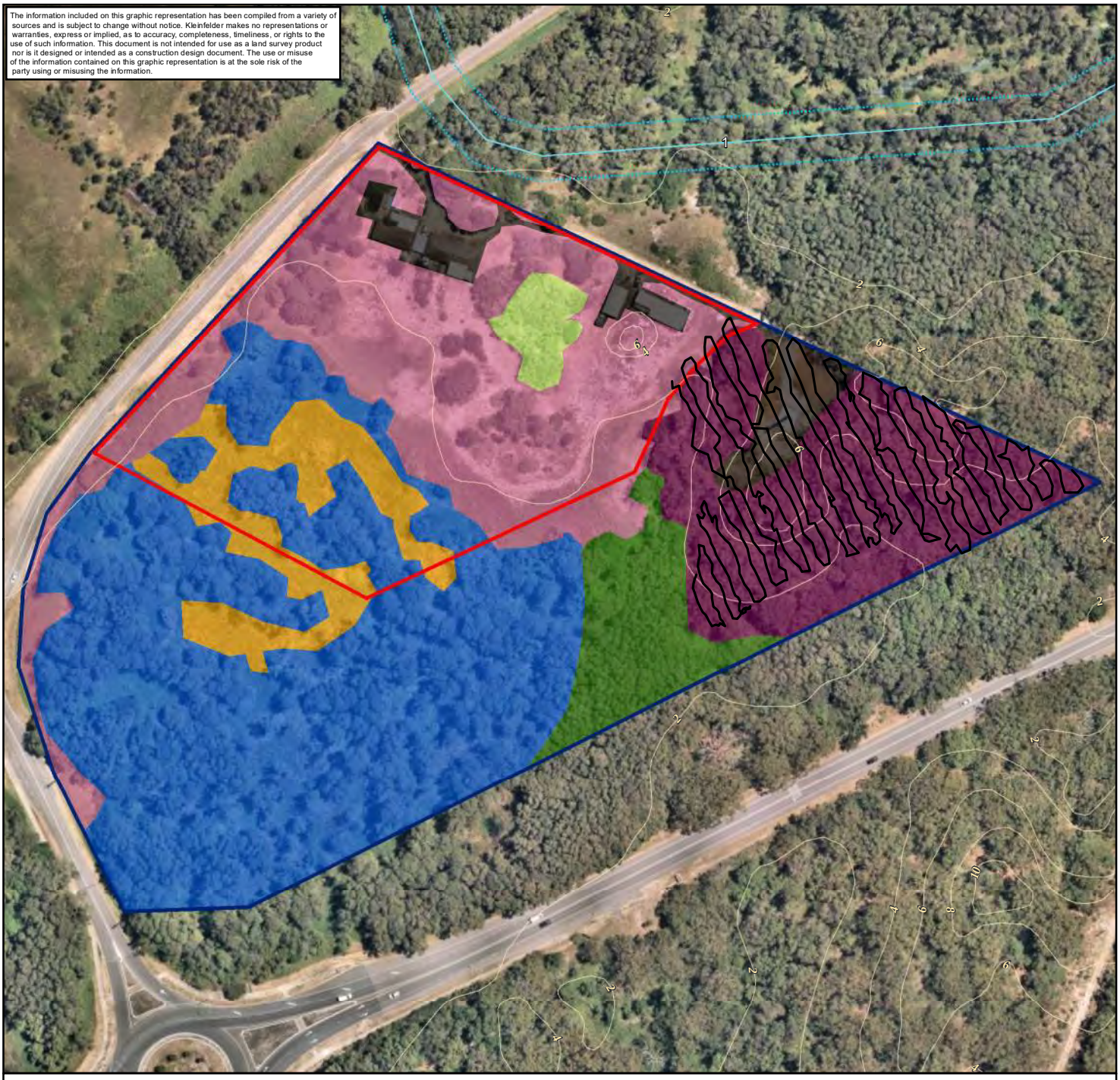
Species	BAM survey period	Date of survey	Date of reference population visit	Location of reference population	Species flowering at reference population (yes/no)
Corybas dowlingii Red Helmet Orchid	June - July	July 8th, 2020	June 17th, 2020	Soldiers Point, NSW	Yes
Cryptostylis hunteriana Leafless Tongue Orchid	November - January	November 17th, 2020	October 10th & 31st, 2020	Bulahdelah, NSW	Yes

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Species	BAM survey period	Date of survey	Date of reference population visit	Location of reference population	Species flowering at reference population (yes/no)
			November 14th, 2020	Munmorah State Recreation Area, NSW	
Diuris arenaria Sand Doubletail	September	September 22nd, 2020	September 19th, 2020	Nelson Bay, NSW	Yes
Diuris praecox Rough Doubletail	August	August 19th, 2020	August 8th, 2020	Crangan Bay, NSW	Yes
Pterostylis chaetophora	September - November	September 22nd, 2020	September 10th, October 21st & November 14th, 2020	Columbey National Park, NSW	Yes

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Targeted Threatened Flora Search Tracks (08 July

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

N

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Targeted Threatened Flora Search 08 July 2020

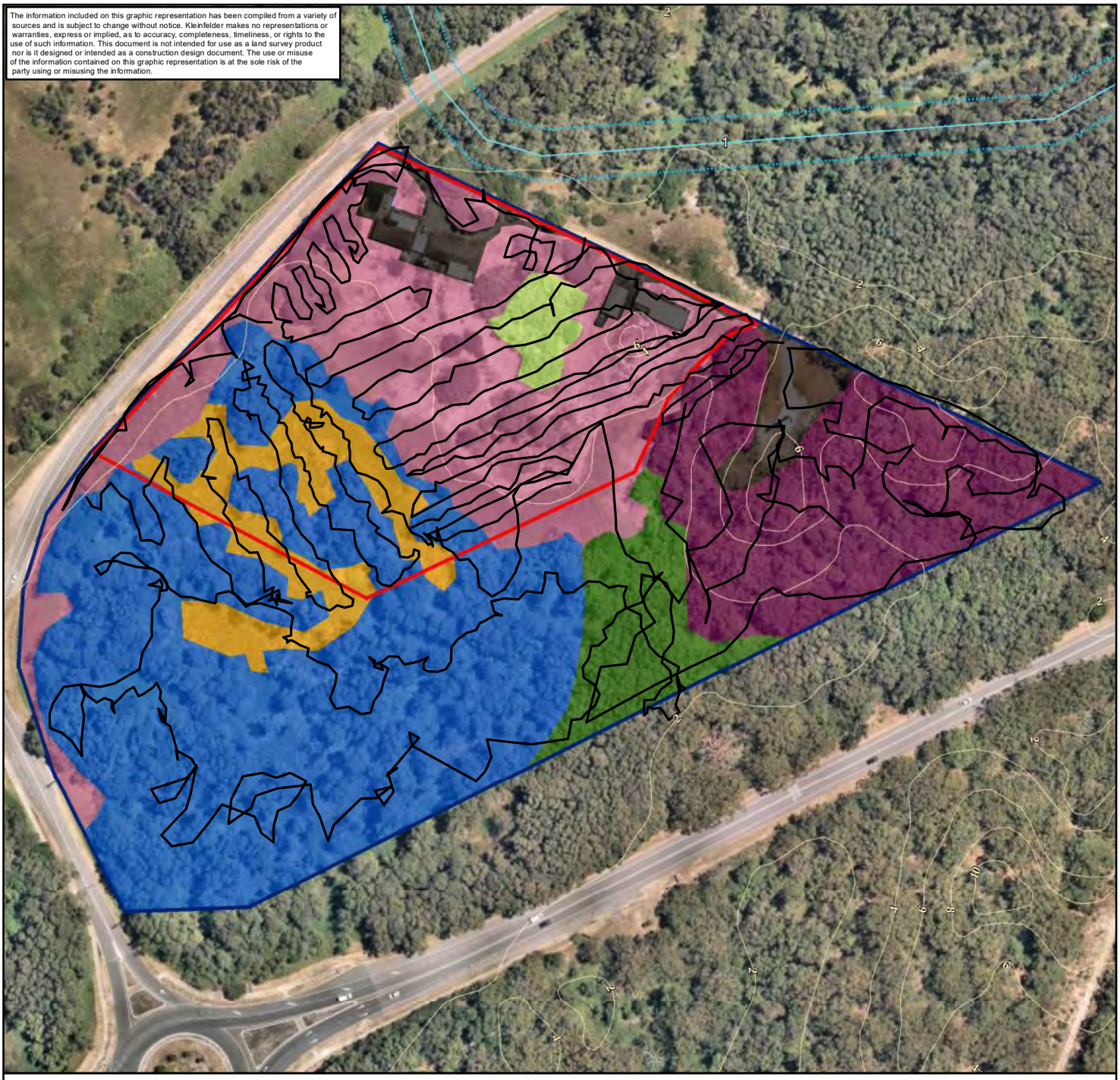
Monteath and Powys
Biodiversity Development Assessment Report
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Lot 14 DP 258848

FIGURE:

5

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Targeted Threatened Flora Search Tracks (19 & 24 August

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

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Nearmap - 2020

Targeted Threatened Flora Search
19 & 24 August 2020

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Lot 14 DP 258848

FIGURE:
6

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Targeted Threatened Flora Search Tracks (22 September 2020)

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

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Targeted Threatened Flora Search
22 September 2020

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FIGURE:

7

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Targeted Threatened Flora Search Tracks (17 November

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
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Nearmap - 2020

Targeted Threatened Flora Search 17 November 2020

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Lot 14 DP 258848

FIGURE: 8

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Targeted Threatened Flora Search Tracks (10 December

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
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Targeted Threatened Flora Search 10 December 2020

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FIGURE:

9

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4.2.2.2 Flora Survey Results

A total of 114 flora species were identified during field surveys. Native plant species were comprised of the following growth forms:

- 3 fern species
- 8 forb species
- 6 grass and grass-like species
- 19 “other” species (such as vines and epiphytes)
- 9 shrub species
- 10 tree species

A further 59 plant species are considered exotic, of which three species are listed as priority weeds for the Hunter LGA. These including the following species:

- *Lantana camara* (Lantana).
- *Opuntia stricta* (Common Prickly Pear)
- *Rubus fruticosus* (Blackberry)

Flora species also comprised 14 High Threat Exotics (HTEs) according to DPIEs HTE list:

- *Anredera cordifolia* (Madeira Vine)
- *Bidens pilosa* (Cobbler’s Pegs)
- *Cenchrus longispinus* (Spiny Burrgrass)
- *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush)
- *Eragrostis curvula* (African Lovegrass)
- *Galenia pubescens* (Galenia)
- *Ipomoea indica* (Morning Glory – purple)
- *Lantana camara* (Lantana)
- *Megathyrsus maximums* (Guinea Grass)
- *Phoenix canariensis* (Canary Island Date Palm)
- *Rubus fruticosus* (Blackberry)
- *Rumex acetosella* (Sorrel)
- *Schefflera actinophylla* (Umbrella Tree)
- *Stenotaphrum secundatum* (Buffalo Grass)

No threatened flora species were identified within the Study Area.

A complete list of the flora species identified within the Study Area is provided in **Appendix 2**.

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4.2.3 Candidate Threatened Fauna

4.2.3.1 Survey Methodology

The following sub-sections outline the methods for all fauna surveys conducted across the Study Area. While habitats within the Development Site are mostly unsuitable for threatened fauna species listed below (particularly breeding habitat), various targeted surveys were undertaken to detect species within the Study Area (although not strictly required). While survey efforts included the Development Site, camera trapping, spotlighting and other surveys focused on forested habitats within the Study Area that had the highest potential for threatened species detection.

Survey Timing

All candidate threatened fauna species were surveyed for within the appropriate season as per the BAM (**Table 9**).

Table 9: Survey of threatened fauna species

Scientific name	Common name	Seasonal Requirements	Survey Timing & Type
Amphibians			
Crinia tinnula	Wallum Froglet	All year	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 Nocturnal spotlighting searches, stationary listening points.
Litoria aurea	Green and Golden Bell Frog	November to March	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 Nocturnal spotlighting searches, stationary listening points and call playback.
Litoria brevipalmata	Green-thighed Frog	October to March	October 26th & December 16th Nocturnal spotlighting searches, stationary listening points.
Uperoleia mahonyi	Mahony's Toadlet	October - March	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 Nocturnal spotlighting searches, stationary listening points.
Birds			
Burhinus grallarius	Bush Stone-curlew	All year	August 20th, 24th & November 19th

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Scientific name	Common name	Seasonal Requirements	Survey Timing & Type
			Spotlighting and call playback December 17 and 18 Meandering dusk and dawn bird census. December 17 and 18 2-ha bird survey at 3 locations
Callocephalon fimbriatum	Gang-gang Cockatoo	October - January	December 17 and 18 Meandering dusk and dawn bird census. December 17 and 18 2-ha bird survey at 3 locations
Calyptorhynchus lathami	Glossy Black-Cockatoo	April to August	August 28th Morning bird census focusing on hollow-bearing trees
Dromaius novaehollandiae	Emu (Endangered population in Port Stephens LGA)	All year	December 17 and 18 Meandering dusk and dawn bird census. December 17 and 18 2-ha bird survey at 3 locations
Haliaeetus leucogaster	White-bellied Sea-Eagle	July - December	September 22nd Nest searches covering whole site December 17 and 18 Meandering dusk and dawn bird census. December 17 and 18 2-ha bird survey at 3 locations
Hieraaetus morphnoides	Little Eagle	August - October	September 22nd Nest searches covering whole site
Lophoictinia isura	Square-tailed Kite	September - January	September 22nd Nest searches covering whole site December 17 and 18 Meandering dusk and dawn bird census. December 17 and 18 2-ha bird survey at 3 locations
Ninox connivens	Barking Owl	May to December	August 20th & August 24th Spotlighting and call playback
Ninox strenua	Powerful Owl	May to August	August 20th & August 24th

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Scientific name	Common name	Seasonal Requirements	Survey Timing & Type
			Spotlighting, call playback and two nights stag watching
Pandion cristatus	Eastern Osprey	April - November	September 22nd Nest searches covering whole site
Tyto novaehollandiae	Masked Owl	May to August	August 20th & August 24th Spotlighting and call playback
Tyto tenebricosa	Sooty Owl	April - August	August 20th & August 24th Spotlighting and call playback
Mammals			
Cercartetus nanus	Eastern Pygmy-possum	October - March	November 12th – 26th Remote cameras and spotlighting (November 19th)
Myotis macropus	Southern Myotis	October - March	December 7th – 11th Harp trapping and passive call recording (Anabat)
Petaurus norfolcensis	Squirrel Glider	All Year	November 12th -26th December 7th – 11th Fauna trapping (arboreal) and remote cameras
Phascogale tapoatafa	Brush-tailed Phascogale	December to June	November 12th -26th December 7th – 11th Fauna trapping (arboreal) and remote cameras
Phascolarctos cinereus	Koala (Breeding)	All Year	August 20th, 24th, November 12th -26th, December 11th. Spotlighting, call playback and SAT searches November 12th -26th remote cameras
Phascolarctos cinereus	Koala (Endangered population – Hawks Nest and Tea Gardens)	All year	August 20th, 24th, November 12th -26th, December 11th. Spotlighting, call playback, remote cameras and SAT searches
Planigale maculata	Common Planigale	All year	December 7th – 11th Fauna trapping (terrestrial)
Potorous tridactylus	Long-nosed Potoroo	All Year	December 7th – 11th Fauna trapping (terrestrial)
Pteropus poliocephalus	Grey-headed Flying Fox	October - December	November 19th, December 10th, December 16th Diurnal camp search and Spotlighting.

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Scientific name	Common name	Seasonal Requirements	Survey Timing & Type
Vespadelus troughtoni	Eastern Cave Bat	November - January	December 7th – 11th Harp trapping and passive call recording (Anabat)
Reptiles			
Hoplocephalus bitorquatus	Pale-headed Snake	November to March	November 19th, December 16th Spotlighting.
Insects			
Petalura gigantea	Giant Dragonfly	December - January	December 10th Walking transects through suitable habitat

Weather Data

Temperature and rainfall data from Williamtown RAAF (Weather Station 061078 ~10 km away) during the fauna survey period is summarised in **Table 10**.

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Table 10: Weather conditions during fauna surveys.

Date	Temps		Rain	9 am				3 pm			
	Min	Max		Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C	mm	°C	%	Km/h		°C	%	Km/h	
Spotlighting and Call play back											
20/08/2020	10.7	18.4	0	14.6	56	NW	41	17.5	40	WNW	41
24/08/2020	8.4	17.9	0	12.0	55	WNW	31	17.3	32	WNW	24
Diurnal Bird survey											
28/08/2020	8.1	19.0	0	16.1	43	W	24	17.0	38	SSE	28
17/12/2020	22.0	31.1	0	25.0	78	N	8	27.1	67	NE	24
18/12/2020	20.8	33.1	13.6	27.8	70	NW	15	23.6	80	NNW	20
Raptor Nest Search											
22/09/2020	15.5	28.0	0.4	23.3	71	WNW	22	26.7	22	WNW	41
Nocturnal Herp / Amphibian											
26/10/2020	13.7	16.8	128.8	15.3	100	SSE	50	14.5	100	S	37
Remote Cameras (12/11 – 26/11)											
12/11/2020	16.4	31.1	0	23.0	67	N	13	30.6	40	ENE	17
13/11/2020	19.0	28.9	4.4	23.0	74	NNE	15	27.7	56	NNE	15
14/11/2020	15.8	24.6	13.6	21.1	72	WNW	9	23.2	63	SE	22
15/11/2020	13.4	30.4	0	20.4	84	NW	7	29.4	51	SE	19
16/11/2020	17.0	38.2	0	24.8	61	N	13	36.9	25	NW	19
17/11/2020	19.4	23.0	5.8	20.9	72	SSE	22	22.0	64	SE	24
18/11/2020	18.3	23.5	0	21.6	60	E	11	22.5	55	ESE	30
Spotlighting and Call play back (19/11)											
19/11/2020	16.3	26.8	0	22.5	59	ENE	15	24.4	56	ENE	30
20/11/2020	15.3	33.3	0	22.5	70	NNW	13	32.7	43	NE	13
21/11/2020	19.4	24.2	0	20.5	75	S	20	22.6	64	SSE	24
22/11/2020	17.1	29.1	0	20.6	85	N	11	24.9	74	ESE	17
23/11/2020	20.3	30.9	0	23.5	77	ESE	13	26.6	51	W	33
24/11/2020	17.5	23.6	0	20.1	76	S	28	22.7	60	SSE	31
25/11/2020	14.1	24.3	0.4	20.7	68	NE	7	23.3	49	ESE	28
26/11/2020	14.7	33.1	0	22.1	65	NW	13	32.3	40	ESE	20
Trapping (Elliot – ground and arboreal, Harp, Anabats, Cages) (07/12 – 11/12)											
07/12/2020	15.4	31.3	0	21.5	56	WNW	13	30.0	20	NW	35
08/12/2020	15.9	22.6	0	20.1	35	W	30	21.2	46	SSE	33
09/12/2020	13.0	24.4	0	19.5	54	WNW	11	23.0	50	ESE	26
Invertebrates (10/12)											
10/12/2020	13.6	27.7	0	20.5	68	NW	9	24.0	62	SSE	33
11/12/2020	18.4	22.3	1.0	19.3	60	SSE	30	20.4	53	SSE	26
Spotlighting / Nocturnal Herp Search (Amphibian)											
16/12/2020	21.3	29.6	14.8	26.2	79	NE	15	27.5	74	NE	31
21/12/2021	21.9	30.6	0.2	27	78	W	11	29.3	71	SE	20
23/12/2021	22.4	-	0	26.3	78	E	19	24.1	84	ENE	13

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Mammals

Spotlighting transects were undertaken by two observers from dusk for a one person-hour (30 minutes each) period on four separate nights (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020) using high-powered headtorches and hand-held torches. Spotlighting efforts covered both the vegetated areas adjacent to the Development Site that contained hollow-bearing trees and the vegetation within the Development Site. Hollows suitable for threatened species, such as Squirrel Gliders and large forest owls, were watched at dusk until suitably dark for fauna to emerge. In addition to hollow watching, calls of threatened species were played at locations across spotlighting transects in an effort to elicit a response. Calls were broadcast for 15 mins on each of the four nights across multiple locations (**Figure 10**).

A total of six (6) Reconyx Hyperfire™ remote trigger cameras were installed at heights of 1.5 m or 3 m for a total of 14 consecutive nights (12/11/2020 to 26/11/2020) (**Figure 10**). Cameras were installed at 1.5 m, targeted Eastern Pygmy-possum and Long-nosed Potoroo, while cameras installed at 3 m, targeted Squirrel Gliders and Koala. Cameras were baited with a mixture of oats, peanut butter, treacle, vanilla essence and truffle oil mixture in a mesh canister, and the surrounding area (including the tree trunk) was sprayed with honey water. Camera baits were checked once during the survey period and re-baited as necessary. Images were analysed to identify species captured on camera.

Four AnaBat™ ultrasonic recorders (Titley Scientific, Lawnton QLD) were used to passively record the calls of any Microchiropteran bats within the Study Area. Three Anabats were placed within the Swamp Oak forest areas adject to standing bodies of water. One Anabat was placed within the remnant Swamp Sclerophyll forest (**Figure 10**). The units were set up adjacent to open flyway areas and bodies of water which are likely to be favoured by foraging bats. Each Anabat was set-up to record over four consecutive nights (07/12/2020 to the 11/12/2020) of continuous recording from dusk.

Spot Assessment Technique (SAT), following the methodology of Phillips and Callaghan (2011), was used to survey for Koala scats within the Study Area. One SAT was conducted within the proposed Development Site within the remnant Swamp Sclerophyll vegetation and surrounds. Another SAT was conducted in remnant Swamp Sclerophyll vegetation, containing large individuals of *Eucalyptus robusta*, outside of the proposed Development Site (**Figure 10**). No SAT was conducted in the Swamp Oak forest vegetation (PCT 1728) within the proposed Development Site due to water inundation within the area.

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A diurnal habitat tree assessment was used to search for Grey-headed Flying-fox camps and large stick-nests of threatened raptors.

Diurnal Birds

Visual and auditory bird surveys were conducted throughout the Development Site and the wider Study Area at three central point locations (20 minute 2-ha census) on 28 August, 17 and 18 December 2020. Surveys were undertaken at dusk and sawn. Meandering bird transects were also undertaken on the 18 and 18 December 2020 targeting areas with suitable hollows for threatened cockatoos. Birds were recorded visually, with the aid of binoculars, or by call interpretation. Weather conditions during the survey were warm, clear and calm.

Owls

No suitable breeding habitat (large hollows) occur within the Development Site and as such, majority of the spotlighting and call playback efforts were focused within forested areas containing hollows outside of the Development Site. Spotlighting, call playback and stag watching were conducted during breeding months (August) for Powerful Owl, Barking Owl, Masked Owl and Sooty Owl. Two nocturnal surveys were conducted on 20/08/2020 and 24/08/2020 for these species. Both surveys included stag watching one large hollow (>20cm diameter) at dusk.

Reptiles

Reptile searches were conducted during nocturnal spotlighting searches (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020). Searches targeted both terrestrial and arboreal habitats, such as logs and hollows primarily within the forested areas (to be retained), however, searches also included areas of the Development Site containing vegetation and debris.

Amphibians

Amphibian surveys were conducted between October and December, over two nights (26/10/2020 and 16/12/2020). Surveys were structured around rainfall events and warm nights and consisted of walking transects through suitable habitat (areas containing semi-permanent – permanent water bodies) with stationary listing points along the transect. Amphibians were identified through visual and aural detection. Additionally, a reference population of *Crinia tinnula* and *Uperoleia mahonyi* within the Port Stephens LGA were visited on 28/10/2020 and 15/12/2020 to confirm species were calling. Both *C. tinnula* and *U. mahonyi* were confirmed

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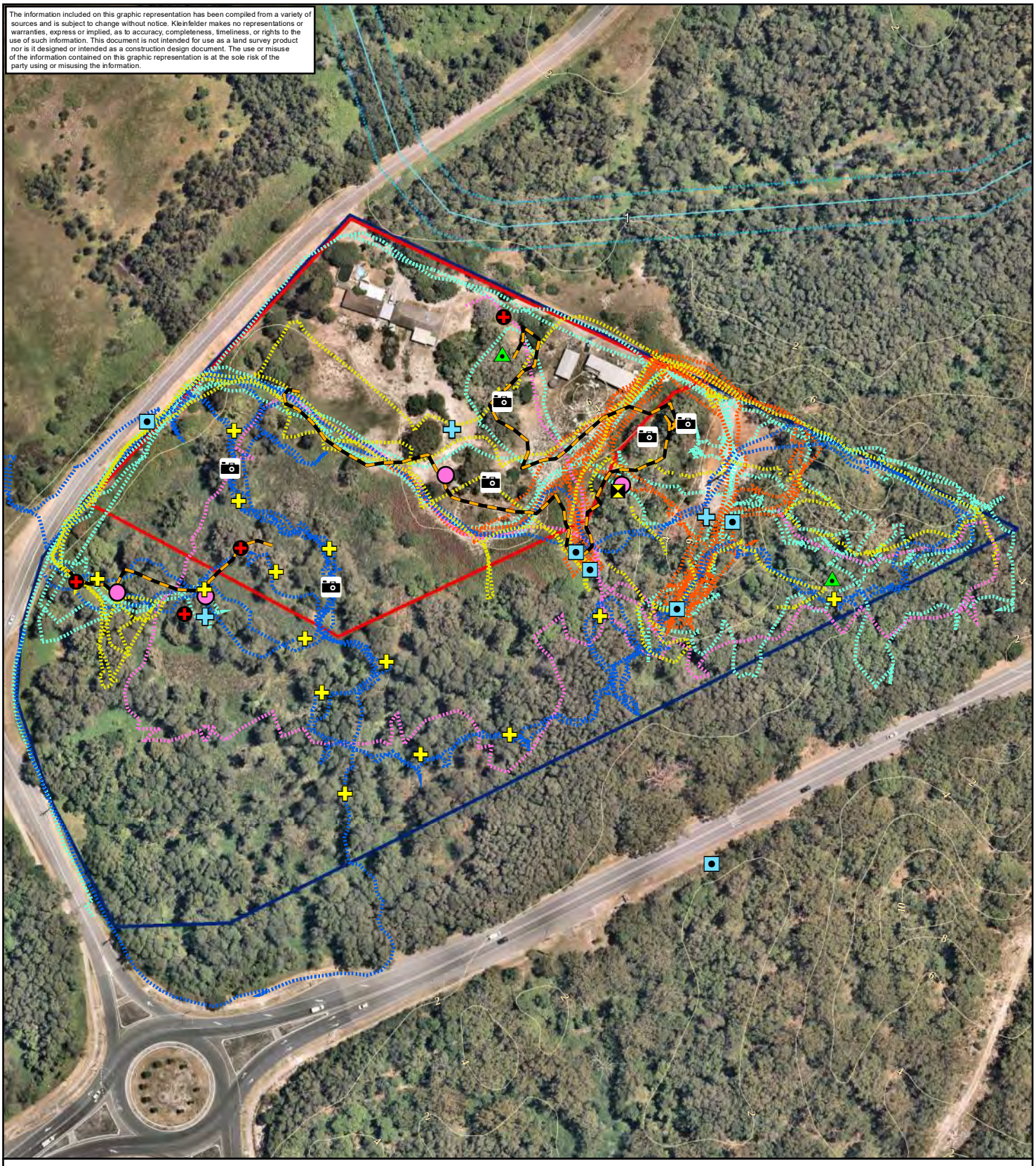
calling on 28/10/2020, while only *C. tinnula* was confirmed calling on 15/12/2020 at the reference site.

Insects

Walking transects were conducted on 10/12/2020 through areas of standing water and swamp vegetation, and areas adject to standing water, within Development Site targeting *Petalura gigantea* (Giant Dragonfly) (**Figure 11**). Dragonflies encountered during the survey were collected using a sweep net for closer inspection and identification.

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Owl/Koala Call Playback
- Listening Point
- Bird Census
- Anabat
- Harp Trap
- Koala SAT Test
- Remote Camera
- Stag Watch
- Bird Census
- Nocturnal Herp Search
- Raptor Nest Search
- Spotlight Search
- Habitat search
- Trapping Transect

Metres
0 10 20 40 60 80 100

N

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DATA SOURCE:
NSW DFSI - 2020
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Nearmap - 2021

Fauna Survey Effort

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

10

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig10_FaunaSurveyEffort.mxd

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- *Petalura gigantea* (Giant Dragonfly) Survey Tracks

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

N

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Petalura gigantea (Giant Dragonfly) Survey Effort

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

11

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig11_GiantDragonflySurvey.mxd

4.2.3.2 Fauna Survey Results

A total of 65 species of fauna were detected within the Study Area during field surveys (**Appendix 3**). This includes 40 bird, 20 mammal, one reptile and four amphibian species

Of the fauna species detected throughout the surveys, the following six (6) species are threatened species listed under the BC Act

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)
- *Miniopterus australis* Little Bent-winged Bat)
- *Myotis macropus* (Southern Myotis)
- *Ninox strenua* (Powerful Owl)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)

The above listed species were detected through spotlighting, passive bat call recording (Anabat) and call playback.

The Powerful Owl was successfully detected on two (2) separate nights within the Study Area through a call playback response. Call playback was broadcast from multiple locations surrounding the Study Area in attempts to determine location of the roost or nesting tree (if any). An individual Powerful Owl responded on two consecutive nights from a location to the north-east of the Study Area. The owl was observed to fly in from the east. Call playback was discontinued after the two nights as to limited disturbance to breeding behaviours. Following, multiple diurnal searches were undertaken within the approximate area the owl was observed flying from, however, the roosting location could not be identified. Given the minimal number of suitable size hollows (1 large hollow >20cm) within the Study Area, absence of signs of hollow use (individual was not detected through two nights of stag watching the large hollow) and directions owl flew in from, it is likely that roosting/nesting habitat is located outside of the Study Area **(Figure 12**).

Of the total fauna species detected throughout surveys, two are introduced species:

- *Mus musculus* (House Mouse).
- *Rattus rattus* (Black Rat).

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals

Threatened Fauna

Observed

- Powerful Owl (Called in to these locations)

Detected

- Yellow-bellied Sheathtail Bat
- Southern Myotis
- Eastern False Pipistrelle
- Little Bent-winged Bat
- Eastern Coastal Free-tailed Bat
- Large Hollow
- Approximate Powerful Owl Roost Location
- 100m Buffer from Powerful Owl Roost Tree

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone**
- Tracks and Infrastructure

Metres
0 10 20 40 60 80 100

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Threatened Fauna Observations

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

12

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig12_ThreatenedFaunaObservations.mxd

4.3 IDENTIFIED THREATENED SPECIES

Step 5: Determine the area or count, and location of suitable habitat for species credit species & Step 6: Determine the habitat condition within the species polygon for species assessed by area

Three species credit species were identified within the Study Area. Justifications for the extent of species polygons are provided below in accordance with Section 6 (Step 5 of the BAM). The sensitivity classes of each identified threatened species within the Development Site is presented in **Table 11**.

- Southern Myotis (*Myotis macropus*): this species was identified within the Study Area but was not detected within the Development Site. Suitable areas of foraging habitat (0.12 ha) (open waterbodies >3m diameter) occur within the western portion of the Development Site. As such, the species polygon includes all PCTs linked to the species within 200m from foraging habitat. The species polygon encompasses 1.83 ha of the Development Site consisting of degraded PCT 1717 (Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest),degraded PCT 1646 (Smooth-barked Apple - Blackbutt - Old Man Banksia woodland) and moderate condition PCT 1737 (*Typha* rushland) (EEC) (**Figure 13**).
- Powerful Owl (*Ninox strenua*)*:* this species was identified outside of the Development Site, to the east of the Study Area. No nest tree, or potential nest tree, was identified during surveys. Based on species' observation and behaviour during spotlighting surveys, the likely location of a potential roost/nest tree (if any) is further to east of the Study Area (**Figure 12**). As a precaution, a 100m buffer has been mapped around the approximate location where the Owl was observed to have originated. The buffer does not overlap with any part of the Development Site and therefore, no species polygon has been generated for this species.
- Little Bent-winged Bat (*Miniopterus australis*): this species was recorded outside of the Development Site via passive call recording (Anabat). No important breeding features (caves, tunnels, mines or tunnels) were identified during the surveys. Due to the absence of suitable breeding habitat within the Study Area and Development Site, a species polygon was not generated for this species.

Table 11 Sensitivity class of identified threatened species within the Development Site.

Identified threatened species within the Development Site	Sensitivity Class	Biodiversity Risk Weighting
Southern Myotis (*Southern Myotis*)	Moderate (Based on TBDC)	2

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- Contours - 2m intervals
- Southern Myotis (*Myotis macropus*) Detected

Southern Myotis (*Myotis macropus*) Habitat

- Species Polygon
- Foraging Habitat
- 200m Buffer from Foraging Habitat

Plant Community Type and Vegetation Zone

(Vegetation Zones apply within Development Site only)

- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Moderate) - **Zone 1**
- PCT 1646: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Degraded) - **Zone 2**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Degraded) - **Zone 3**
- PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Good)
- PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate) EEC - **Zone 4**
- PCT 1737: Typha rushland (Moderate) EEC - **Zone 5**
- Tracks and Infrastructure

Metres
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Nearmap - 2020

Southern Myotis (*Myotis macropus*) Habitat

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE: 13

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig13_SouthernMyotisHabitat.mxd

5. IMPACT ASSESSMENT

5.1 AVOIDING AND MINIMISING IMPACTS

5.1.1 Avoid and Minimising Impacts on Native Vegetation and Habitat

The proponent has reviewed various options regarding the location and layout of the Project. The proposed Development Site has been selected to limit direct impacts to areas of intact native vegetation and is within a previously managed portion of the Study Area containing mostly planted and exotic vegetation.

Areas of intact vegetation, current land use, location of approved developments, location of existing (or approved) roads and services and land zoning were all considered when selecting the location of the proposed development. The proposed location is accessible by an existing road (Fullerton Cove Road) which adjoins with Nelson Bay Road. As such, the use of this site was considered the best option to minimise environmental impacts.

The Development Site contains vegetation commensurate with two (2) threatened ecological communities; *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (known hereafter as Freshwater Wetlands EEC) (Vegetation Zone 5) and *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (known hereafter as Swamp Oak Floodplain Forest EEC) (Vegetation Zone 4). Both of these TECs occur outside of the Development Site, within the broader Study Area. The proposal aims to rezone more than 80% (approximately 2.30 ha) of vegetation commensurate with Swamp Oak Floodplain Forest EEC from *RU2: Rural Landscape* to *E3: Environmental Management*. Residual impacts to this EEC will be limited to areas of PCT 1728 proposed for rezoning to *B1: Neighbourhood Centre* (0.45 ha).

Impacts to Freshwater Wetlands EEC will be limited to 0.30 ha within land proposed for rezoning to *B1: Neighbourhood Centre* (Development Site). A total of 0.15 ha (more than 30% of this EECs distribution within the Study Area) will be retained as part of the proposed rezoning of land from *RU2: Rural Landscape* to *E3: Environmental Management*.

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Additionally, as part of the proposed rezoning of land from *RU2: Rural Landscape* to *E3: Environmental Management*, good condition vegetation (PCT 1717) likely commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, will be retained. Retained vegetation containing good structural complexity, especially good condition PCT 1717 and moderate condition PCT 1646, likely provides suitable foraging and potential roosting habitat for the Powerful Owl (*Ninox strenua*) a threatened species detected outside of the Development Site during surveys (**Figure 12**).

5.1.2 Avoid and Minimise Impacts on Prescribed Biodiversity Impacts

The following are prescribed impacts which need to be considered as per section 8.2 of the BAM (OEH, 2017).

Impact of development on the habitat of threatened species or ecological communities associated with significant geological features, human made structure or non-native vegetation.

No significant geological features occur within the Study Area. Non-native vegetation and a dwelling currently exist within the Study Area; however, these field surveys have determined that these features are not associated with threatened species habitat or ecological communities.

Impacts of the development on the connectivity of different habitat which facilitates movement of threatened species

The vegetation within the Development Site is not a key area for local connectivity of threatened species and does not represent an important local wildlife corridor. Habitat outside of the Development Site, and within the Study Area, contains potentially important foraging habitat for threatened species such as the Koala (*Eucalyptus robusta* dominated vegetation), Powerful Owl (forested areas containing arboreal mammals) and Southern Myotis (open water bodies in forested wetland areas). However, these areas will not be fragmented or have fragmentation increased as a result of the proposed development due to adjoining vegetation within and surrounding the Study Area. Therefore, the proposed development would not increase fragmentation on a local scale.

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Impact of the development on the movement of threatened species that maintains their life cycle

Impacts on vegetation as a result of the proposed development is confined mainly to areas that are low condition (degraded), with minor impacts on moderate condition forested wetland areas. These habitats are not considered important to threatened species within the locality, so as that their removal would significantly impact threatened species movement within the area and significantly impact their life cycle.

The retention of intact forested vegetation of higher quality outside of the Development Site which are connected to larger areas of vegetation within the area, is likely to maintain movement routes for any threatened species likely to occur within the locality.

Impacts of the development on water quality, bodies and hydrological processes that sustain threatened species or ecological communities.

The proposed development lies approximately 400m south-east of the Fullerton Cove which is part of the Hunter Estuary Wetlands RAMSAR site. Areas mapped under the Hunter Estuary Wetlands would not be directly impacted by the proposed development. Any indirect impacts to these areas would be minimised or avoided by the mitigation measures outlined in **Section 5.3**.

The Study Area (including parts of the Development Site) contain small patches of wetland complex and areas of forested wetlands which are periodically inundated. Majority of the Development Site has historically been cleared of native vegetation and managed regularly. Alterations to the topography of the site has likely resulted in changes to the hydrological regime which have likely affected these areas of forested wetlands and wetland complex.

The proposed development will impact 0.45 ha of PCT 1728 which contains waterbodies suitable for foraging for Southern Myotis (**Figure 13**). Although a small impact to suitable foraging habitat for Southern Myotis will result from the proposed development, the proposed rezoning of land to *E3: Environmental Management* will retain approximately 2.30 ha of vegetation (PCT 1728) in the south-western portion of the Study Area that is likely to provide suitable foraging habitat for the Southern Myotis (i.e., greater than 3 metres wide), particularly following rainfall events. Furthermore, as vegetation within Zone 5 largely consists of dense stands of *Typha orientalis*, the ability for open waterbodies to form, especially with open pools greater than 3 metres wide, is unlikely. As such, impacts to this area are unlikely to further impact suitable foraging habitat for the Southern Myotis. Mitigation measures outlined in

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Section 5.3 of this report will ensure impacts to foraging habitat for the Southern Myotis are restricted to within the proposed Development Site.

A portion of the vegetation within the west of the Study Area and Development Site has been identified in the BOM Groundwater Dependent Ecosystem Atlas as high potential Groundwater Dependent Ecosystems (GDE). Direct impacts to this vegetation would be offset via the ecosystem credit requirement. Indirect impacts to vegetation, and in the adjacent lot to the north-east, also mapped as high potential for GDE, would be avoided and minimised through the implementation of measures outlined in **Section 5.3**.

Impact of wind turbine strikes on protected animals

Not applicable to the current application.

Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The Study Area lies within the bounds of Fullerton Cove Road and Nelson Bay Road. The chance of vehicle strikes to threatened species or fauna associated with a TEC already exists. There is the chance of increased vehicle strike during the construction phase of the proposed development, however, this would be mitigated by enforcing speed limits within the immediate area, as outlined in **Section 5.3**.

Additionally, due to the likelihood of encounters of Koalas within the Port Stephens area, warning signs have previously been erected in areas with a high likelihood of encounter to help warn motorists.

5.2 ASSESSMENT OF IMPACTS

5.2.1 Impacts on Native Vegetation, Threatened Ecological Communities and Threatened Species Habitat

5.2.1.1 Direct Impacts – Native Vegetation

Within the Development Site, a total area of 2.46 ha of native vegetation will be impacted for the proposed development. Of these impacts, a total of 0.45 of vegetation is commensurate with *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC and 0.30 ha is commensurate with *Freshwater Wetlands*

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on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC. Each vegetation zone equates to one management zone. The future vegetation integrity score of each management zone will be 0 and is based on the removal of vegetation to facilitate the proposed development.

5.2.1.2 Direct Impacts – Threatened Flora Species

No threatened flora species were detected during surveys.

5.2.1.3 Direct Impacts – Threatened Fauna Species

Six threatened fauna species (five microbat species, one large forest owl species) were detected within the Study Area. Species detected include the following:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)
- *Miniopterus australis* Little Bent-winged Bat)
- *Myotis macropus* (Southern Myotis)
- *Ninox strenua* (Powerful Owl)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)

Impacts to threatened microbat species will be limited to the removal of potential foraging habitat only. No important breeding habitat such as caves or hollow-bearing trees will be removed for the proposed development. Similarly, no suitable nesting hollows for threatened forest owls will be removed. Given the minor scale of the development, it is unlikely that direct impacts would lead to a significant decline or local extinction of threatened fauna species within the locality.

Impacts to the Koala consist of the removal of currently mapped Supplementary Habitat along with the removal of one individual food tree (*Eucalyptus robusta*) (see **Section 4.3**).

5.2.1.4 Indirect Impacts

The Project has the potential to cause the following indirect impacts on land adjacent to the Development Site during construction:

- Increased levels of dust.
- Increased levels of noise and light; however, the majority of operations are expected to be during the day, so increased light levels would be minimal.

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- Erosion and sedimentation.
- Transfer of weeds and pathogens to adjoining vegetation
- Increased rubbish dumping in adjoining vegetation.

5.2.2 Prescribed Impacts

The proposed development has the potential to impact on one prescribed impact; the removal of foraging habitat for the threatened species Southern Myotis and Powerful Owl as discussed in **Section 5.1.2**.

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5.3 MITIGATING AND MANAGING IMPACTS ON BIODIVERSITY VALUES

A summary of mitigation and management measures for the Project are outlined in **Table 12**.

Table 12: Mitigation and management measures for the Project

Impact	Action and Outcome	Responsibility	Timing
Direct impact / prescribed impact			
Clearing of native vegetation	• Avoid and minimise clearing impacts to native vegetation where possible. • Clearly delineate the boundaries of the project footprint to prevent any unnecessary clearing beyond its extent. • Ensure vehicle and equipment parking areas and stockpile areas are identified and positioned to avoid areas containing ecological value. • Appropriate signage such as 'no go zone' or 'environmental protection area' should be installed. • Identify and communicate the location of any 'no go zones' in site inductions.	Construction site manager	Prior to and during vegetation clearing.
Removal of hollow-bearing trees / habitat trees, resulting in fauna injury and mortality.	• Limit the removal of habitat trees where possible. • If a habitat tree is identified within the Development Site during the construction phase, then a pre-clearing protocol should be implemented: o Pre-clearance surveys will be undertaken to determine if any inhabiting fauna are present; o A suitably qualified and trained fauna handler will be present during hollow-bearing tree clearing to rescue and relocate displaced fauna. • Appropriate exclusion fencing around any trees and woodland that are to be retained within the Development Site should be erected, considering allowance for Tree Protection Zones in accordance with AS4970 (Standards Australia, 2009).	Construction site manager and suitably qualified/trained ecologist.	Prior to and during tree clearing.

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Impact	Action and Outcome	Responsibility	Timing
Impacts to surface and groundwater quality and quantity due to sediment run-off and/or contaminant runoff into adjacent watercourses	• Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate. • Site-based vehicles will carry spill kits. • Erosion and sediment control will be required for the development in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) prior to commencement of construction. • Given the possibility of GDEs within the Development Site, A Groundwater Management Plan should be prepared for the proposed development. • Given the proximity of the proposed development to the Hunter Estuary Wetlands, A Surface Water Management Plan should be prepared for the proposed development. • Acid sulphate soils potentially occur within the Development Site therefore associated management actions may be required. • Limit the use of pesticides in the project footprint where possible to avoid contamination of nearby watercourses/wetland areas.	Construction site manager	During vegetation clearing, construction and operation
Vehicle collision with fauna	• Speed limits within the Development Site will be limited to 40 km/hr. • This limit should be clearly signed at all entry points to site.	Construction site manager	During construction and operation
Indirect Impact			
Transfer of weeds and pathogens to and from site.	• The fungal pathogens *Phytophora cinnamomi* and Myrtle Rust (*Austropuccinia psidii*) are known to occur in the Port Stephens LGA however, it is unknown if they occur within the Development Site. These pathogens can have devastating impacts on native plant communities and inhabiting fauna if not properly managed. • Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival on-site and prior to departure. • Ensure soil and seed material is not transferred in accordance with measures outlined in the CEMP. • Weed infestations within the construction footprint are to be identified and mapped prior to construction. • A Plan of Management for the control of weeds is to be prepared for the proposed development. High priority and high threat weeds should be the main focus of this plan. These include species weeds listed in **Section 4.2.2.2**.	Construction site manager	During vegetation clearing and construction.
Accidental incursions during clearing	• Identify and clearly mark 'No-Go Zones' (retained vegetation and site boundary). • All personnel onsite to be made aware of the sensitivity of the surrounding environmental features.	Construction site manager	During vegetation clearing and construction.

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Impact	Action and Outcome	Responsibility	Timing
Increase in dust and noise during clearing works	• Increased human activity (from workers and traffic levels) directly adjacent to sensitive habitat areas may cause disturbance to flora and fauna species in adjoining habitat. • Impacts from operational activities, such as disturbance to an animal's normal behaviour patterns due to noise, vibration, lighting or dust may cause areas of previously suitable habitat to become sub-optimal and may cause fauna species to vacate areas of previously suitable habitat. • Measures to mitigate impacts on flora and fauna from noise, vibration, waste, light and air pollution such as: o Enforce 'carry-in, carry-out' policy regarding rubbish and waste materials generated on-site during construction to avoid waste materials entering adjacent vegetation. o Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction. o Fence sensitive areas to delineate 'no go' zones. o Levels of lighting that will accompany the access road will be reduced to a minimal level to reduce any adverse effects upon the essential behavioural patterns of light-sensitive fauna. o Lighting should comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting. o Noise minimisation practices in accordance with DPIE recommendations.	Construction site manager	During vegetation clearing and construction.

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6. IMPACT SUMMARY

6.1 SERIOUS AND IRREVERSIBLE IMPACTS

No Serious and Irreversible Impacts (SAIIs) were identified within the Development Site.

6.2 IDENTIFICATION OF IMPACTS REQUIRING OFFSETS

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10.3 of the BAM (OEH, 2017).

6.2.1 Impacts on Native Vegetation

A summary of the impacts within the Development Site on native vegetation and the required ecosystem credits is provided in **Table 13**. The Biodiversity Credit Report is provided in **Appendix 5**.

Table 13: Summary of ecosystem credit requirements

Vegetation Zone	PCT & Class	Area (ha)*	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Credits Required
1	1646 (Moderate)	0.01	55.8	0	1
2	1646 (Degraded)	1.42	12.0	0	0
3	1717 (Degraded)	0.10	29.8	0	1
4	1728 (Moderate)	0.45	35.6	0	8
5	1737 (Moderate)	0.30	40.1	0	6
Total Credit Requirement					**16**

6.2.2 Impacts on Threatened Species

Only one threatened species will be impacted by the proposal. A summary of the impacts within the Development Site on threatened species and the required species credits is provided in **Table 13**. The Biodiversity Credit Report is provided in **Appendix 5**.

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Table 14: Summary of species credit requirements

Zone	PCT & Class	Biodiversity risk weighting	Area (ha)*	Credits Required
Southern Myotis (*Myotis macropus*)				
2	1646 Degraded	2	1.4	9
3	1717 Degraded	2	0.1	1
4	1728 Moderate	2	0.1	2
5	1737 Moderate	2	0.30	6
			Total Credits Required	**18**

6.3 CKPOM

Review of the Port Stephens Koala Habitat Planning Map indicates the most native vegetation with the Study Area is mapped as 'Supplementary Koala Habitat', with remaining areas mapped as 'Mainly cleared' (Plate 5).

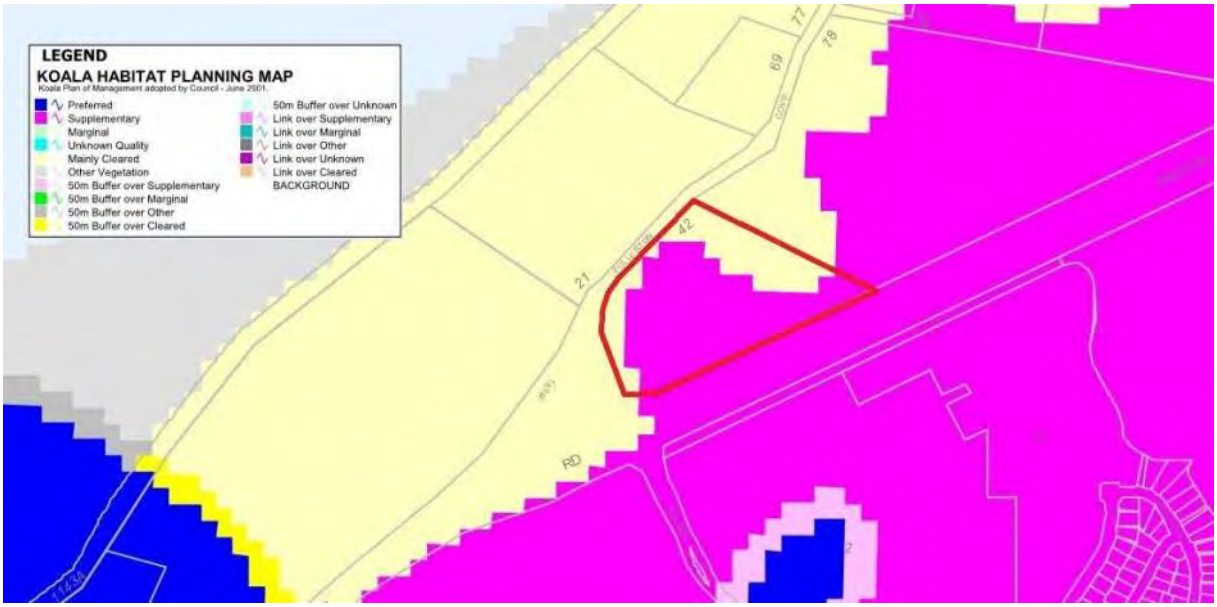


Plate 5. Port Stephens Koala Habitat mapping for the Study Area

In accordance with Appendix 6 of the Port Stephens CKPoM, the Koala Habitat was assessed using vegetation surveys to ground-truth the Port Stephens Koala Habitat Mapping. Vegetation within the Development Site was assessed and categorised based on the Habitat classifications defined in Lunney et. al. 1998. As such, it is recommended that the the Koala Habitat Mapping be amended as detailed in (**Table 15**). Based on the above descriptions from

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ground-truthed data, a site-specific Koala Habitat map has been developed to reflect Koala habitat (**Figure 14**).

Table 15: Proposed mapping of vegetation within the Study Area based on CKPoM guidelines.

PCT	Applicable Vegetation Zones	Community-based Survey Equivalent	Preferred Koala Food tree composition	Proposed Koala Habitat Mapping
Areas within Development Site				
1646	Zone 1	Category C – Tall open Blackbutt and Sydney Red Gum Forest	No food trees present within veg community	Supplementary
1646 & 1717	Zone 2 & Zone 3	Category C – Open Swamp Mahogany and Swamp Oak forest with Paperbark Category C – Tall open Blackbutt and Sydney Red Gum Forest	No food trees present within veg community	Mainly Cleared
1728	Zone 4	Category D – Open Sw Mahogany and Sw Oak Forest with Paperbark Dm	<10% (one *E. robusta*)	Supplementary
1737	Zone 5	Excluded – Swamp with dense reedland	No food trees present within veg community	Other
Areas outside the Development Site				
1646	N/A	Category C – Tall open Blackbutt and Sydney Red Gum Forest	No food trees present within veg community	Other
1717	N/A	Secondary Habitat (Lunney et al. 1998)	>10% *E. robusta*	Supplementary
1728	N/A	None – however, currently mapped as Supplementary under CKPoM	<10% (one *E. robusta*)	Supplementary
1737	N/A	Excluded – Swamp with dense reedland	No food trees present within veg community	Other

In accordance with the Port Stephens Comprehensive Koala Plan of Management, the proposed development was assessed against the performance criteria for rezoning requests (Appendix 2 of the Port Stephens CKPoM).

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As per the criteria outlined in Appendix 2 of the Port Stephens CKPoM, Council should be satisfied that the rezoning would:

a. No areas of Preferred Koala Habitat or defined Habitat Buffers are mapped within the Development Site or within the Study Area.

b. Potential impacts to Koalas from the proposed rezoning are considered to be negligible. A proposed development within the Development Site is considered to have a potential low impact to Koalas, given that a small portion of Supplementary habitat (within vegetation zones 1 and 4) would be modified as a result.

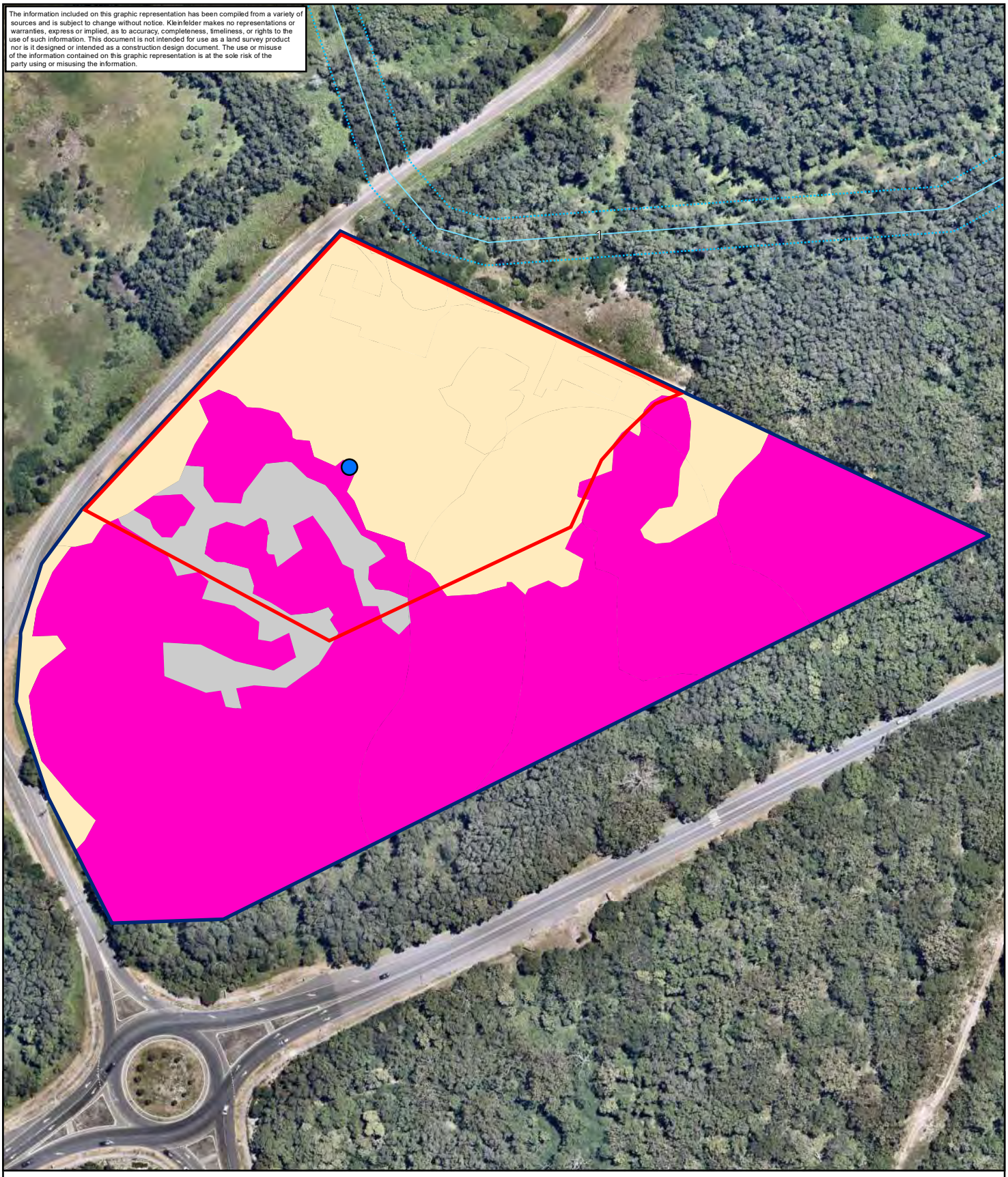
c. The strategic design of the proposed development aims at avoiding large areas of Supplementary Habitat which contain the preferred food tree *Eucalyptus robusta*. Only one (1) individual (< 30cm DBH) of *E. robusta* will be impacted as a result of the proposed development. Additionally, offset planting of Koala food trees (*E. robusta*) is recommended at 1:8 ratio, as per the replacement Koala habitat plantings guideline (PSC, 2014). Replacement plantings should be focused within retained habitat within the Study Area, i.e. *PCT 1717 - Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast*.

d. The strategic design of the proposed development would not significantly increase fragmentation of Koala habitat, nor would it impeded Koala movement, due to the already degraded nature of majority of the vegetation within the Development Site, limited number of preferred food trees (one *E. robusta*) and bordering roads (Fullerton Cove Road and Nelson Bay Road).

See **Appendix 6** for suitably qualified persons undertaking this assessment in accordance with the Port Stephens CKPoM.

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Legend

- Development Site Boundary
- Study Area
- Watercourse (Labelled with stream order)
- Riparian Buffers
- *Eucalyptus robusta*

Ground-truthed Koala Habitat Mapping (CKPoM)

- Supplementary Koala Habitat
- Other Vegetation
- Mainly Cleared

Metres
0 10 20 40 60 80 100

N

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PROJECT REFERENCE: 20210926

DATE DRAWN: 2021/03/25 09:16Version 2

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020
NSW EOH - 2020
Nearmap - 2021

Ground-truthed Koala Habitat Map (CKPoM)

Monteath and Powys
Biodiversity Development Assessment Report
42 Fullerton Cove Road, Fullerton Cove NSW
Lot 14 DP 258848

FIGURE:

14

L:\GIS FOLDER\00 CLIENT FILES\131996_MonteathPowys\20210926_BDAR_42FullertonCoveRd\Mapping\20210926_BDAR_Fig14_GroundTruthedKoalaHabitatMap.mxd

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APPENDIX 1. THREATENED SPECIES DATABASE SEARCH

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a ten-kilometre radius of the Study Area was obtained from the following databases:

- NSW Office of Environment and Heritage (OEH) BioNet Atlas: (http://www.bionet.nsw.gov.au/).

An assessment was then made of the likelihood of the threatened species, populations, and / or ecological communities reported or modelled to occur in the locality occurring within the Study Area or using the habitat within the Study Area as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Study Area based on the habitat requirements of each species. A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys.
- High – species known from the area (OEH Wildlife Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site.
- Moderate – species may be known from the area, potential habitat is present within the site.
- Low – species not known from the area and/or marginal habitat is present within the site.
- Nil – habitat requirements not met for this species within the site.

Note: Marine species identified within the desktop assessment including fish, whales, sharks, turtles, some marine bird species, cetaceans and species from the family Syngnathidae have been excluded from the list based on obvious habitat constraints. However, indirect impacts on these species and ecological communities have been considered.

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An assessment of the likelihood of threatened species, populations and ecological communities occurring within the Study Area

No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
Threatened Ecological Communities							
1.	*Central Hunter Valley Eucalypt Forest and Woodland*	-	CE	-	PMST	Study Area does not meet the Key Diagnostic features of this community.	
2.	*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*	-	E	-	PMST	**Community occurs within the Development Site**.	
3.	*Lowland Rainforest of Subtropical Australia*	-	CE	-	PMST	Vegetation within the Study Area does not meet the floristic diagnostics of this community.	
4.	*Subtropical and Temperate Coastal Saltmarsh*	-	V	-	PMST	Vegetation within the Study Area does not meet the floristic diagnostics of this community.	
Flora							
5.	*Allocasuarina simulans* Nabiac Casuarina	V	V	-	BAM candidate Species	The Nabiac Casuarina is restricted to the mid-north coast of NSW, from Nabiac to Forster and is very rare. This species grows in heathland on coastal sands. **Potentially suitable habitat within the Study Area, however it is likely geographically restricted. BAM candidate species**	Low
6.	*Angophora inopina* Charmhaven Apple	V	V	-	PMST	Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. **No BioNet records within the locality. Species has not been detected on site. Part of BAM candidate species list.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
7.	*Asperula asthenes* Trailing Woodruff	V	V	-	PMST	Occurs in damp sites, often along riverbanks. Occurs from Taree to Bulahdelah NSW. **Marginal habitat in the Study Area and no known records within locality and most likely geographically restricted. BAM candidate species.**	Low
8.	*Caladenia tessellata* Thick-lipped Spider-Orchid	E	V	-	PMST	The Thick-lipped Spider-orchid is known to favour low, dry sclerophyll woodland (for example open Kunzea woodland) with a heathy or sometimes grassy understorey on clay loams or sandy soils. **No suitable habitat within Study Area and no known records within locality.**	Nil
9.	*Callistemon linearifolius* Netted Bottlebrush	V	-	-	BAM candidate species list	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. **Potentially suitable habitat within Study Area. No known records within the locality. BAM candidate species.**	Low
10.	*Commersonia prostrata* Dwarf Kerrawang	E	E	-	PMST	Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (*Eucalyptus pauciflora*) Woodland and Ephemeral Wetland floor at Rowes Lagoon; Blue leaved Stringybark (*E. agglomerata*) Open Forest at Tallong; and in Brittle Gum (*E. mannifera*) Low Open Woodland at Penrose; Scribbly Gum (*E. haemastoma*)/ Swamp Mahogany (*E. robusta*) Ecotonal Forest at Tomago. **No suitable habitat within the Study Area. No known records within the locality.**	Nil
11.	*Corybas dowlingii* Red Helmet Orchid	E	-	-	BAM candidate species	Tuberous orchid species which grows in clonal colonies. The orchid has a solitary dark green heart-shaped to circular leaf 15-35 mm long and 15-35 mm wide ending in a sharp point. The solitary, erect flower grows close to the ground and is dark purplish red with whitish areas in the labellum. Occurs in sheltered areas such as gullies and southerly slopes in tall open forest on well-drained gravelly soil at elevations of 10-200 m. **No suitable habitat present within the Study Area. BAM candidate species.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
12.	*Cryptostylis hunteriana* Leafless Tongue Orchid	V	V	-	PMST	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. Occurs in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silver Top Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black She-oak (*Allocasuarina littoralis*). **No suitable habitat within the Study Area. No database records occur within the locality. Part of BAM candidate species list.**	Low
13.	*Cynanchum elegans* White-flowered Wax Plant	E	E	-	PMST	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (*Leptospermum laevigatum*) – Coastal Banksia (*Banksia integrifolia subsp. integrifolia*) coastal scrub; Forest Red Gum (*Eucalyptus tereticornis)* aligned open forest and woodland; Spotted Gum (*Corymbia maculata*) aligned open forest and woodland; and Bracelet Honey myrtle *Melaleuca armillaris* scrub to open scrub**. No suitable habitat within Study Area, no known records within locality.**	Nil
14.	*Diuris arenaria* Sand Doubletail	E	-	-	BAM candidate species	This species occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Grows in gently undulating country in eucalypt forest with a grassy understorey on clay soil. **Marginally suitable habitat present within the Study Area. No BioNet records within 5km locality. Part of the BAM candidate species list.**	Low
15.	*Diuris praecox* Rough Doubletail	V	V	-	PMST, BAM candidate species list	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. **No suitable habitat present within the Study Area. No database records within the 5km locality. Part of the BAM candidate species list.**	Low
16.	*Eucalyptus camfieldii* Camfield's Stringybark	V	V	2	BioNet Atlas, PMST	Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. **Two known records within the locality and occur north of Fullerton Cover near the Tilligerry SCA. Potentially suitable habitat within a small portion of the Development Area.**	**Moderate**

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
17.	*Eucalyptus parramattensis subsp. decadens* Earp's Gum	V	V	10	BioNet Atlas, PMST	Occurs in low-lying, often swampy areas and in woodlands with associates such as *Eucalyptus racemosa, E. globoidea* and *Angophora bakeri.* In the regional vegetation classification of the National Parks and Wildlife Service Earp's Gum occurs in two vegetation communities: Tomago Sand Swamp and the Kurri Sands Swamp (Bell 2006) communities, both of which occur on poor sandy soils from either Pleistocene sands or Permian sediments. **Low number of database records. Records occur within proximity of the Study Area. Potentially suitable habitat within the Study Area.**	**Moderate**
18.	*Euphrasia arguta*	-	CE	-	PMST	Known from Nundle State Forest and adjacent private land, in New South Wales. The species is known from three locations in two areas approximately 14 km apart. Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest. **Geographically restricted habitat for this species. No known BioNet records within the locality.**	Nil
19.	*Grevillea parviflora subsp. Parviflora* Small-flower Grevillea	V	V	-	PMST, BAM candidate species	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Also occurs in the Hunter in Kurri Sand Swamp Woodland. Hunter occurrences are usually 30-70m ASL. **No suitable habitat within the Study Area. Assessed as per the BAM candidate species list.**	Low
20.	*Lindernia alsinoides* Noah's False Chickweed	E	-	-	BAM candidate species	Recorded in coastal areas from Buladelah to Coopernook and with occurrences further north at Shannon Creek west of Coutts Crossing and also at Bungawalbyn. Grows in swamp forests and wetlands along coastal and hinterland creeks. **Potentially suitable habitat within the Development Site. BAM candidate species.**	Low
21.	*Maundia triglochinoides*	V	-	-	BAM candidate species	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. **Potential habitat within the Development Site due to standing water, however, heavy clay soils are not present. BAM candidate species.**	Low
22.	*Melaleuca biconvexa* Biconvex Paperbark	V	V	-	PMST	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. **Potentially suitable habitat within the Study Area, no known records within the locality. BAM candidate species.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
23.	*Melaleuca groveana* Grove's Paperbark	V	-	-	BAM candidate species	Grove's Paperbark grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry shrubby open forest and woodlands. **No suitable habitat in Study Area and no number of known records within 5km locality. BAM candidate species.**	Low
24.	*Persicaria elatior* Tall Knotweed	V	V	-	PMST	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance**. Potential suitable habitat within the Development Site. BAM candidate species**	Low
25.	*Phaius australis* Lesser Swamp-orchid	E	E	-	PMST	The Lesser Swamp-orchid is commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany are found. **Potentially suitable habitat present within the Study Area, no known records within the locality. No suitable habitat within the Development Site.**	Low
26.	*Prostanthera densa* Villous Mint-bush	V	V	-	BAM candidate species	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay). *Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. **No suitable habitat in Study Area. BAM candidate species.**	Low
27.	*Rhizanthella slateri* Eastern Underground Orchid	V	E	-	PMST	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. **No suitable habitat for this species occurs within the Study Area.**	Nil
28.	*Syzygium paniculatum* Magenta Lilly Pilly	E	V	-	PMST	On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. **No suitable habitat in Study Area.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
29.	*Tetratheca juncea* Black-eyed Susan	V	V	-	PMST	It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. **Potential habitat present within the Study Area. However, no known records within locality. BAM candidate species.**	Low
30.	*Thesium australe* Austral Toadflax	V	V	-	BAM candidate species	The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast. . **Marginal habitat present within the Study Area. BAM candidate species.**	Low
31.	*Zannichellia palustris*	E	-	-	BAM candidate species	A submerged aquatic plant. Leaves 2-7 cm long by less than 1 mm wide. Grows in fresh or slightly saline stationary or slowly flowing water. NSW populations behave as annuals, dying back completely every summer. **Potentially suitable habitat within the Development Site. BAM candidate species.**	Low
Amphibians							
1.	*Crinia tinnula* Wallum Froglet	V	-	3	BioNet Atlas	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. **Potentially suitable habitat in paperbark areas within the Study Area. Low number of database records mostly situated north of Fullerton Cove.**	**Moderate**
2.	*Heleioporus australiacus* Giant Burrowing Frog	V	V	-	PMST	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species are generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. **No suitable breeding habitat within the Study Area.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
3.	*Litoria aurea* Green and Golden Bell Frog	E	V	9	BioNet Atlas, PMST	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha spp*.) or spikerushes (*Eleocharis spp.).* Breeding habitat in NSW includes water bodies that are still, shallow, ephemeral, unpolluted (but the frog can be found in polluted habitats). **No suitable breeding habitat present within the Study Area. Density of Typha and lack of open water reduces habitat suitability for the species. Only 3 records of within the 5km locality in the last 10 years. Closest record is from 2011 and is greater than 2km in distance from the Development Site.**	Low
4.	*Mixophyes balbus* Stuttering Frog	-	V	-	PMST	The species occurs along the east coast of Australia. Habitat for the species includes rainforest and wet, tall, open forest, sheltering in deep leaf litter and thick understorey vegetation on the forest floor. Within Sydney Basin the species is now confined to populations in the Watagan Mountains, the southern Blue Mountains and Macquarie Pass. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts. **No suitable habitat for breeding for this species within the Study Area. No known records from the locality.**	Nil
5.	*Uperoleia mahonyi* Mahony's Toadlet	E	-	8	BioNet Atlas	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (*Schoenoplectus spp*., *Baumea spp*. and *Lepironia articulata*) and Broadleaf Cumbungi (*Typha orientalis*). **Potential suitable habitat within Study Area. Recent records are located north of Fullerton Cove.**	**Moderate**
Birds							

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
1.	*Anthochaera phrygia* Regent Honeyeater	CE	CE	-	PMST	Mostly recorded in box-ironbark eucalypt associations. At times of food shortage, the species also uses other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *E. maculata* (Spotted Gum). **Potentially suitable foraging habitat within the Study Area. No suitable foraging habitat within the Development Site. Study Area is not mapped as important habitat for this species under the BAM – Important Areas Map (DPIE, 2020c).**	Low
2.	*Artamus cyanopterus* Dusky Woodswallow	V	-	1	BioNet Atlas	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Most breeding activity occurs on the western slopes of the Great Dividing Range. **Potential habitat within the Study Area due to the species broad habitat requirements. Unlikely breeding habitat within the Study Area. Only one database record.**	Low
3.	*Botaurus poiciloptilus* Australasian Bittern	E	E	2	BioNet Atlas, PMST	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha spp.*) and spikerushes (*Eleocharis spp.*). **Marginal habitat within the Study Area (dense Typha). Low number of records within the locality. Usually prefers larger wetlands.**	Moderate
4.	*Burhinus grallarius* Bush Stone-curlew	E	-	4	BioNet Atlas	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feeds on insects and small vertebrates, such as frogs, lizards and snakes. Nests on the ground in a scrape or small bare patch. **Marginal habitat present within the Study Area. Low number of database records.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
5.	*Dromaius novaehollandiae* Emu (Population in Port Stephens LGA)	E	-	-	BAM candidate species	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest. **Potential habitat within the Study Area. BAM candidate species**	Low
6.	*Ephippiorhynchus asiaticus* Black-necked Stork	E	-	2	BioNet Atlas	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. Occasionally individuals will stray into open grass, woodland areas or flooded paddocks in search of food. Storks usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates. Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). **No suitable foraging or breeding habitat present within Study Area.**	Low
7.	*Epthianura albifrons* White-fronted Chat	V	-	38	BioNet Atlas	This species is gregarious and usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. **Potential foraging habitat, but no breeding habitat within Study Area. Closest record to Study Area occurred in 1997.**	Low
8.	*Erythrotriorchis radiatus* Red Goshawk	CE	V	-	PMST	Occurs in tropical and warm-temperate woodlands and forests. Mostly occurs in northern Australia with populations also occurring in the southeast of QLD and northeast of NSW. **No suitable habitat present within the Study Area, no known records within the locality.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
9.	*Falco hypoleucos* Grey Falcon	-	V	-	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. **Habitat within the Study Area is likely unsuitable for this species. Additionally, it is less common east of the Dividing Range. No known records within the locality.**	Nil
10.	*Grantiella picta* Painted Honeyeater	V	V	-	PMST	Inhabits *Acacia pendula* (Weeping Myall), *Acacia harpophylla* (Brigalow), Box-Gum Woodlands and Box-Ironbark Forests. Feeds on the fruits of mistletoes growing on woodland eucalyptus and acacia. **No suitable habitat present within the Study Area and no known records within the locality.**	Nil
11.	*Haematopus fuliginosus* Sooty Oystercatcher	V	-	5	BioNet Atlas	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. **No suitable foraging habitat within the Study Area. Breeds on offshore islands. Low number of database records.**	Low
12.	*Haematopus longirostris* Pied Oystercatcher	E	-	24	BioNet Atlas	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. **No suitable foraging or nesting habitat within the Study Area. Low number of records**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
13.	*Haliaeetus leucogaster* White-bellied Sea-Eagle	V	-	47	BioNet Atlas	This species hunts for fish, turtles and sea snakes however will feed on carrion along the waterline. The White-bellied Sea-Eagle most often nests in trees 30 m above the ground. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). **Potential roosting habitat present within the Study Area. May fly over Study Area. Moderate number of database records, some in proximity to the Study Area.**	**Moderate**
14.	*Hieraaetus morphnoides* Little Eagle	V	-	1	BioNet Atlas	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occupies open eucalypt forest, woodland, or open woodland. She-oak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. **Potentially suitable habitat for nest building within the Study Area. Only one record within the locality from 2000.**	Low
15.	*Lathamus discolor* Swift Parrot	E	CE	-	PMST	This migratory species has been recorded on the mainland from a variety of habitat types including dry and wet sclerophyll forest, forested wetlands, coastal swamp forests and heathlands. Known to use *E. pilularis*. This species breeds in Tasmania. **Marginal foraging habitat present within Study Area. No suitable foraging habitat present within the Development Site. Study Area is not mapped as habitat for this species under the BAM -Important Habitat Map (DPIE, 2020d).**	Low
16.	*Neophema pulchella* Turquoise Parrot	V	-	1	BioNet Atlas	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. **Potentially suitable foraging habitat within the Study Area. Only one record within the locality from 1982.**	Low

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		BC Act	EPBC Act				
17.	*Ninox strenua* Powerful Owl	V	-	6	BioNet Atlas	The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera* (Turpentine), *Allocasuarina littoralis* (Black She-oak), *Acacia melanoxylon* (Blackwood), *Angophora floribunda* (Rough-barked Apple), *Exocarpos cupressiformis* (Cherry Ballart) and a number of eucalypt species. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. **Potential foraging and roosting habitat present within the Study Area. Previous assessments within the Study Area (Ecobiological, 2011) have recorded this species.**	**Known**
18.	*Pandion cristatus* Eastern Osprey	V	-	2	BioNet Atlas	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. **No suitable foraging habitat present within the Study Area. Potential for breeding habitat. Low number of records, none in immediate vicinity to Study Area.**	Low
19.	*Rostratula australis* Australian Painted Snipe	-	E	-	PMST	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Breeding requirements include shallow wetlands with bare mud. It has also been noted to breed in grazing land. Forages under clumps of tea-trees. **Marginal breeding/foraging habitat within the Study Area. No records within the locality, however, areas of Typha could constitute potential habitat.**	Moderate

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		BC Act	EPBC Act				
20.	*Tringa brevipes* Grey-tailed Tattler	-	M	91	BioNet Atlas	In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. It is more heavily distributed along coastal regions north of Sydney. The Grey-tailed Tattler usually forages in shallow water, on hard intertidal substrates, such as reefs and rock platforms, in rock pools and among rocks and coral rubble, over which water may surge. The Grey-tailed Tattler usually roosts in the branches of mangroves or, rarely, in dense stands of other shrubs, or on snags or driftwood. The species breeds in the Northern Hemisphere. **No suitable foraging or roosting habitat within the Study Area. This species does not breed in Australia.**	Low
21.	*Tyto novaehollandiae* Masked Owl	V	-	3	BioNet Atlas	Lives in dry eucalypt forest and woodlands from sea level to 1100m. Optimal habitat includes an open understory and a mosaic of sparse (grassy) and dense (shrubby) ground cover on gentle terrain. Masked Owls nest in large hollow eucalypts (diameter at breast height at minimum 90 cm), with hollows greater than 40cm wide and 100cm deep and at least 3m above the ground. **Potential foraging and roosting habitat present within the Study Area. Three database records, with closest to sight recorded in 2006.**	**Moderate**
22.	*Tyto longimembris* Eastern Grass Owl	V	-	8	BioNet Atlas	Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation. **No suitable nesting habitat within the Study Area. A small number of database records within the locality, none of which are close to the Study Area.**	Low
Mammals							
1.	*Chalinolobus dwyeri* Large-eared Pied Bat	V	V	-	PMST	Found in well-timbered areas containing gullies. Prefers dry forest close to sandstone ridgelines. Roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. **No suitable roosting habitat present within Study Area. No known records within the locality.**	Nil

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		BC Act	EPBC Act				
2.	*Dasyurus maculatus* Spotted-tailed Quoll	V	E	-	PMST	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. **Potential habitat within the Study Area. No suitable denning habitat present within the Development Site due to lack of hollows, logs and rocky outcrops.**	Low
3.	*Falsistrellus tasmaniensis* Eastern False Pipistrelle	V	-	2	BioNet Atlas	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. **Suitable roosting and foraging habitat present within the Study Area. Low number of database records, none of which, occur within the Study Area.**	**Known**
4.	*Miniopterus australis* Little Bent-winged Bat	V	-	10	BioNet Atlas	Occupies moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. **Suitable foraging and roosting habitat (hollows) present within the Study Area, however, no caves, tunnels, mines are known from the locality. Low number of data base records.**	**Known**
5.	*Miniopterus orianae oceanensis* Large Bent-winged Bat	V	-	10	BioNet Atlas	Forages in forested habitats. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. **Suitable foraging habitat present within the Study Area, but roosting habitat is limited by lack of caves and artificial structures. Low number of records within the locality.**	**Moderate**

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		BC Act	EPBC Act				
6.	*Micronomus norfolkensis* Eastern Freetail-bat	V	-	12	BioNet Atlas	Tall open forest, *Melaleuca*, dry sclerophyll forest, River Red Gum and Yellow Box woodlands and riparian open forest. Roost mainly in tree hollows but will also roost under bark or in man-made structures. **Suitable foraging and roosting habitat present within the Study Area. Low number of records, none occur within the Study Area.**	**Known**
7.	*Myotis macropus* Southern Myotis	V	-	7	BioNet Atlas	This species generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. **Potential foraging habitat exists within the Study Area. Potential roosting habitat, (hollow-bearing trees) occur within the Study Area, outside the Development Site. Potential for foraging habitat also occurs within the stream to the north of the Study Area.**	**Known**
8.	*Petaurus norfolcensis* Squirrel Glider	V	-	17	BioNet Atlas	Inhabits mature or old growth Box, Box-Ironbark woodlands and *Eucalyptus tereticornis* (River Red Gum) forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. **Suitable foraging and denning habitat present within the Study Area. Low number of records with some in proximity to the Study Area.**	**Moderate**
9.	*Petaurus volans* Greater Glider	-	V	-	PMST	The species occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Occupy a relatively small home range with an average size of 1 to 3 ha .**No suitable habitat is present within the Development Site, however potentially suitable habitat exists within the Study Area. No records within the locality.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
10.	*Phascogale tapoatafa* Brush-tailed Phascogale	V	-	-	BAM candidate species	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. **Marginal foraging and breeding habitat within the Study Area. No known records within 5km locality. BAM candidate species.**	Low
11.	*Phascolarctos cinereus* Koala	V	V	59	BioNet Atlas	In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. **Suitable foraging habitat present within the Study Area. Moderate number of records with some in proximity to the Study Area. The Study Area connects to larger areas of Koala foraging habitat.**	**Moderate**
12.	*Planigale maculata* Common Planigale	V	-	1	BioNet Atlas	Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water**. Potential habitat within Study Area. Only one record (2018), within the locality and close to the Study Area.**	**Moderate**
13.	*Pseudomys novaehollandiae* New Holland Mouse	-	V	14	BioNet Atlas, PMST	Inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. **Potentially suitable habitat present within the Study Area. Low number of known records within the locality.**	Low
14.	*Pteropus poliocephalus* Grey-headed Flying-fox	V	V	23	BioNet Atlas, PMST	Occurs across a wide range of habitat types along the eastern seaboard of Australia, depending on food availability. Fruit from myrtaceous trees and rainforest trees form the major components of their diet. **Suitable foraging habitat present within the Study Area when Eucalyptus trees are flowering. Closest nationally important GHFF camp is in Carrington outside of the locality. Another known flying fox camp exists at Tomago near Fullerton Cove within the locality (DAWE, 2020).**	**Moderate**

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		BC Act	EPBC Act				
15.	*Potorous tridactylus* Long-nosed Potoroo	V	V	-	PMST	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. **Potentially suitable habitat within small section of the Development Site. No BioNet records within the locality. This species is linked to PCT 1717 and requires assessment.**	Low
16.	*Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat	V	-	3	BioNet Atlas	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country**. Potential roosting habitat within Study Area, but outside of the Development Area. Low number of records, none occurring within close proximity to Study Area.**	**Known**
17.	*Scoteanax rueppellii* Greater Broad-nosed Bat	V	-	7	BioNet Atlas	This species occurs in a variety of habitats including rainforest, dry and wet sclerophyll forest and eucalypt woodland. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Roosts in tree hollows and occasionally buildings. **Suitable foraging and roosting habitat present within the Study Area. Low number of database records, none of which occur directly within the Study Area.**	**Moderate**
Migratory Species							
1.	*Actitis hypoleucos* Common Sandpiper	-	M	9	BioNet Atlas	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Generally, the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. The population of Common Sandpiper that migrates to Australia breeds in the Russian far east. **No suitable foraging habitat or breeding habitat within the Study Area. Low number of database records.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
2.	*Apus pacificus* Fork-tailed Swift	-	M	3	BioNet Atlas	Almost exclusively aerial. Mostly occur over inland plains but sometimes above foothills or in coastal areas. Occurs over cliffs and beaches and over islands and sometimes well out to sea. Also occurs over settled areas, including towns, urban areas and cities. Mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. Also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. Sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. **May fly over Study Area to forage due to wide range of habitat preferences. Low number of database records, closest occurs at Fern Bay, south of the Study Area.**	Low
3.	*Arenaria interpres* Ruddy Turnstone	-	M	48	BioNet Atlas	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. The Ruddy Turnstone mainly forages between lower supralittoral and lower littoral zones of foreshores, from strand-line to wave-zone. The Ruddy Turnstone roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris. The Ruddy Turnstone breeds on the coasts of Europe, Asia and North America, generally north of 60° latitude. **No suitable foraging or roosting habitat within the Study Area. This species does not breed in Australia.**	Low
4.	*Ardea ibis* Cattle Egret	-	M	4	BioNet Atlas	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. The Cattle Egret often forages away from water on low lying grasslands, improved pastures and croplands. The Cattle Egret roosts in trees, or amongst ground vegetation in or near lakes and swamps. **No suitable foraging habitat within Study Area. Low number of known records.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
5.	*Ardenna carneipes* Flesh-footed Shearwater	V	M	2	BioNet atlas	The Flesh-footed Shearwater mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. The Flesh-footed Shearwater is a locally common visitor to waters of the continental shelf and continental slope off southern Australia (south-western Western Australia to south-eastern Queensland) and around Lord Howe Island. The Flesh-footed Shearwater feeds on small fish, cephalopod molluscs (squid, cuttlefish, nautilus and argonauts), crustaceans (barnacles and shrimp), other soft-bodied invertebrates. **No suitable foraging habitat within the Study Area. Low number of database records, none of which occur within the Study Area.**	Low
6.	*Ardenna pacifica* Wedge-tailed Shearwater	-	M	7	BioNet Atlas	The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. In Australia, Wedge-tailed Shearwaters have been observed feeding along the junction between inshore and offshore water masses. The Wedge-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands. **No suitable foraging or breeding habitat exists within the Study Area.**	Low
7.	*Ardenna tenuirostris* Short-tailed Shearwater	-	M	6	BioNet Atlas	The Short-tailed Shearwater establishes massive breeding colonies off the southern and south-eastern coasts of Australia each year. The nest is a leaf-lined chamber at the end of a burrow in the ground. The Short-tailed Shearwater feeds on krill, small fish and other small marine creatures. Food is caught mostly on the surface of the water but sometimes birds are seen diving for food. **No foraging habitat within the Study Area. Species nests in Australia but usually off of the coast. Low number of database records.**	Low
8.	*Calidris acuminata* Sharp-tailed Sandpiper	-	M	539	BioNet Atlas	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short sparse vegetation, such as grass or saltmarsh. **No suitable foraging habitat is present within the Study Area. This species does not breed within Australia.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
9.	*Calidris canutus* Red Knot	-	E,M	160	BioNet Atlas	In NSW the Red Knot mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. **No suitable habitat within the Study Area.**	Low
10.	*Calidris ferruginea* Curlew sandpiper	-	CE, M	915	BioNet Atlas	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. This species does not breed in Australia. **No suitable breeding or foraging habitat within the Study Area.**	Low
11.	*Calidris melanotos* Pectoral Sandpiper	-	M	7	BioNet Atlas	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. They walk slowly on grass fringing water to forage. The Pectoral Sandpiper breeds in northern Russia and North America. **No suitable foraging habitat present within the Study Area. This species does not breed within Australia.**	Low
12.	*Calidris minuta* Little Stint	-	M	1	BioNet Atlas	The Little Stint, *Calidris minuta*, breeds in Arctic regions from Norway east to the New Siberian Islands. It is a vagrant to Australia. Little stints consume small invertebrates obtained by rapid pecking action on muddy surfaces. **No suitable foraging habitat occurs within the Study Area. This species breeds outside of Australia.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
13.	*Calidris ruficollis* Red-necked Stint	-	M	167	BioNet Atlas	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. The Red-necked Stint mostly forages on bare wet mud on intertidal mudflats or sandflats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. The Red-necked Stint roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation. The Red-necked Stint breeds in Siberia and sporadically in north and west Alaska. **No suitable foraging habitat within the Study Area. This species does not breed within Australia.**	Low
14.	*Calidris tenuirostris* Great Knot	V	M	27	BioNet Atlas	The Great Knot has been recorded around the entirety of the Australian coast. In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds. The Great Knot breeds in alpine and sub-alpine vegetation in north-east Siberia and the far north-east of Russia. **No suitable foraging habitat present within the Study Area. This species does not breed in Australia.**	Low
15.	*Charadrius leschenaultii* Greater Sand-plover	V	V	3	BioNet Atlas	In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water. The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. **No suitable foraging habitat present within the Study Area. This species does not breed in Australia.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
16.	*Charadrius mongolus* Lesser Sand Plover	V	M	30	BioNet Atlas	Within Australia, the Lesser Sand-Plover is widespread in coastal regions and has been recorded in all states. Internationally important sites in Australia include the Hunter Rivers Estuary. The species feeds mostly on extensive, freshly-exposed areas of intertidal sandflats and mudflats in estuaries or beaches, or in shallow ponds in saltworks. They roost near foraging areas, on beaches, banks, spits and banks of sand or shells. The species does not breed in Australia. **No suitable foraging or roosting habitat within the Study Area. This species does not breed in Australia.**	Low
17.	*Charadrius veredus* Oriental Plover	-	M	1	BioNet Atlas	The Oriental Plover is a non-breeding visitor to Australia. Oriental Plovers usually forage among short grass or on hard stony bare ground, but also on mudflats or among beachcast seaweed on beaches. Oriental Plovers sometimes roost on soft wet mud or in shallow water of beaches and tidal mudflats. **Limited foraging habitat (grassy areas) within the Study Area. This species does not breed within Australia.**	Low
18.	*Chlidonias leucopterus* White-winged Black Tern	-	M	2	BioNet Atlas	The species is a non-breeding migrant to Australia. In Australia, and elsewhere in their non-breeding range, the species mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. They mainly forage over coastal estuaries and freshwater wetlands, and occasionally over terrestrial vegetation. **No suitable foraging habitat present within the Study Area. This species does not breed within Australia.**	Low
19.	*Gallinago hardwickii* Latham's Snipe	-	M	20	BioNet Atlas	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). **Marginal habitat present within the Study Area. Low number of records, within the locality.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
20.	*Hirundapus caudacutus* White-throated Needletail	-	M	-	PMST	In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level'. The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. The species breeds in wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests. **Species may forage aerially above the Study Area. No suitable roosting habitat present within the Study Area. No records within the locality.**	Low
21.	*Hydroprogne caspia* Caspian Tern	-	M	7	BioNet Atlas	Widespread east of the Great Divide, mainly in coastal regions, and also in the Riverina and Lower and Upper Western Regions, with occasional records elsewhere. The Caspian Tern breeds on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks. Breeding is recorded from the Menindee Lakes (western NSW). The Caspian Tern usually forages in open wetlands, including lakes and rivers. **No suitable foraging or breeding habitat present within the Study Area. Low number of database records.**	Low
22.	*Limicola falcinellus* Broad-billed Sandpiper	V	M	8	BioNet Atlas	The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. The Broad-billed Sandpiper is omnivorous, foraging on worms, including polychaetes, molluscs, crustaceans, insects, seeds and occasionally rootlets and other vegetation. This species does not breed in Australia. **No suitable breeding or foraging habitat present within the Study Area.**	Low
23.	*Limnodromus semipalmatus* Asian Dowitcher	-	M	-	BioNet Atlas	The Asian Dowitcher occurs in sheltered coastal Environments, such as embayments, coastal lagoons, estuaries and tidal creeks. They are known to frequent shallow water and exposed mudflats or sandflats. The Asian Dowitcher breeds in Siberia, Mongolia and north-east China. There is only limited information on the diet of the Asian Dowitcher in Australia. It is known to eat polychaete worms and larvae, also insect larvae and molluscs. The species feeds on inter-tidal mudflats. **No suitable foraging or breeding habitat within the Study Area.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
24.	*Limosa lapponica* Bar-tailed Godwit	-	M	765	BioNet Atlas, PMST	Inhabits and feeds in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh. **No suitable habitat for foraging or roosting present within the Study Area.**	Nil
25.	*Limosa lapponica menzbieri* Northern Siberian Bar-tailed Godwit	-	CE, M	-	PMST	This migratory species breeds in Siberia and has been recorded coastally in all Australian states. It forages on coastal water edges, estuaries and harbours. **No suitable habitat present within the Study Area and no known records within the locality.**	Nil
26.	*Limosa limosa* Black-tailed Godwit	V	M	274	BioNet Atlas	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The Black-tailed Godwit forages on wide intertidal mudflats or sandflats, in soft mud or shallow water and occasionally in shallow estuaries. They use similar habitats on shores of inland lakes and other wetlands. The Black-tailed Godwit does not breed in Australia. **No suitable foraging habitat present within the Study Area. Breeding for this species does not occur in Australia.**	Low
27.	*Merops ornatus* Rainbow Bee-eater	-	M	1	BioNet Atlas	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It also occurs in grassland, wetland areas and farmland**. Potential habitat within the Study Area within the cleared areas. One record within the locality.**	Low
28.	*Numenius madagascariensis* Eastern Curlew	-	M	87	BioNet Atlas, PMST	Occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets. **No suitable foraging or roosting habitat present within the Study Area. Moderate amount of database records occurring around the intertidal areas of Fullerton Cove.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
29.	*Numenius phaeopus* Whimbrel	-	M	66	BioNet Atlas	The Whimbrel is often found on the intertidal mudflats of sheltered coasts. The Whimbrel generally forages on intertidal mudflats, along the muddy banks of estuaries and in coastal lagoons, either in open unvegetated areas or among mangroves. The Whimbrel nests in the branches of mangroves, around mudflats and in estuaries. **No suitable nesting or foraging habitat present within the Study Area.**	Low
30.	*Pachyptila turtur subantarctica* Fairy Prion (southern)	-	M	-	PMST	he fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. Feeds by plucking food from the ocean surface**. No suitable breeding or foraging habitat within the Study Area. No records within the locality.**	Nil
31.	*Plegadis falcinellus* Glossy Ibis	-	M	1	BioNet Atlas	The Glossy Ibis' preferred habitat for foraging and breeding are fresh-water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. **No suitable breeding or foraging habitat is present within the Study Area. Only one database record from within the locality.**	Low
32.	*Pluvialis fulva* Pacific Golden Plover	-	M	282	BioNet Atlas	Within Australia, the Pacific Golden Plover is widespread in coastal regions. The Pacific Golden Plover breeds mostly in northern Siberia. In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. This species usually forages on sandy or muddy shores. They usually roost near foraging areas, on sandy beaches and spits or rocky points, islets or exposed reefs, occasionally among or beneath vegetation including mangroves or low saltmarsh, or among beachcast seaweed. **No suitable foraging, roosting or breeding habitat present within the Study Area.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
33.	*Pluvialis squatarola* Grey Plover	-	M	1	BioNet Atlas	In Australia, the Grey Plover has been recorded in all states, where it is found along the coasts. Grey Plovers breed north of 65° N in the Northern Hemisphere, in northern Siberia. Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They usually roost in sandy areas, such as on unvegetated sandbanks or sand-spits on sheltered beaches or other sheltered environments such as estuaries or lagoons. **No suitable foraging or roosting habitat present within the Study Area. This species does not breed in Australia.**	Low
34.	*Sternula albifrons* Little Tern	E	M	25	BioNet Atlas, PMST	Almost exclusively coastal, preferring sheltered environments; however, may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. **No suitable habitat within the Study Area. Low number of database records.**	Low
35.	*Sterna hirundo* Common Tern	-	M	34	BioNet Atlas	The species is a non-breeding migrant to Australia. In Australia, Common Terns are mainly found along the eastern coast, where they are widespread and common from south-eastern Queensland to eastern Victoria. Common Terns are marine, pelagic and coastal. Common Terns forage in marine environments, often close to the shore, including sheltered embayments and in the surf-zone, but also well out to sea. **No suitable foraging habitat present within the Study Area. This species does not breed in Australia. Relatively low number of database records.**	Low
36.	*Sternula nereis nereis* Australian Fairy Tern	-	V	-	PMST	The Australian Fairy Tern nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there. This species feeds over water and preys on small fish. **No suitable breeding or foraging habitat on site. No records within the locality.**	Nil

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
37.	*Thinornis cucullatus cucullatus* Eastern Hooded Plover	-	V	-	PMST	The Eastern Hooded Plover is a small Australian beach nesting bird. It mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Nests are found above the high-water mark on flat beaches, on stony terraces, or on sparsely vegetated dunes. **No suitable habitat within the Study Area and no known records within the locality.**	Nil
38.	*Tringa glareola* Wood Sandpiper	-	M	1	BioNet Atlas	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. The Wood Sandpiper forages on moist or dry mud at the edges of wetlands, either along shores, among open scattered aquatic vegetation, or in clear shallow water. The Wood Sandpiper has been recorded loafing on a low, grassy hillock in a flooded meadow. It has also been recorded perched low in trees and on fences. The Wood Sandpiper breeds across Eurasia, mostly in Scandinavia, the Baltic countries and Russia. **No suitable foraging or roosting habitat present within the Study Area. This species breeds outside of Australia.**	Low
39.	*Tringa nebularia* Common Greenshank		M	268	BioNet Atlas	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and salt flats. **No suitable habitat within Study Area. Records are concentrated around the wetland areas of Fullerton Cove.**	Low
40.	*Tringa stagnatilis* Marsh Sandpiper	-	M	346	BioNet Atlas	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. The Marsh Sandpiper usually forages in shallow water at the edge of wetlands. The Marsh Sandpiper has been recorded roosting or loafing on tidal mudflats, near low saltmarsh, and around inland swamps. **No suitable foraging or roosting habitat within Study Area. Database records are concentrated around intertidal areas within the locality.**	Low

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No.	Species	Legal Status*		Number of records (10 km)	Source#	Habitat Preferences	Likelihood of occurrence
		BC Act	EPBC Act				
41.	*Xenus cinereus* Terek Sandpiper	V	M	237	BioNet Atlas	The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally, roosts communally amongst mangroves or dead trees, often with related wader species. **No suitable foraging or roosting habitat within Study Area. Database records concentrated around intertidal areas.**	Low

* Legal Status: V = Vulnerable, E = Endangered, CE = Critically Endangered under BC Act # Source: Bionet Atlas of NSW Wildlife (DPIE).

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APPENDIX 2. FLORA SPECIES LIST

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Family	Scientific Name	BAM Growth Form	Q01		Q02		Q03		Q04		Q05		Q06	
			C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab
Aizoaceae	*Carpobrotus glaucescens*	Forb (FG)							0.1	1	2	20		
Aizoaceae	*Galenia pubescens*	High Threat							2	20				
Alliaceae	*Agapanthus* spp.	Exotic											0.1	10
Amaranthaceae	*Alternanthera denticulata*	Forb (FG)			0.2	50								
Apiaceae	*Hydrocotyle bonariensis*	Exotic			0.5	20			25	500	0.5	20	0.1	50
Apiaceae	*Hydrocotyle sibthorpioides*	Forb (FG)											0.1	50
Apiaceae	*Platysace lanceolata*	Shrub (SG)	0.1	1										
Apocynaceae	*Parsonsia straminea*	Other (OG)			1	1	0.2	1						
Araliaceae	*Schefflera actinophylla*	High Threat											0.5	1
Arecaceae	*Livistona australis*	Other (OG)											1	1
Arecaceae	*Phoenix canariensis*	High Threat											3	1
Asteraceae	*Ambrosia tenuifolia*	Exotic	0.1	2					0.5	50	0.1	20		
Asteraceae	*Bidens pilosa*	High Threat	0.2	20										
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata*	High Threat	60	50							2	2		
Asteraceae	*Conyza bonariensis*	Exotic											0.1	50
Asteraceae	*Heterotheca grandiflora*	Exotic							1	50				
Asteraceae	*Hypochaeris radicata*	Exotic							0.1	10			5	500
Asteraceae	*Hypochoeris radicata*	Exotic									0.5	50		
Asteraceae	*Sonchus asper*	Exotic											0.1	10
Basellaceae	*Anredera cordifolia*	High Threat	0.1	1										
Bignoniaceae	*Jacaranda mimosifolia*	Exotic											1	0
Bignoniaceae	*Pandorea pandorana*	Other (OG)	0.2	20										
Blechnaceae	*Blechnum indicum*	Fern (EG)											0.1	2

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Family	Scientific Name	BAM Growth Form	Q01		Q02		Q03		Q04		Q05		Q06	
			C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab
Cactaceae	*Opuntia stricta*	Exotic							0.1	1				
Caryophyllaceae	*Paronychia brasiliana*	Exotic											5	2000
Caryophyllaceae	*Paronychia franciscana*	Exotic							0.1	50	0.1	20		
Caryophyllaceae	*Petrorhagia velutina*	Exotic							0.1	2	0.1	1		
Caryophyllaceae	*Stellaria media*	Exotic							0.1	20				
Casuarinaceae	*Casuarina glauca*	Tree (TG)			10	2	1	1						
Commelinaceae	*Commelina cyanea*	Forb (FG)	0.1	20										
Convolvulaceae	*Dichondra repens*	Forb (FG)											2	10000
Convolvulaceae	*Ipomoea indica*	High Threat			5	20	0.2	5			0.5	5		
Cyperaceae	*Baumea articulata*	Grass & grasslike (GG)			1	50	0.1	20						
Cyperaceae	*Cyperus sesquiflorus*	Exotic											2	500
Dennstaedtiaceae	*Pteridium esculentum*	Fern (EG)	5	50					15	100	25	500		
Dilleniaceae	*Hibbertia fasciculata*	Shrub (SG)							0.1	1				
Dilleniaceae	*Hibbertia linearis*	Shrub (SG)	0.1	2										
Ericaceae	*Monotoca elliptica*	Shrub (SG)	5	3							2	2		
Euphorbiaceae	*Homalanthus populifolius*	Shrub (SG)	0.1	5										
Fabaceae (Faboideae)	*Kennedia rubicunda*	Other (OG)	0.2	10										
Fabaceae (Mimosoideae)	*Acacia longifolia*	Shrub (SG)	0.3	1							1	2		
Fumariaceae	*Fumaria officinalis*	Exotic	0.1	20										
Iridaceae	*Romulea minutiflora*	Exotic											1	500
Juglandaceae	*Carya illinoensis*	Exotic									0.1	1		
Juncaginaceae	*Triglochin* spp.	Forb (FG)			20	1000								
Lamiaceae	*Clerodendrum tomentosum*	Tree (TG)	0.3	3										
Lauraceae	*Cassytha glabella*	Other (OG)	5	1000					0.2	50				

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Family	Scientific Name	BAM Growth Form	Q01		Q02		Q03		Q04		Q05		Q06	
			C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab
Lomandraceae	*Lomandra longifolia*	Grass & grasslike (GG)	0.5	6										
Luzuriagaceae	*Geitonoplesium cymosum*	Other (OG)	1	50										
Malvaceae	*Sida rhombifolia*	Exotic	0.1	2					2	20				
Menispermaceae	*Sarcopetalum harveyanum*	Other (OG)	1	50										
Moraceae	*Maclura cochinchinensis*	Other (OG)	0.1	2										
Myrtaceae	*Eucalyptus pilularis*	Tree (TG)	40	1										
Myrtaceae	*Eucalyptus piperita*	Tree (TG)	30	5										
Myrtaceae	*Melaleuca quinquenervia*	Tree (TG)			35	7	5	1					30	3
Oleaceae	*Notelaea longifolia*	Tree (TG)	0.1	2										
Onagraceae	*Oenothera mollissima*	Exotic							0.5	10	0.1	5		
Other	*Aechmea spp.*	Other (OG)											0.1	10
Other	*Cyperus spp.*	Other (OG)							0.1	3				
Other	*Ficus spp.*	Other (OG)											5	2
Other	*Gardenia spp.*	Other (OG)											1	2
Other	*Grevillea spp.*	Other (OG)									1	1		
Other	*Hakea spp.*	Other (OG)									1	1		
Other	*Persicaria strigosa*	Other (OG)			0.1	20	3	100						
Other	Yellow Asteraceae	Other (OG)							2	20	3	50		
Oxalidaceae	*Oxalis latifolia*	Exotic											0.1	20
Oxalidaceae	*Oxalis perennans*	Forb (FG)											0.1	20
Oxalidaceae	*Oxalis pes-caprae*	Exotic	0.1	5					0.1	50				
Passifloraceae	*Passiflora herbertiana*	Other (OG)	0.2	1										
Passifloraceae	*Passiflora subpeltata*	Exotic	0.2	5										
Phormiaceae	*Dianella revoluta*	Forb (FG)	0.5	5										
Phyllanthaceae	*Breynia oblongifolia*	Shrub (SG)	5	20										

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Family	Scientific Name	BAM Growth Form	Q01		Q02		Q03		Q04		Q05		Q06	
			C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab
Phyllanthaceae	*Glochidion ferdinandi*	Tree (TG)	1	5									2	1
Pinaceae	*Pinus elliotii*	Exotic									5	1		
Pittosporaceae	*Billardiera scandens*	Other (OG)	0.1	20										
Pittosporaceae	*Pittosporum undulatum*	Shrub (SG)	1	1										
Plantaginaceae	*Plantago lanceolata*	Exotic							0.2	20			1	100
Poaceae	*Avena barbata*	Exotic							10	1000				
Poaceae	*Bromus catharticus*	Exotic											10	1000
Poaceae	*Cenchrus longispinus*	High Threat							0.1	2				
Poaceae	*Cynodon dactylon*	Grass & grasslike (GG)							5	1000	2	500	1	500
Poaceae	*Eragrostis curvula*	High Threat							25	200	40	500		
Poaceae	*Imperata cylindrica*	Grass & grasslike (GG)	0.5	5										
Poaceae	*Megathyrsus maximus*	High Threat	15	500									0.2	20
Poaceae	*Melinis repens*	Exotic							0.1	2	0.1	1		
Poaceae	*Panicum effusum*	Grass & grasslike (GG)							0.1	1				
Poaceae	*Stenotaphrum secundatum*	High Threat					5	500					20	10000
Polygonaceae	*Acetosella vulgaris*	High Threat							2	50				
Proteaceae	*Banksia serrata*	Tree (TG)	5	1										
Proteaceae	*Persoonia levis*	Shrub (SG)	0.1	1										
Rhamnaceae	*Alphitonia excelsa*	Tree (TG)	1	2										
Rosaceae	*Rubus fruticosus*	High Threat	0.1	5			5	50						
Rubiaceae	*Richardia humistrata*	Exotic											15	10000
Rubiaceae	*Richardia stellaris*	Exotic							0.5	10	0.2	10		
Sapindaceae	*Cupaniopsis anacardioides*	Tree (TG)	0.1	1										
Selaginaceae	*Hebenstretia dentata*	Exotic							2	50	0.2	5		
Solanaceae	*Solanum nigrum*	Exotic	0.1	5			0.1	1	0.5	3				

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Family	Scientific Name	BAM Growth Form	Q01		Q02		Q03		Q04		Q05		Q06	
			C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab	C (%)	Ab
Strelitziaceae	*Strelitzia reginae*	Exotic											0.5	1
Thelypteridaceae	*Cyclosorus interruptus*	Fern (EG)			5	50	2	20						
Tropaeolaceae	*Tropaeolum majus*	Exotic											0.1	30
Typhaceae	*Typha orientalis*	Grass & grasslike (GG)			10	500	70	5000						
Verbenaceae	*Lantana camara*	High Threat									0.5	1	0.1	1
Verbenaceae	*Lantana camara var. camara*	Exotic	5	20										
Vitaceae	*Cayratia clematidea*	Other (OG)											0.1	2
		Native Diversity	**29**		**9**		**7**		**7**		**5**		**9**	
		Exotic Diversity	**12**		**2**		**4**		**22**		**18**		**23**	
		Total Diversity	**41**		**11**		**11**		**29**		**23**		**32**	

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APPENDIX 3. FAUNA SPECIES LIST

No.	*Scientific Name*	Common Name	Status	Method
Amphibians				
1.	*Limnodynastes peronii*	Striped Marsh Frog	-	Heard
2.	*Litoria caerulea*	Green Tree Frog	-	Heard
3.	*Litoria fallax*	Eastern Dwarf Tree Frog	-	Heard
4.	*Litoria peronii*	Peron's Tree Frog	-	Heard
5.	*Litoria tyleri*	Tyler's Tree Frog	-	Heard
6.	*Litoria quiritatus*	Screaming Tree Frog	-	Heard
Bats				
1.	*Austronomus australis*	White-striped Freetail-bat	-	Anabat™ Record (Ultrasound
2.	*Chalinolobus gouldii*	Gould's Wattled Bat	-	Anabat™ Record (Ultrasound
3.	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	Anabat™ Record (Ultrasound)
4.	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V	Anabat™ Record (Ultrasound)
5.	*Miniopterus australis*	Little bent-wing bat	V	Anabat™ Record (Ultrasound)
6.	*Myotis macropus*	Southern Myotis	V	Anabat™ Record (Ultrasound)
7.	*Nyctophilus geoffroyi*	Gould's Long-eared Bat	-	Harp Trap
8.	*Nyctophilus gouldi*	Lesser Long-eared Bat	-	Harp Trap
9.	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail Bat	V	Anabat™ Record (Ultrasound)
10.	*Scoteanax rueppelli*	Greater Broad-nosed Bat	V	Anabat™ Record (Ultrasound)
11.	*Vespadelus pumilus*	Eastern Forest Bat	-	Anabat™ Record (Ultrasound)
12.	*Vespadelus vulternus*	Little Forest Bat	-	Anabat™ Record (Ultrasound)
Birds				
1.	*Sphecotheres viridis*	Australasian Figbird	-	Bird survey
2.	*Cracticus tibicen*	Australian Magpie	-	Bird survey
3.	*Corvus coronoides*	Australian Raven	-	Bird survey
4.	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	-	Bird survey
5.	*Entomyzon cyanotis*	Blue-faced Honeyeater	-	Bird survey
6.	*Gerygone mouki*	Brown Gerygone	-	Bird survey
7.	*Scythrops novaehollandiae*	Channel-billed Cuckoo	-	Bird survey
8.	*Eurystomus orientalis*	Dollarbird	-	Bird survey
9.	*Eudynamys orientalis*	Eastern Koel	-	Bird survey
10.	*Platycercus eximius*	Eastern Rosella	-	Bird survey
11.	*Acanthorhynchus tenuirostris*	Eastern Spinebill	-	Bird survey
12.	*Psophodes olivaceus*	Eastern Whipbird	-	Bird survey

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No.	*Scientific Name*	Common Name	Status	Method
13.	*Eopsaltria australis*	Eastern Yellow Robin	-	Bird survey
14.	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	-	Bird survey
15.	*Pachycephala pectoralis*	Golden Whistler	-	Bird survey
16.	*Cracticus torquatus*	Grey Butcherbird	-	Bird survey
17.	*Rhipidura albiscapa*	Grey Fantail	-	Bird survey
18.	*Dacelo novaeguineae*	Laughing Kookaburra	-	Bird survey
19.	*Meliphaga lewinii*	Lewin's Honeyeater	-	Bird survey
20.	*Grallina cyanoleuca*	Magpie-lark	-	Bird survey
21.	*Glossopsitta concinna*	Musk Lorikeet	-	Bird survey
22.	*Oriolus sagittatus*	Olive-backed Oriole	-	Bird survey
23.	*Cracticus nigrogularis*	Pied Butcherbird	-	Bird survey
24.	*Ninox strenua*	Powerful Owl	V	Nocturnal survey
25.	*Porphyrio porphyrio*	Purple Swamphen	-	Bird survey
26.	*Trichoglossus moluccanus*	Rainbow Lorikeet	-	Bird survey
27.	*Anthochaera carunculata*	Red Wattlebird	-	Bird survey
28.	*Neochmia temporalis*	Red-browed Finch	-	Bird survey
29.	*Rhipidura rufifrons*	Rufous Fantail	M	Bird survey, Remote Camera
30.	*Todiramphus sanctus*	Sacred Kingfisher	-	Bird survey
31.	*Myzomela sanguinolenta*	Scarlet Honeyeater	-	Bird survey
32.	*Zosterops lateralis*	Silvereye	-	Bird survey
33.	*Pardalotus punctatus*	Spotted Pardalote	-	Bird survey
34.	*Acanthiza lineata*	Striated Thornbill	-	Bird survey
35.	*Malurus cyaneus*	Superb Fairy-wren	-	Bird survey
36.	*Sericornis frontalis*	White-browed Scrubwren	-	Bird survey
37.	*Gerygone albogularis*	White-throated Gerygone	-	Bird survey
38.	*Acanthiza nana*	Yellow Thornbill	-	Bird survey
39.	*Caligavis chrysops*	Yellow-faced Honeyeater	-	Bird survey
40.	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	-	Bird survey
Mammals				
1.	*Acrobates pygmaeus*	Feathertail Glider	-	Remote Camera
2.	*Antechinus stuartii*	Brown Antechinus	-	Harp trap
3.	*Bellatorias major*	Land Mullet	-	Cage trap
4.	*Mormopterus ridei*	Eastern Freetail-bat	-	Anabat™ Record (Ultrasound)
5.	*Mus musculus**	House Mouse	-	Elliot trap
6.	*Rattus lutreolus*	Australian Swamp Rat	-	Elliot trap
7.	*Rattus rattus**	Black Rat	-	Remote Camera
8.	*Trichosurus vulpecula*	Common Brush-tail Possum	-	Cage trap, Spotlighting
Reptiles				

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No.	*Scientific Name*	Common Name	Status	Method
1.	*Varanus varius*	Lace Monitor	-	Observed

‘*’ denotes an introduced species.

‘V’ denotes a threatened species (BC Act).

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APPENDIX 4. PREDICTED AND CANDIDATE SPECIES REPORTS

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BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021991/BAAS21023/20/00021992	Fullerton Cove - Monteath and Powys	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Gilbert Whyte	24/12/2021	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18041	Part 4 Developments (General)	Open
Assessment Revision	**BOS entry trigger**	**Date Finalised**
0		To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
Australian Painted Snipe	Rostratula australis	1737-Typha rushland
Barking Owl	Ninox connivens	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Black Bittern	Ixobrychus flavicollis	1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland

Black Bittern	Ixobrychus flavicollis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Black-necked Stork	Ephippiorhynchus asiaticus	1737-Typha rushland
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Black-tailed Godwit	Limosa limosa	1737-Typha rushland
Broad-billed Sandpiper	Limicola falcinellus	1737-Typha rushland
Comb-crested Jacana	Irediparra gallinacea	1737-Typha rushland
Common Blossom-bat	Syconycteris australis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Curlew Sandpiper	Calidris ferruginea	1737-Typha rushland
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Eastern False Pipistrelle	Falsistrellus tasmaniensis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Eastern Grass Owl	Tyto longimembris	1737-Typha rushland
Eastern Osprey	Pandion cristatus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Freckled Duck	Stictonetta naevosa	1737-Typha rushland
Gang-gang Cockatoo	Callocephalon fimbriatum	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Glossy Black-Cockatoo	Calyptorhynchus lathami	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Golden-tipped Bat	Phoniscus papuensis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Great Knot	Calidris tenuirostris	1737-Typha rushland
Greater Broad-nosed Bat	Scoteanax rueppellii	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Greater Broad-nosed Bat	Scoteanax rueppellii	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Grey-headed Flying-fox	Pteropus poliocephalus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Koala	Phascolarctos cinereus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Little Bent-winged Bat	Miniopterus australis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Little Eagle	Hieraaetus morphnoides	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Little Lorikeet	Glossopsitta pusilla	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Magpie Goose	Anseranas semipalmata	1737-Typha rushland
Masked Owl	Tyto novaehollandiae	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Powerful Owl	Ninox strenua	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Regent Honeyeater	Anthochaera phrygia	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Speckled Warbler	Chthonicola sagittata	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Spotted Harrier	Circus assimilis	1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
Spotted-tailed Quoll	Dasyurus maculatus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Square-tailed Kite	Lophoictinia isura	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Swift Parrot	Lathamus discolor	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Terek Sandpiper	Xenus cinereus	1737-Typha rushland
Turquoise Parrot	Neophema pulchella	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
Varied Sittella	Daphoenositta chrysoptera	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
White-bellied Sea-Eagle	Haliaeetus leucogaster	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
White-fronted Chat	Epthianura albifrons	1737-Typha rushland
White-throated Needletail	Hirundapus caudacutus	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1737-Typha rushland
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Yellow-bellied Glider	Petaurus australis	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast
		1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Candidate Species Report

Proposal Details

Assessment Id 00021991/BAAS21023/20/00021992	Proposal Name Fullerton Cove - Monteath and Powys	BAM data last updated * 24/11/2021
Assessor Name Gilbert Whyte	Report Created 24/12/2021	BAM Data version * 50
Assessor Number BAAS18041	Assessment Type Part 4 Developments (General)	BAM Case Status Open
Assessment Revision 0	Date Finalised To be finalised	BOS entry trigger

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Allocasuarina simulans Nabiac Casuarina	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Angophora inopina Charmhaven Apple	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Anthochaera phrygia Regent Honeyeater	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Asperula asthenes Trailing Woodruff	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Calidris ferruginea Curlew Sandpiper	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Calidris tenuirostris Great Knot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Corybas dowlingii Red Helmet Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cryptostylis hunteriana Leafless Tongue Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris arenaria Sand Doubletail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Diuris praecox Rough Doubletail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dromaius novaehollandiae - endangered population Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Eucalyptus camfieldii Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus parramattensis subsp. decadens Eucalyptus parramattensis subsp. decadens	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Grevillea parviflora subsp. parviflora Small-flower Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Limicola falcinellus Broad-billed Sandpiper	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Limosa limosa Black-tailed Godwit	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lindernia alsinoides Noah's False Chickweed	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Litoria aurea Green and Golden Bell Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria brevipalmata Green-thighed Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Maundia triglochinoides Maundia triglochinoides	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca biconvexa Biconvex Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca groveana Grove's Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Myotis macropus Southern Myotis	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pandion cristatus Eastern Osprey	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Persicaria elatior Tall Knotweed	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Petalura gigantea Giant Dragonfly	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Petauroides volans Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus - endangered population Koala, Hawks Nest and Tea Gardens population	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Planigale maculata Common Planigale	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Potorous tridactylus Long-nosed Potoroo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Prostanthera densa Villous Mint-bush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Pterostylis chaetophora Pterostylis chaetophora	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhizanthella slateri Eastern Australian Underground Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Thesium australe Austral Toadflax	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Turnix maculosus Red-backed Button-quail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Uperoleia mahonyi Mahony's Toadlet	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Xenus cinereus Terek Sandpiper	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Zannichellia palustris Zannichellia palustris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Eucalyptus seeana population in the Greater Taree local government area	Eucalyptus seeana - endangered population	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints

APPENDIX 5. BIODIVERSITY CREDIT REPORTS

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BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021991/BAAS21023/20/00021992	Fullerton Cove - Monteath and Powys	24/11/2021
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	24/12/2021	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18041	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast												
5	1717_Degraded	Not a TEC	29.8	29.8	0.1	PCT Cleared - 68%	High Sensitivity to Potential Gain			1.75		1
											Subtotal	**1**
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast												
1	1646_Moderate	Not a TEC	55.8	55.8	0.01	PCT Cleared - 45%	High Sensitivity to Potential Gain			1.50		1
2	1646_Degraded	Not a TEC	12	12.0	1.4	PCT Cleared - 45%	High Sensitivity to Potential Gain			1.50		0
											Subtotal	**1**

Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast												
3	1728_Moderate	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	35.6	35.6	0.45	PCT Cleared - 81%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		8
											Subtotal	**8**
Typha rushland												
4	1737_Moderate	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	40.1	40.1	0.3	PCT Cleared - 70%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		6
											Subtotal	**6**
											Total	**16**

Species credits for threatened species

BAM Credit Summary Report

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)									
1646_Degraded	12.0	12.0	1.4			Vulnerable	Not Listed	False	9
1728_Moderate	35.6	35.6	0.1			Vulnerable	Not Listed	False	2
1737_Moderate	40.1	40.1	0.3			Vulnerable	Not Listed	False	6
1717_Degraded	29.8	29.8	0.1			Vulnerable	Not Listed	False	1
								Subtotal	**18**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00021991/BAAS21023/20/00021992

Proposal Name
Fullerton Cove - Monteath and Powys

BAM data last updated *
24/11/2021

Assessor Name
Gilbert Whyte

Assessor Number
BAAS18041

BAM Data version *
50

Proponent Names

Report Created
24/12/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Not a TEC	1.4	0	1	1
1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.5	0	8	8
1737-Typha rushland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.3	0	6	6
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Not a TEC	0.1	0	1	1

1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775	Coastal Dune Dry Sclerophyll Forests <50%	1646_Moderate	No	1	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775	Coastal Dune Dry Sclerophyll Forests <50%	1646_Degraded	No	0	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798	Coastal Swamp Forests >=50% and <70%	1717_Degraded	No	1	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1728_Moderate	No	8	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1737-Typha rushland

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911	-	1737_Moderate	No	6	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1646_Degraded, 1728_Moderate, 1737_Moderate, 1717_Degraded**	1.9	18.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00021991/BAAS21023/20/00021992

Proposal Name
Fullerton Cove - Monteath and Powys

BAM data last updated *
24/11/2021

Assessor Name
Gilbert Whyte

Assessor Number
BAAS18041

BAM Data version *
50

Proponent Name(s)

Report Created
24/12/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Not a TEC	1.4	0	1	1.00
1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.5	0	8	8.00
1737-Typha rushland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.3	0	6	6.00
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Not a TEC	0.1	0	1	1.00

1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775	Coastal Dune Dry Sclerophyll Forests <50%	1646_Moderate	No	1	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775	Coastal Dune Dry Sclerophyll Forests <50%	1646_Degraded	No	0	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1646_Moderate	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1646_Degraded	No	0	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798	Coastal Swamp Forests >=50% and <70%	1717_Degraded	No	1	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Forested Wetlands	Tier 3 or higher threat status	1717_Degraded	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1728_Moderate	No	8	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 3 or higher threat status	1728_Moderate	No	8	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1737-Typha rushland	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911	-	1737_Moderate	No	6	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Freshwater Wetlands	Tier 3 or higher threat status	1737_Moderate	No	6	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1646_Degraded, 1728_Moderate, 1737_Moderate, 1717_Degraded**	1.9	18.00

Credit Retirement Options

Like-for-like options

Myotis macropus/ Southern Myotis	Spp		IBRA region
	Myotis macropus/Southern Myotis		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

APPENDIX 6. STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Table 16: Staff contributions.

Name	Qualification	Title/Experience	Contribution
Ben Stewart	MMarSc & Mgt	Ecologist	Field Surveys and Report Writing
David Martin	MSc	Ecologist	Fauna Surveys
David Russell	BSc	Senior Ecologist Accredited BAM Assessor	Flora Surveys
Dr. Daniel O'Brien	BEnvSc & Mgt (Hons) PhD	Senior Ecologist	Field Surveys, Report Review
Dr. Gilbert Whyte	BSc (Hons) PhD	Senior Ecologist	Report Review
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	Preparation of figures
Mark Dean	BEnvSc & Mgt	Ecologist	Field Surveys

Table 17: Suitably Qualified Persons – Port Stephens Comprehensive Koala Plan of Management (CKPoM).

Name	Qualification	Experience	Contribution
David Martin	MSc	• Has lead research on the overabundant Koala population on French Island, undertaking hundreds of Koala population surveys, Spot Assessment Technique surveys, and assessments on Koala feed tree condition. • Has completed Koala surveys locally in the Port Stephens LGA and the Central Coast of NSW with familiarity of suitable Koala habitat and the identification of Koala scats. • Has a botany background and completed vegetation mapping and assessments throughout NSW and Victoria, including the identification of Koala feed trees.	Koala SAT Surveys
Dr. Daniel O'Brien	BEnvSc & Mgt (Hons) PhD	• Experience in flora and fauna identification, survey and management including experience in conducting Koala surveys: • Has routinely conducted Koala surveys within the Port Stephens LGA and more broadly within NSW over the past 10 years • Has undertaken Spot Assessment Technique surveys in various vegetation communities and is familiar with the identification of Koala scats • Has extensive experience identifying Koala feed trees and mapping Koala habitat.	Port Stephens CKPoM Report Review

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APPENDIX 7. LICENSING

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: 31 March 2021) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.

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APPENDIX 8. BAM PLOT DATA

Copyright 2013 Kleinfelder

BAM Strata Datasheet

for Plot **Q01** on **12 Aug 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85481 Longitude: 151.805624 Accuracy: 5.000 m

Comments:

Strata Breakdown

Overstorey Species	3 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Myrtaceae Eucalyptus pilularis	40	1
Myrtaceae Eucalyptus piperita	30	5
Proteaceae Banksia serrata	5	1

Midstorey Species	3 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Ericaceae Monotoca elliptica	5	3
Pittosporaceae Pittosporum undulatum	1	1
Rhamnaceae Alphitonia excelsa	1	2

Ground Cover Shrubs	9 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Apiaceae Platysace lanceolata	0.1	1
Euphorbiaceae Homalanthus populifolius	0.1	5
Fabaceae (Mimosoideae) Acacia longifolia	0.3	1
Lamiaceae Clerodendrum tomentosum	0.3	3
Oleaceae Notelaea longifolia	0.1	2
Phyllanthaceae Breynia oblongifolia	5	20
Phyllanthaceae Glochidion ferdinandi	1	5
Proteaceae Persoonia levis	0.1	1
Sapindaceae Cupaniopsis anacardioides	0.1	1

Ground Cover Grasses	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Poaceae Imperata cylindrica	0.5	5

Ground Cover Other	13 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Bignoniaceae Pandorea pandorana	0.2	20
Commelinaceae Commelina cyanea	0.1	20
Dennstaedtiaceae Pteridium esculentum	5	50
Dilleniaceae Hibbertia linearis	0.1	2
Fabaceae (Faboideae) Kennedia rubicunda	0.2	10
Lauraceae Cassytha glabella	5	1000
Lomandraceae Lomandra longifolia	0.5	6
Luzuriagaceae Geitonoplesium cymosum	1	50
Menispermaceae Sarcopetalum harveyanum	1	50

BAM Strata Datasheet

for Plot **Q01** on **12 Aug 2020** by **D Russell**

Moraceae Maclura cochinchinensis	0.1	2
Passifloraceae Passiflora herbertiana	0.2	1
Phormiaceae Dianella revoluta	0.5	5
Pittosporaceae Billardiera scandens	0.1	20

Exotic	**12 species**	
Species	C (foliage cover) (%)	Ab (abundance rating)
Asteraceae Ambrosia tenuifolia	0.1	2
Asteraceae Bidens pilosa	0.2	20
Asteraceae Chrysanthemoides monilifera subsp. rotundata	60	50
Basellaceae Anredera cordifolia	0.1	1
Fumariaceae Fumaria officinalis	0.1	20
Malvaceae Sida rhombifolia	0.1	2
Oxalidaceae Oxalis pes-caprae	0.1	5
Passifloraceae Passiflora subpeltata	0.2	5
Poaceae Megathyrsus maximus	15	500
Rosaceae Rubus fruticosus	0.1	5
Solanaceae Solanum nigrum	0.1	5
Verbenaceae Lantana camara var. camara	5	20
Total # of species identified:	**41**	

BAM Plot Datasheet

for Plot **Q01** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	230.41		
Start Location:	Latitude: -32.854808	Longitude:151.805548	Accuracy:10.000 m
End Location:	Latitude: -32.855072	Longitude:151.805168	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm	2	1	
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in these stem size classes
	20 - 29 cm	N	Y	
	10 - 19 cm	N	Y	
	5 - 9 cm	N	N	
	<5 cm	Y	Y	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	2, 35	Total (m)	41

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	95	100	95	95	90	95.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type	Landform Element
Lithology	Landform Pattern
Slope and Aspect	Soil Colour
Site Drainage	Microrelief

Distance to nearest water and type

General Notes

BAM Plot Datasheet

for Plot **Q01** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks:

BAM Strata Datasheet

for Plot **Q02** on **12 Aug 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85535 Longitude: 151.803438 Accuracy: 5.000 m

Comments:

Strata Breakdown

Overstorey Species	2 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Casuarinaceae Casuarina glauca	10	2
Myrtaceae Melaleuca quinquenervia	35	7
Ground Cover Other	**7 species**	
Species	C (foliage cover) (%)	Ab (abundance rating)
Amaranthaceae Alternanthera denticulata	0.2	50
Apocynaceae Parsonsia straminea	1	1
Cyperaceae Baumea articulata	1	50
Juncaginaceae Triglochin spp.	20	1000
Persicaria strigosa	0.1	20
Thelypteridaceae Cyclosorus interruptus	5	50
Typhaceae Typha orientalis	10	500
Exotic	**2 species**	
Species	C (foliage cover) (%)	Ab (abundance rating)
Apiaceae Hydrocotyle bonariensis	0.5	20
Convolvulaceae Ipomoea indica	5	20
Total # of species identified:	**11**	

BAM Plot Datasheet

for Plot **Q02** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	113.17		
Start Location:	Latitude: -32.855357	Longitude:151.803393	Accuracy:5.000 m
End Location:	Latitude: -32.855536	Longitude:151.803891	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm		4	
All other Trees:	30 - 49 cm	N	Y	Only record presence or absence of trees in these stem size classes
	20 - 29 cm	N	Y	
	10 - 19 cm	N	Y	
	5 - 9 cm	N	Y	
	<5 cm	N	N	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	0	Total (m)	0

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	100	100	100	100	100	100.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type	Landform Element
Lithology	Landform Pattern
Slope and Aspect	Soil Colour
Site Drainage	Microrelief

Distance to nearest water and type

General Notes

BAM Plot Datasheet

for Plot **Q02** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks: **Inundated Litter estimated**

BAM Strata Datasheet

for Plot **Q03** on **12 Aug 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85508 Longitude: 151.803726 Accuracy: 5.000 m

Comments:

Strata Breakdown

Overstorey Species	2 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Casuarinaceae Casuarina glauca	1	1
Myrtaceae Melaleuca quinquenervia	5	1

Ground Cover Other	5 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Apocynaceae Parsonsia straminea	0.2	1
Cyperaceae Baumea articulata	0.1	20
Persicaria strigosa	3	100
Thelypteridaceae Cyclosorus interruptus	2	20
Typhaceae Typha orientalis	70	5000

Exotic	4 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Convolvulaceae Ipomoea indica	0.2	5
Poaceae Stenotaphrum secundatum	5	500
Rosaceae Rubus fruticosus	5	50
Solanaceae Solanum nigrum	0.1	1
Total # of species identified:	**11**	

BAM Plot Datasheet

for Plot **Q03** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	141.96		
Start Location:	Latitude: -32.855067	Longitude:151.803677	Accuracy:5.000 m
End Location:	Latitude: -32.855402	Longitude:151.803989	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm			
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in
	20 - 29 cm	N	N	these stem size classes
	10 - 19 cm	N	N	
	5 - 9 cm	N	N	
	<5 cm	N	N	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	5	Total (m)	5

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	100	100	100	100	100	100.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type
Lithology
Slope and Aspect
Site Drainage
Distance to nearest water and type
General Notes

Landform Element
Landform Pattern
Soil Colour
Microrelief

BAM Plot Datasheet

for Plot **Q03** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks: **Inumdated Litter estimated**

BAM Strata Datasheet

for Plot **Q04** on **12 Aug 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85506 Longitude: 151.804964 Accuracy: 5.000 m

Comments:

Strata Breakdown

Ground Cover Grasses	2 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Poaceae Cynodon dactylon	5	1000
Poaceae Panicum effusum	0.1	1

Ground Cover Other	5 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Aizoaceae Carpobrotus glaucescens	0.1	1
Cyperus sp.	0.1	3
Dennstaedtiaceae Pteridium esculentum	15	100
Dilleniaceae Hibbertia fasciculata	0.1	1
Lauraceae Cassytha glabella	0.2	50

Exotic	22 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Aizoaceae Galenia pubescens	2	20
Apiaceae Hydrocotyle bonariensis	25	500
Asteraceae Ambrosia tenuifolia	0.5	50
Asteraceae Heterotheca grandiflora	1	50
Asteraceae Hypochaeris radicata	0.1	10
Cactaceae Opuntia stricta	0.1	1
Caryophyllaceae Paronychia franciscana	0.1	50
Caryophyllaceae Petrorhagia velutina	0.1	2
Caryophyllaceae Stellaria media	0.1	20
Malvaceae Sida rhombifolia	2	20
Onagraceae Oenothera mollissima	0.5	10
Other Other Yellow Asteraceae	2	20
Oxalidaceae Oxalis pes-caprae	0.1	50
Plantaginaceae Plantago lanceolata	0.2	20
Poaceae Avena barbata	10	1000
Poaceae Cenchrus longispinus	0.1	2
Poaceae Eragrostis curvula	25	200
Poaceae Melinis repens	0.1	2
Polygonaceae Acetosella vulgaris	2	50
Rubiaceae Richardia stellaris	0.5	10
Selaginaceae Hebenstretia dentata	2	50
Solanaceae Solanum nigrum	0.5	3
Total # of species identified:	**29**	

BAM Plot Datasheet

for Plot **Q04** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	220.85		
Start Location:	Latitude: -32.855024	Longitude:151.804887	Accuracy:5.000 m
End Location:	Latitude: -32.855365	Longitude:151.804536	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm			
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in
	20 - 29 cm	N	N	these stem size classes
	10 - 19 cm	N	N	
	5 - 9 cm	N	N	
	<5 cm	N	N	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	0	Total (m)	0

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	5	40	100	10	10	33.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type	Landform Element
Lithology	Landform Pattern
Slope and Aspect	Soil Colour
Site Drainage	Microrelief

Distance to nearest water and type

General Notes

BAM Plot Datasheet

for Plot **Q04** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks:

BAM Strata Datasheet

for Plot **Q05** on **12 Aug 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85528 Longitude: 151.804412 Accuracy: 5.000 m

Comments:

Strata Breakdown

Midstorey Species	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Ericaceae Monotoca elliptica	2	2

Ground Cover Shrubs	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Fabaceae (Mimosoideae) Acacia longifolia	1	2

Ground Cover Grasses	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Poaceae Cynodon dactylon	2	500

Ground Cover Other	2 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Aizoaceae Carpobrotus glaucescens	2	20
Dennstaedtiaceae Pteridium esculentum	25	500

Exotic	18 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Apiaceae Hydrocotyle bonariensis	0.5	20
Asteraceae Ambrosia tenuifolia	0.1	20
Asteraceae Chrysanthemoides monilifera subsp. rotundata	2	2
Asteraceae Hypochoeris radicata	0.5	50
Caryophyllaceae Paronychia franciscana	0.1	20
Caryophyllaceae Petrorhagia velutina	0.1	1
Convolvulaceae Ipomoea indica	0.5	5
Grevillea sp.	1	1
Hakea sp.	1	1
Juglandaceae Carya illinoensis	0.1	1
Onagraceae Oenothera mollissima	0.1	5
Pinaceae Pinus elliotii	5	1
Poaceae Eragrostis curvula	40	500
Poaceae Melinis repens	0.1	1
Rubiaceae Richardia stellaris	0.2	10
Selaginaceae Hebenstretia dentata	0.2	5
Verbenaceae Lantana camara	0.5	1
Yellow Asteraceae	3	50
Total # of species identified:	**23**	

BAM Plot Datasheet

for Plot **Q05** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	321.60		
Start Location:	Latitude: -32.855313	Longitude:151.804415	Accuracy:5.000 m
End Location:	Latitude: -32.854977	Longitude:151.804098	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm			
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in
	20 - 29 cm	N	N	these stem size classes
	10 - 19 cm	N	N	
	5 - 9 cm	N	N	
	<5 cm	N	N	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	0	Total (m)	0

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	60	95	10	50	70	57.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type
Landform Element
Lithology
Landform Pattern
Slope and Aspect
Soil Colour
Site Drainage
Microrelief
Distance to nearest water and type
General Notes

BAM Plot Datasheet

for Plot **Q05** on **12 August 2020** by **D Russell**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks:

BAM Strata Datasheet

for Plot **Q06** on **17 Nov 2020** by **B Stewart**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Plot Location: Latitude: -32.85449 Longitude: 151.804667 Accuracy: 5.000 m

Comments: Very weedy managed lawn

Strata Breakdown

Overstorey Species	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Myrtaceae Melaleuca quinquenervia	30	3

Midstorey Species	2 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Arecaceae Livistona australis	1	1
Phyllanthaceae Glochidion ferdinandi	2	1

Ground Cover Grasses	1 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Poaceae Cynodon dactylon	1	500

Ground Cover Other	5 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Apiaceae Hydrocotyle sibthorpioides	0.1	50
Blechnaceae Blechnum indicum	0.1	2
Convolvulaceae Dichondra repens	2	10000
Oxalidaceae Oxalis perennans	0.1	20
Vitaceae Cayratia clematidea	0.1	2

Exotic	23 species	
Species	C (foliage cover) (%)	Ab (abundance rating)
Alliaceae Agapanthus spp.	0.1	10
Apiaceae Hydrocotyle bonariensis	0.1	50
Araliaceae Schefflera actinophylla	0.5	1
Arecaceae Phoenix canariensis	3	1
Asteraceae Conyza bonariensis	0.1	50
Asteraceae Hypochaeris radicata	5	500
Asteraceae Sonchus asper	0.1	10
Bignoniaceae Jacaranda mimosifolia	1	0
Caryophyllaceae Paronychia brasiliana	5	2000
Cyperaceae Cyperus sesquiflorus	2	500
Gardenia sp.	1	2
Iridaceae Romulea minutiflora	1	500
Other Other Achmea spp.	0.1	10
Other Other Ficus spp.	5	2
Oxalidaceae Oxalis latifolia	0.1	20
Plantaginaceae Plantago lanceolata	1	100

BAM Strata Datasheet

for Plot **Q06** on **17 Nov 2020** by **B Stewart**

Poaceae Bromus catharticus	10	1000
Poaceae Megathyrsus maximus	0.2	20
Poaceae Stenotaphrum secundatum	20	10000
Rubiaceae Richardia humistrata	15	10000
Strelitziaceae Strelitzia reginae	0.5	1
Tropaeolaceae Tropaeolum majus	0.1	30
Verbenaceae Lantana camara	0.1	1
Total # of species identified:	**32**	

BAM Plot Datasheet

for Plot **Q06** on **17 November 2020** by **B Stewart**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Magnetic Bearing:	194.45		
Start Location:	Latitude: -32.854510	Longitude:151.804665	Accuracy:5.000 m
End Location:	Latitude: -32.854911	Longitude:151.804542	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes
Count of **Large Trees**	80+ cm		4	Record DBH of each tree at 1.3 m from ground
	50+ cm		2	
All other Trees:	30 - 49 cm	N	Y	Only record presence or absence of trees in
	20 - 29 cm	N	N	these stem size classes
	10 - 19 cm	N	Y	
	5 - 9 cm	N	N	
	<5 cm	N	N	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class	<20 cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class		

Length of logs (m) (>= 10 cm diameter, > 50 cm in length)	Tally	0	Total (m)	0

1 m2 subPLOT

Subplot	A	B	C	D	E	Avg
Litter Cover(%)	85	5	60	5	10	33.0

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)

Morphological Type		Landform Element	
Lithology		Landform Pattern	
Slope and Aspect		Soil Colour	Grey - white
Site Drainage		Microrelief	
Distance to nearest water and type			
General Notes	Depression containing melaleucas		

BAM Plot Datasheet

for Plot **Q06** on **17 November 2020** by **B Stewart**

42 Fullerton Cove Rd BDAR 2020
20210926.001A
24 Fullerton Cove Road
Whyte, Gilbert

Photo Log

Fig. 1: Photo of Starting Area



Fig. 2: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 4: Photo of Ending Area



Remarks:

ATTACHMENT 6 – Flood Impact Assessment

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

19 January 2022

NL161067-01_B03_[A]

Nicholas Dan
C/- Rebecca Boresch
Monteath & Powys Pty Ltd
125 Bull Street
Newcastle West, NSW, 2302

Dear Rebecca,

Re: 42 Fullerton Cove Road, Fullerton Cove – Flood Impact Assessment – Response to DPIE BCD Request for Additional Information

Northrop Consulting Engineers have been engaged by Nicholas Dan, care of Monteath and Powys Pty. Ltd. to prepare a two-dimensional flood investigation to assess the potential flood impact of the proposed development at 42 Fullerton Cove Road, Fullerton Cove.

A previous investigation has been prepared by Northrop Consulting Engineers titled "42 Fullerton Cove Road, Fullerton Cove – Flood Impact Assessment" dated the 19 July 2021, herein referred to as the "Original Flood Impact Assessment".

Following submission of the Original Flood Impact Assessment, the NSW Department of Planning, Industry and Environment, Biodiversity Conservation Division (BCD) has requested additional information (dated 09/09/21) in relation to the flooding and flood risk of the proposed development.

Contained herein is a response to the flooding related items raised in the BCD RFI. This correspondence should be read in conjunction with the Flood Figures 4, D9 and D10 which can be found in Appendix A.

Item 6 – Manning's n values are inconsistent with other studies in the same area.

> *Recommendation 6: The proponent should review the adopted hydraulic roughness values used for the flood assessment*

Flood studies performed in the area include the Williamtown – Salt Ash Floodplain Risk Management Plan and Study (2017) and the Anna Bay Flood Study (2017) which have adopted different roughness values in preparation of the studies.

Noting that the Dense Vegetation and Grass land use values adopted in the Original Flood Impact Assessment fall within the reasonable range presented in Table 10-1 of ARR 2019 - Project 15, a sensitivity test has been performed to review the influence surface roughness has on the existing flood behaviour in the area. The developed case 1% AEP design storm event presented in the Original Flood Impact Assessment has been used for the sensitivity test.

		Date
Prepared by	RS	19/01/2022
Checked by	LG	19/01/2022
Admin	BBR	19/01/2022

The Manning's roughness values used in the Original Flood Impact Assessment have been updated to be similar to the flood studies mentioned above. The adopted roughness values are presented in Figure 4 (Rev B) and are summarised in **Table 1** below.

Table 1 - Updated Roughness for Sensitivity Test

Land Use	Original FIA (2021)	Sensitivity Test
Dense Vegetation	0.070	0.150
Residential	0.090	0.060
Grass / Floodplain	0.045	0.035

A flood depth comparison was prepared to assess the change in flood behaviour created by the revised roughness values. The results presented in Figure D9 show only minor variations in flood depth across the wider catchment and are generally within +/- 50mm. There is no significant change to the flood levels within the vicinity of the subject site and the proposed development.

The sensitivity test shows only a minor change in flood depths of up to 50mm at various locations across the catchment. These results are not expected to fundamentally alter the flood behaviour or the results of the Original Flood Impact Assessment as the increase is expected to be observed in both the existing and developed case scenarios. The roughness assumptions are also not expected to influence Flood Planning Levels for the subject site as these are largely dictated by the regional flood characteristics provided in Council's Flood Information Certificate (ref: 83-2020-592-1).

Upon review of the hydraulic roughness values, and the results of the sensitivity test discussed above, the results presented in the Original Flood Impact Assessment are considered reasonable, noting that it is possible that the assessment may be further refined during Development Application phase once a layout is developed.

Item 7 – The Bellbird stormwater channel has not been included in the hydraulic model.

> *Recommendation 7: The hydraulic model should be revised so that Bellbird Ct is included in the TUFLOW hydraulic model and flood impact assessment should be reassessed accordingly.*

The channel roughness through the Bellbird Ct channel was updated as suggested (from 0.045 to 0.040). This was included when performing the sensitivity analysis to address item 6 with the results demonstrating only minor changes to the original assessment.

Item 8 – The proposed detention basin may not be required.

> *Recommendation 8: The proponent should review the size and need for on-site detention and review capacity of the 450mm pipe.*

The original two-dimensional flood impact assessment focused on the impacts of the proposed earthworks and assumed the same fraction impervious for both the existing and developed cases. In doing so, it assumed existing case peak flows on the subject site were maintained post development (i.e. with stormwater detention included).

An additional sensitivity test has been prepared herein to review the potential flood impact of the development if OSD were excluded. As the site layout is yet to be finalised, an approximate development footprint of 2.3ha was adopted with an assumed fraction impervious of 90%.

Figure D10 presents a flood depth comparison for the developed case, with the assumed increase in impervious area as described above. The results suggest that there are no significant adverse impacts downstream of the subject site with a minor increase in flood depths of up to 7mm. A decrease of 5mm is also observed upstream of the subject site which was attributed to the slight change in timing of flows from the subject site and local catchment.

The results indicate that on-site detention may not be required with only minor changes to the existing flood behaviour observed. It is anticipated that this will be further assessed during the Development Application phase of the project, when additional information regarding the site layout becomes available.

No significant adverse impacts on the capacity of the 450mm pipe is observed as presented in original flood impact assessment. It is anticipated that if this pipe were to be upgraded, flood storage contained on the subject site and vicinity has the potential to drain out, possibility creating adverse flood impacts in the downstream properties.

Conclusion

A response has been provided in relation to the flooding and flood risk queries prepared by the NSW Department of Planning, Industry and Environment, Biodiversity Conservation Division for the proposed development at 42 Fullerton Cove Road, Fullerton Cove, NSW.

The results suggest that the Original Flood Impact Assessment remains valid in its findings and that the proposed development is not expected to result in significant adverse impacts on the subject site or within the adjacent properties surrounding the subject site.

Should you have any queries regarding this correspondence, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by:

[redacted]

Robert Suckling
Civil Engineer

Reviewed by:

[redacted]

Laurence Gitzel
Civil and Flood Engineer

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Nicholas Dan.

The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required. To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Attachment 1 – Flood Figures

Legend

- Subject_Site
- 1d Network (Culverts)
- Downstream Boundary
- Model Extent

Land Use (Manning's n)

- Grass (0.035)
- Sealed Roads (0.020)
- Dense Vegetation (0.150
- Open Water (0.020)
- Drainage Channels (0.040)
- Residential Areas (0.060)
- Buildings (0.100)

0 100 200 300 Metres

1:10000

Figure 4 - (B)

2D Tuflow
Model Setup & Landuse

42 Fullerton Cove Road
Fullerton Cove
NL161067

NORTHROP

17/1/2022 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\Figures_RS.qgzFigures_RS.qgz

Data Source:

Approx. 51mm Increase

Approx. 49mm Increase

Approx. 24-40mm Increase

Approx. 12-28mm Increase

Approx. 5mm Increase

Legend

- Subject_Site
- Proposed Filll
- Proposed Cut
- Model Extent

Flood Depth Difference (m)

- <-0.051
- -0.011- -0.050
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 70 140 Metres

1:4000

Figure D9 [A]

Developed Case
1% AEP Event
Manning's Roughness Sensitivity
Flood Depth Comparison

42 Fullerton Cove Road
Fullerton Cove
NL161067

NORTHROP

17/1/2022 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\Figures_RS.qgzFigures_RS.qgz

Data Source:

Approx. 7mm Increase

Approx. 5mm Decrease

Legend

- Subject_Site
- Proposed Filll
- Proposed Cut
- Model Extent

Flood Depth Difference (m)

- <-0.051
- -0.011- -0.050
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 70 140 Metres

1:4000

Figure D10 [A]

Developed Case
1% AEP Event
Increased Fraction Impervious
Flood Depth Comparison

42 Fullerton Cove Road
Fullerton Cove
NL161067

NORTHROP

18/1/2022 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\Figures_RS.qgzFigures_RS.qgz

Data Source:

NORTHROP
Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

19 July 2021

NL161067-01_[C]

Nicholas Dan
C/- Rebecca Boresch
Monteath & Powys Pty Ltd
125 Bull Street
Newcastle West, NSW, 2302

Dear Rebecca,

Re: 42 Fullerton Cove Road, Fullerton Cove – Flood Impact Assessment

Northrop Consulting Engineers have been engaged by Nicholas Dan, care of Monteath and Powys Pty. Ltd. to perform a two-dimensional flood investigation to assess the potential flood impact of the proposed development of 42 Fullerton Cove Road, Fullerton Cove, herein referred as "the subject site" or "the site". Figure 1, shown overleaf presents the locality of the subject site and general vicinity.

A previous one-dimensional investigation has been performed for the subject site as presented in the *Flooding and Stormwater Management Study rezoning report prepared by Northrop Consulting Engineers and dated the 28th of February 2017* (refer to Attachment 3). The revised study contained herein has been performed following a request from Port Stephens Council to review the flood impact of the proposed development using two-dimensional modelling methods as an alternative to the previous one-dimensional methodology.

The purpose of this correspondence is to present the updated investigation and to review the potential impact of the proposed development on the existing flood behaviour on the subject site and general vicinity. Contained herein is a brief outline of the modelling methodology, a summary of the parameters and assumptions used during the development of the two-dimensional model and a discussion of the results of the investigation.

Modelling Methodology

The assessment has been performed using the following methodology:

- Review available information including previous studies, existing terrain data, land use and hydraulic structures.
- Perform a site visit to confirm previous assessment assumptions, review existing hydraulic structures and confirm model hydrologic and hydraulic roughness.
- Construction of an "Existing Case" one-dimensional DRAINS model using the latest procedures outlined in the 2019 Australian Rainfall and Runoff guidelines (AR&R 2019) to determine catchment runoff and estimate the critical storm duration for the 20%, 5%, 1% AEP (Annual Exceedance Probability) and PMF (Probable Maximum Flood) design storm events.

- In addition to the aforementioned design storms, two climate change scenarios (2050 and 2090) have been modelled in the existing case using the interim climate change factors provided in the 2019 Australian Rainfall and Runoff guidelines
- Preparation of a "Existing Case" two-dimensional TUFLOW hydraulic model using the inflow hydrographs for the critical event derived by the one-dimensional DRAINS model.
- Preparation of a "Developed Case" two-dimensional TUFLOW model by modifying the existing case model to include the proposed development.
- A comparison of the results for the Existing and Developed Case scenarios to review the impact of the proposed development on the existing case flood behaviour.

This assessment has been prepared with consideration given to the following documents:

- The latest Australian Rainfall and Runoff 2019 (AR&R 2019) guidelines.
- NSW Government Floodplain Development Manual (NSW Government, 2005).
- Port Stephens Council Development Control Plan (PSC, 2019).
- Williamtown Salt Ash Flood Study (WBM, 2005).
- Williamtown/ Salt Ash Flood Study Review (BMT WBM, 2012).
- Williamtown - Salt Ash Floodplain Risk Management Study & Plan (BMT WBM, 2017).

The assessment should also be read in conjunction with the following report and documents:

- Flood Information Certificate for 42 Fullerton Cove Road, Fullerton Cove provided by Port Stephens Council and dated 30th of September 2020 (includes as Attachment 2).
- Flooding and Stormwater Management Study for Rezoning Proposal Submission at Lot 14 DP 258848 Fullerton Cove (Northrop, 2017) (included as Attachment 3).



Legend

- Subject Site
- Cadastre

0 350 700 1,400

1:30,000 Metres

Figure 1

Locality

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

29/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

Site Characteristics

Subject Site

The subject site is located at 42 Fullerton Cove Road, Fullerton Cove and is contained within Lot 14 DP 258848. The subject site has an approximate area of 6.7 hectares and is bound by a rural residential property to the east, Fullerton Cove Road to the north and west and Nelson Bay Road to the south (refer to Figure 1).

Light Detection and Ranging (LiDAR) terrain data provided by NSW Spatial Services suggests topography across the subject site is largely low lying and is generally flat. Elevations across the subject site range from approximately 1.2 metres AHD in the western and southern portions of the site to a maximum of approximately 6.7 metres AHD in the south eastern corner. The site is largely made up of dense bushland with a small portion of rural residential land use at the north eastern portion of the site.

The subject site drains to the south west through a 450mm diameter pipe under Fullerton Cove Road. Runoff then passes through the road reserve and into Lot 1 DP 270695 "The Cove Village". A drainage easement through the village directs water through three 900mm diameter pipes under the Cove Drive and towards Fullerton Cove.

Proposed Development

It is proposed to rezone the subject site from the current Rural Landscape (RU2) land use to a combination of Neighbourhood Centre (B1) and Environmental Conservation (E2) land use. This will enable future construction of a retail/ commercial facility on the subject site and protection of environmentally sensitive areas.

To review the sensitivity of introducing fill over the subject site, a fill pad is proposed within the B1 zone with a top elevation consistent with the Flood Planning Level of 2.9 metres AHD as stated in the Flood Information Certificate provided by Council (ref: 83-2020-592-1). This level defines the minimum floor level for habitable rooms in flood prone land as stated in the Flood Information Certificate (ref: 83-2020-592-1).

The proposed fill pad has a footprint area of approximately one (1) hectare as shown in Figure 2 overleaf. Compensatory cut is also proposed to limit flood impacts of the development with approximate area of 0.62 hectares and an invert level of 1.30 metres AHD. The cut and fill extents presented herein are intended to be indicative only and are expected to be formalised at Development Approval stage when a formal site layout is developed.

Study Area

The subject site is situated within the Fullerton Cove region which is expected to be subject to flooding through three mechanisms namely local catchment runoff, tidal inundation and flooding from the regional Fullerton Cove and Hunter River catchment.

The impact of fill on the existing flood behaviour within the subject site and general vicinity is expected to be greatest during the local catchment runoff and as such this mechanism is the focus of the flood impact portion of this assessment. Flood Planning Levels for the subject site are based on the regional flood event which has been provided by Council in the Flood Information Certificate (ref: 83-2020-592-1).

The following Figure 3 presents the extent of the local catchment which has an approximate area of 228 hectares with terrain elevations ranging from approximately 0.1 metres AHD in the lower reaches to 26 metres AHD in upper reaches of the catchment. Land use throughout the local catchment is largely characterised as dense bushland, grassland and small to medium sized patches of residential areas.

It is noted that possible sites for future development within the Study Area are expected to have already been filled. As such, analysis of cumulative impacts of nearby development are considered to have been reviewed as part of this assessment. In addition, it is expected that any future development within flood prone land within the Study Area would require their own flood study and assessment of flood impact to be prepared.



Legend

- Subject Site
- Cadastre
- Proposed Cut
- Proposed Fill
- Overland Flow Path

Proposed Landform (mAHD)

- 0.00 - 1.25
- 1.25 - 1.50
- 1.50 - 1.75
- 1.75 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 4.00
- 4.00 - 5.00
- 5.00 - 7.00

0 35 70 140

1:3,000 Metres

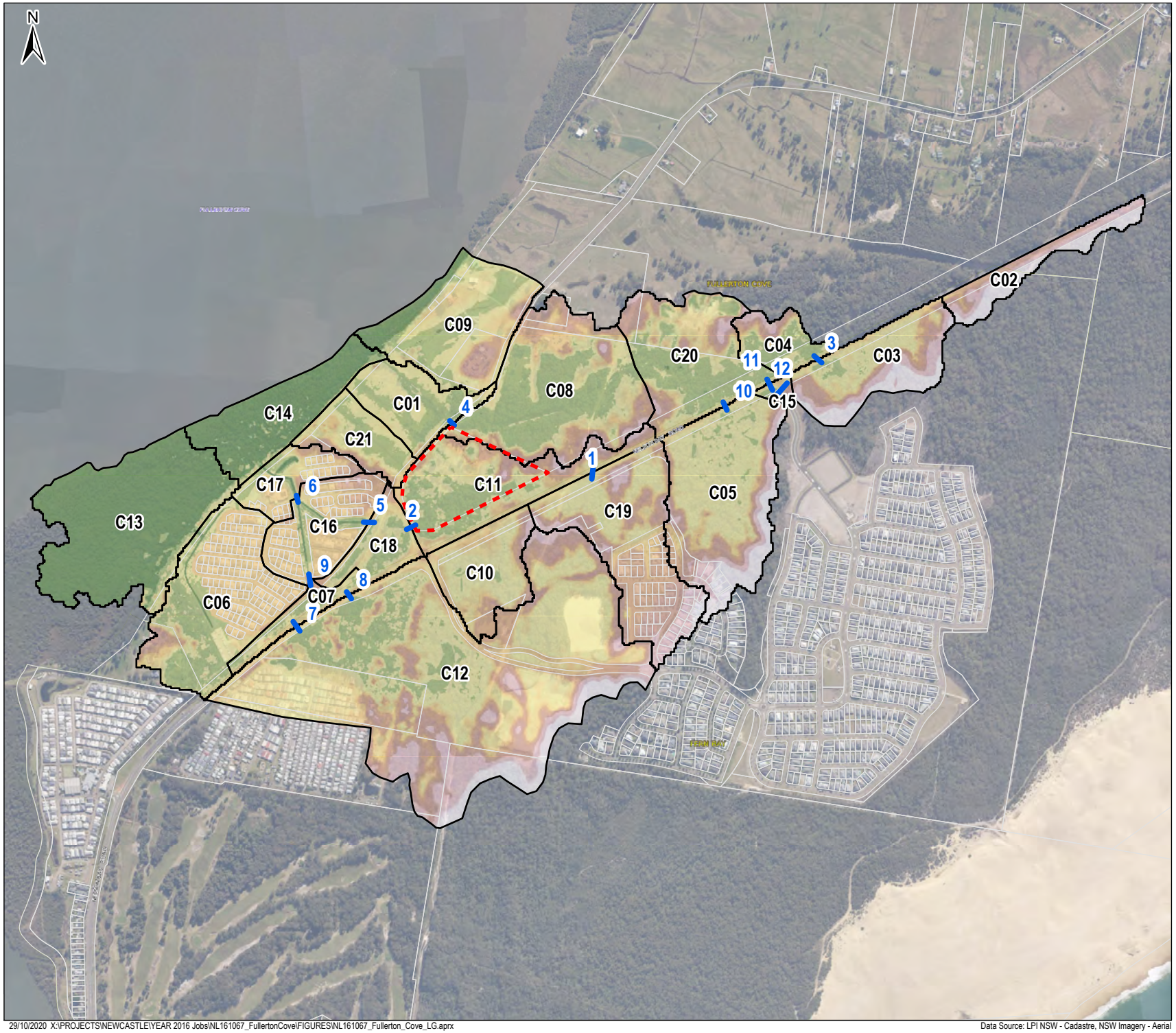
Figure 2

Proposed Development

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- Subcatchments
- Cadastre
- Culverts

Existing Landform (mAHD)

- 0.0 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 4.0
- 4.0 - 6.0
- 6.0 - 10.0
- 10.0 - 26.0

0 175 350 700

1:15,000 Metres

Figure 3

Study Area - Subcatchments, Existing Topography and Hydraulic Structures

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

Hydrological Model Setup

The hydrological model used in preparation of this study is the DRAINS one-dimensional software coupled with the Initial and Continuing Loss model. The combined hydrological and hydraulic computational capacity of DRAINS makes it ideal for this study as it enables storages to be included when reviewing the critical storm duration to be passed to the two-dimensional model.

Sub-Catchment Details

The latest Australian Rainfall and Runoff 2019 guidelines have been used for this study with a total of 21 sub-catchments delineated using a combination of LiDAR terrain data, cadastre aerial imagery and observations made during the site visit. The modelled sub-catchments are shown in Figure 3 with the catchment properties presented in the below Table 1.

Table 1 - Modelled Sub-Catchment Properties

Catchment Reference	Area (ha)	Slope (%)	Catchment Reference	Area (ha)	Slope (%)
C01	5.76	2.4	**C12**	52.9	5.7
C02	4.29	17.8	**C13**	18.9	2.7
C03	8.21	10.6	**C14**	8.35	1.5
C04	3.36	4.9	**C15**	0.59	10.6
C05	16.1	10.6	**C16**	7.12	3.0
C06	14.6	1.8	**C17**	4.01	3.8
C07	2.42	3.8	**C18**	3.70	2.8
C08	17.1	3.9	**C19**	14.3	6.4
C09	11.8	2.5	**C20**	11.6	3.9
C10	6.99	3.3	**C21**	4.47	2.4
C11	11.3	3.9			

Burst Rainfall

The latest AR&R 2019 rainfall has been obtained from the Bureau of Meteorology while the accompanying rainfall temporal patterns have been obtained by the AR&R Data Hub for a location over the study area. AR&R 2019 recommends the use of the storm ensemble method using 10 temporal patterns for each storm duration. For this investigation, storm durations ranging from the 6, 9, 12, 18, 24, 30, 36, 48, 72, 96, 120 and 144 hours events were assessed in the hydrological model to determine the critical storm event.

The Probable Maximum Precipitation (PMP) design storm event rainfall depths and temporal patterns were estimated using the Generalised Short-Duration Method (GSDM) for durations up to 6 hours. The durations 15, 30, 45 minutes and 1, 1.5, 2, 2.5, 3, 4, 5, 6 hours were modelled to define PMF.

The 2050 and 2090 Climate Change horizons have also been considered as part of this investigation. An increase in rainfall depths of 9% and 19.7% respectively have been used which is based on the worst case RCP8.5 Interim Climate Change Factors provided by the AR&R 2019 Data Hub.

Pre-Burst Rainfall

The latest NSW Specific Transformational Pre-Burst depths has also been used as part of the investigation. These were obtained from the AR&R Data Hub for a location over the study area. As recommended by the latest AR&R 2019 guidelines, the 60min pre-burst depths have been used for storm durations less than 60 minutes.

Infiltration Losses

As mentioned previously, the Initial and Continuing Loss model has been used for this study with the latest AR&R 2019 storm losses were obtained from the AR&R Data Hub for a location over the study area. The Initial and Continuing Loss method simulates catchment storage as an initial loss in rainfall followed by a constant loss rate (continuing loss).

The below **Table 2** presents the Initial and Continuing losses obtained from the ARR data hub and the corresponding modelled loss rates. The latest OEH guidelines recommend reducing the continuing loss values provided by the ARR Data Hub, by a factor 0.4 for un-calibrated models within NSW. As such, modelled continuing losses have been reduced accordingly.

Table 2 – Infiltration Loss Rates

Land Use	Initial Loss (mm)	Continuous Loss (mm/hr)
ARR Data Hub Losses	13.0	2.80
Modelled Pervious Losses	13.0	1.12
Modelled Impervious Losses	1.5	0.00

Hydraulic Model Parameters

The hydraulic model used for this study is the two-dimensional TUFLOW hydrodynamic modelling software. The following provides a summary of the of the parameters and assumptions used in the development of the two-dimensional flood model.

The TUFLOW model extent, boundary conditions, surface roughness and modelled 1D elements are shown on Figure 4 overleaf.

Digital Terrain Model

The Digital Terrain Model (DTM) used for the two-dimensional model has been prepared using one-metre resolution LiDAR elevation data, captured over the Fullerton Cove area in 2013 and sourced from NSW Spatial Services.

Some additional minor terrain modifications were also entered into the TUFLOW model manually to update the LiDAR elevation data to include observations made from the latest aerial imagery and during a site visit.

Grid Size

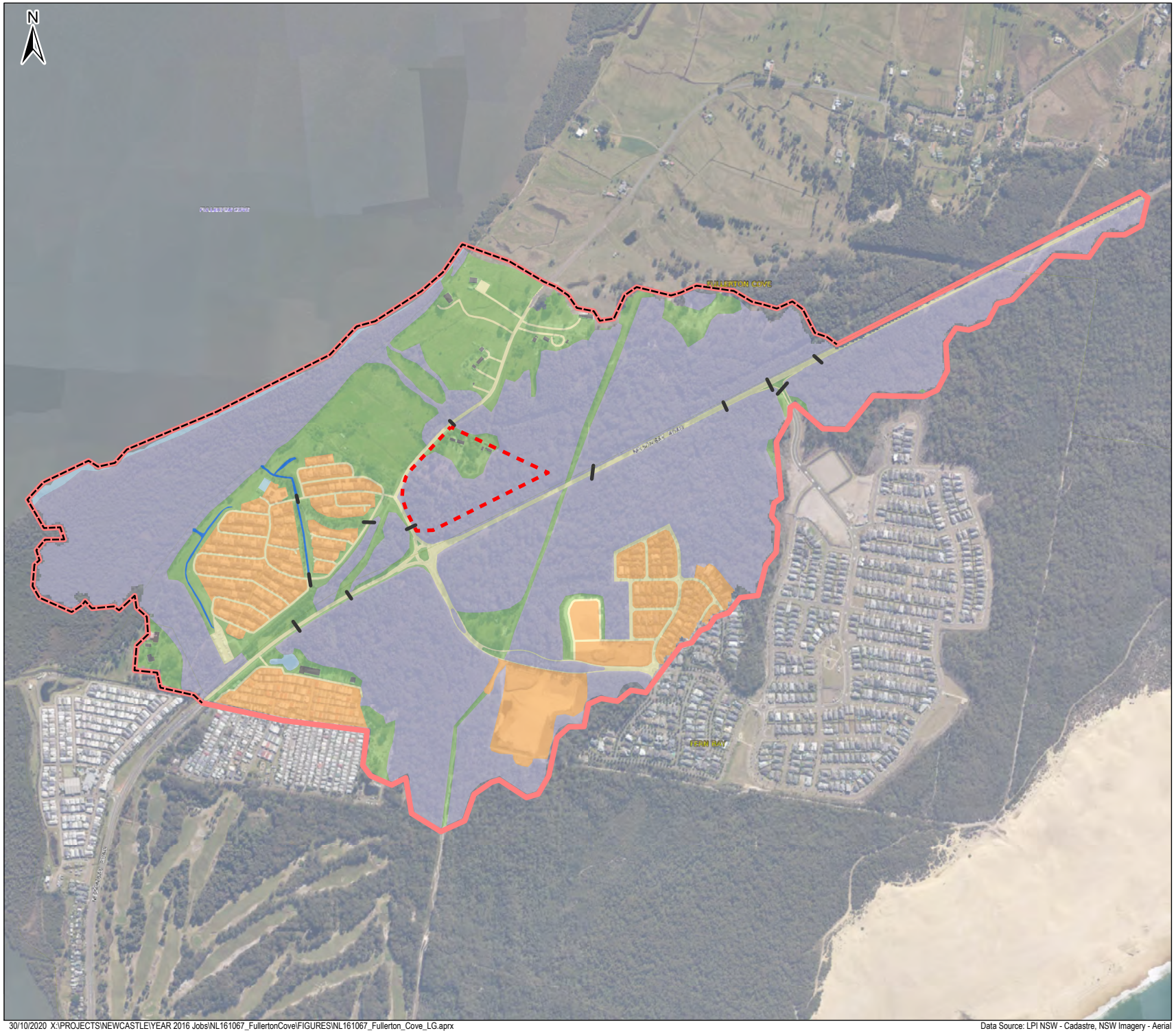
The two-dimensional grid extent covers the full catchment extent presented in Figure 3. A three-meter grid size has been adopted which was considered an appropriate balance between the representation of flows through open channels and model run-time.

TUFLOW version 2020-01-AA has been used for this study using the HPC GPU solver.

Adopted Boundary Conditions

Critical storm inflow hydrographs for the 20%, 5%, 1% AEP and PMF design storm events, generated by the one-dimensional DRAINS model were entered into the two-dimensional model at sub-catchment storage zones and outlet locations.

Outflow tailwater conditions were based on information contained in the *Williamtown Salt Ash Flood Study (WBM, 2005)* with a dynamic outlet head boundary, simulating the 50% AEP tide with a maximum elevation of 1.17m AHD, entered into the model at the location shown in Figure 4 overleaf. These conditions represent a “Free Outfall” tailwater condition which have been adopted as a worst-case scenario for flood impact comparison purposes.



Legend

- Subject Site
- Downstream Boundary
- 2D Model Extent
- 1d Network (Culverts)

LandUse - Manning's n

- Grass (0.045)
- Sealed Roads (0.015)
- Dense Vegetation (0.070)
- Open Water (0.020)
- Drainage Channels (0.040)
- Residential Areas (0.090)
- Buildings (0.100)

0 175 350 700

1:15,000 Metres

Figure 4

2D TUFLOW Model Setup

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

30/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

Hydraulic Structures

The location of the modelled below ground stormwater infrastructure entered the two-dimensional TUFLOW model is presented in Figure 4 overleaf. The type, size and assumed blockage factors are summarised in in the below Table 3. Blockage is based on observations made during a site inspection with a sensitivity test for "severe" blockage also assessed as part of this investigation for the 1% AEP design storm event.

Table 3 - Modelled Hydraulic Structures (Culverts)

Culvert Reference (Refer to Figure 3)	Culvert Type	Culvert Size	Design Blockage	Severe Blockage
1	Pipe	450 mm	0%	0%
2	Pipe	450 mm	50%	100%
3	Pipe	600 mm	0%	0%
4	Pipe	225 mm	90%	100%
5	Pipe	600 mm	0%	100%
6	Pipe	3 x 900 mm	0%	50%
7	Pipe	600 mm	0%	0%
8	Pipe	450 mm	0%	0%
9	Pipe	3 x 900 mm	0%	50%
10	Box	1200 mm x 600 mm	0%	0%
11	Pipe	450 mm	0%	0%
12	Pipe	375 mm	0%	0%

Results

Critical Storm Duration

To determine the critical storm duration for the 20%, 5% and 1% AEP design storm events, the guidance provided in the latest AR&R 2019 guidelines was considered as summarised below:

- Classification of the median value of the ten temporal patterns for each storm duration; and
- Selection of the duration that produces the maximum median value for each return interval.

For the 20%, 5% and 1% AEP design storm events, the one-dimensional DRAINS model was used to determine the critical storm durations which were then passed into the two-dimensional TUFLOW model. The one-dimensional DRAINS model incorporates hydrodynamic linkages (channels, culverts, overflow routes and storage basins) between sub-catchment nodes to ensure the catchment storage within the catchment is accounted for when determining the local catchment critical storm duration.

All durations ranging from the 15-minute to the 6-hour were run in the TUFLOW model to determine the critical event for the PMF design storm event. The below Table 4 presents the resultant critical storm durations for each return interval across the subject site.

Table 4 – Critical Storm Durations

Return Interval	Duration	Temporal Pattern
20% AEP	48-Hour	TP7
5% AEP	72-Hour	TP1
1% AEP	72- Hour	TP8
PMF	30 Minute	-

The results presented herein for the PMF are an envelope of all durations analysed however, the duration nominated in the above Table 3 was observed to produce the highest water level across the majority of the catchment and the subject site.

Existing Flood Behaviour

The existing case maximum water depth and flood elevations across the subject site and vicinity, for the 20%, 5%, 1% AEP and PMF design storm events are presented in **Figures A1, A2, A3 and A4** of Attachment A respectively.

Due to the low lying and flat nature of the local catchment, flows derived by the upstream catchment are expected to pond across the subject site and in the upper reaches of the catchment before continuing downstream. Flows derived from the upstream catchment, pass across Nelson Bay Road before continuing in a north-westerly direction through the subject site and across Fullerton Cove Road located adjacent to the western boundary of the subject site. Downstream of the subject site, flows continue in a north-westerly direction, through an open channel located in the Cove Village before continuing in a northerly direction and discharging into Fullerton Cove.

During local catchment flood conditions, the results presented in **Figures A1 and A2** demonstrate flood water is expected to begin overtopping Fullerton Cove Road and Nelson Bay Road during the 5% AEP design storm event. Flood depths during the 1% AEP remain relatively shallow with **Figure A4** showing depths less than 300mm are expected across these roads. During the PMF, **Figure A4** suggests flood depths in excess of 500mm and 300mm are expected across Fullerton Cove Road and Nelson Bay Road respectively.

The following Table 5 summarises the modelled maximum water depth and elevations across the subject site during existing conditions for the 20%, 5%, 1% AEP and PMF events.

Table 5 – Subject Site Existing Case Flood Depth and Elevation

Return Interval	Max Water Level (m AHD)	Max Water Depth (m)
20% AEP	1.74	0.54
5% AEP	2.03	0.83
1% AEP	2.12	0.92
1% AEP Sensitivity (Culvert Blockage)	2.17	0.97
PMF	2.83	1.63

It is noted these elevations differ slightly to those presented by the one-dimensional assessment presented in the original *Flooding and Drainage Study dated the 28th of February 2017* (refer to Attachment 3). This is expected to be due to a combination the adoption of the latest AR&R modelling methodologies and data and the updated two-dimensional modelling methodology.

The attached Flood Information Certificate (ref: 83-2020-592-1) and LiDAR data suggests regional flood elevations and depths across the subject site range from an elevation of 1.7m AHD and a depth of 0.5m during the 1% AEP (current conditions) to 5.3m AHD and 4.1m deep during the PMF respectively. This corresponds to variable flood hazard conditions across the subject site with High Hazard Flood Storage defined in the low-lying areas of the site to flood free land in the upper reaches.

Developed Case

The modelled maximum water depth and elevation for the developed case scenario during the 20%, 5% 1% AEP and PMF design storm events are presented in **Figures B1, B2, B3 and to B6**. Flow velocities and flood hazard conditions for the 1% AEP and PMF design storm events during the developed scenario are presented in **Figures B4, B5, B7 and B8.**

Flow conditions during the developed case remain largely unchanged when compared with the existing case with the exception of the removal of a minor flow path across the proposed B1 zone during the PMF design storm event as a result of the proposed fill pad.

A summary of the modelled maximum flood elevation, depth, velocity and hazard flow conditions across the subject site are summarised in the below Table 7.

Table 7 – Subject Site Developed Case Flood Behaviour

Return Interval	Max Water Level (m AHD)	Max Water Depth (m)	Maximum Velocity (m/s)	Maximum Hazard (ARR 2019)
20% AEP	1.72	0.52	-	-
5% AEP	2.03	0.83	-	-
1% AEP	2.12	0.92	0.18	H3
1% AEP Sensitivity (Culvert Blockage)	2.17	0.97	-	-
PMF	2.84	1.64	0.49	H4

A comparison of the available flood storage volumes on the subject site during the 20%, 5% and 1% AEP for both the developed and existing case scenarios is shown in Table 6 below.

Table 6 – Comparison of Available Flood Storage

Return Interval	Existing (m^3)	Developed (m^3)	Difference (m^3)	Difference (%)
20% AEP	9978	11204	+1226	+12.3
5% AEP	23287	23172	-115	-0.5%
1% AEP	27541	26845	-696	-2.5%

The comparison presented in Table 6 above shows an increase of up to 12.3% in available flood storage during minor events and a slight decrease of up to 2.5% during major events. The slight reduction in flood storage during the 1% AEP does not have a significant impact on the existing flood behaviour as discussed below. In addition, it is anticipated the cut and fill balance will be reviewed and fine-tuned further at Development Application Phase when a site layout is determined.

Flood Impact

The impact of the proposed development on the existing flood conditions on the subject site and within adjacent properties during the 20%, 5%, 1% AEP and PMF design storm events is shown in the attached **Figures D1 to D5**.

During the 20% AEP, **Figure D1** shows a decrease in flood elevation of approximately 22-24mm across the subject site and downstream which is expected to be due to the proposed cut and increased flood storage volume available at lower levels within the subject site. Only minor changes are observed during the 5% and 1% AEP design storm events with **Figures D2 and D3** showing an increase in the order of 3mm and 5mm during the 5% AEP and 1% AEP design storm events respectively.

The attached **Figure D5** presents the impact of the proposed development on the existing flood behaviour during the PMF design storm event. The results demonstrate an increase generally less than 10mm in adjacent properties but up to 14mm through the overland flow path in The Cove Village downstream. A commensurate decrease is also observed to the north of the subject site with these changes in flood levels are expected to be due to the removal of a minor flow path across the proposed fill pad located in the north-eastern corner of the subject site. Given the magnitude of the event and the magnitude of the increase, these impacts are not expected to create a significant adverse impact on the subject site or within the adjacent properties. The time of inundation across major road crossings and within catchment storage zones is not expected change significantly due to the introduction of the proposed development.

The sensitivity of the flood impact results to culvert blockage has also been assessed with the results presented in **Figure D4.** The results suggest a change of less than +/- 2mm change in flood levels across the subject site and adjacent properties which is less than those presented in Figure D3.

The impact of the proposed development during the 2050 and 2090 climate change scenarios are presented in **Figures D6** and **D7**. The results demonstrate an increase of up to approximately 4mm in The Cove Village and vicinity during the 2050 climate change scenario and approximately 7mm during the 2090 climate change scenario.

In addition, the attached **Figure D8** presents the pre to post development flood velocity difference during the 1% AEP design storm event. A difference generally less than +/- 0.1m/s is observed which is not expected to significantly impact the existing flood velocity across the site and the surrounding

properties. Similar results are observed in the 2050 and 2090 Climate Change scenarios with velocity changes during these scenarios ranging from approximately -0.1 to 0.2m/s.

Figure B4 of Attachment 1 shows flow velocities across the subject site and vicinity generally less than 0.25m/s and a maximum of approximately 1.0m/s. As these velocities are less than a typical erosive threshold of 2.0m/s for grass, the increases discussed above are not expected to result in additional scour or significant impacts in adjacent properties.

Discussion

Flood Related Development Controls

The below Table demonstrates how the proposed development complies, or otherwise, with the flooding related development controls outlined in Section B5 of Port Stephens Council Development Control Plan.

Table 8 – Development Controls (PSC DCP, 2019)

Item	Item Reference	Response
B5.1	Flood Hazard	• The flood hazard conditions presented herein and within the Flood Information Certificate provided by Council (ref: 83-2020-592-1) presents the flood hazard conditions expected across the subject site during both the Local and Regional Flood Events. • Additional discussion with respect to warning time, evacuation and access / egress restrictions are provided in Item B5.10 below.
B5.2	Flood Hazard	• Regional flood information is presented in the Flood Information Certificate provided by Council (ref: 83-2020-592-1) while, the local flood conditions have been reviewed herein. • The local catchment flood conditions presented herein have considered the principles of the NSW Floodplain Development Manual (2005) and the latest Australian Rainfall and Runoff Guidelines (2019).
B5.3	All Hazard Categories	• Refer to below Item B5.10.
B5.4	All Hazard Categories	• It is recommended that opportunities for ongoing flood adaption be reviewed at Development Approval Stage when a concept development layout is prepared.
B5.5	All Hazard Categories	• The fill height proposed herein has been sited in order to facilitate placement of floor levels at a minimum elevation of 2.9m AHD in accordance with the Flood Planning Level presented in the Flood Certificate provided by Council (ref: 83-2020-592-1). • It is recommended that Finished Floor Levels and the necessary Flood Planning Levels be reviewed when a concept layout is prepared at Development Approval Stage. • It is recommended that finished floor levels be sited in accordance with the Port Stephens Council Local Environmental Plan and Development Control Plan.
B5.6	Minimal Risk – Flood Prone Land that is above the FPL	• It is recommended a site-specific Flood Emergency Response Plan be prepared at Development Approval Stage to; ensure future occupants are aware of the existing site flood risk, to identify evacuation/ off-site and on-site refuge opportunities and, to promote early self-

Item	Item Reference	Response
		motivated evacuation in the event of a predicted extreme flood event. • Additional information is provided in the below Item B5.10.
B5.7	Low Hazard 1 - Floodway	• The Flood Certificate provided by Council (ref: 83-2020-592-1) suggests Low Hazard 1 – Floodway flow conditions are not observed across the subject site. • As such this criterion is not applicable.
B5.8	Low Hazard 2 - Storage	• The Flood Certificate provided by Council (ref: 83-2020-592-1) suggests Low Hazard 2 – Storage flow conditions are observed across the subject site. • Filling is proposed and the accompanying flood study and impact assessment is contained herein. • The results show the proposed development is not expected to significantly alter the existing flood behaviour on the subject site or in adjacent properties. • It is recommended that a site-specific Flood Emergency Response Plan be prepared for the subject site at Development Approval Stage – refer to Item B5.10 for additional information.
B5.9	Low Hazard 3 - Fringe	• The Flood Certificate provided by Council (ref: 83-2020-592-1) suggests Low Hazard 3 - Fringe flow conditions are not observed across the subject site. • As such this criterion is not applicable.
B5.10	High Hazard Categories	• The Flood Certificate provided by Council (ref: 83-2020-592-1) suggests the subject site is located in a High Hazard area, in particular High Hazard 2 – Storage and High Hazard 3 - Fringe. • Flood levels presented in The Flood Certificate provided by Council (ref: 83-2020-592-1) suggest a lower flood level can be expected during a regional 1% AEP design storm event (1.7m AHD) when compared to the local catchment flood event (2.12m AHD). Thus, the local catchment is considered worst case for refuge/evacuation during the 1% AEP. • The results presented in Figure B5 of Attachment B suggests vehicular access, across public roads in the vicinity of the site, is available for all events up to and including the 1% AEP design storm event (maximum of H1). Isolation of the subject site during events up to and including the 1% AEP is not expected. • Given the height of the regional PMF flood event (ref: 83-2020-592-1) and the height of the nearby road levels, it is likely the subject site will become isolated during an extreme event. This is also observed during the local catchment flooding with Figure B8 demonstrating hazard conditions of up to H3 observed in Fullerton Cove Road

Item	Item Reference	Response
		and H2 in Nelson Bay Road in the vicinity of the subject site during the PMF. • The potential for isolation during the PMF does not preclude development of the subject site provided refuge is available (as suggested in this item). • A maximum elevation on the subject site of 6.7m is observed using LiDAR elevation data which is 1.3m above the Regional PMF level. This provides an opportunity for on-site refuge during an extreme event. • Opportunities for vertical evacuation (into upper levels of the facilities) should also be reviewed at Development Approval Stage when a concept layout is prepared. • Given the magnitude of the event it is anticipated that during a regional PMF flood event, ample warning time will be available for the site to enable early self-motivated evacuation. • It is recommended a site-specific Flood Emergency Response Plan be prepared at Development Approval Stage to ensure future occupants are aware of the flood risk and to promote early self-motivated evacuation in the event of a predicted extreme flood event.
B5.11	High Hazard 1 - Floodway	• The Flood Certificate provided by Council (ref: 83-2020-592-1) suggests High Hazard 1 - Floodway flow conditions are not observed across the subject site. • As such this criterion is not applicable.
B5.13	High Hazard 2 - Storage	• The impact of the proposed filling has been reviewed as part of this study. It is concluded that the proposed development is not expected to create a significant adverse impact on adjacent properties. • It is recommended a site-specific Flood Emergency Response Plan be prepared at Development Approval Stage to ensure future occupants are aware of the flood risk and to promote early self-motivated evacuation in the event of a predicted extreme flood event.
B6.14	High Hazard 3 - Fringe	• It is recommended a site-specific Flood Emergency Response Plan be prepared at Development Approval Stage to ensure future occupants are aware of the flood risk and to promote early self-motivated evacuation in the event of a predicted extreme flood event.

Conclusion

A flood impact assessment has been undertaken for the proposed development at 42 Fullerton Cove Road, Fullerton Cove, NSW.

It is concluded that development of the subject site is not expected to result a significant adverse impact on the subject site or within the adjacent properties surrounding the subject site.

We commend our findings to Council and the Department for their review.

Should you have any queries regarding this correspondence, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by:



Ruslan Batirov
Flooding and Water Resources Engineer

Reviewed by:



Laurence Gitzel
Flood Engineer

Limitation Statement

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Document Register

Rev	Status	Prepared	Approved	Date
A	Draft for Client Review	RB	LG	30 Oct 2020
B	For Approval	RB	LG	17 Nov 2020
C	For Approval	NM	LG	19 July 2021

Attachment 1 – Flood Figures

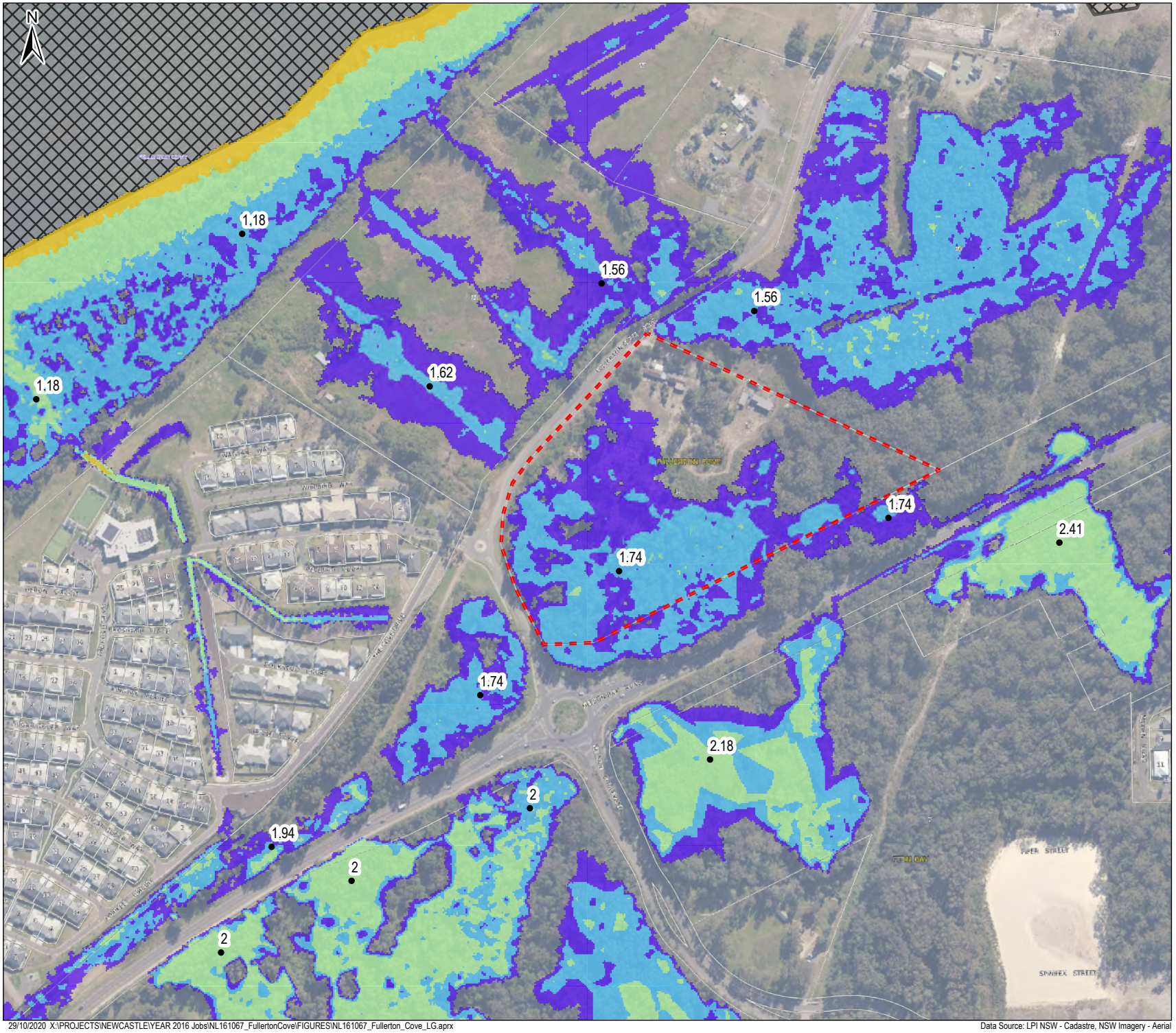


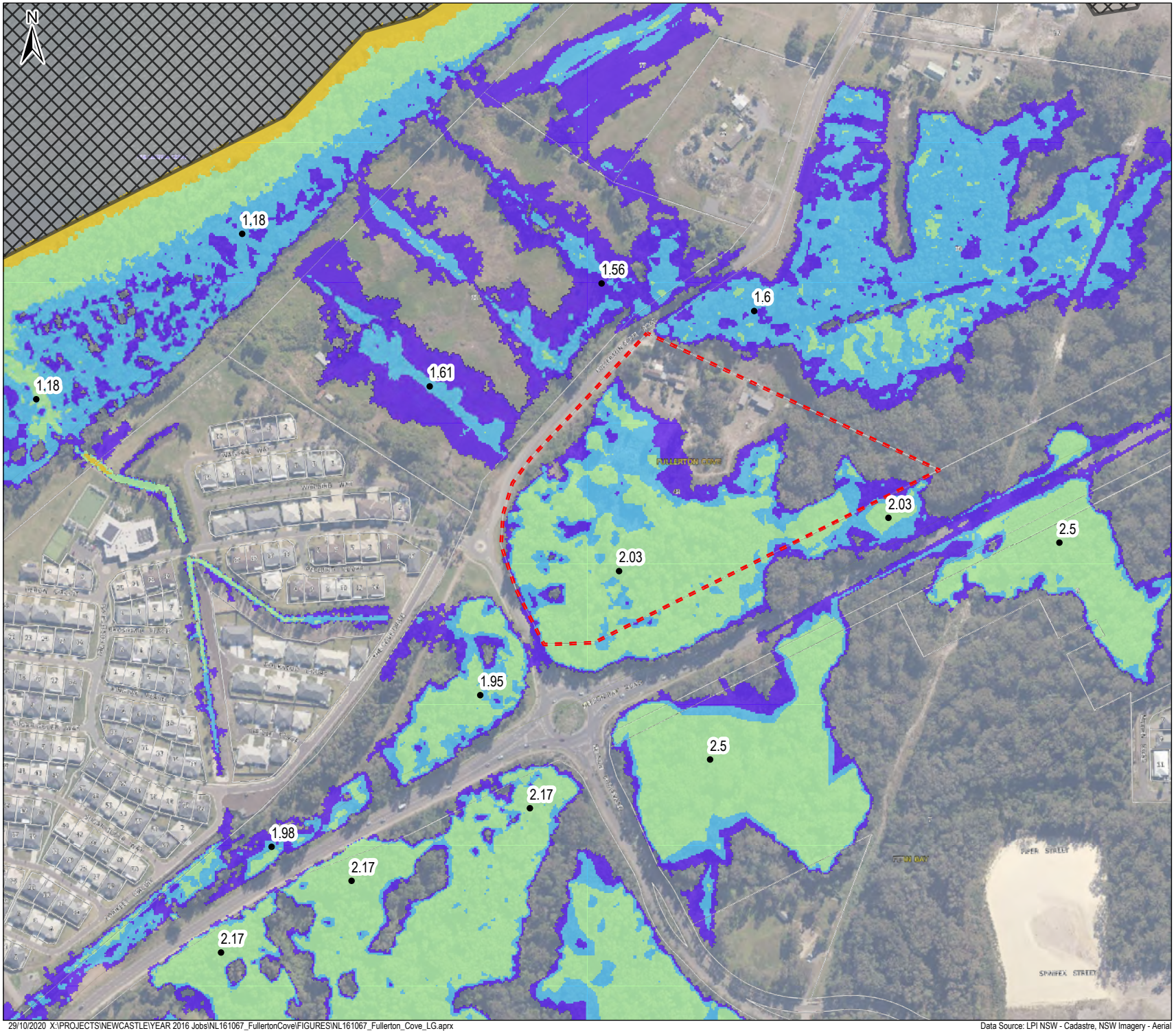
Figure A1

Existing Conditions
Flood Depth and Elevation
20% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

Figure A2

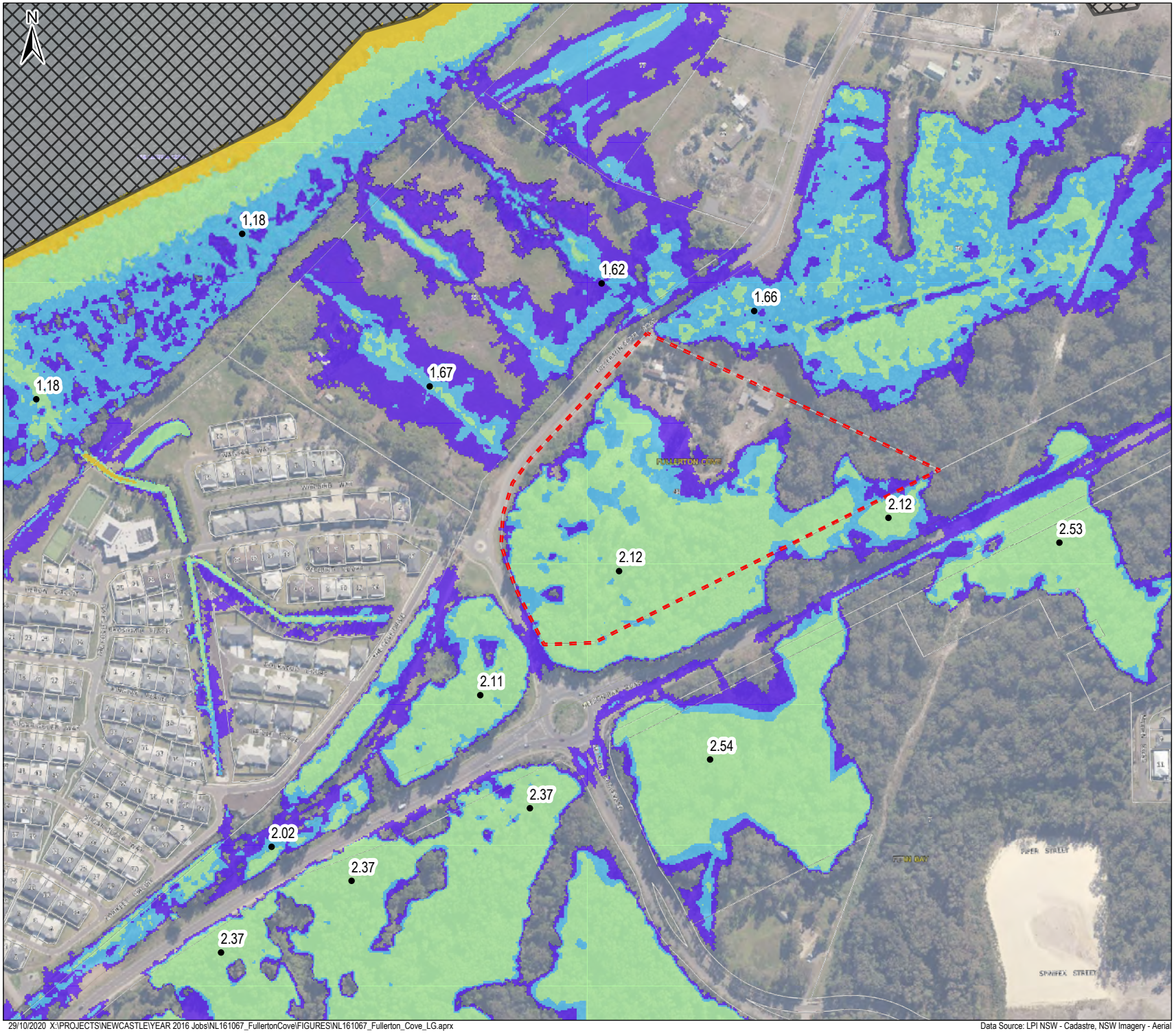
Existing Conditions
Flood Depth and Elevation
5% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

29/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

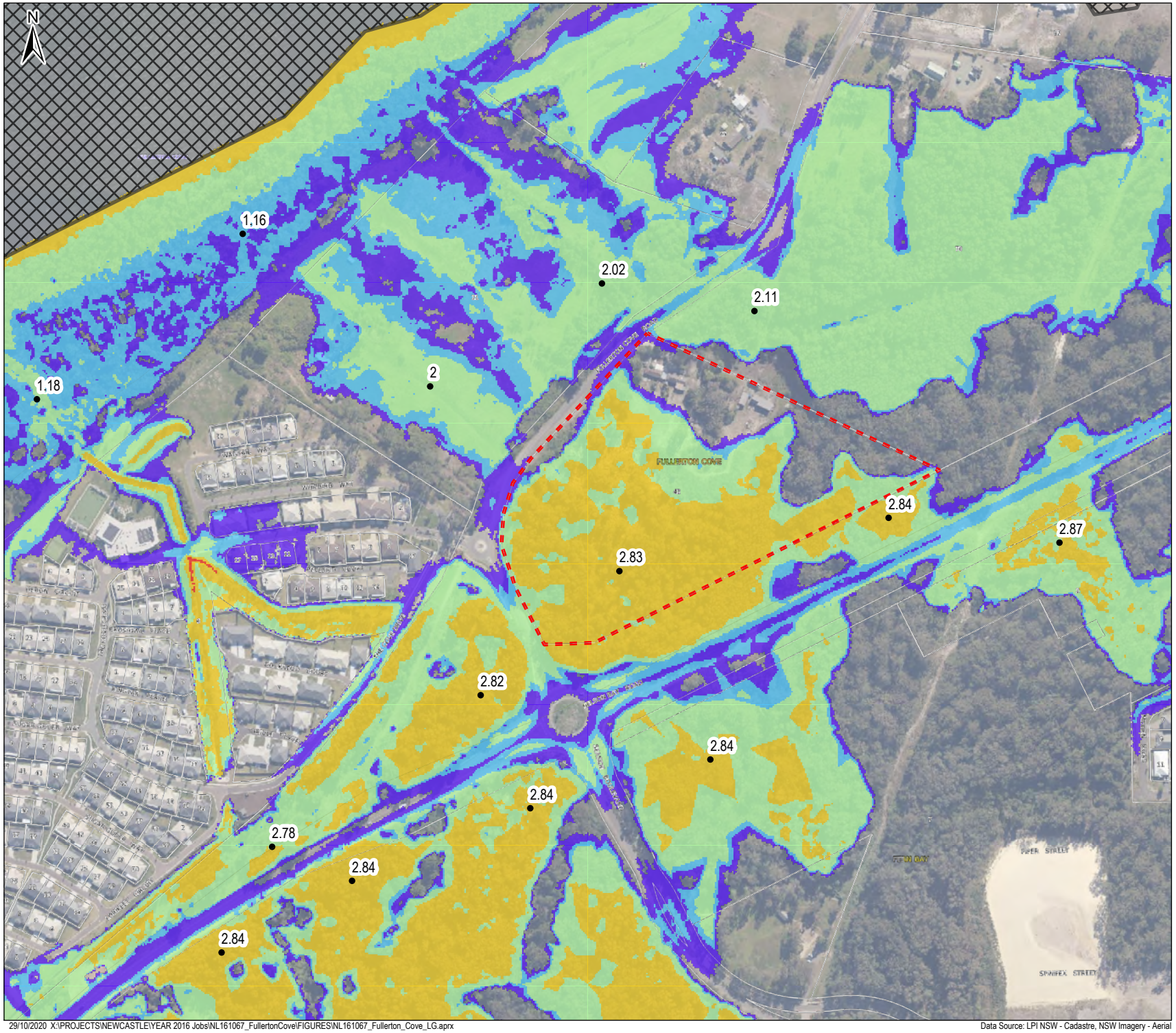
Figure A3

Existing Conditions
Flood Depth and Elevation
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

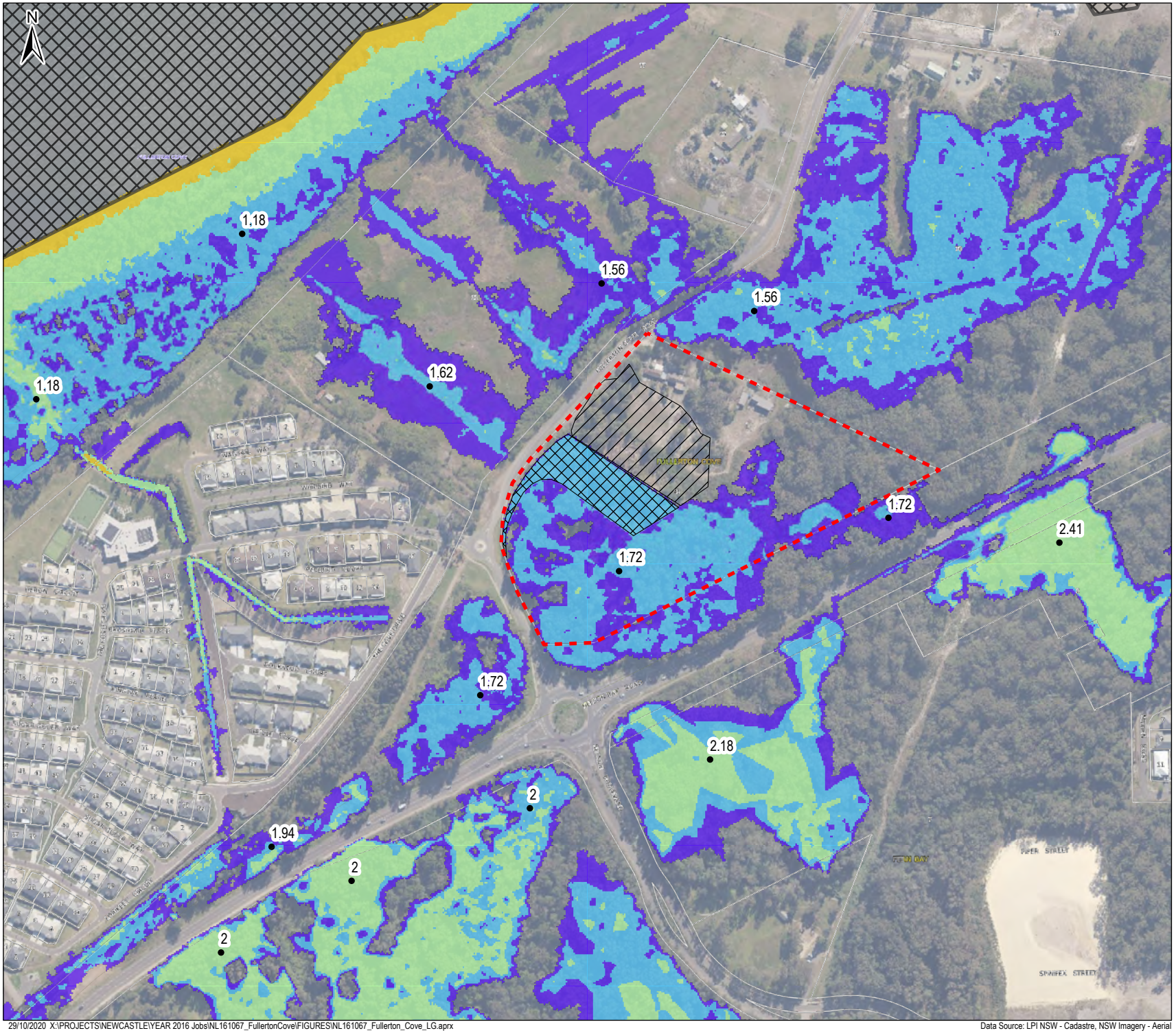
Figure A4

Existing Conditions
Flood Depth and Elevation
PMF Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

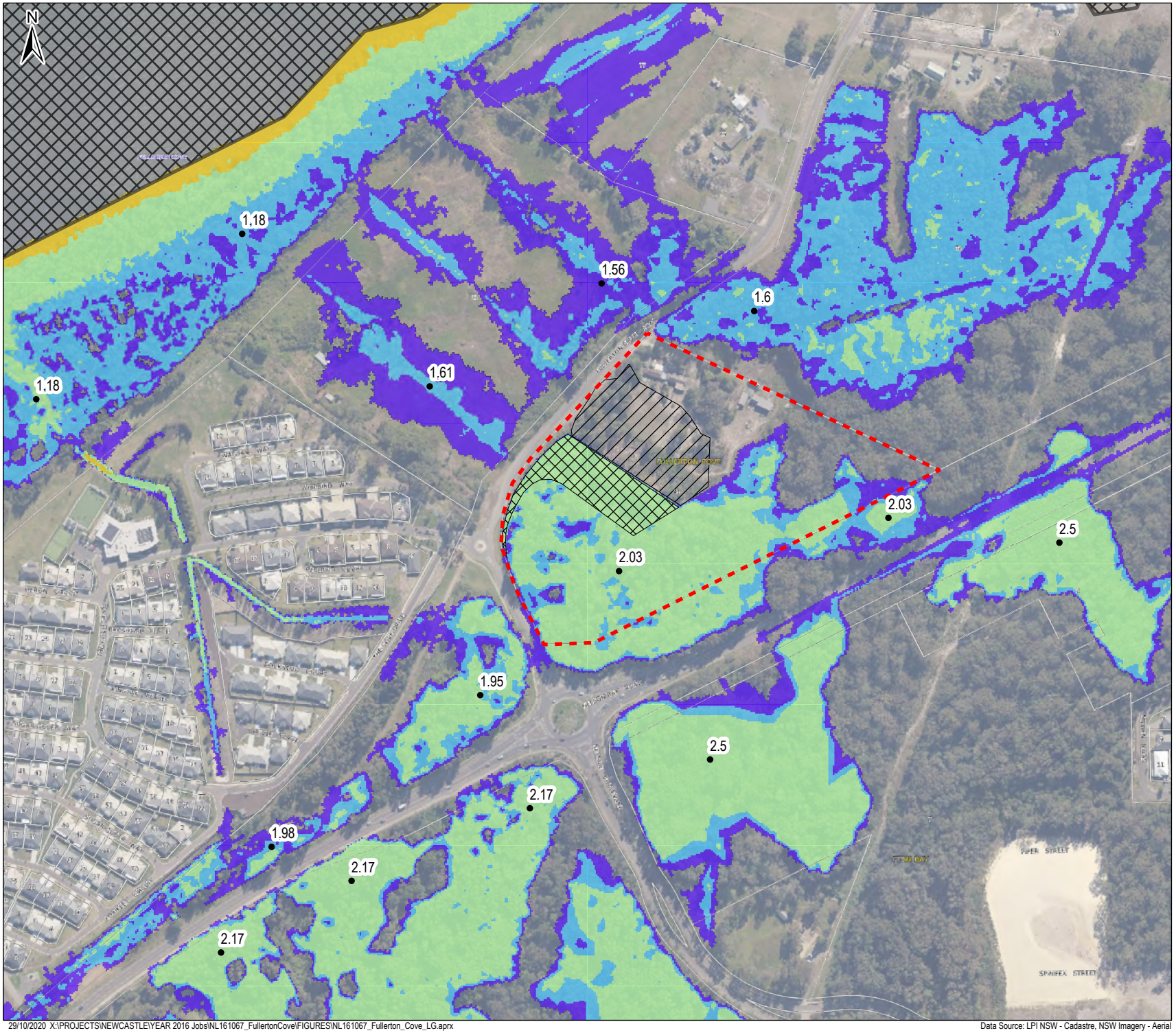
Figure B1

Developed Conditions
Flood Depth and Elevation
20% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

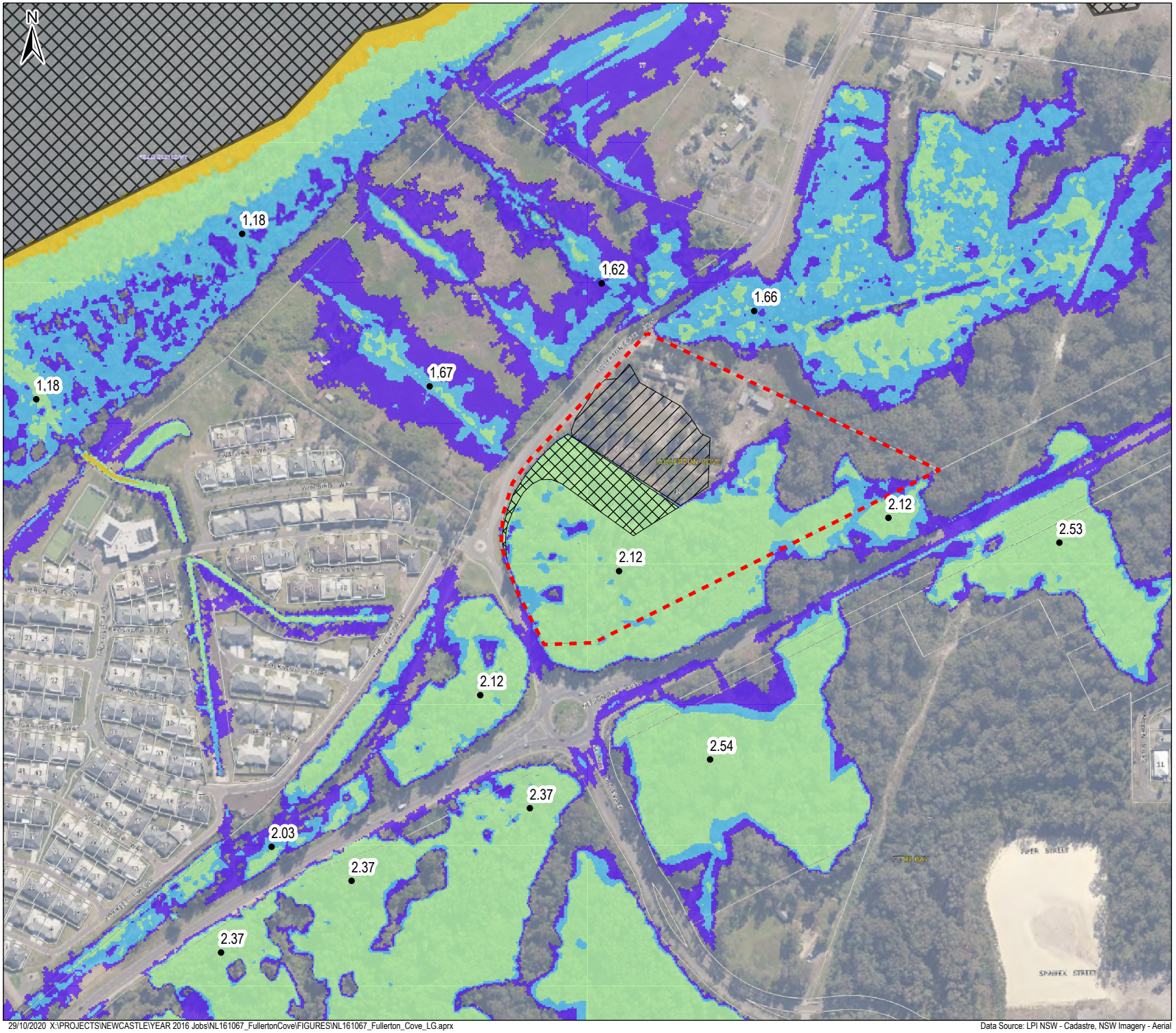
Figure B2

Developed Conditions
Flood Depth and Elevation
5% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Water Elevation (mAHD)
- Cadastre

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

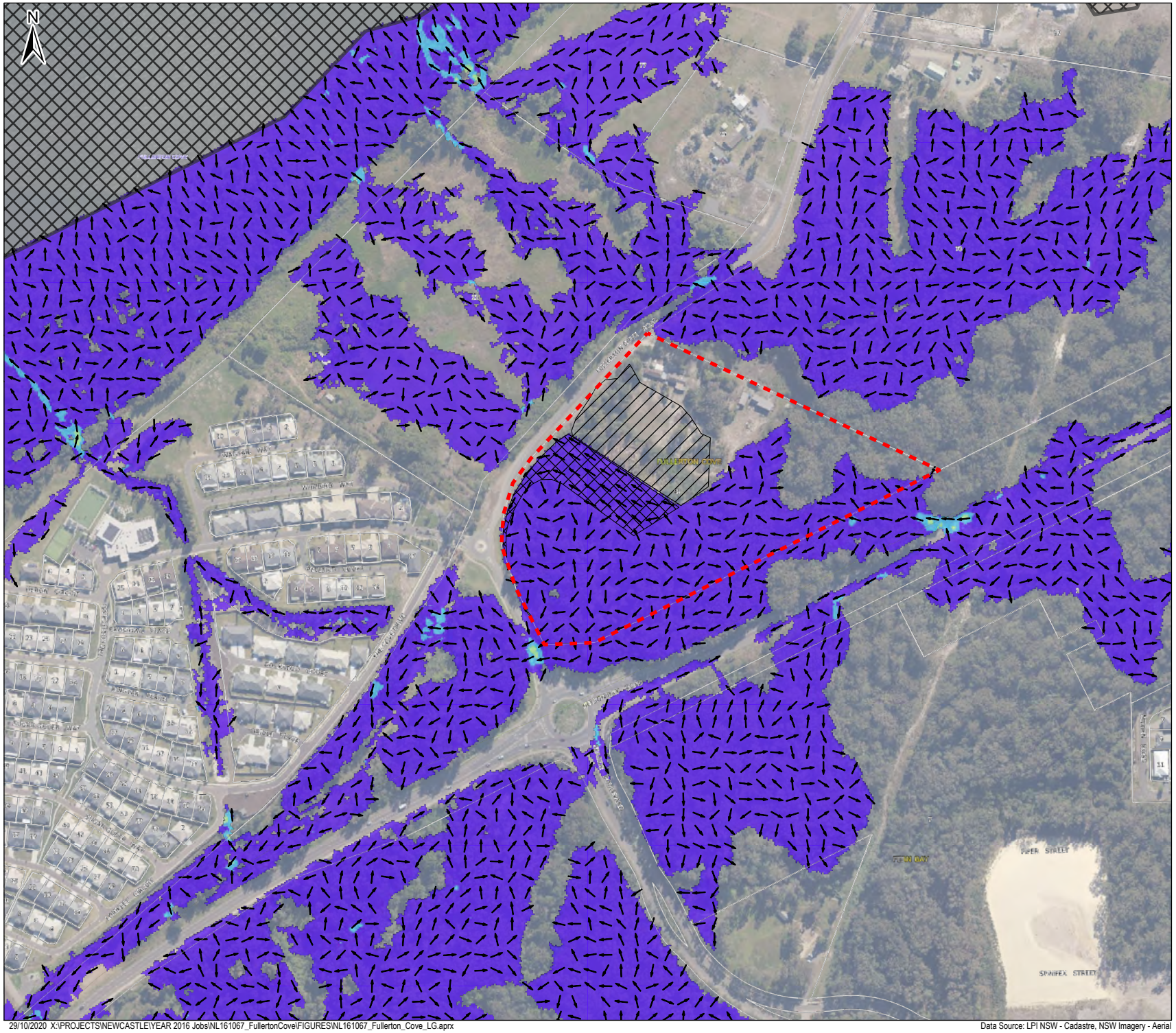
Figure B3

Developed Conditions
Flood Depth and Elevation
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre

Velocity (m/s)

- 0.00 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

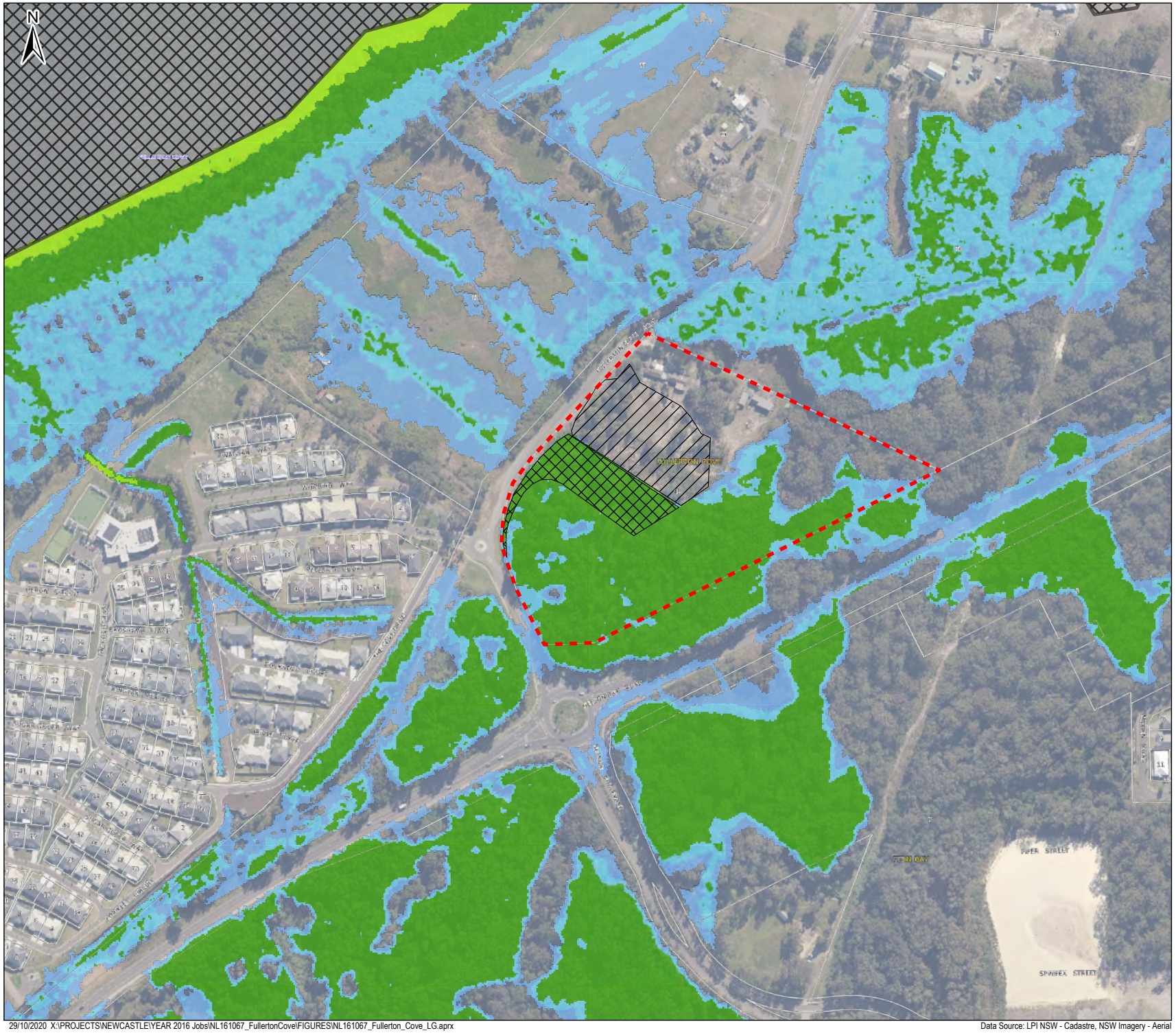
Figure B4

Developed Conditions
Flood Velocity
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

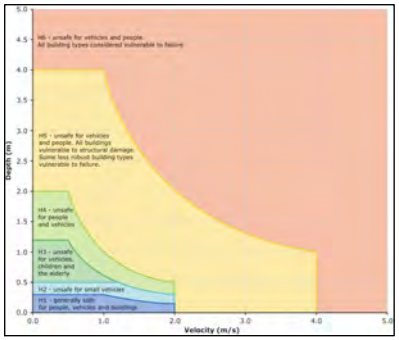


Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre

Hazard (ARR 2019)

- H1
- H2
- H3
- H4
- H5
- H6



0 55 110 220

1:5,000 Metres

Figure B5

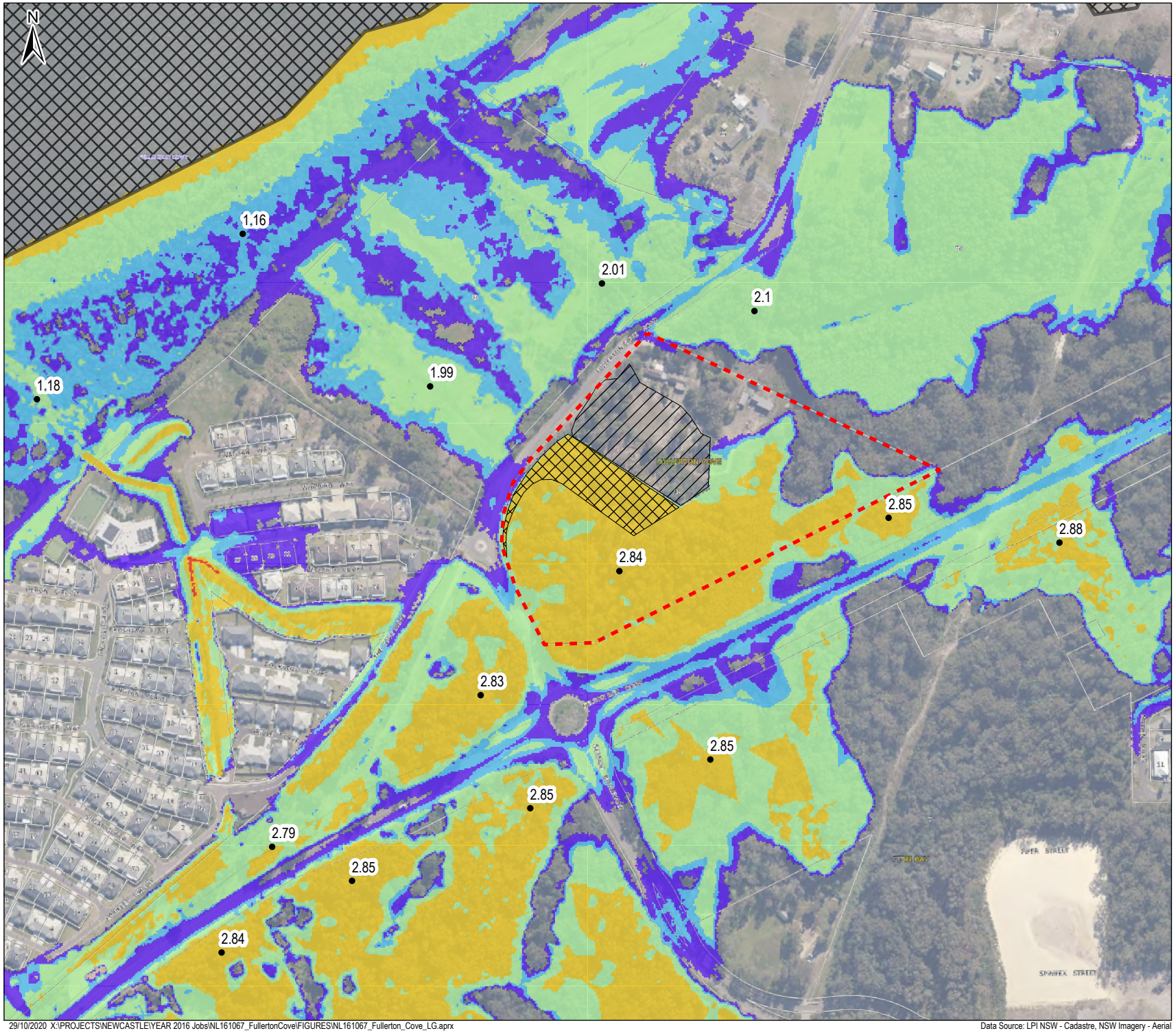
Developed Conditions
ARR 2019 Hazard
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

29/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

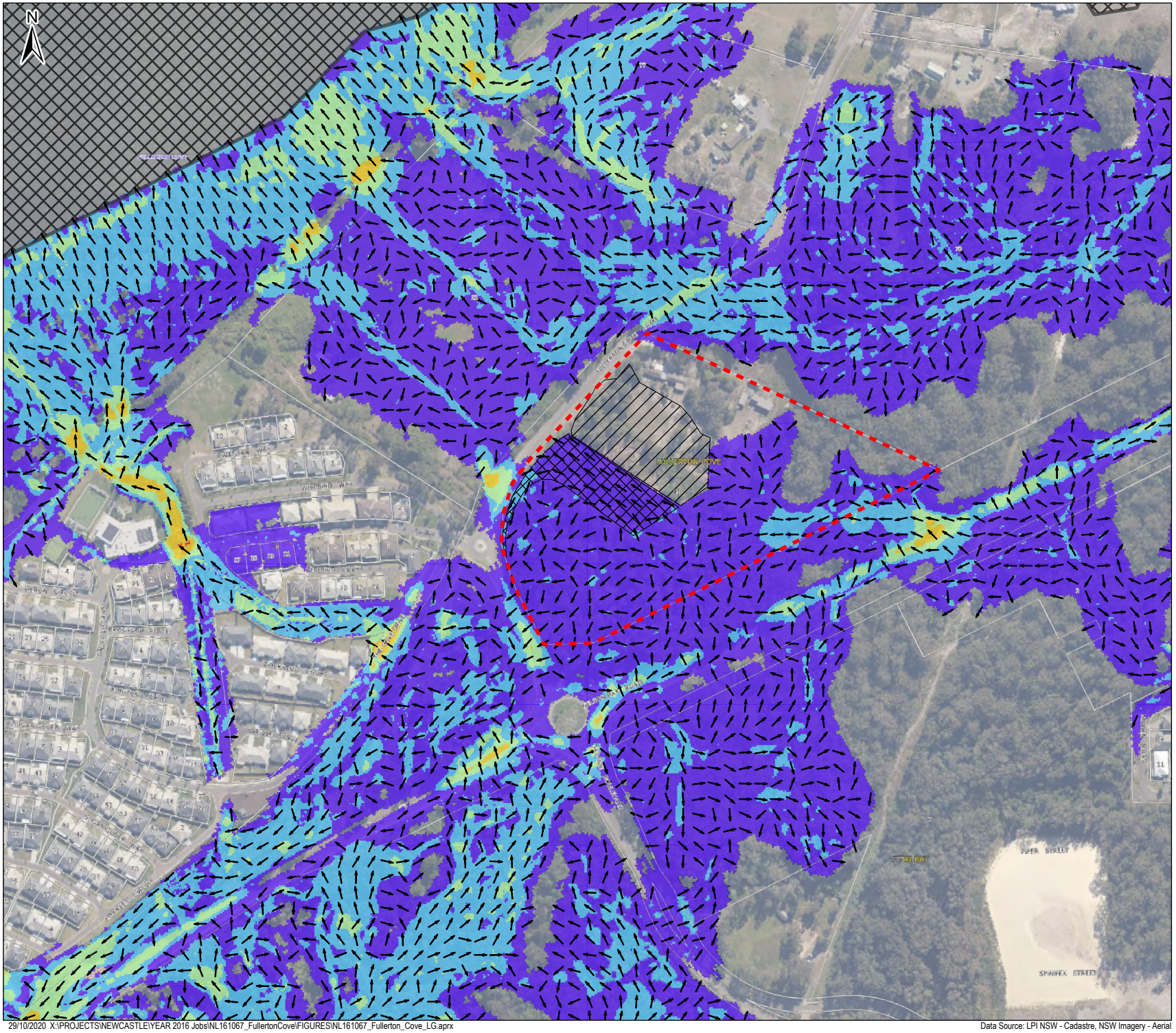
Figure B6

Developed Conditions
Flood Depth and Elevation
PMF Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre

Velocity (m/s)

- 0.00 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

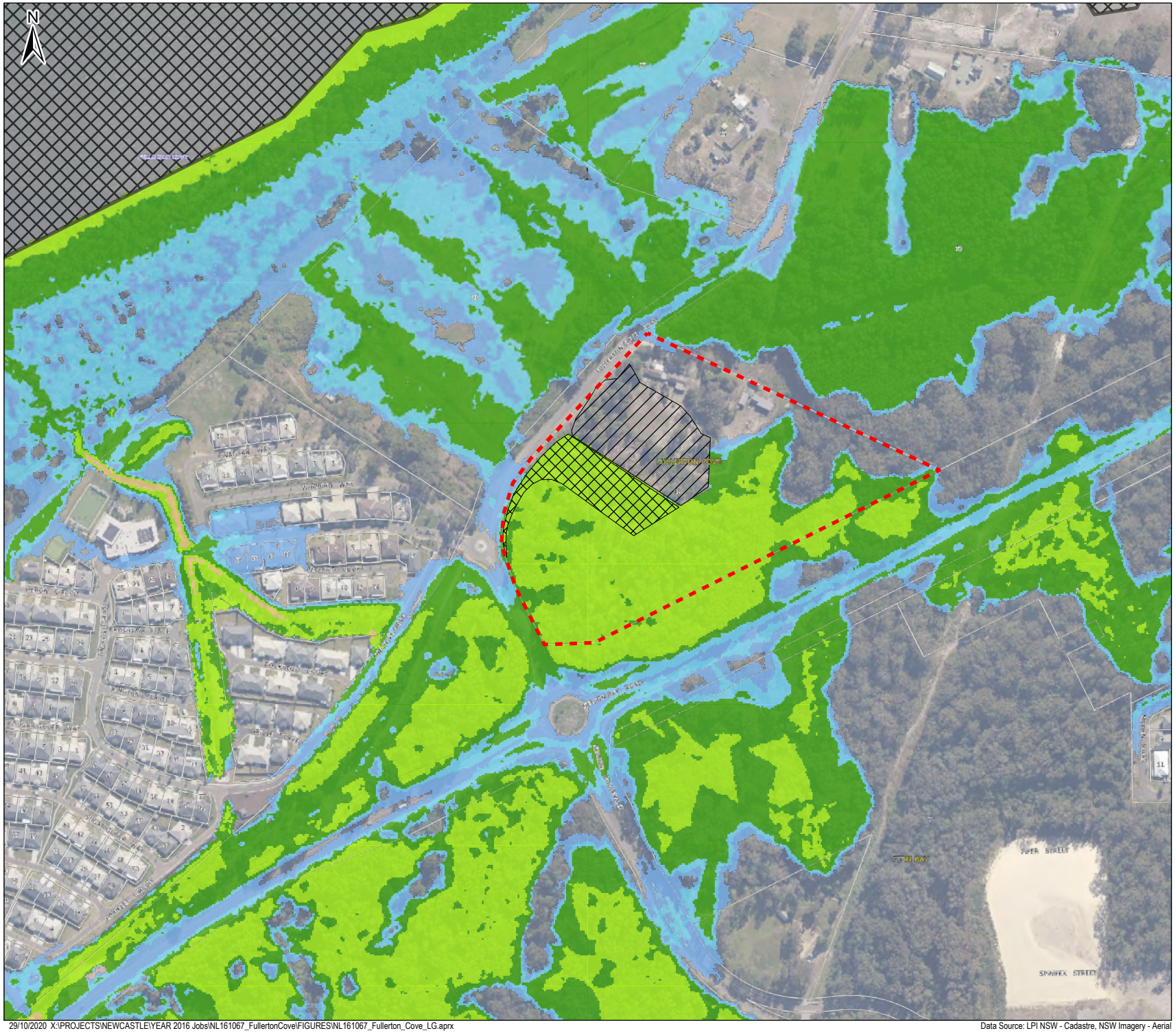
Figure B7

Developed Conditions
Flood Velocity
PMF Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

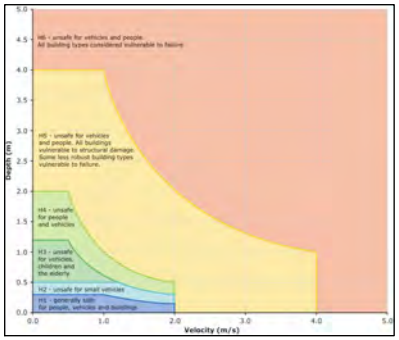


Legend

- Subject Site
- 2D Model Extent
- Proposed Fill
- Proposed Cut
- Cadastre

Hazard

- H1
- H2
- H3
- H4
- H5
- H6



0 55 110 220

1:5,000 Metres

Figure B8

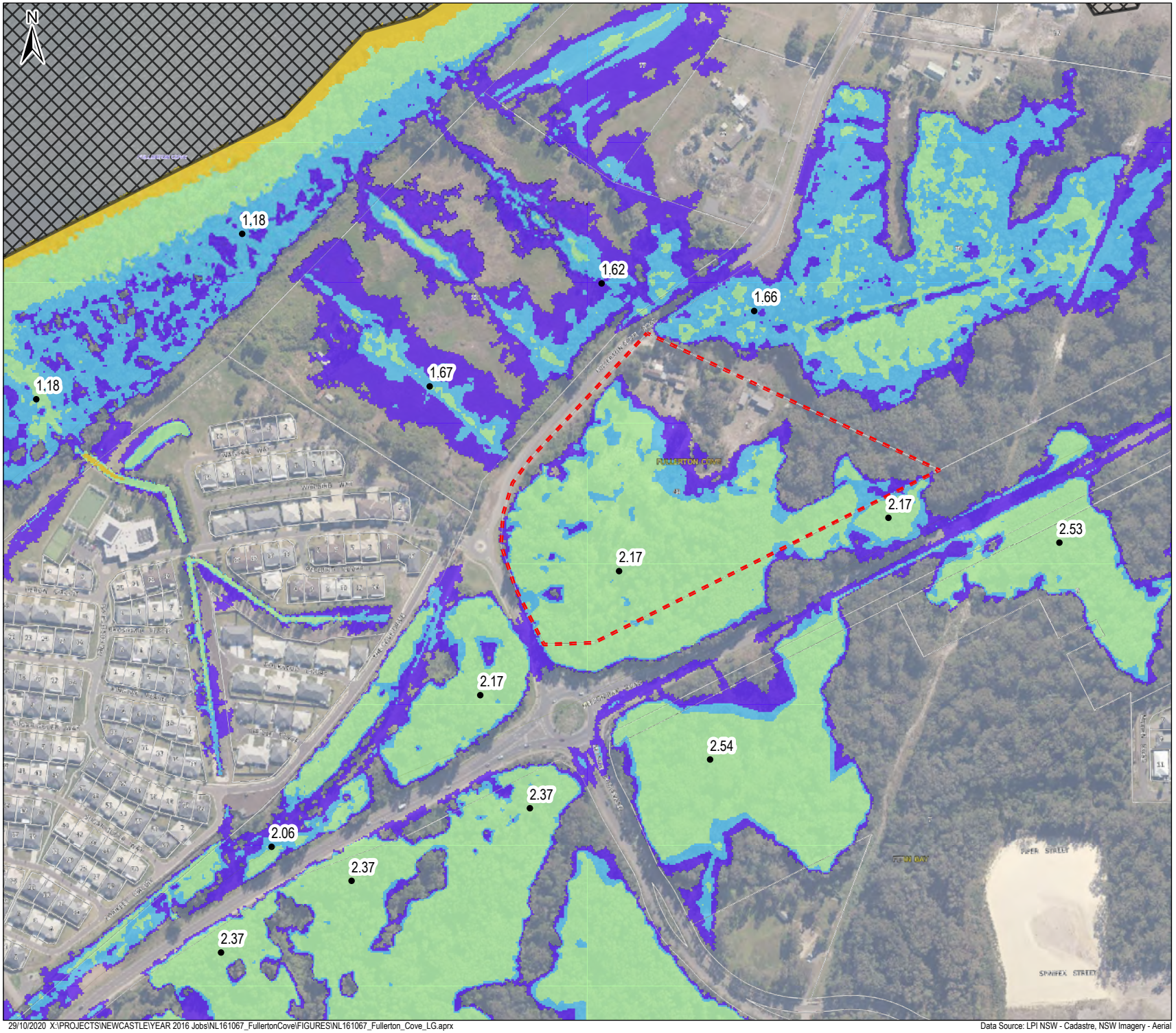
Developed Conditions
ARR 2019 Hazard
PMF Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

29/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

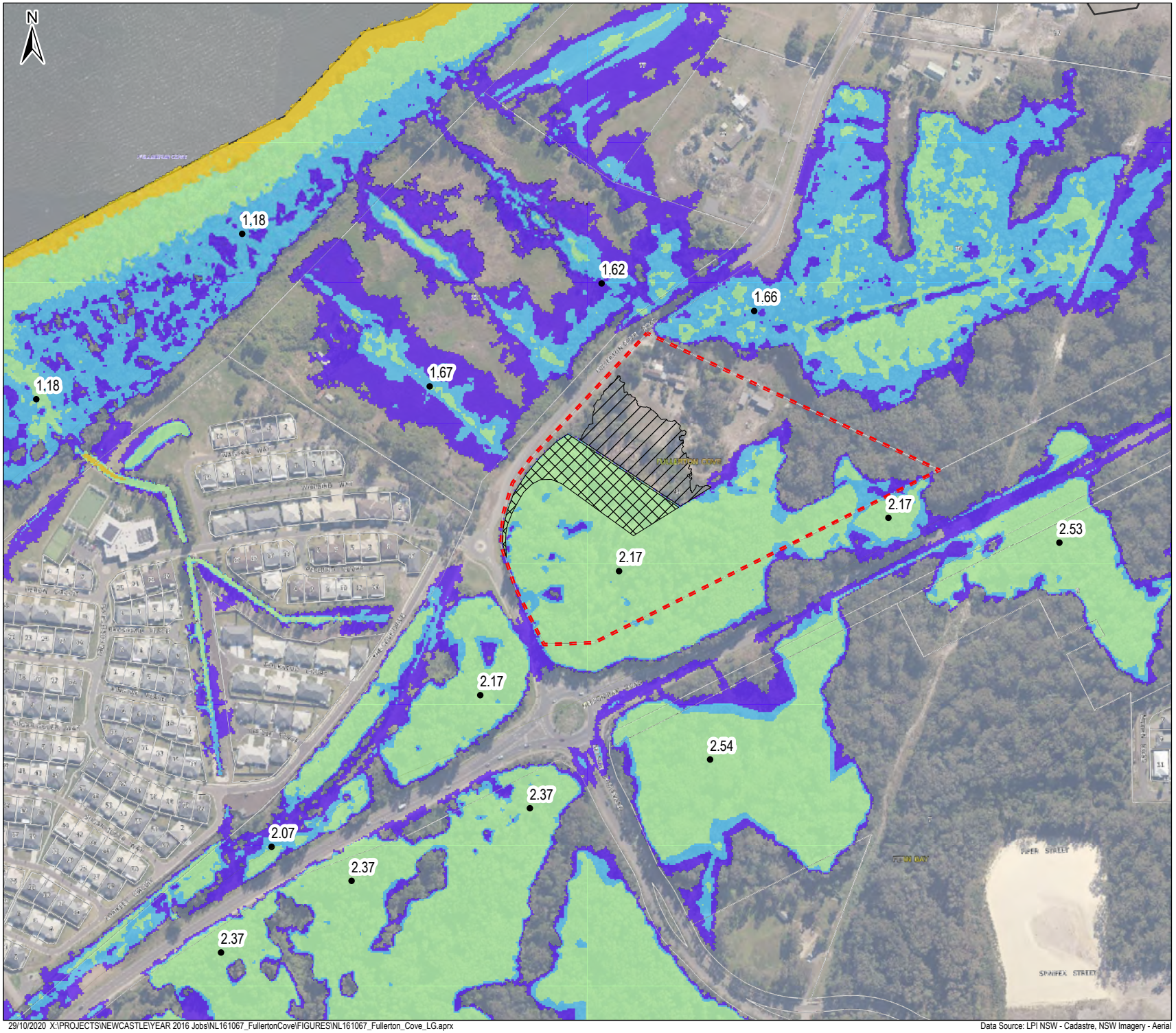
Figure C1

Existing Conditions
Severe Blockage Sensitivity
Flood Depth and Elevation
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- Proposed Fill
- Proposed Cut
- 2D Model Extent
- Cadastre
- Water Elevation (mAHD)

Depth (m)

- 0.00 - 0.30
- 0.31 - 0.50
- 0.51 - 1.20
- 1.21 - 2.00
- 2.01 - 4.00

0 55 110 220

1:5,000 Metres

Figure C2

Developed Conditions
Severe Blockage Sensitivity
Flood Depth and Elevation
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- Proposed Fill
- Proposed Cut
- 2D Model Extent
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

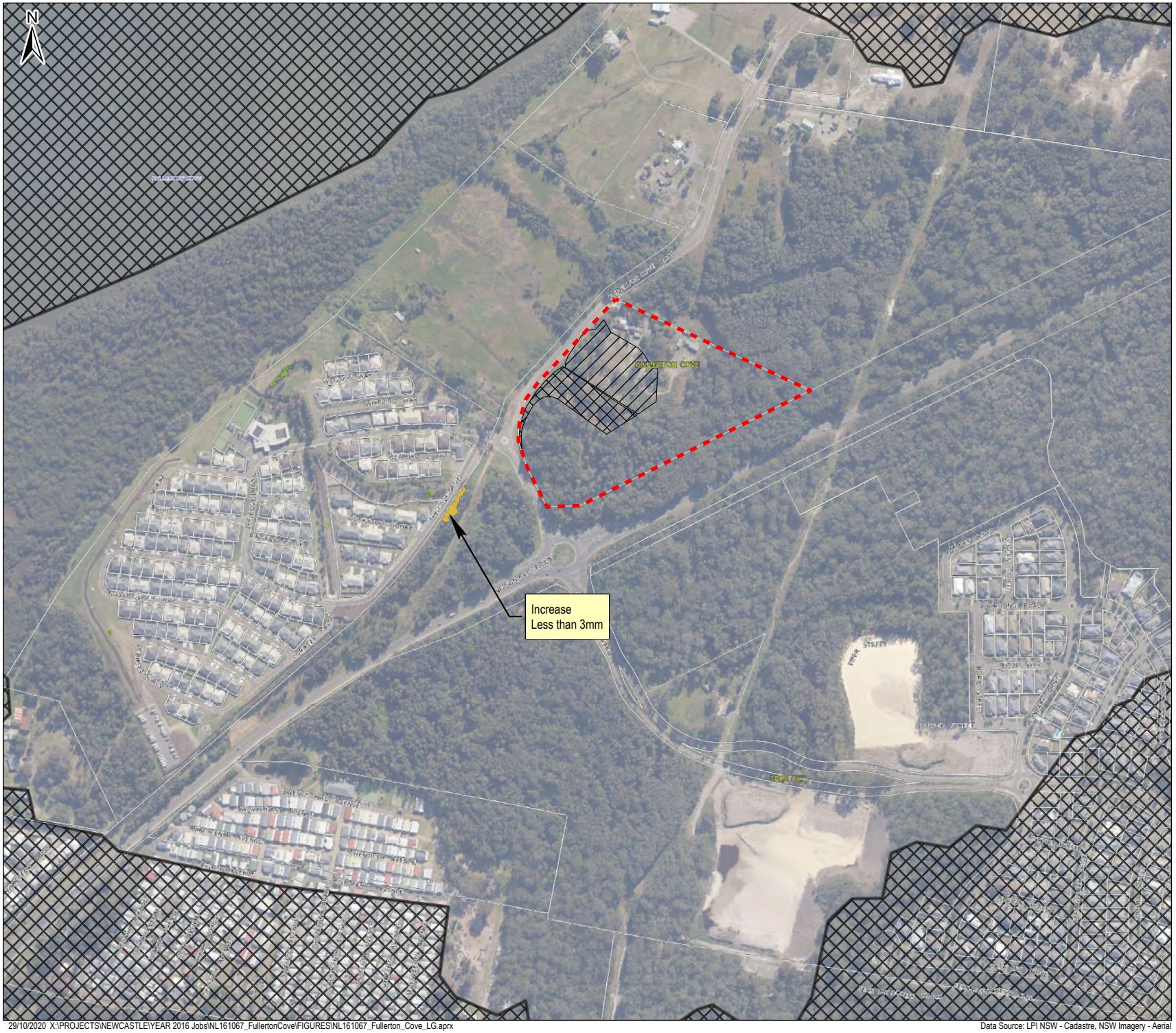
Figure D1

Developed minus Existing Water Elevation Difference 20% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

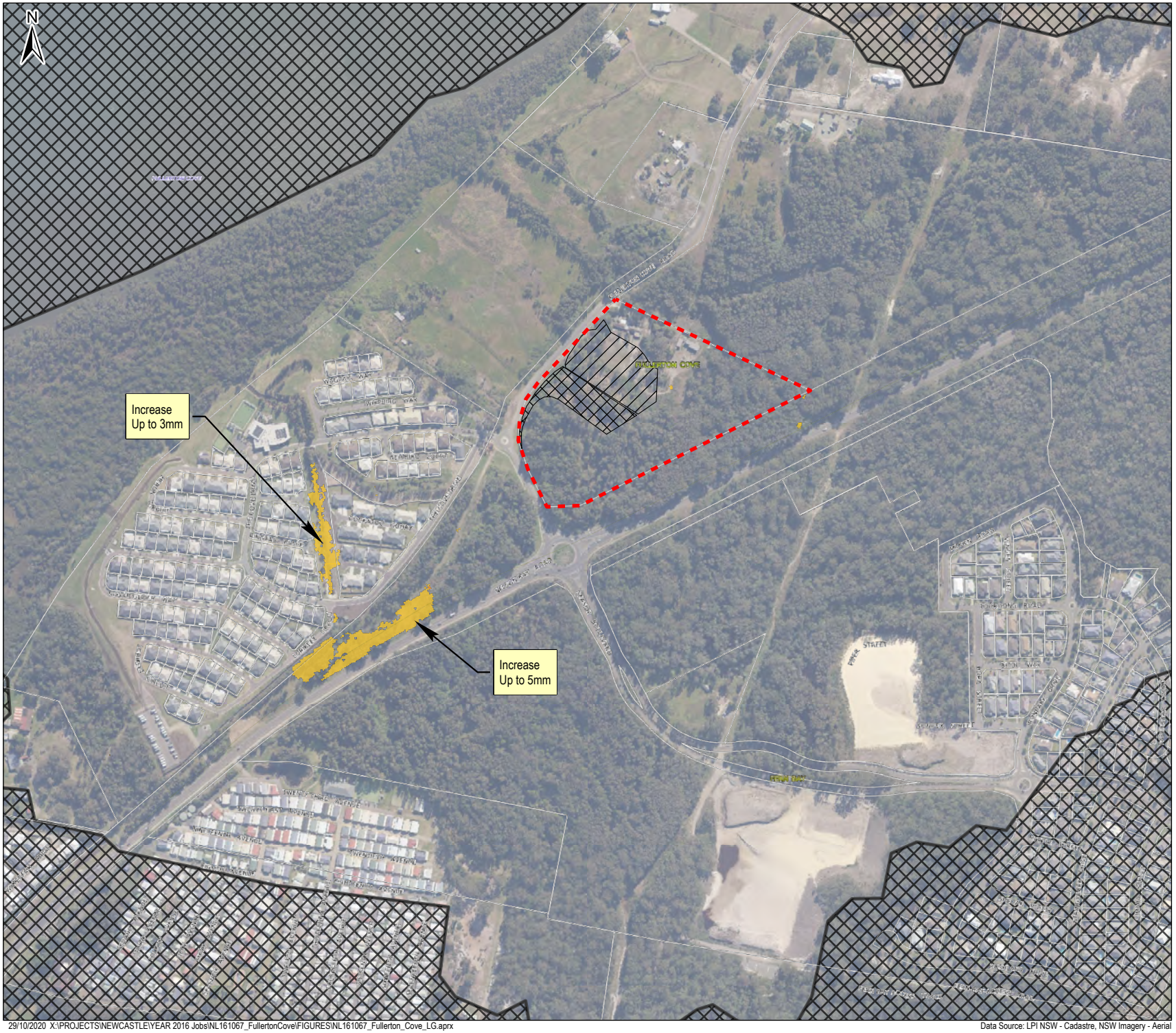
Figure D2

Developed minus Existing Water Elevation Difference 5% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

Figure D3

Developed minus Existing Water Elevation Difference 1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

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Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

Figure D4

Developed minus Existing
Water Elevation Difference
Severe Blockage Sensitivity
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

Figure D5

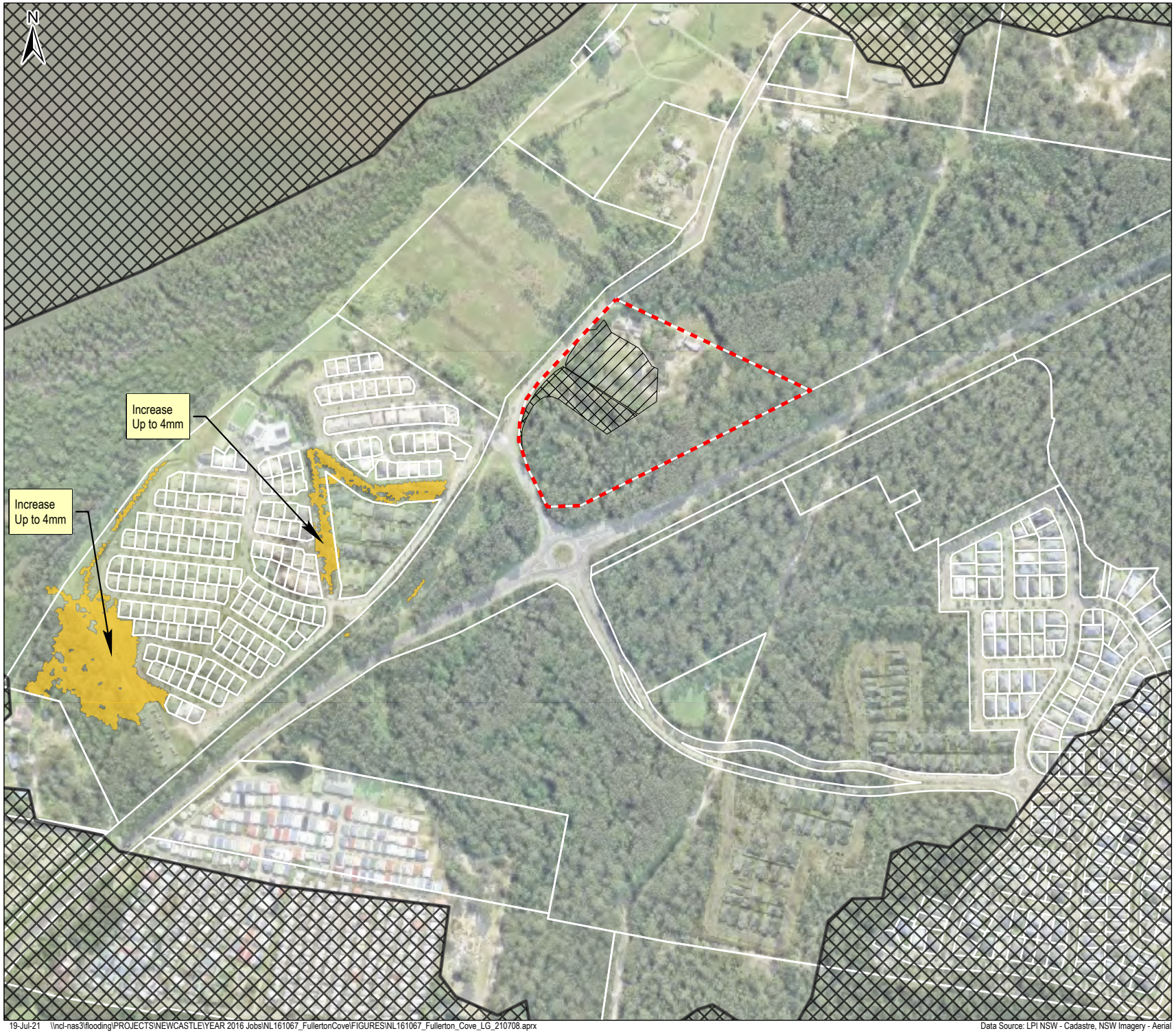
Developed minus Existing Water Elevation Difference PMF Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

29/10/2020 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES\NL161067_Fullerton_Cove_LG.aprx

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

Figure D6

Developed minus Existing Water Elevation Difference 2050 Climate Change Horizon

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Cadastre
- Proposed Fill

Difference (m)

- <-0.051
- -0.050 - -0.011
- -0.003 - -0.010
- Less than +/- 2mm
- 0.003 - 0.010
- 0.011 - 0.050
- >0.051

0 88 175 350

1:7,500 Metres

Figure D7

Developed minus Existing Water Elevation Difference 2090 Climate Change Horizon

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial



Legend

- Subject Site
- 2D Model Extent
- Proposed Cut
- Proposed Fill
- Cadastre

Velocity Difference (m/s)

- Less than -1.0
- -0.99 to -0.5
- -0.49 to -0.1
- -0.09 to -0.01
- Less than +/- 0.009
- 0.01 to 0.1
- 0.11 to 0.5
- 0.51 to 1
- Greater than 1.0

0 88 175 350

1:7,500 Metres

Figure D8

Developed minus Existing
Velocity Difference
1% AEP Design Storm

42 Fullerton Cove Road
Fullerton Cove
(NL161067)

NORTHROP

Data Source: LPI NSW - Cadastre, NSW Imagery - Aerial

Attachment 2 – Flood Information Certificate

FLOOD CERTIFICATE

File No: PSC2013-05401
Issue date: 30-Sep-20
Property ID: 14269

Laurence Gitzel
Level 1, 215 Pacific Highway
Charlestown NSW 2290

Certificate number: 83-2020-592-1

Property details: 42 Fullerton Cove Road FULLERTON COVE LOT: 14 DP: 258848

Thank you for your recent flood enquiry regarding the above property. This certificate confirms that this property **is** located in a **flood prone** area. This **is** a "flood control lot" for the purposes of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

Flood Planning Level	**2.9 metres AHD** (velocity = 0.1 m/s)	(This level defines the minimum floor level for habitable rooms and land that is subject to flood-related development controls (refer to Port Stephens LEP Section 7.3, Port Stephens DCP Section B5).
Highest Hazard Category	**High Hazard Flood Storage**	

Flood levels that may be useful are:

Probable maximum flood level	5.3 metres AHD (velocity = 1.0 m/s)	(The highest flood level that could conceivably occur at this location. If required, onsite flood refuges are built at or above this level, refer to the Port Stephens Development Control Plan B5.2)
Current day 1% AEP flood level	1.7 metres AHD	(This level is useful for insurance purposes, refer to your insurance policy and the Insurance Contracts Regulation 1985 (Cwealth).)
Adaptable minimum floor level	2.7 metres AHD	(The 1% AEP flood level plus 0.5m, 50 years from now, refer to the Port Stephens Development Control Plan B5.2.)
Minimum onsite wastewater level	1.8 metres AHD	(The 5% AEP level 50 years from now, refer to the Port Stephens On-site Sewage Management Development Assessment Framework and AS/NZS 1547:2012 5.5 land application system design.)

Flooding extent on subject lot, categorised by hazard



Crown © NSW Land and Property Information, © Port Stephens Council

Flood Hazard Categories

- Flood Prone Land
- Flood Planning Level
- Low Hazard Flood Fringe area
- Low Hazard Flood Storage area
- Low Hazard Overland Flow Path area
- Low Hazard Floodway area
- High Hazard Flood Fringe area
- High Hazard Flood Storage area
- High Hazard Overland Flow Path area
- High Hazard Floodway area
- Flood Prone Land subject to further investigation

Information derived from Port Stephens Council 2017, Williamtown / Salt Ash Floodplain Risk Management Study & Plan, BMT WBM, Newcastle.

PORT STEPHENS COUNCIL
116 Adelaide Street
Raymond Terrace NSW 2324
PO Box 42
Raymond Terrace NSW 2324
Phone: 02 4980 0255
Email: council@portstephens.nsw.gov.au
www.portstephens.nsw.gov.au
ABN 16 744 377 876

IMPORTANT INFORMATION

This Certificate is provided in good faith and in accordance with the provisions of section 733 of the Local Government Act 1993. This certificate provides an estimate of real flood characteristics. Any particular flood may be different to the conditions that were assumed to determine the information shown in this certificate.

The provided flood information has been compiled from information provided by external consultants and flood studies completed by Council in accordance with the NSW Floodplain Development Manual. The information has not been independently verified or checked beyond the agreed scope of work and Council does not accept liability in connection with unverified information.

Council acknowledges that its flood information may be incomplete and varying in accuracy, however it is the best information available to Council at the time of issue.

The information is provided to give the applicant an understanding as to the extent of flooding affecting the property as well as assist in the preparation of a Floodplain Risk Management Report. The information is subject to change if more accurate data becomes available to Council. Accordingly the information in this certificate is not warranted after the day of issue.

Council is not responsible for updating flood data when site conditions have change from the time of the original flood study and does not accept responsibility arising from any change in site conditions.

Where the relevant information is available, Council's Flood Planning Levels include the estimated impact of climate change.

Council recommends that the information contained in this Certificate be interpreted by a suitably qualified professional. It is the responsibility of the applicant to obtain survey level data (in metres AHD) for the site.

Council disclaims responsibilities to any other person other than the person nominated on the Flood Certificate arising from or in connection with the information provided.

The floor level survey for the property (if available) is based on the conditions on the date of the survey. Any changes to buildings since the survey may alter the appropriate floor level. Refer to the Port Stephens LEP 2013 Section 7.3 and Port Stephens Development Control Plan Section B5 for details on development controls on flood prone land.

For information, the insurance industry uses its own estimates of flood risk and its own definitions for flooding, which may differ when compared with Council's information and the NSW Floodplain Development Manual. You should contact your insurance company to find out if a flood certificate may influence your insurance premium.

The information provided may contain personal information as defined under the Privacy and Personal Information Protection Act 1998. The purpose of collecting this information is to enable Council to consider matters under related legislation, issue related documentation where required and other associated matters as provided by law and will be utilised by Council officers in assessing the proposal and other associated activities. The information may also be made available to other persons in accordance with the relevant Acts and regulations, such as the Government Information (Public Access) Act 2009 and will be stored in Council's record system.

DEFINITIONS

"Flood Planning Level" defines the area of land below the 1% AEP flood event in the year 2100 plus freeboard and is the area of land subject to flood-related development controls (refer to Port Stephens LEP Section 7.3, Port Stephens Development Control Plan Section B5). The Flood Planning Level defines the minimum floor level for habitable rooms.

"Freeboard" is a safety margin applied to the estimation of flood levels to compensate for uncertainties due to factors such as wave action, localised hydraulic behaviour (eg flow path blockages caused by natural and urban debris such as trees, 'wheelie' bins, cars, containers) and changes in rainfall patterns and ocean water levels as a result of the changing climate (refer Flood Manual Section 4).

"Habitable room" in a residential situation is a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom; in an industrial or commercial situation is an area used for offices or to store valuable possessions susceptible to flood damage (refer Flood Manual Section 4).

"Adaptable minimum floor level" is the reduced flood planning level allowed in Council's Development Control Plan where the proposed development facilitates ongoing flood adaptation (for example, where the design facilitates building raising in the future, such as a pier and beam housing design).

"Probable maximum flood level" is the flood level that arises from the largest flood that could conceivably occur at a particular location (the "PMF" or extreme design event). This level does not include any freeboard and provides an upper limit of flooding and associated consequences for the problem being investigated. It is used for emergency response planning purposes to address the safety of people and defines the floodplain and identifies "Flood Prone" land.

"AEP" (Annual Exceedance Probability) is the chance of a flood of a given or larger size occurring in any one year (for example, the 1% AEP event has a 1% chance of occurring every year; the 5% AEP event has a 5% chance of occurring every year).

"Surveyed floor level" is the surveyed level at the entrance to the residence, usually measured as part of the floodplain risk management plan undertaken for the area.

"AHD" (Australian Height Datum) a common national survey level datum, approximately corresponding to mean sea level set in the mid to late 1960s.

Hazard Categories

"High hazard" flood area is the area of flood which poses a possible danger to personal safety, where the evacuation of trucks would be difficult, where able-bodied adults would have difficulty wading to safety or where there is a potential for significant damage to buildings (refer Flood Manual Appendix L).

"Low hazard" flood area is the area of flood where, should it be necessary, a truck could evacuate people and their possessions or an able-bodied adult would have little difficulty in wading to safety (refer Flood Manual Appendix L).

Hydraulic Categories

"Floodways" are those areas where a significant volume of water flows during floods and are often aligned with obvious natural channels. They are areas that, even if only partially blocked, would cause a significant increase in flood levels and/or a significant redistribution of flood flow, which may in turn adversely affect other areas (refer Flood Manual Section 4).

"Overland flow path" is land inundated by local runoff on its way to a waterway, rather than overbank flow from a stream, river, estuary, lake or dam (refer Flood Manual Section 4).

"Flood Storage" areas are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The loss of storage areas may increase the severity of flood impacts by reducing natural flood attenuation (refer Flood Manual Section 4).

"Flood Fringe" is the remaining land in the Flood Planning Area after the Floodway area and Flood Storage area have been defined (refer Flood Manual Section 4).

"Flood Prone Land subject to further investigation" refers to the area of land susceptible to flooding where a comprehensive technical investigation of flood behaviour (to define the variation over time of flood levels, extent, velocity, flood hazard and the Flood Planning Level up to and including the probable maximum flood) has not yet been carried out (refer Flood Manual Appendix F).

"Minimal Risk Flood Prone Land" is land on the floodplain that is above the Flood Planning Level. This means that there are no flood-related development controls that apply to residential development, but critical emergency response and recovery facilities, such as evacuation centres and vulnerable development types, such as aged care and child care facilities, may not be appropriate in this location.

Attachment 3 – Original Flooding and Stormwater Management Study

Flooding and Stormwater Management Study

for

Rezoning Proposal Submission

at

Lot 14, DP 258848, Fullerton Cove

Job No: NL161067
Date: 28/02/2017
Issue No: B

	BY	DATE
Prepared	GB	28/02/2017
Checked	AB	28/02/2017
Admin	LB	28/02/2017

NORTHROP

Level 1, 215 Pacific Highway Charlestown NSW 2290
PO Box 180 Charlestown NSW 2290
T (02) 4943 1777 F (02) 4943 1577
E newcastle@northrop.com.au

Civil Hydraulic Mechanical Structural Electrical Environmental Civil Hydraulic Mechanical Structural Electrical Environmental Civil Hydraulic Mechanical Structural Electrical Environmental

Report Details

Project: Rezoning
42 Fullerton Cove Road, Fullerton Cove
Project Ref: NL161067_E01
File Location: Y:\YEAR 2016 Jobs\NL161067\E - Reports\E01 - Flooding and Stormwater Management for Rezoning\NL161067_E01_Flooding and Stormwater Management for Rezoning - issued B.docx

Revision History

Revision	Report Status	Prepared/Reviewed	Issue Date
DRAFT	Draft Report Issued	A Brien / A Brown	15/11/2016
A	For Approval	A Brien / A Brown	24/11/2016
B	Revised For Approval	A Brien / A Brown	28/02/2017

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Monteath and Powys. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

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Civil Hydraulic Mechanical Structural Electrical Environmental Civil Hydraulic Mechanical Structural Electrical Environmental Civil Hydraulic Mechanical Structural Electrical Environmental

Executive Summary

Northrop Consulting Engineers have undertaken a Flooding and Stormwater Management investigation to support the rezoning of Lot 14, DP 258848, located at 42 Fullerton Cove Road, Fullerton Cove.

The purpose of this investigation was to determine both whether flooding had any impact on the site, and whether it was feasible to implement Council's policies relating to stormwater management.

A preliminary assessment of the flood behaviour within the local catchment was undertaken and it was found that developing a two-hectare parcel of land and providing compensatory flood storage produced only marginal increases in flood level both on-site and downstream. Specifically, a 30mm increase on-site in the 1%AEP event and 40mm increases in the 5% and 20%AEP events. Downstream a 20mm increase was calculated in the 1%AEP and 10mm increases for the 5% and 20%AEP events.

Flood levels within Fullerton Cove were also considered and it is expected this will be used to specify finished floor and surface levels on-site. The 2100 1%AEP with a 10% increase in flow results in a flood level of 2.5m AHD adjacent to the site. It is expected a minimum 3.0m AHD floor level will be required.

Stormwater management policies of Port Stephens Council were analysed and tested for their feasibility to be implemented onsite. In particular, a DRAINS model was prepared to assess detention and a MUSIC model was built for water quality. It was found that providing detention and water quality measures to satisfy Council's policies was feasible on the subject site.

Watercourses were identified to the north and west of the subject site which will be subject to riparian corridor considerations. These do not encroach on the subject site, however correspondence with DPI Water during the Development Application process to identify any riparian requirements for standing water onsite is recommended.

The options presented herein have been chosen to demonstrate the feasibility of the subject site to accommodate the type of development expected in the proposed zoning. There are a number of alternatives which could be considered during Development Application stage.

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1 Introduction

Northrop Consulting Engineers have been engaged to undertake a flooding and stormwater management investigation to support the rezoning of Lot 14, DP 258848, located in Fullerton Cove.

The objective of this investigation was to determine the feasibility of implementing New South Wales Government and Port Stephens Council's flooding and water management policies and guidelines, within the context of the proposed new zoning. This is not intended to be a summary of detailed design options, rather a conceptual study regarding the suitability of the land for development.

Consideration has been given to the following documents throughout the course of this investigation.

- Port Stephens Council Development Control Plan (2014);
- Williamtown / Salt Ash Flood Study Review (BMT WBM, 2012);
- NSW Government Floodplain Development Manual (NSW Government, 2005);
- NSW Government Floodplain Risk Management Guideline - Practical Consideration of Climate Change (NSW Government, 2007);
- Water Management Act 2000 (NSW Government, 2016); and,
- Department of Primary Industries - NSW Oyster Industry Sustainable Aquaculture Policy.

2 Locality Description

2.1 Subject Site

The site consists of Lot 14, DP 258848 and shall hereafter be known as "the subject site". The subject site is approximately 6.7 hectares in area and located in the suburb of Fullerton Cove in the Port Stephens LGA. Currently, the land is zoned Rural Landscape (RU2) and is used for a residential purpose.

The subject site is bounded a rural residential property to the north east, Fullerton Cove Road to the west and Nelson Bay Road to the south.

LIDAR elevation data shows that the topography of the site is low lying and generally flat for the western portion, with elevations in the order of 1-2m AHD. A ridgeline runs along the north western boundary with the existing dwelling on a pad at approximately 3m AHD and maximum elevation of approximately 6.7m AHD in the eastern corner.

The subject site drains to the south west through a 300mm diameter RCP under Fullerton Cove Road. Runoff then passes through the RMS road reserve and into Lot 1 DP 270695 “The Cove Village”. A drainage easement through the village directs water through three 900mm diameter pipes under the Cove Drive towards Fullerton Cove.

Vegetation varies around the subject site from pastoral grasses to densely wooded vegetation. Several species of Endangered Ecological Communities (EEC) have been identified onsite including Swamp Oak Forest and Swamp Mahogany. Soils in the area have been observed to vary between loamy sands at higher elevations, to clays in the lower areas to the south east.

The locality of the subject site is included in Figure A1.

2.2 Proposed Development

At this stage the final development proposal is unknown, however it is likely to comprise of a bulky goods or retail style development. Land take is expected to be in the order of 1.5 to 2 hectares.

A sketch showing the development layout used for the basis of this assessment is shown in Figure A2.

2.3 Local Catchment

Seven local sub-catchments have been considered as part of the analysis. These are shown in Figure A3 and summarised below in Table 1.

Table 1 - Local catchments characteristics

Catch	Area (ha)	Flood Storage Volume (ML)	Description
1	11.0	28.4	Catchment 1 encompasses the subject site and land adjacent to Nelson Bay Road to the east. Both clayey and sandy soil types are expected within the catchment with dense vegetation. Levels are lower in the west and up to approximately 6.5m AHD along the ridgeline with Catchment 3.
2	35.9	85.6	Catchment 2 is located to the south of Nelson Bay Road and is characterised by dense bushland. It is bounded by Seaside Boulevard to the west, a ridge to the east and the Seaside subdivision to the south.

Catch	Area (ha)	Flood Storage Volume (ML)	Description
3	31.4	43.3	Catchment 3 is to the east of the subject site and has been analysed to assess whether there is any interaction with the site. It is bounded by a ridge to the north, Nelson Bay Road to the east, Fullerton Cove Road and the subject site. The vegetation includes heavy vegetation apart from a small development in the north western corner.
4	30.8	67.8	Catchment 4 discharges into Catchment 3 under Fullerton Cove Road. It is characterised by dense wooded vegetation and lower levels, however rises sharply at its extremities up to approximately 20m AHD. A portion of the Seaside subdivision is included in this catchment.
5	25.4	40.1	Catchment 5 is located to west of Seaside Boulevard and is also bounded by Nelson Bay Road and the Bayway Village. Elevations are generally lower than Catchment 2 and the outlet connects the catchment with Catchment 6.
6	3.3	21.3	Catchment 6 is a triangular parcel of land bounded by the Cove Village, Nelson Bay Road and Fullerton Cove Road. Elevations are low, in the order of 1.2m AHD and coverage is heavily vegetated.
7	5.7	17.3	Catchment 7 located within the Cove Village site and outlets through a channel towards Fullerton Cove.

2.4 Fullerton Cove Catchment

The local Fullerton Cove catchment includes areas around Raymond Terrace, Williamtown and Salt Ash, however also has interactions with spill from the Hunter River to the north west as well as downstream outlet impacts. It is categorised by low elevations and open agricultural land.

3 Flooding

3.1 Objectives

A flood assessment was undertaken in order to ascertain the effect of flooding on the subject site, as well as any affect the proposed development may have on flood levels upstream or downstream. Peak flows were determined at various points within the catchment for a range of design storm events to inform the flood study, as well as the stormwater management options presented for the proposed development later within the report. The following cases have been considered;

- Flooding from Fullerton Cove and potential impacts of climate change.
- Runoff from upstream local catchments traversing the subject site.

This study has been undertaken to a level commensurate with a rezoning application. We expect further analysis may be required at the Development Application stage once a layout has been determined.

3.2 Authority Policies and Guidelines

3.2.1 Port Stephens Council

Council's requirements for floodplain management are outlined in DCP 2014 Section B5. Requirements vary depending on the hydraulic categorisation of the land and the flood hazard. Generally speaking, the minimum floor levels are set at the 1%AEP plus 500mm freeboard and fill is not supported unless accompanied by an engineer's report.

3.2.2 NSW Floodplain Development Manual

The Floodplain Development Manual specifies any development should not have a significant adverse impact on adjoining properties. It also provides guidance on the setting of floor levels, as well as assessment and management of flood risks.

3.3 Methodology

Firstly, a literature review was undertaken to determine the effect of downstream water bodies, sea level rise and climate change on the subject site. Catchments were then determined using LIDAR survey information provided by the NSW Land and Property Information (LPI).

Rainfall patterns for the design storm events ranging from the 20%AEP up to the 1%AEP was estimated using Australian Rainfall and Runoff 1987 (Engineers Australia, 1987), and the PMP rainfall hyetograph was estimated using the Generalised Short Duration Method (Bureau of Meteorology, 2003).

The flood assessment was then undertaken using design rainfall patters and the one-dimensional software, DRAINS. DRAINS was chosen to simplify the spill behaviour and assess the changes to available flood storage volume and range of potential mitigation solutions.

Meetings were also held with Council representatives to determine the requirements for finished floor levels, impacts on adjacent properties and potential points of discharge.

3.4 Fullerton Cove Flooding

The Fullerton Cove flood levels have been determined from the Williamtown / Salt Ash Flood Study and Review (BMT WBM, April 2005 and February 2012) and are listed below in Table 2.

For all but the baseline case, this results in a **High Hazard Flood Storage** categorisation for the subject site.

Table 2 - Fullerton Cove flood levels

Design Storm	Flood Level (m AHD)
Baseline	1.85
1%AEP 2100 (sea level rise)	2.40
1% AEP 2100 (sea level rise + 10% flow)	2.50
1% AEP 2100 (sea level rise + 30% flow)	2.70
PMF	4.00

Port Stephens Council DCP states that no fill is permitted in a high hazard flood storage area unless accompanied by an engineering report assessing the impact of fill. In the case of the Fullerton Cove catchment, it is considered the storage volume of the site compared to the total storage volume is negligible and as such will not have a significant impact on flood levels.

3.5 Local Catchment Flooding

3.5.1 Existing Case

The results for the existing scenario are shown below in Tables 3 and 4.

Table 3 - Existing scenario water level (m AHD)

Catch	PMF	1%AEP	5%AEP	20%AEP
1	2.46	1.98	1.82	1.62
2	2.63	2.21	2.07	1.95
3	2.11	1.62	1.51	1.34
4	2.80	2.27	2.06	1.85
5	2.30	1.93	1.81	1.67
6	2.66	1.86	1.67	1.53
7	1.78	1.24	1.17	1.11

Table 4 - Existing scenario flow (L/s)

Design Storm	PMF	1%AEP	5%AEP	20%AEP
Inflow to subject site	12,100	81	77	51
Outflow from subject site	8,400	76	73	38
Through the Cove Village	5,500	127	106	53

It is noted the flow magnitude is quite low given the upstream catchment size. This is likely due to the small size of stormwater infrastructure and relatively large storage volumes.

3.5.2 Development Impact

The impact of the proposed development has been assessed and the results are included overleaf in Tables 5 and 6.

In the 1%AEP, the level is increased on-site by a maximum of 30mm and downstream by a maximum of 20mm. No increase was calculated in Catchment 5 which contains the Bayway Village development.

It is likely these small increases are due to the increased volume of runoff from the proposed development footprint. No measures to mitigate this have been included in this model such as rainwater tanks or infiltration devices.

Table 5 - Post developed water levels (m AHD)

Catch	PMF	1%AEP	5%AEP	20%AEP
1	2.46	2.01 (+30mm)	1.86 (+40mm)	1.66 (+40mm)
2	2.63	2.21	2.07	1.95
3	2.11	1.62	1.51	1.34
4	2.80	2.27	2.06	1.85
5	2.30	1.93	1.81	1.67
6	2.66	1.88 (+20mm)	1.68 (+10mm)	1.54 (+10mm)
7	1.78	1.24	1.17	1.11

Table 6 - Post developed flow (L/s)

Design Storm	PMF	1%AEP	5%AEP	20%AEP
Inflow to subject site	12,100	81	76 (-1L/s)	51
Outflow from subject site	8,400	102 (+26L/s)	75 (+2L/s)	45 (+7L/s)
Through the Cove Village	5,500	129 (+2L/s)	107 (+1L/s)	54 (+1L/s)

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4 Legal Point of Discharge

4.1 Objective

A number of informal drainage paths exist within the Port Stephens Council area with no easements and the objective of this portion of the investigation was to determine the legal point of discharge.

4.2 Methodology

Stormwater infrastructure was identified in the area and a number of meetings held with Port Stephens Council officers. A copy of the downstream deposited plan was also obtained from Monteath and Powys for our review.

4.3 Outcome

The subject site currently drains to the Fullerton Cove Road reserve to the west and this will remain the legal point of discharge for the site. Downstream of this road reserve, water discharges into Crown Land and through a 10-metre-wide easement benefiting Council on DP 270695 prior to entering Fullerton Cove.

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5 Stormwater Quality

5.1 Objectives

A review of Council's water quality policies has been undertaken in order to assess whether it is feasible to implement them on the subject site. In particular, Council's Development Control Plan (DCP) 2014, Section B4 – Drainage and Water Quality has been assessed.

5.2 Targets

The proposed development area for this assessment has been taken as two hectares, and since it is outside the drinking water catchment, the following controls apply as per Figure BE from the DCP.

Table 7 - Adopted treatment train efficiencies used in assessment.

Pollutant	Target (%)
Gross pollutants	90
Total Suspended Solids	90
Total Phosphorus	60
Total Nitrogen	45

5.3 Model Development

MUSIC-Link rainfall data for Williamtown draining to a sensitive catchment with a sandy soil was entered as the hydrological template in order to most accurately reflect the climate and soil conditions expected at the subject site.

A possible treatment train has been proposed and assessed using the MUSIC software package. The model was developed in accordance with the NSW Guidelines to MUSIC Modelling, BMT WBM, 2012 using the surface type source node method.

A hypothetical development has been entered with a one-hectare roof at 100% impervious and a one-hectare carpark at 90% impervious.

5.4 Treatment Train

The treatment train incorporates water sensitive urban design measures in line with current industry practice. Roof water is captured by a rainwater tank for re-use internally and for landscape irrigation. Both the overflow from the tank and the carpark areas are conveyed into a bio-retention basin before being released back to the catchment.

Rainwater Tank

A rainwater tank has been included in the test treatment train and will perform as a primary treatment device, presenting several benefits. These include reduced potable demand as well as at-source control of roof water pollutants. Sediment and nutrients are removed from the stormwater stream via a "first flush" device and discharged to landscaped areas thus increasing the efficiency of the treatment devices downstream.

Bio-retention System

A vegetated bio-retention system has the potential to provide a good water quality outcome, as well as enhanced aesthetics. The system may form part of localised "rain gardens" around the carpark to treat local catchments prior to entering the pipe network, or through an end of line basin. An end of line basin has been included in the test treatment train for simplicity.

5.5 Results

The results from the MUSIC modelling are included in Table 8 below, and the MUSIC link report has been included in Appendix B.

Table 8 - MUSIC water quality results

Pollutant	Target (%)	Sources	Residual	Reduction
Gross pollutants	90	495	0	100
Total Suspended Solids	90	3360	256	92.4
Total Phosphorus	60	6.85	1.56	77.3
Total Nitrogen	45	43.7	16.3	62.8

On this basis, it is considered implementing Council's policies is feasible on this site.

5.6 Construction Runoff Quality Control

Management of water quality during any construction activity on the subject site is to be undertaken in accordance with the recommendations outlined in Landcom's, Managing Urban Stormwater-Soils and Construction; "the Blue Book". This may include but not limited to; cut off swales on the high side of disturbed work, sediment fences, sediment basins, staked bales and stockpile erosion protection.

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6 On-Site Detention

6.1 Objectives

Council's Development Control Plan (DCP) 2014, Section B4 – Drainage and Water Quality has been reviewed with respect to detention requirements.

6.2 Requirements

The proposed impervious percentage is less than 30 percent of the site and therefore would not normally require detention in accordance with Figure BD in Section B4 of the DCP. However, due to the flooding constraints it is considered appropriate to take measures to alter the catchment so that no significant adverse impacts are realised on downstream properties.

For the purposes of this exercise, detention has been assessed for the proposed developed area reducing post developed flows back to the natural case.

6.3 Model Development

Detention has been assessed using the DRAINS software. The ILSAX hydrological model has been adopted with soil type of 4 representing the sandy soils encountered on-site, a grassed depression storage of 5mm and a paved depression storage of 1mm.

The pre developed node was adopted as 100% pervious, with the developed roof 100% impervious and the carpark 90% impervious as per the water quality modelling.

A basin has been proposed with a low level outlet pipe and high level weir. At the weir spill depth approximately 650m³ of storage has been provided. This option would be compatible with the biofiltration basin as an increase in depth should it be adopted in the final design.

6.4 Results

The results from the detention analysis are shown below in Table 9. It is noted these numbers are for flows leaving the development footprint only.

Table 9 – DRAINS OSD results

Event	Pre development (L/s)	Post development (L/s)	Difference (L/s)
20% AEP	390	353	-37
10% AEP	455	368	-87
5% AEP	547	397	-150
2% AEP	669	421	-248
1% AEP	763	611	-152

It is therefore considered that detention can be provided on the subject site.

7 Watercourses and Riparian Corridor Management

7.1 Objectives

A review of available information regarding watercourses in the vicinity of the subject site was undertaken to determine any potential constraints regarding riparian corridors running through the subject site.

7.2 Methodology

A review of the latest 1:25,000 topographic maps was undertaken to identify any “blue line watercourses” on or adjacent to the subject site. A site visit was also undertaken on the 25 May 2016 to validate these lines and observe other features.

7.3 Location of Waterfront Land

No watercourses are noted on the topographical maps traversing the subject site. To the north, a first order stream passes under Fullerton Cove Road and to the south a first order stream originates from Bayway Village and passes under Nelson Bay Road and The Cove Drive before joining another first order stream from the east. This forms a second order stream in accordance with the Strahler system prior to discharging to Fullerton Cove. These were all verified onsite and photos are included overleaf.

It was also noted during the site visit that standing water was present in the western portion of the lot commensurate with its low lying nature. This may be classified as a wetland in accordance with the act and require a riparian offset. It is not likely this will have an impact on the develop-ability of the subject site given the ecological constraints already in place throughout this area.

7.4 Riparian Corridor Widths and Management

Core riparian zone widths are outlined in DPI Water; Guidelines for Riparian Corridors on Waterfront Land and requires a 10 metre buffer distances from the defined top of bank for first order streams and 20 metre from second order streams. For the wetland areas, previous experience suggests a 10 metre offset will be required.

The respective buffer distances are plotted with respect to the proposed development is included in Figure A4. As shown, the first order watercourse to the north of the development is clear of the development envelope. Furthermore, the guidelines make provision for re-alignment of first order watercourses and riparian corridors should it be required.

It is expected discussions with DPI Water at Development Application stage will confirm the classification of waterfront land on the subject site and in the vicinity. From the investigations undertaken to date, it does not appear this will form a significant constraint for development.

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Photo 3 - Eastern branch first order stream through The Cove Village



Photo 4 - Western branch first order stream through The Cove Village

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8 Discussion and Recommendations

8.1 Finished Floor Level and Site Surface Levels

Council has stipulated finished floor levels for the development are to be set at the 2100 1%AEP plus 500mm freeboard. The worst case has not been adopted in this case with the 2100 1%AEP plus 10% flow used for the purposes of this analysis. As outlined above, this level is 2.5m AHD resulting in a **proposed minimum finished floor level of 3.0m AHD.**

Site surface levels are expected to be determined to minimise the risk to property with depths limited to approximately 300mm in the 2100 1%AEP event. This would mean car-parking levels **are above 2.2m AHD.**

8.2 Management of Flood Risks

The site is currently exposed to High Hazard flood waters in the 1%AEP and PMF events.

The proposed pad has been located along the northern boundary in an area of higher ground to reduce the impact of flooding on any future development. The floor level has been set as described above to provide mitigation with respect the 1%AEP and also the potential impacts of climate change. Filling is also proposed as a mechanism to reduce the hazard category of the development area.

Given the site will be inundated in the PMF and a flood island created it is recommended flood refuge above the PMF is created either at natural levels on-site or within the proposed development.

It is expected education and awareness procedures will be implemented prior to occupation to assist in responding to a flood emergency.

8.3 Development Footprint

A two-hectare footprint has been assumed for this analysis, however should additional area be required it is expected it could be accommodated to the east of the proposed pad by cutting into areas of higher elevation, or alternatively, flood storage could be provided under the carpark area reducing the potential flood impact.

8.4 Flood Impact Assessment

A preliminary flood impact assessment has been undertaken which shows the development proposal does not significantly impact the flood behaviour in the vicinity of the subject site. It is expected this will be refined as the detailed layout is determined at Development Application stage.

8.5 Stormwater Management Strategies

The stormwater management strategy proposed herein indicates the feasibility of implementing the Council's policies on the subject site. Alternative measures may be considered for achieving the water quality and detention outcomes as discussed below.

Grass Lined/Vegetated Swales

Swales further filter stormwater and replicate natural concentration of water which reflects the objectives of a secondary treatment device. Sediment is deposited in the vegetation and some pollutants attach to soil particles and organic matter. The use of swales may be considered as a perimeter treatment measure or within the carpark layout.

Permeable Paving

Permeable paving can be used to filter sediment and attached particulates close to the source of pollutants. Detention and retention can also be considered in the granular base.

Permeable paving is not typically considered for high traffic areas, but may perform an important function over the parking areas.

Proprietary Devices

Proprietary devices such as gross pollutant traps, pit inserts or filtration technology may be considered to supplement the treatment train at various stages. This may have benefits in terms of reducing land occupied by water treatment devices.

Proprietary devices should not be considered as a replacement for water sensitive design measures, however. Generally speaking, they are expensive to install and maintain, and become ineffective after poor maintenance.

Underground Detention Tanks

At this stage detention has been proposed above ground, however it is considered to have the same impact below ground.

8.6 NSW Oyster Industry Aquaculture Strategy

The aquaculture strategy nominates guidelines for maintaining and improving water quality in the vicinity of oyster growing areas. In particular the following recommended actions are outlined;

- Fencing of riparian corridors on agricultural properties;
- Riparian corridor buffer areas for high nutrient generating activities;
- At source control of stormwater for new developments;

This proposal considers at source treatment measures that may be implemented as part of the final layout. Section 5 demonstrates compliance with Council's policies with respect to stormwater management and as such, it is considered the intent of the aquaculture strategy is also satisfied.

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9 Conclusion

Through the completion of the flooding and stormwater management assessment, the following is concluded regarding the rezoning of Lot 14 DP 258848;

- It is expected the proposed filling for development of approximately two hectares will not have a significant impact on flood levels or behaviour in both the Fullerton Cove and local catchment dominated events;
- Development larger than this area may occur to the south east of the proposed pad at levels above 2m AHD from a flood management perspective. There may be ecological constraints in this area;
- Development larger than this area which encroach on areas lower than 2m AHD to the south west of the proposed pad would be expected to maintain flood storage in underground tanks to minimise impact on surrounding properties;
- The subject site has an existing legal point of discharge to Fullerton Cove Road to the south west. Further investigations undertaken on behalf of Council show a 10-metre-wide easement for drainage through the downstream development to Fullerton Cove;
- Council's policies regarding water quality and detention for the proposed development are feasible to be implemented in this case;
- Riparian corridors are not expected to be a constraint for the proposed development, however liaison with DPI Water during the Development Application phase should be undertaken to confirm this; and
- The treatment measures and flood impact are based on a hypothetical development footprint through which to assess the feasibility of implementing Council policies. This has been undertaken for a rezoning purpose and should not preclude alternative devices or design solutions which would be assessed as part of any Development Application submission.

10 References

Bureau of Meteorology (2003) The Estimation of Probable Maximum Precipitation in Australia: General Short Duration Method

New South Wales Government (2005) Floodplain Development Manual: the management of flood liable land

New South Wales Government Department of Environment and Climate Change (2007) Floodplain Risk Management Guideline – Practical Consideration of Climate Change

New South Wales Office of Water (2012) Guidelines for Riparian Corridors on Waterfront Land

The Institute of Engineers, Australia (1987) Australian Rainfall and Runoff - A Guide to Flood Estimation

BMT WBM (2005) Williamtown Salt Ash Flood Study

BMT WBM (2012) Williamtown Salt Ash Flood Study Review

Port Stephens Council (2014) Development Control Plan - B General Provisions

NSW DPI (2016) NSW Oyster Industry Sustainable Aquaculture Strategy

APPENDIX A – FIGURES

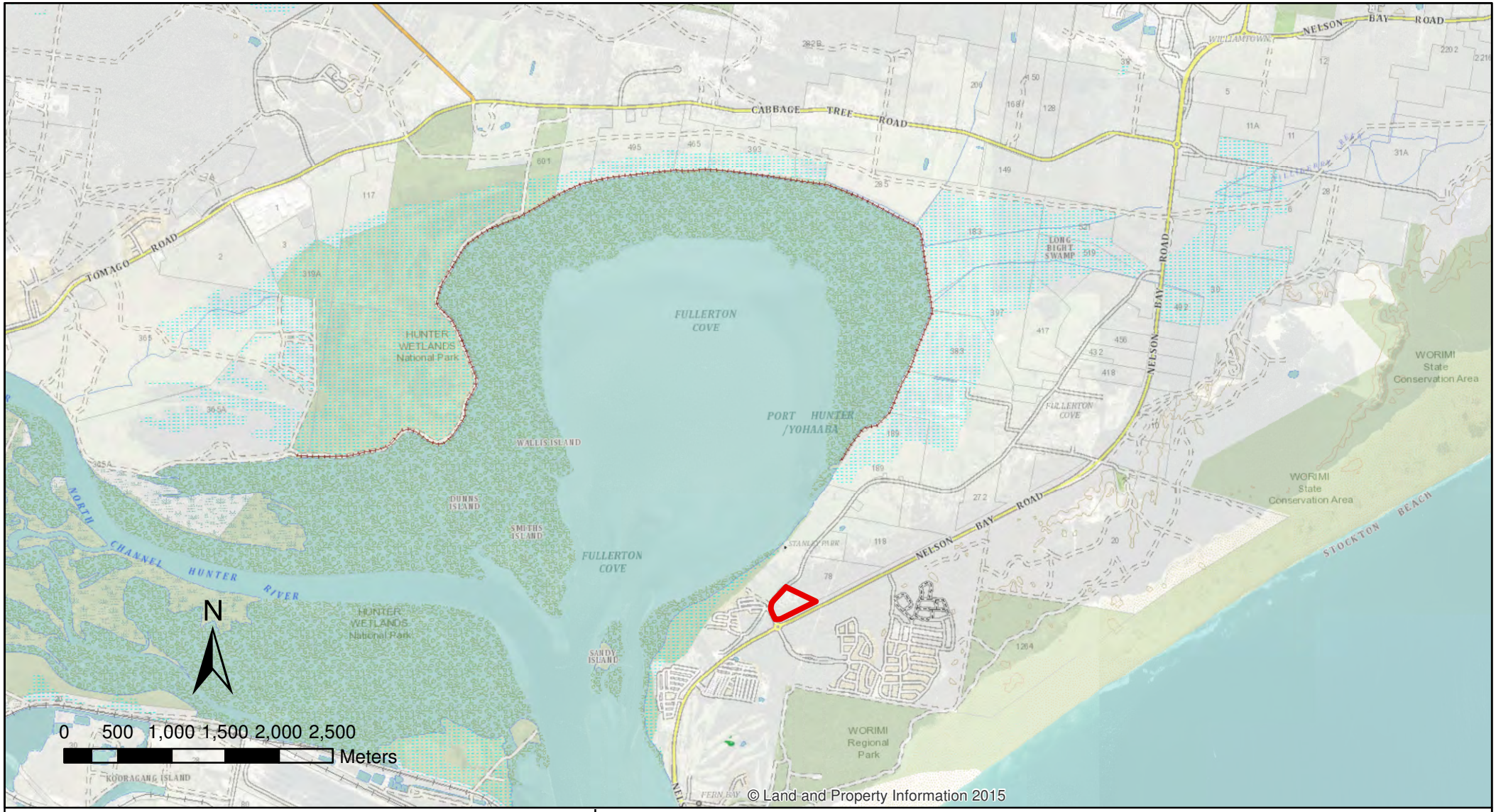


FIGURE A1

Locality

42 Fullerton Cove Road,
Fullerton Cove

Legend

Subject Site

NORTHROP

Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
P.O Box 180, Charlestown NSW 2290
email newcastle@northrop.com.au ABN 81 094 433 100

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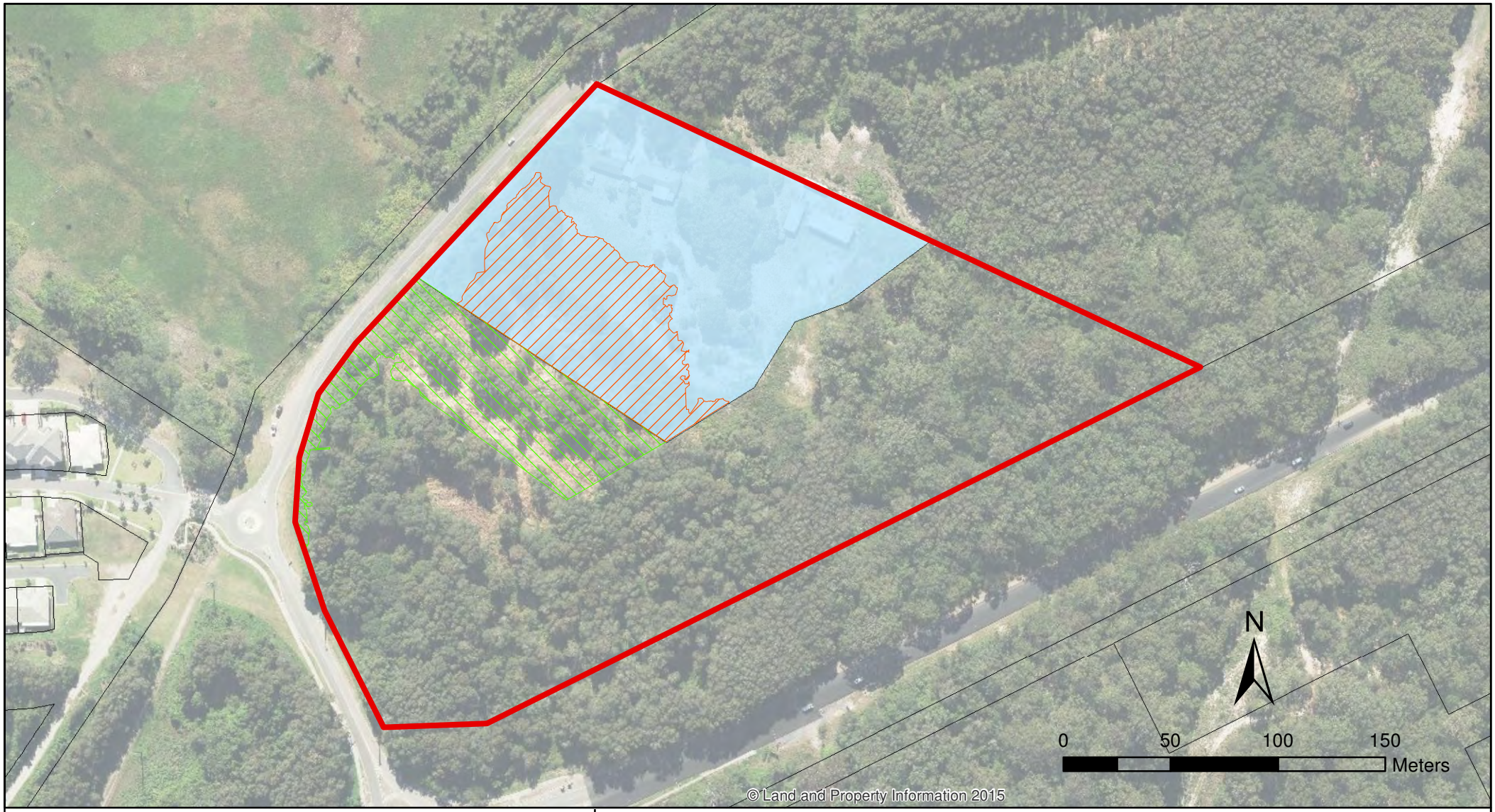


FIGURE A2

Preliminary Development Layout

42 Fullerton Cove Road,
Fullerton Cove

Legend

- Subject Site
- Indicative Fill Areas
- Indicative Cut Areas
- Development
- Cadastre

NORTHROP

Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
P.O Box 180, Charlestown NSW 2290
email newcastle@northrop.com.au ABN 81 094 433 100

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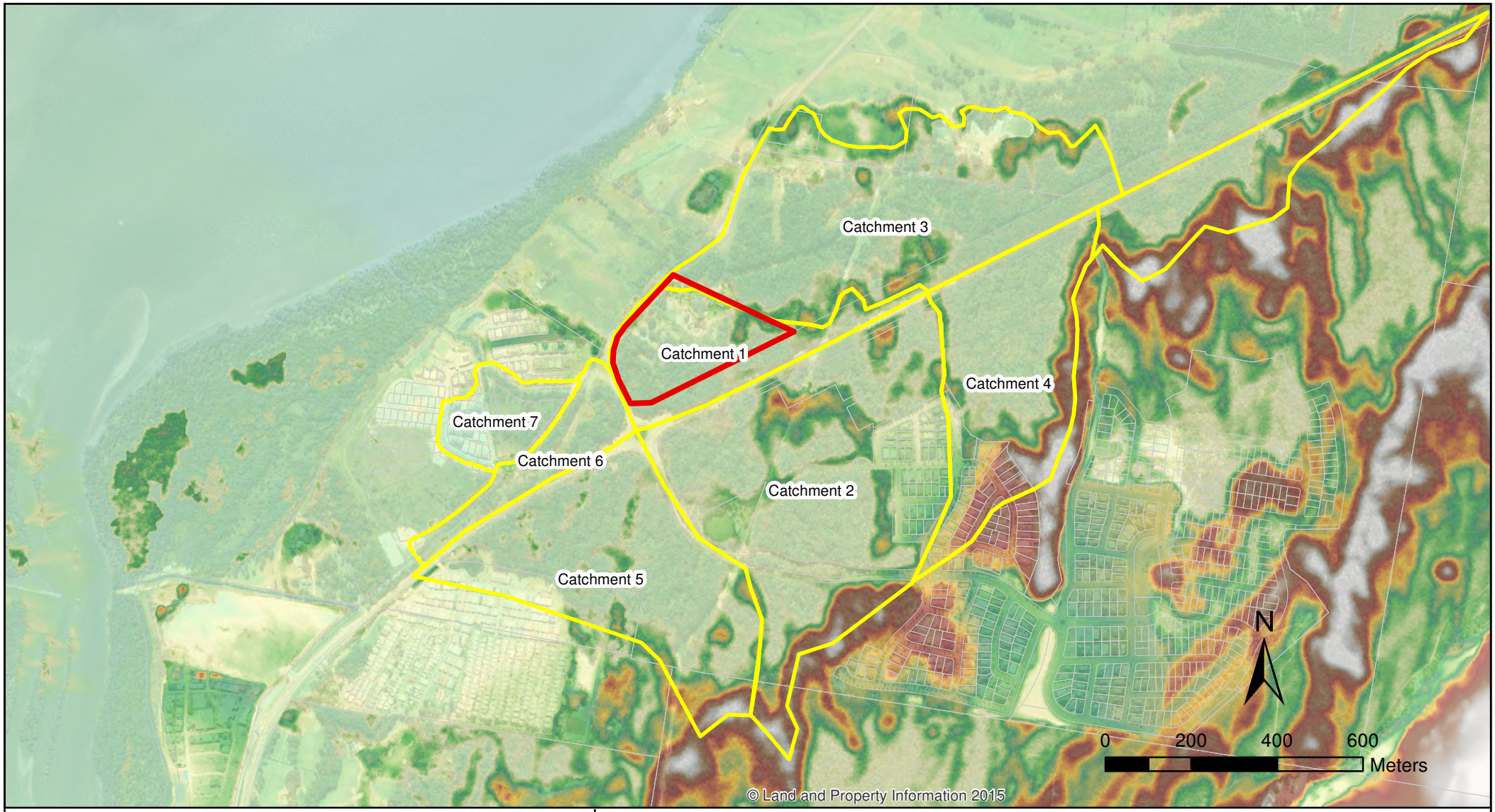


FIGURE A3

Local Catchments

42 Fullerton Cove Road,
Fullerton Cove

Legend

- Subject Site
- Local Catchments
- Cadastre

Elevation (m AHD)

25
12.5
0

NORTHROP

Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
P.O Box 180, Charlestown NSW 2290
email newcastle@northrop.com.au ABN 81 094 433 100

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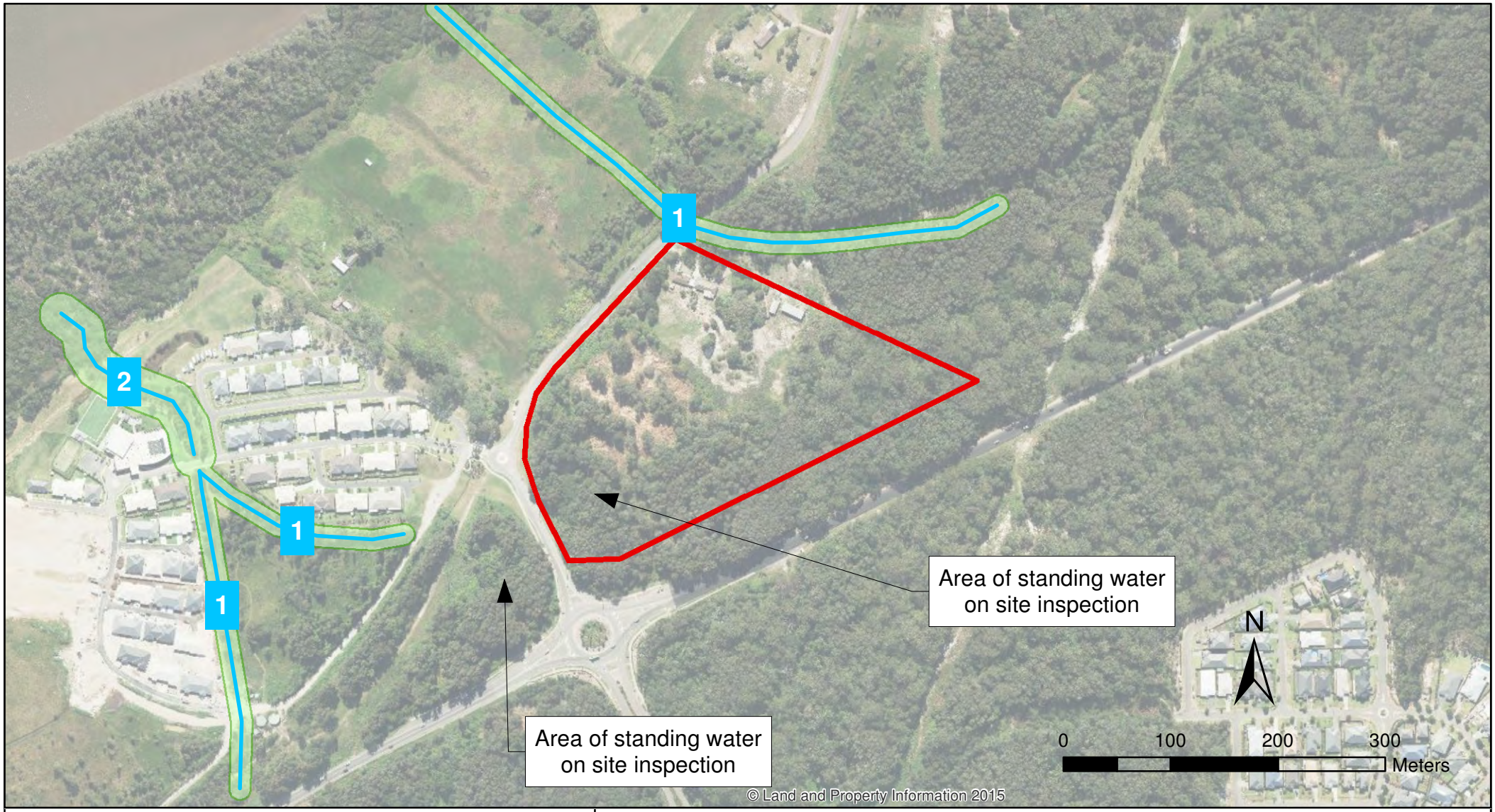


FIGURE A4

Riparian Corridors

42 Fullerton Cove Road,
Fullerton Cove

Legend

- Creeks
- Preliminary Riparian Corridors
- Subject Site

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Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
P.O Box 180, Charlestown NSW 2290
email newcastle@northrop.com.au ABN 81 094 433 100

Document Path: Y:\YEAR 2016 Jobs\NL161067\O - Drawings\GIS\ArcMap Figures - Nov 2016\FIGUREA4_RIPARIAN.mxd

APPENDIX B – MUSIC LINK REPORT

PORT STEPHENS COUNCIL

music*link*

MUSIC-*link* Report

Project Details		Company Details	
Project:	Fullerton Cove Rezoning	**Company:**	Northrop Engineers
Report Export Date:	15/11/2016	**Contact:**	Angus Brien
Catchment Name:	NL161067_Rezoning_2ha	**Address:**	
Catchment Area:	2ha	**Phone:**	49431777
Impervious Area*:	94.78%	**Email:**	abrien@northrop.com.au
Rainfall Station:	WILLIAMTOWN RAAF - Station 061078 - Zone B		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1998 - 31/12/2007 23:54:00		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1394mm		
MUSIC Version:	6.2.1		
MUSIC-link data Version:	6.21		
Study Area:	Williamtown		
Scenario:	Sensitive Catchment - Sandy soils		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	4.78%	Rain Water Tank Node	1	Urban Source Node	2
TSS	92.5%	Bio Retention Node	1		
TP	77.3%				
TN	62.7%				
GP	100%				

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Post	Post-Development Node	% Load Reduction	None	None	4.78
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	50	None	62.7
Post	Post-Development Node	TP % Load Reduction	65	None	77.3
Post	Post-Development Node	TSS % Load Reduction	85	None	92.5
Rain	Rainwater Tank	% Reuse Demand Met	None	None	100
Urban	Carpark	Area Impervious (ha)	None	None	0.895
Urban	Carpark	Area Pervious (ha)	None	None	0.104
Urban	Carpark	Total Area (ha)	None	None	1
Urban	Roof	Area Impervious (ha)	None	None	1
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	1

Only certain parameters are reported when they pass validation

ATTACHMENT 7 – Acid Sulfate Soils Study

24 February 2021

Ms Christine Jordan
c/o Monteath & Powys
Suite 3, 125 Bull Street
Newcastle West NSW 2309

Attention: Ms Christine Jordan

Dear Christine

RE: PROPOSED REZONING – 48 FULLERTON COVE ROAD, FULLERTON COVE NSW
ACID SULFATE SOIL ASSESSMENT

1 INTRODUCTION

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present the findings of an Acid Sulfate Soil (ASS) Assessment for the proposed to rezoning of 48 Fullerton Cove Road, Fullerton Cove NSW. (the site). The site location is shown on Figure 1, attached.

As the site is mapped as Class 2 and Class 4 Acid Sulfate Soils on the Port Stephens Local Environment Plan, an assessment of whether Acid Sulfate Soils (ASS) are present was required.

The ASS assessment has been completed in accordance with the ASSMAC (1998) Acid Sulfate Soil Manual and the relevant National ASS Guidance (Sullivan et al 2018). Reference is also made to Dear et al (2014) Queensland Acid Sulfate Soil Technical Manual - Soil Management Guidelines Version 4.1.

2 OBJECTIVES

The objectives of the works were to identify if ASS was present, to a depth of approximately 2.0m, below ground surface, on the site.

3 SCOPE OF WORKS

In order to meet the above objectives, the following works were carried out:

- Drilling of three boreholes;
- Collection of soil samples from the boreholes;
- Field screening of ASS samples, and laboratory analysis of selected samples; and
- Data assessment and preparation of this letter report.

4 SITE DESCRIPTION

The site is about 6.6ha in area. The site area was approximately 6.6 ha and comprised Lot 14 DP 258848. The site is currently used for residential purposes, and contains a residence with a swimming pool, and two large sheds, the area south of the house is grass cover and towards the southern boundary vegetated bushland.

The site is surrounded by Fullerton Cove Road and rural residential land to the north, Nelson Bay Road and undeveloped bushland to the south, Fullerton Cove Road, bushland and residential land to the west and undeveloped bushland to the east. Fullerton Cove is located about 430m west of the site.

5 TOPOGRAPHY AND DRAINAGE

Reference to the NSW Land and Property Information Spatial Information Exchange website (https://six.nsw.gov.au/wps/portal/) indicated the elevation of the site was below 10m AHD.

During the site walkover, the site was observed to generally slope from the north-east down towards the south-west. A low-lying area was present in the northern portion of the site, though it was not clear if this was a man-made feature or a natural gully.

Rain falling on the site would be expected to infiltrate into the site surface. Excess surface water was expected to follow the site topography, and flow to the south west and into municipal stormwater drains, located on Fullerton Cove Road. It was expected that the municipal stormwater drains discharged to Fullerton Cove located approximately 500m west of the site.

6 REGIONAL GEOLOGY

Reference to the 1:25,000 Nelson Bay Coastal Quaternary Geology map indicates that the site was underlain by Holocene aged backbarrier flats comprising marine sand, silt, clay, gravel and shell.

7 HYDROGEOLOGY

Groundwater beneath the site is anticipated to be present in an unconfined aquifer in sands. Groundwater was expected to be located within 5m below ground surface (bgs). Groundwater flow direction was anticipated to flow to the south-west, and discharge into Fullerton Cove, located approximately 500m to the west, which drains to North Arm of the Hunter River and then Stockton Bight.

It should be noted that groundwater conditions can vary due to rainfall and other influences including regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

8 FIELD WORK

Field work was carried out by an Environmental Scientist from Qualtest on 8 February 2021. Three boreholes (BH01 to BH03) were drilled on the site. The borehole locations are shown on Figure 1, attached.

The boreholes were advanced using a hand auger, to depths of about 1.7m and 2.0m bgs. Soil samples were collected at intervals of approximately 0.2m. The samples were placed into

zip-lock bags and stored in an ice filled esky during fieldwork and transported to the Qualtest soils laboratory at Warabrook NSW. Disposable nitrile gloves were used during collection of samples.

Following field screening at the Qualtest laboratory selected samples kept on ice and transported under chain of custody documentation to Eurofins laboratory for further testing using the chromium reducible sulphur test

Photographs taken during fieldworks are provided below.



Photo 1 – Showing site looking from north to south



Photo 2 – Showing site looking from south to west



Photo 3 - Showing site looking from west to east

9 SUBSURFACE CONDITIONS

Table 9.1 presents a summary of the typical soil profiles observed at the borehole locations during the field investigations, divided into representative geotechnical units. The borehole logs are also attached.

Table 9.1 – Summary of Soil Profile

Unit	Soil Description	Depth Range (m)		
		BH01	BH02	BH03
Topsoil	Sand - fine to medium grained, dark brown to grey, rootlets.	0.0 to 0.3	0.0 to 0.15	0.0 to 0.2
Aeolian/Alluvial	Sand – fine to medium grained, orange brown, orange yellow. Sandy Clay – medium to high plasticity, dark grey, fine to medium grained sand. SAND – fine to medium grained, light brown to grey, dark grey.	0.3 to 2.0*	0.15 to 1.7*	0.2 to 1.8*

Note: * depth of investigation.

No odours and/or anthropogenic materials were observed during hand auguring, groundwater inflows were observed at 1.4m in BH02 and BH03.

10 ACID SULFATE SOILS

10.1 Risk Map

Reference to the Acid Sulfate Soil Risk Mapping (Edition 3, 2008) for Part of the Lower Hunter River Catchment indicates that:

- The majority of the site is located within an area of "low probability of acid sulfate soils within 1m of the ground surface, in an Aeolian sandplain at an elevation of 1-2m AHD; and,
- The north-eastern corner of the site is located within an area of "low probability of acid sulfate soils within 1m to 3m of the ground surface, in an Aeolian sandplain at an elevation of 2-4m AHD.

The NSW Planning Portal (https://www.planningportal.nsw.gov.au/spatialviewer/) shows that the site is mapped as Class 2 and Class 4 Acid Sulfate Soils as shown in Figure 3, attached.

10.2 Occurrence

Acid sulfate soils can form in a number of geologic and geomorphic landscapes provided there is a source of iron, sulfate and soil bacteria. Coastal Acid Sulfate Soils (CASS) have formed along the east coast of Australia, since the last glacial period (19,000 to 18,000 years ago), when sea levels were around 120m to 130m below today's levels.

Sea levels rose rapidly to about 7,000 years ago, reaching a height about 1.0m above the present day mean sea level (0.0m AHD), at which time they stabilised. Since that time there has been a slow accumulation of coastal sediments within the intertidal zone, including saline wetlands, salt marshes and as bottom sediments in embayments, coastal rivers, estuaries and coastal lakes. This accumulation is still occurring today.

CASS are found along most of the coast of mainland Australia, generally found below about 5m AHD where tidal ranges are large, such as northern Queensland. Along coastal areas with smaller tidal ranges, it is rare to find significant accumulations of CASS above about 2m AHD (Simpson et al 2018).

The formation of sulfidic sediments is a natural part of the sulfur cycle where sulfates from sea water, in combination with iron and sulfate reducing bacteria (SRB), combine to produce reduced inorganic sulphides (RIS). RIS can include iron disulfides (FeS2), pyrite and marcasite, monosulfides (FeS) and elemental sulfur (S8) (Sullivan et al 2018). Provided these sediments remain in an anoxic state (saturated) they are benign (Dear et al 2014, Sullivan et al 2018).

10.3 Action Criteria

In order to assess the presence of ASS, the laboratory results were compared to Action Criteria from ASSMAC (1998) Acid Sulfate Soil Manual.

The ASSMAC (1998) action levels are based on oxidisable sulfur concentrations for three differing soil textures. There are separate action levels depending on the amount of soil disturbed as a result of the proposed works. For this project it has been assumed that less than 1000 tonnes of ASS would be disturbed. The applicable action levels are indicated below in Table 10.1.

Table 10.1 – ASSMAC (1998) Action Criteria

Texture Category	Approx. Clay Content (%)	Action Criteria	
		Net Acidity (S_{CR}/S_{POS}) (%)	Net Acidity (mot H+/tonne)
Coarse	<5%	0.03	18
Medium	5 to 40%	0.06	36
Fine	>40%	0.1	62

10.4 Field Screening

Field screening of the twelve soil samples collected was carried out by an experienced Qualtest Environmental Scientist, at our Warabrook laboratory. The field screening sheets are attached, and a summary of the results provided in Table 10.2 below.

Table 10.2 – Results of Field Screening Tests

Sample ID	pH_F	pH_{FOX}	Reaction
BH01 0.0-0.1	5.92	4.38	None observed
BH01 0.4-0.5	5.73	4.38	None observed
BH01 0.9-1.0	5.77	4.76	None observed
BH01 1.4-1.5	6.02	4.67	None observed
BH01 1.9-2.0	5.87	5.00	None observed
BH02 0.0-0.1	5.66	4.30	None observed
BH02 0.4-0.5	5.40	3.94	Slight
BH02 1.0-1.0	5.76	3.77	None observed
BH02 1.5-1.6	6.15	4.66	None observed
BH02 1.6-1.7	6.19	5.21	None observed
BH03 0.0-0.1	5.76	4.07	Slight
BH03 0.5-0.6	5.71	4.35	None observed
BH03 1.0-1.1	5.62	4.72	None observed
BH03 1.5-1.6	5.48	4.55	None observed
BH03 1.7-1.8	5.41	4.55	None observed

A pH_{FOX} around 3.5 or lower, can sometimes indicate a potential for reduced inorganic sulphides (RIS) to be present within the soils. None of the screened samples recorded a pH_{FOX}

below 3.5 and observed reactions were none to slight following the addition of hydrogen peroxide.

10.5 Laboratory Results

Based on the results of the field screening, three samples were selected for laboratory analysis. The samples were dispatched to NATA accredited laboratory Eurofins MGT for Chromium Reducible Sulfur (CRS) testing. The laboratory reports are attached and Table 10.3 provides a summary of the results.

Table 10.3: Laboratory Results

Sample ID	Description	pH_{KCL}	TAA (mol H+/t)	Scr (%S)	Net Acidity (%S)
BH02 0.4-0.5	Clayey SAND – fine to medium grained, dark grey, fines of low plasticity.	5.3	15	<0.005	0.02
BH02 1.0-1.1	SAND – fine to medium grained, orange brown.	5.9	6.5	<0.005	<0.02
BH03 1.0-1.1	Sand – fine to medium grained, grey brown.	5.8	2.5	<0.005	<0.02
Action Criteria*		-	18	0.03	0.03

ASSMAC (1998), Acid Sulfate Soil Manual, Table 4.4 – Action Criteria for medium textured soil, <1000 tonnes

The laboratory results showed Titratable Actual Acidity (TAA) below the adopted criteria of 18mol H+/tonne in each sample tested, and Chromium Reducible Sulfur (Scr) and Net Acidity were reported below the adopted criteria of 0.03%S in each sample tested.

11 CONCLUSION AND RECOMMENDATIONS

ASS were not considered to be present in the soils to about 2.0m depth, based on field observations and results of the laboratory analysis.

The field screening indicated that ASS were not present, and this was confirmed by the results of the laboratory testing which showed concentrations of TAA and Chromium Reducible Sulfur below the action criteria in each sample tested.

Based on the results of the assessment, an ASS Management Plan is not required.

12 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using industry accepted practices and standards. To our knowledge, they represent a reasonable interpretation of the general conditions of the site. However, it is noted that under no circumstances, can it be considered that these finding represent the actual state of the site at all points. A suitable qualified geotechnical engineer/environmental scientist should be contacted if the subsurface conditions encountered during earthworks differ from those described.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

If you have any further questions regarding this report, please do not hesitate to contact the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd.

[redacted]

Stephanie Cullen
Environmental Scientist

Attachments:

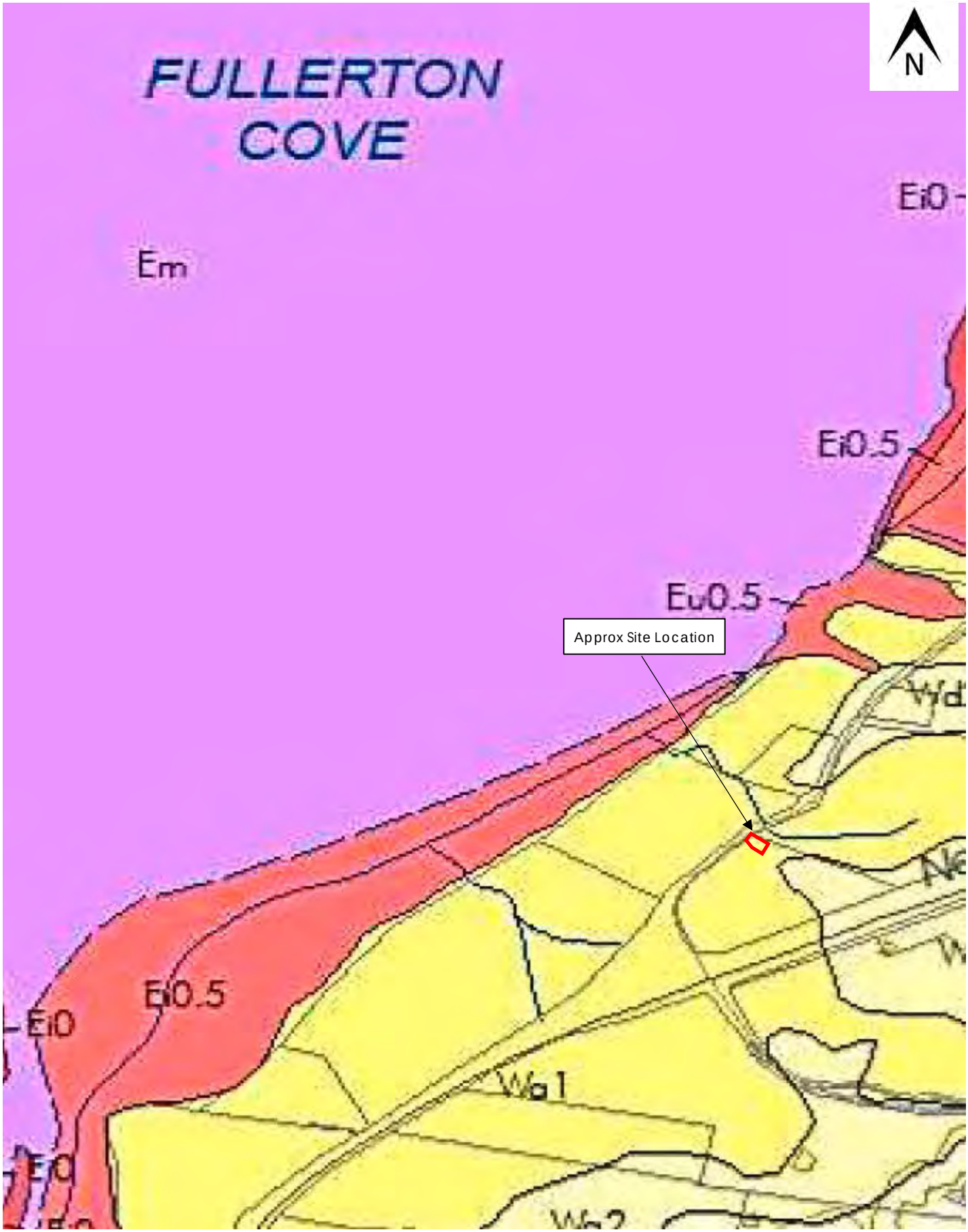
Figure 1 – Site and Sampling Locations
Figure 2 – ASS Risk Map
Figure 3 – ASS Class Map – Lake Macquarie LEP
Borehole Logs
Field Screening Results
Laboratory Reports



Image obtained from Sixmaps (https://maps.six.nsw.gov.au/) 11 Febuary 2021

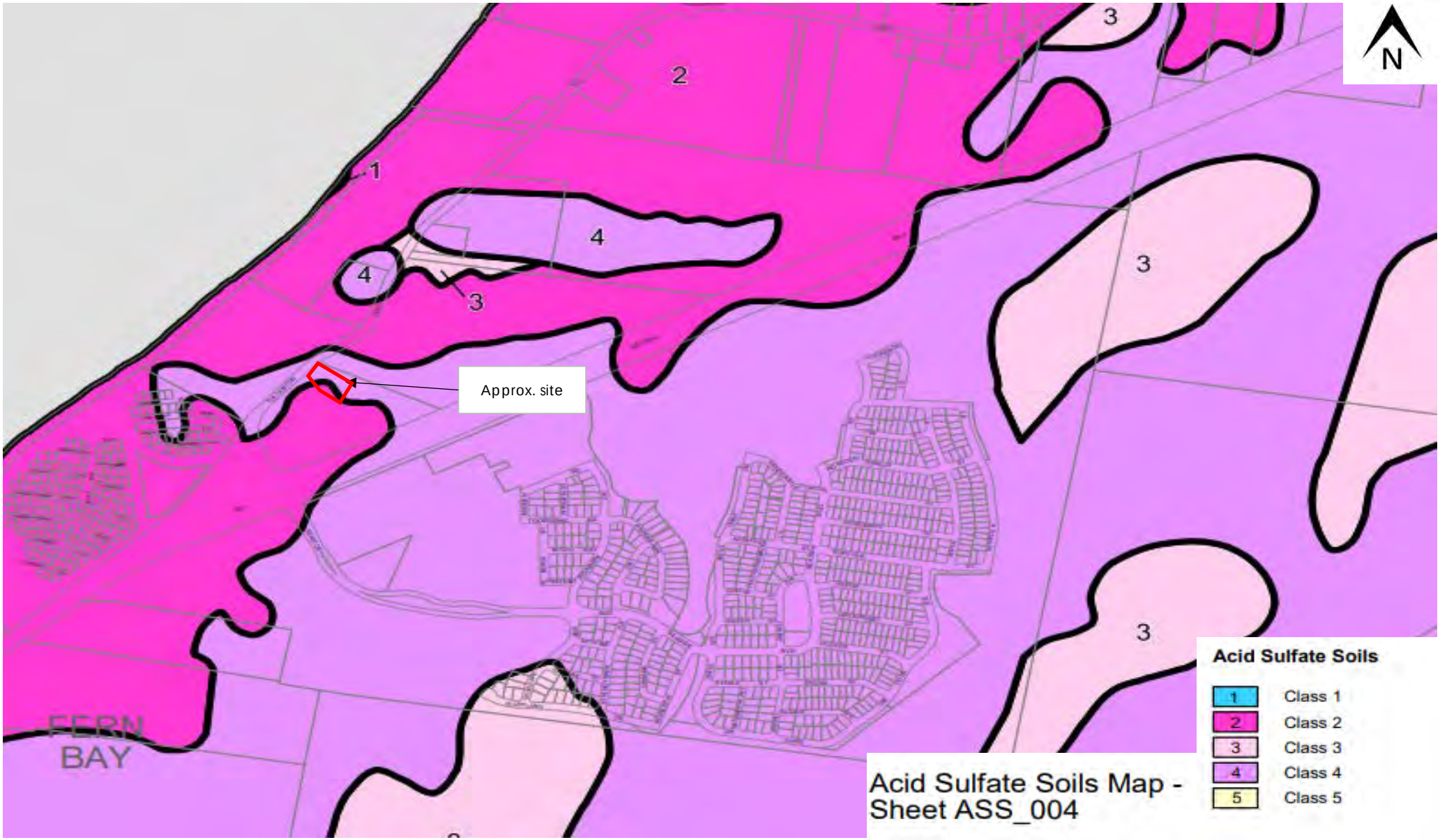
Qualtest LABORATORY (NSW) PTY LTD

Client:	MS CHRISTINE JORDAN C/O MONTEAH & POWYS PTY LTD	Drawing No:	FIGURE 1
Project:	ACID SULFATE SOIL ASSESSMENT	Project No:	NEW20P-0178-AB
Location:	48 FULLERTON COVE ROAD, FULLERTON COVE NSW	Scale:	N.T.S.
Title:	SITE LOCATION AND BOREHOLE LOCATIONS	Date:	24/02/2020



ASS Risk Map overlaid on Google Earth image by Qualtest.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDAN C/O MONTEAH & POWYS PTY LTD	Drawing No:	FIGURE 2
	Project:	ACID SULFATE SOIL ASSESSMENT	Project No:	NEW20P-0178-AB
	Location:	48 FULLERTON COVE ROAD, FULLERTON COVE NSW	Scale:	N.T.S
	Title:	ASS RISK MAP	Date:	24/02/2021



Client:	CATHOLIC DIOCESE OF MAITLAND AND NEWCASTLE	Drawing No:	FIGURE 3
Project:	ACID SULFATE SOIL ASSESSMENT	Project No:	NEW20P-0178-AB
Location:	40 ERNEST STREET, BELMONT, NSW	Scale:	N.T.S.
Title:	ASS CLASS MAP - LAKE MACQUARIE LEP	Date:	24/02/2021

Qualtest LABORATORY (NSW) PTY LTD

ENGINEERING LOG - HAND AUGER

HAND AUGER NO: BH01

CLIENT: CHRISTINE JORDAN C/O MONTEATH AND POWYS
PAGE: 1 OF 1

PROJECT: MS CHRISTINE JORDAN PROPOSED REZONING
JOB NO: NEW20P-0178

LOCATION: 42 FULLERTON COVE ROAD, FULLERTON COVE
LOGGED BY: SC

DATE: 8/2/21

DRILL TYPE:
SURFACE RL:

BOREHOLE DIAMETER:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	E 0.10m					TOPOSIL: SAND - fine to medium graine, dark brown to grey, rootlets, trace gravel.					TOPSOIL / FILL
							0.30m SAND - fine to medium grained, light brown to grey.					AEOLIAN DEPOSITS
		0.40m E 0.50m		0.5			Becoming dark grey in colour.					
		1.00m E 1.10m		1.0			Becoming light grey in colour.					
		1.40m E 1.50m		1.5								
		1.90m E 2.00m					2.00m Hole Terminated at 2.00 m Limit Of Required Investigation					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

QT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW20P-0178 LOGS.GPJ <<DrawingFile>> 23/02/2021 15:31 10.0.000 Datgel Lab and In Situ Tool

ENGINEERING LOG - HAND AUGER

HAND AUGER NO: BH02

CLIENT: CHRISTINE JORDAN C/O MONTEATH AND POWYS **PAGE:** 1 OF 1

PROJECT: MS CHRISTINE JORDAN PROPOSED REZONING **JOB NO:** NEW20P-0178

LOCATION: 42 FULLERTON COVE ROAD, FULLERTON COVE **LOGGED BY:** SC

DATE: 8/2/21

DRILL TYPE: **SURFACE RL:**

BOREHOLE DIAMETER: **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA		E 0.10m					TOPSOIL: SAND - fine to medium grained, grey white, some rootlets.					TOPSOIL
							0.15m SAND - fine to medium grained, orange yellow.					AEOLIAN DEPOSITS
		0.40m					0.40m Clayey SAND - fine to medium grained, dark grey, fines of low plasticity.					ALLUVIAL / AEOLIAN DEPOSITS
		E 0.50m		0.5				D				
							0.60m SAND - fine to medium grained, orange brown.					
							Becoming grey and orange in colour.	M				
							Getting wetter.					
		1.00m		1.0								
		E 1.10m					1.10m Sandy CLAY - medium to high plasticity, dark grey, fine to medium grained sand.					
	▶						1.45m					
		1.50m		1.5			SAND - fine to medium grained, dark grey to brown.	W				
		E 1.60m										
		E 1.70m					1.70m					
							Hole Terminated at 1.70 m Sides collapsing as per water content					

LEGEND:

Water

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes

- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

QT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW20P-0178 LOGS.GPJ <<DrawingFile>> 23/02/2021 15:32 10.0.000 Datgel Lab and In Situ Tool

ENGINEERING LOG - HAND AUGER

HAND AUGER NO: BH03

CLIENT: CHRISTINE JORDAN C/O MONTEATH AND POWYS **PAGE:** 1 OF 1

PROJECT: MS CHRISTINE JORDAN PROPOSED REZONING **JOB NO:** NEW20P-0178

LOCATION: 42 FULLERTON COVE ROAD, FULLERTON COVE **LOGGED BY:** SC

DATE: 8/2/21

DRILL TYPE: **SURFACE RL:**

BOREHOLE DIAMETER: **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA		E 0.10m					TOPSOIL: SAND - fine to medium grained, white grey, some rootlets.	D				TOPSOIL
							0.20m SAND - fine to medium grained, brown grey.					AEOLIAN DEPOSITS
		0.40m E 0.50m		0.5				M				
		1.00m E 1.10m		1.0			Becoming dark grey.	M - W				
	▶	1.50m E 1.60m		1.5				W				
		1.70m E 1.80m					1.80m Hole Terminated at 1.80 m Sides collapsing as per water content					

LEGEND:

Water

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes

- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

QT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW20P-0178 LOGS.GPJ <<DrawingFile>> 23/02/2021 15:32 10.0.000 Datgel Lab and In Situ Tool

Qualtest LABORATORY (NSW) PTY LTD

8 Ironbark Close Warabrook NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

Acid Sulfate Soil Screening Test Report

Client:	Christine Jordan C/O Moneath & Powys Pty Ltd	Date Tested:	8/02/2021	Project No:	NEW20P-0178
Project:	Acid Sulfate Sampling	Tested By:	SC	Sheet No:	1 of 2
Location:	42 Fullerton Cove Road Fullerton Cove NSW	Date Sampled:	8/02/2021		

Hydrogen peroxide pH prior to use (4.5 to 5.5): 4.83 Hydrogen peroxide temperature prior to use: 11.7

Sample Location	Sample Depth	Soil Description	pH_F (pH in 1:5 Soil: Deionised Water)	pH_{FOX} (oxidation in 30% hydrogen peroxide)										pH change (pH_F - pH_{FOX})	Additional Observations / Comments (e.g. presence of shells or organics)
				Duration (minutes)	pH_{FOX}	Temperature During Oxidation	Colour Before Oxidation	Colour After Oxidation	Effervescence				Sulfurous Odour		
									None Observed	Slight	Moderate	Vigorous			
BH01	0.0-0.1	Sand	**5.92**	15	**4.38**	27.7	dark brown	dark brown	x				no	1.54	
BH01	0.4-0.5	Sand	**5.73**	15	**4.38**	24.2	dark brown	dark brown	x				no	1.35	
BH01	1.0-1.1	Sand	**5.77**	15	**4.76**	24.1	dark brown	dark brown	x				no	1.01	
BH01	1.5-1.6	Sand	**6.02**	15	**4.67**	25.1	brown	brown	x				no	1.35	
BH01	1.9-2.0	Sand	**5.87**	15	**5.00**	24.2	brown	brown	x				no	0.87	
BH02	0.0-0.1	Sand	**5.66**	15	**4.30**	25.7	dark brown	dark brown	x				no	1.36	
BH02	0.4-0.5	Sand	**5.40**	15	**3.94**	25.1	dark brown	dark brown		x			no	1.46	
BH02	1.0-1.1	Clayey Sand/Clay	**5.76**	15	**3.77**	26.1	dark brown	dark brown	x				no	1.99	
BH02	1.5-1.6	Sand	**6.15**	15	**4.66**	25.3	dark brown	dark brown	x				no	1.49	
BH02	1.6-1.7	Sand	**6.19**	15	**5.21**	25.8	dark brown	dark brown	x				no	0.98	
BH03	0.0-0.1	Sand	**5.76**	15	**4.07**	26.4	dark brown	dark brown		x			no	1.69	
BH03	0.4-0.5	Sand	**5.71**	15	**4.35**	25.4	dark brown	dark brown	x				no	1.36	

Explanatory Notes:

Acid Sulfate Soil (ASS) screening provides an early indication of the likely presence of actual or potential ASS, and should be followed by analytical testing if screening results are of concern. As a guide:

- $pH_F \leq 4$ is indicative of actual ASS.
- $pH_F > 4$ and < 5.5 are acid and may be the result of some previous or limited oxidation of sulfites, but is not confirmatory of actual ASS.
- Potential positive reactions include one or more of the following:
  - Change in colour of the soil from grey tones to brown tones
  - Effervescence
  - The release of sulfurous odours
  - A substantial depression in pH_{FOX} below pH_F
  - $pH_{FOX} < 3$

8 Ironbark Close Warabrook NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

Acid Sulfate Soil Screening Test Report

Client:	Christine Jordan C/O Moneath & Powys Pty Ltd	Date Tested:	8/02/2021	Project No:	NEW20P-0178
Project:	Acid Sulfate Sampling	Tested By:	SC	Sheet No:	2 of 2
Location:	42 Fullerton Cove Road Fullerton Cove NSW	Date Sampled:	8/02/2021		

Hydrogen peroxide pH prior to use (4.5 to 5.5): 4.83 Hydrogen peroxide temperature prior to use: 11.7

Sample Location	Sample Depth	Soil Description	pH_F (pH in 1:5 Soil: Deionised Water)	pH_{FOX} (oxidation in 30% hydrogen peroxide)										pH change (pH_F - pH_{FOX})	Additional Observations / Comments (e.g. presence of shells or organics)
				Duration (minutes)	pH_{FOX}	Temperature During Oxidation	Colour Before Oxidation	Colour After Oxidation	Effervescence				Sulfurous Odour		
									None Observed	Slight	Moderate	Vigorous			
BH03	1.0-1.1	Sand	**5.62**	15	**4.72**	15	dark brown	dark brown	x				no	0.90	
BH03	1.5-1.6	Sand	**5.48**	15	**4.55**	15	dark brown	dark brown	x				no	0.93	
BH03	1.7-1.8	Sand	**5.41**	15	**4.55**	15	dark brown	dark brown	x				no	0.86	

Explanatory Notes:

Acid Sulfate Soil (ASS) screening provides an early indication of the likely presence of actual or potential ASS, and should be followed by analytical testing if screening results are of concern. As a guide:

- $pH_F \leq 4$ is indicative of actual ASS.
- $pH_F > 4$ and < 5.5 are acid and may be the result of some previous or limited oxidation of sulfites, but is not confirmatory of actual ASS.
- Potential positive reactions include one or more of the following:
  - Change in colour of the soil from grey tones to brown tones
  - Effervescence
  - The release of sulfurous odours
  - A substantial depression in pH_{FOX} below pH_F
  - $pH_{FOX} < 3$

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory
Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1 21 Smallwood Place Murarrie QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Qualtest	Project №	NEW20P-0178	Project Manager	Libby Betz
Address	8 Ironbark Close Warabrook NSW 2304	Project Name	ASS testing Fullerton Cove	EDD Format (ESdat, EQuIS etc)	Excel
Contact Name	Libby Betz				
Phone №					
Special Directions					
Purchase Order					
Quote ID №					

Sampler(s)	Steph Cullen				
Handed over by					
Email for Invoice	accounts@qualtest.com.au				
Email for Results	libbybetz@qualtest.com.au emmacoleman@qualtest.com.au stephcullen@qualtest.com.au billynow@qualtest.com				

Analyses
Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing

Containers
Change container type & size if necessary

Required Turnaround Time (TAT)
Default will be 5 days if not ticked.

♦Surcharge will apply
☐ Overnight (reporting by 9am)♦
☐ Same day♦ ☐ 1 day♦
☐ 2 days♦ ☐ 3 days♦
☑ 5 days (Standard)
☒ Other due 15/02/21

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	Chromium Reducible Sulfur Suite	500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
11	BH01 0.0-0.1	8/02/21	soil									1	
12	BH01 0.4-0.5	8/2/21	soil									1	
13	BH01 1.0-1.1	8/2/21	soil									1	
14	BH01 1.4-1.5	8/2/21	soil									1	
15	BH01 1.9-2.0	8/2/21	soil									1	
16	BH02 0.0-0.1	8/2/21	soil									1	
17	BH02 0.4-0.5	8/2/21	soil	X								1	
18	BH02 1.0-1.1	8/2/21	soil	X								1	
19	BH02 1.5-1.6	8/2/21	soil									1	
20	BH02 1.6-1.7	8/2/21	soil									1	
	Total Counts			2								10	

#773055

Method of Shipment ☐ Courier (#) ☐ Hand Delivered ☐ Postal Name Signature Date Time

Laboratory Use Only											
Received By	Andrew Black	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	8/2/21	Time	3:20pm	Temperature	10°c
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time		Report №	

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

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07 3902 4600 EnviroSampleQLD@eurofins.com

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08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Qualtest	Project №	NEW20P-0178	Project Manager	Libby Betz
Address	8 Ironbark Close Warabrook NSW 2304	Project Name	ASS testing Fullerton Cove	EDD Format (ESdat, EQuIS etc)	excel
Contact Name	Libby Betz				
Phone №					
Special Directions					
Purchase Order					
Quote ID №					

Sampler(s)	Steph Cullen
Handed over by	
Email for Invoice	accounts@qualtest.com.au
Email for Results	libbybetz@qualtest.com.au emmacoleman@qualtest.com.au stephcullen@qualtest.com.au billynow@qualtest.com

Analyses Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.

Containers Change container type & size if necessary.

Required Turnaround Time (TAT) Default will be 5 days if not ticked.

♦Surcharge will apply
- ☐ Overnight (reporting by 9am)♦
- ☐ Same day♦ ☐ 1 day♦
- ☐ 2 days♦ ☐ 3 days♦
- ☑ 5 days (Standard)
- ☒ Other (due 15/02/21)

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	Chromium Reducible Sulfur Suite	500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
11	BH03 0.0-0.1	8/02/21	soil									1	
12	BH03 0.4-0.5	8/2/21	soil									1	
13	BH03 1.0-1.1	8/2/21	soil	X								1	
14	BH03 1.5-1.6	8/2/21	soil									1	
15	BH03 1.7-1.8	8/2/21	soil									1	
16													
17													
18													
19													
20													
	Total Counts			1								5	

Method of Shipment ☐ Courier (# ☐ Hand Delivered ☐ Postal Name Signature Date Time

Laboratory Use Only							
Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature	Date	Time	Temperature		
Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature	Date	Time	Report №		

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

Qualtest
8 Ironbark Close
Warabrook
NSW 2304

NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Libby Betz**

Report **773055-S**
Project name ASS TESTING FULLERTON COVE
Received Date Feb 08, 2021

Client Sample ID			**BH02 0.4-0.5**	**BH02 1.0-1.1**	**BH03 1.0-1.1**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**B21-Fe20241**	**B21-Fe20242**	**B21-Fe20243**
Date Sampled			**Feb 08, 2021**	**Feb 08, 2021**	**Feb 08, 2021**
Test/Reference	LOR	Unit			
Chromium Suite					
pH-KCL	0.1	pH Units	5.3	5.9	5.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	15	6.5	2.5
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.024	0.010	0.004
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	15	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.1	< 1	< 1
Extraneous Material					
<2mm Fraction	0.005	g	120	84	160
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1
% Moisture	1	%	7.2	23	7.4

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	Feb 13, 2021	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	Feb 13, 2021	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Brisbane	Feb 15, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
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2/91 Leach Highway
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Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Qualtest
Address: 8 Ironbark Close
Warabrook
NSW 2304

Project Name: ASS TESTING FULLERTON COVE

Order No.:
Report #: 773055
Phone: 02 4968 4468
Fax: 02 4960 9775

Received: Feb 8, 2021 3:20 PM
Due: Feb 15, 2021
Priority: 5 Day
Contact Name: Libby Betz

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Chromium Reducible Sulfur Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794						X	X	X
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	BH02 0.4-0.5	Feb 08, 2021		Soil	B21-Fe20241		X	X
2	BH02 1.0-1.1	Feb 08, 2021		Soil	B21-Fe20242		X	X
3	BH03 1.0-1.1	Feb 08, 2021		Soil	B21-Fe20243		X	X
4	BH01 0.0-0.1	Feb 08, 2021		Soil	B21-Fe20244	X		
5	BH01 0.4-0.5	Feb 08, 2021		Soil	B21-Fe20245	X		
6	BH01 1.4-1.5	Feb 08, 2021		Soil	B21-Fe20247	X		
7	BH02 0.0-0.1	Feb 08, 2021		Soil	B21-Fe20249	X		
8	BH02 1.5-1.6	Feb 08, 2021		Soil	B21-Fe20250	X		
9	BH02 1.6-1.7	Feb 08, 2021		Soil	B21-Fe20251	X		
10	BH03 0.0-0.1	Feb 08, 2021		Soil	B21-Fe20252	X		

eurofins | Environment Testing

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Company Name: Qualtest
Address: 8 Ironbark Close
Warabrook
NSW 2304

Project Name: ASS TESTING FULLERTON COVE

Order No.:
Report #: 773055
Phone: 02 4968 4468
Fax: 02 4960 9775

Received: Feb 8, 2021 3:20 PM
Due: Feb 15, 2021
Priority: 5 Day
Contact Name: Libby Betz

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Chromium Reducible Sulfur Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794						X	X	X
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory								
External Laboratory								
11	BH03 0.4-0.5	Feb 08, 2021		Soil	B21-Fe20253	X		
12	BH03 1.5-1.6	Feb 08, 2021		Soil	B21-Fe20254	X		
13	BH03 1.7-1.8	Feb 08, 2021		Soil	B21-Fe20255	X		
14	TP01 1.9-2.0	Feb 08, 2021		Soil	B21-Fe21004	X		
15	'TP02 0.0-0.1	Feb 08, 2021		Soil	B21-Fe21005	X		
16	TP02 0.4-0.5	Feb 08, 2021		Soil	B21-Fe21006	X		
17	TP02 0.6-0.7	Feb 08, 2021		Soil	B21-Fe21007	X		
18	BH01 0.9-1.0	Feb 08, 2021		Soil	B21-Fe21008	X		
Test Counts						15	3	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Chromium Suite									
pH-KCL			%	96			80-120	Pass	
Acid trail - Titratable Actual Acidity			%	91			80-120	Pass	
Chromium Reducible Sulfur			%	97			80-120	Pass	
Acid Neutralising Capacity (ANCbt)			%	99			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Chromium Suite				Result 1	Result 2	RPD			
pH-KCL	B21-Fe20241	CP	pH Units	5.3	5.3	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	B21-Fe20241	CP	mol H+/t	15	15	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	B21-Fe20241	CP	% pyrite S	0.024	0.024	<1	30%	Pass	
Chromium Reducible Sulfur	B21-Fe20241	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	B21-Fe20241	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	B21-Fe20241	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	B21-Fe20241	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	B21-Fe20241	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	B21-Fe20241	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	B21-Fe20241	CP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	B21-Fe20241	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	B21-Fe20241	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	B21-Fe20241	CP	% S	0.02	0.02	n/a	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	B21-Fe20241	CP	mol H+/t	15	15	n/a	30%	Pass	
CRS Suite - Liming Rate	B21-Fe20241	CP	kg CaCO3/t	1.1	1.1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B21-Fe20241	CP	%	7.2	7.3	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

Authorised by:

Andrew Black	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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ATTACHMENT 8 – Preliminary Contamination Assessment

Preliminary Contamination Assessment

42 Fullerton Cove Road, Fullerton Cove, NSW.

NEW20P-0178-AA
16 November 2020

Qualtest
LABORATORY (NSW) PTY LTD

GEOTECHNICAL I LABORATORY I EARTHWORKS I QUARRY I CONSTRUCTION MATERIAL TESTING

Document control record

Document prepared for:

Ms Christine Jordan
c/o Monteath & Powys
Suite 3, 125 Bull Street
NEWCASTLE WEST NSW 2309

Document prepared by:

Qualtest Laboratory (NSW) Pty Ltd
ABN 98 153 268 89
8 Ironbark Close
Warabrook, NSW 2304
T 02 4968 4468
W www.qualtest.com.au

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0	16 November 2020	Original	Qualtest	E. Coleman	L. Fox

Executive Summary

Qualtest Laboratory NSW Pty Ltd (Qualtest) has carried out a Preliminary Contamination Assessment (PCA) for a site located at 42 Fullerton Cove Road, Fullerton Cove NSW (the Site).

The site area was approximately 6.6 ha and comprised Lot 14 DP 258848. The site is currently used for residential purposes, and contains a residence with a swimming pool, and two large sheds. Current zoning is RU2 Rural Landscape and the site is proposed to be rezoned with the northern portion rezoned to B1 Neighbourhood Centre and the western, southern and eastern portions rezoned to E3 Environmental Management. The purpose of the PCA was to support the submission to Port Stephens Council for the proposed rezoning.

The objectives of the PCA were to provide an assessment of the likelihood for contamination to be present on the site from past uses and activities, and surrounding land uses, and provide recommendations on the need for further assessment, management and/or remediation (if required).

In order to achieve the above objective, Qualtest carried out the following scope:

- Desktop study and site history review, including review of relevant reports relating to contamination associated with the Williamtown RAAF Base;
- Site walkover; and,
- Data assessment and preparation of a Preliminary Contamination Assessment Report

The site history review showed the site was subjected to sand mining exploration prior to 1979, but was not sand mined due to a lack of commercial grade ore. Since 1979, the northern portion of the site had been used for residential purposes, with two sheds for storing equipment and tools. Materials and waste were observed surrounding the sheds. The southern, western and eastern portions of the site have remained as bushland since at least 1979.

Four Areas of Environmental Concern (AECs) were identified based on the site history and site observations, and surrounding land uses. The AECs related to: stored equipment, materials and waste; use of sheds for vehicle repairs and storage of oils/fuels/paints; potential use of hazardous building materials; and PFAS contaminated groundwater and surface water migrating from Williamtown RAAF Base.

The site is located in the southern tip of the Broader Management Area of the NSW EPA PFAS Management Area for the Williamtown RAAF Base. Based on a review of publicly available information, it is considered that the potential for PFAS contaminated groundwater, surface water and sediment to be present on the site is low.

The Conceptual Site Model (CSM) indicated that should soil contamination exist on the site (from the other AECs), then a potential exposure pathway could exist to current and future site users.

Based on the site history and observations made during the site walkover, it is recommended that additional assessment, comprising soil sampling in the AECs identified, is carried out after removal of buildings and stored equipment and materials. It is recommended that a Hazardous Materials Survey is carried out for the buildings and structures on site, prior to demolition.

The investigation should include surface soil sampling under/adjacent to the residences, sheds, and observed equipment and waste. These assessments could be completed as part of site clean-up activities (i.e. during demolition of buildings and removal of waste) under a Contaminated Land Management Plan.

This report was prepared in general accordance with the relevant sections of the NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Land and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra (referred to as ASC NEPM 2013).

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Appendix A - Figures: Figure 1 - Site Location Plan
Figure 2 – Site Layout Plan
Figure 3 - Site Features Plan
Appendix B: Groundwater Bore Search
Appendix C: Historical Titles
Appendix D: Aerial Photographs

Appendix E: Williamtown RAAF Base PFAS Management Area Plans

Appendix F: NSW EPA Records

Appendix G: Section 10.7 Certificates

Appendix H: Site Photographs

1.0 Introduction

Qualtest Laboratory NSW Pty Ltd (Qualtest) has carried out a Preliminary Contamination Assessment (PCA) for a site located at 42 Fullerton Cove Road, Fullerton Cove NSW (the Site). Figure 1, Appendix A, shows the site location.

The site area was approximately 6.6 ha and comprised Lot 14 DP 258848. The site is currently used for residential purposes, and contains a residence with a swimming pool, and two large sheds. Current zoning is RU2 Rural Landscape and the site is proposed to be rezoned with the northern portion rezoned to B1 Neighbourhood Centre and the western, southern and eastern portions rezoned to E3 Environmental Management.

The purpose of the PCA was to support the submission to Port Stephens Council for the proposed rezoning.

This report was prepared in general accordance with the relevant sections of the NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Land and the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013*, Canberra (referred to as ASC NEPM 2013).

1.1 Objectives

The objectives of the PCA were to provide an assessment of the likelihood for contamination to be present on the site from past uses and activities, and surrounding land uses, and provide recommendations on the need for further assessment, management and/or remediation (if required).

1.2 Scope of Works

In order to achieve the above objective, Qualtest carried out the following scope of work:

- Desktop study and site history review, including review of relevant reports relating to contamination associated with the Williamtown RAAF Base;
- Site walkover; and,
- Data assessment and preparation of a Preliminary Contamination Assessment Report.

2.0 Site Description

2.1 Site Identification

General site information is provided below in Table 2.1. The site location is shown in Figure 1, Appendix A.

Table 2.1: Summary of Site Details

Site Address:	42 Fullerton Cove Road, Fullerton Cove, NSW
Approximate site area and dimensions:	Approx. 6.6 ha Approx. 230m wide by 315m long across the centre.

Title Identification Details:	Lot 14 DP258848 within the Port Stephens local government area, Parish of Stockton, County of Gloucester.
Current Zoning	RU2 Rural Landscape
Current Ownership:	Ms Christina Jordan
Previous and Current Landuse:	Residential in the northern portion of the site Undeveloped land in the southern, western and eastern portion of the site
Proposed Landuse:	B1 Neighbourhood Centre in the northern portion of the site E3 Environmental Management in the southern, western and eastern portion of the site
Adjoining Site Uses:	Fullerton Cove Road and rural-residential land to the north. Nelson Bay Road and undeveloped bushland to the south. Fullerton Cove Road, bushland and residential land to the west. Undeveloped bushland to the east.
Site Coordinates for approx. centre of site:	32°51'20.29 S 151°48'15.61 E

2.2 Topography and Drainage

Reference to the NSW Land and Property Information Spatial Information Exchange website (https://six.nsw.gov.au/wps/portal/) indicated the elevation of the site was below 10m AHD.

During the site walkover, the site was observed to generally slope from the north-east down towards the south-west. A low-lying area was present in the northern portion of the site, it was not clear if this was a man-made feature or a natural gully.

Rain falling on the site would be expected to infiltrate into the site surface. Excess surface water is expected to follow the site topography, and flow to the south west and into municipal stormwater drains, located on Fullerton Cove Road. It is expected that the municipal stormwater drains discharge to Fullerton Cove located approximately 500m west of the site.

2.3 Regional Geology

Reference to the 1:25,000 Nelson Bay Coastal Quaternary Geology map indicates that the site is underlain by Holocene aged backbarrier flats comprising marine sand, silt, clay, gravel and shell.

2.4 Hydrogeology

Groundwater beneath the site is anticipated to be present in an unconfined aquifer in sands. Groundwater is expected to be located within 5m below ground surface (bgs). Groundwater flow direction is anticipated to flow to the south-west, and discharge into Fullerton Cove located approximately 500m to the west, which drains to North Arm of the Hunter River and then Stockton Bight.

It should be noted that groundwater conditions can vary due to rainfall and other influences including regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

A search of the NSW Department of Primary Industries (Office of Water) registered groundwater bores located within a 500m radius of the site was undertaken. The search revealed that there were no registered bores located within this radius. A copy of the search is provided in Appendix B.

2.5 Acid Sulfate Soils

Reference to the Acid Sulfate Soil Risk Mapping (Edition 3, 2008) for Part of the Lower Hunter River Catchment indicates that:

- The majority of the site is located within an area of "low probability of acid sulfate soils within 1m of the ground surface, in an Aeolian sandplain at an elevation of 1-2m AHD; and,
- The north-eastern corner of the site is located within an area of "low probability of acid sulfate soils within 1m to 3m of the ground surface, in an Aeolian sandplain at an elevation of 2-4m AHD.

The NSW Planning Portal (https://www.planningportal.nsw.gov.au/spatialviewer/) shows that the site is mapped as Class 2 and Class 4 Acid Sulfate Soils. No map was available to show where the difference classes were on the site.

3.0 Site History Review

A site history review was undertaken as part of the PCA, and included:

- A review of historical ownership of the site (Lot 14 DP258848);
- A review of aerial photography from the past 55 years;
- A review of Section 10.7 Certificate from Port Stephens Council;
- Search of the NSW EPA's list of contaminated sites applying to the site and nearby properties, including a review of relevant publicly available reports relating to Per and Poly-Fluoroalkyl Substances (PFAS) contamination migrating from the Williamtown RAAF Base via groundwater and surface water.
- A site walkover to help identify current and previous activities carried out on the site, identify surrounding land uses, and assess Areas of Environmental Concern (AECs) and Chemicals of Potential Concern (COPCs).

The information provided from the above reviews is summarised in the sections below.

3.1 Historical Titles Search

A search of historical titles for Lot 14 DP 258848, was undertaken by Advanced Legal Searchers Pty Ltd.

A list of past registered proprietors dating back to 1873 was obtained. The results of the search are included in Appendix C and presented below in Table 3.1.

Table 3.1: Summary of Historical Titles

Date	Owner
2005 – todate	Christina Maria Jordan
1995 – 2005	Paul Jordon Christina Maria Jordan
1993-1995	Ella Christine Hatch Paul Jordon, deputy superintendant Christina Maria Jordon, his wife
1979-1993	Paul Jordon, deputy superintendant Christina Maria Jordon, his wife Christopher Henry Miklea, fitter & turner
1973-1979	Hooker Town Developments
1967-1973	June James, wife of Alan Bonython James engineer welder Florence Caroline Jeffrey, wife of Eugene Henry Jeffrey police sergeant Nancy Jean Smith, widow Ian Campbell Smith, farmer
1932-1967	Various combinations of the following people: • Stanley William Smith, estate, executor • Eliza Linda Smith, single woman, executrix • Andrew William Swan, business manager, trustee • Douglas Stanley Smith, farmer, trustee • Ian Campbell Smith, farmer, trustee
1873-1932	Stanley William Smith, grazier

The historical title search indicated that the site has predominately been owned by private individuals, with occupations listed as trustee, estate, executor/executrix, widow, single woman, grazier, farmer, deputy superintendant, business manager, and fitter & turner. The site was owned by a company, Hooker Town Developments, for about 6years in the 1970s. The site has been owned by the current owner since 1979.

3.2 Aerial Photograph Review

Aerial photographs of the site from 1954, 1966, 1976, 1984 and 1993 were obtained from the NSW Spatial Portal -Historical Imagery (https://portal.spatial.nsw.gov.au/portal/apps/), and satellite images from Nearmaps for 2010 and 2020, were assessed by a Qualtest Environmental Scientist. The results of the aerial photograph review are summarised below in Table 3.2. The aerial photographs are presented in Appendix D.

Table 3.2: Aerial Photograph Review

Year	Site	Surrounding Land
1954	The site is largely cleared, and vacant. There appears to be some disturbance in the central-northern portion of the site.	The surrounding land is largely cleared, vacant land. Bushland is present to the east of the site. Fullerton Cove road is visible and probably unpaved.
1966	The eastern and southern portion of the site has become vegetated. There is still evidence of ground disturbance in the northern portion of the site. A drain appears to intersect the southern tip of the site.	The surrounding area appears similar to the 1954 photograph. The land to the west appears to have potentially been used for cropping. Fullerton Cove Road is present, and a service easement to the east of the site.
1976	The site appears to be relatively unchanged from the 1966 aerial photograph apart from the northern portion which appears to be more vegetated than in the previous photo.	The surrounding area appears to be similar to the 1966 photograph. Nelson Bay Road has been constructed to the south of the site. There are some cleared areas in the bushland to the east and south of the site.
1984	Two buildings have been constructed in the northern portion of the site. The northern portion of the site has largely been cleared of vegetation.	The surrounding area appears to be similar to the 1966 photograph.
1993	One of the buildings in the northern portion of the site, on the western side, has been extended, and appears to be a residence. A second building has been constructed next to the other building in the northern portion of the site, on the eastern side. These buildings appear to be sheds. There appears to be materials or waste stored around the residence and the sheds. The remainder of the site appears similar to the 1984 photograph.	The surrounding area appears to be similar to the 1984 aerial photograph.
2010	The site appears to be similar to the 1993 photograph. A swimming pool has been constructed to the north-west of the residence.	The surrounding area appears similar to the 1993 aerial photograph. The land further to the south and west is being developed for residential estates.

Year	Site	Surrounding Land
2020	The site appears similar to the 2010 aerial photograph. There are more trees present in the northern portion of the site.	The surrounding area appears similar to the 2010 aerial photograph.

3.3 Williamtown RAAF Base PFAS Assessments

The Williamtown RAAF Base has been the subject of numerous investigations due to the occurrence of Per and Poly-FluoroAlkyl Substances (PFAS) contamination. The PFAS contamination has been identified across and beyond the RAAF Base boundaries, largely spread via groundwater and surface water.

Information is publicly available from the Australian Government Department of Defence – PFAS Investigation and Management Program, RAAF Base Williamtown website (https://www.defence.gov.au/environment/pfas/williamtown/Default.asp).

The website states: "*In October 2018, Defence completed the detailed environmental investigation into per- and poly-fluoroalkyl substances (PFAS) on, and in the vicinity of, RAAF Base Williamtown. All findings from the investigation are available on the publications page including detailed reports and factsheets.*

Defence is now focusing on management and remediation of PFAS contamination within the Management Area. The outcomes of the investigation have been used to develop a PFAS Management Area Plan (PMAP) that outlines the best management and remediation solutions for the unique circumstances at Williamtown."

Qualtest have carried out a review of the PMAP (ref: RAAF Base Williamtown, PFAS Management Area Plan, 27 May 2019 Revision 1). Information from the PMAP that is relevant to the site, is summarised below.

NSW EPA Management Area

The site is located within the NSW EPA Management Area. The NSW EPA Management Area is split into three zones:

- Primary Management Zone which includes the land immediately to the south of the RAAF Base;
- Secondary Management Zone which includes land immediately to the west and south of the Primary Management Zone, and extending east along Moors Drain; and,
- Broader Management Zone which surrounds the Secondary Management Zone and extends south along the eastern side of Fullerton Cove.

The site is located in the southern tip of the Broader Management Zone.

The institutional controls for the Broader Management Zone are: "*Do not use groundwater, bore water or surface water for drinking or cooking. Avoid swallowing groundwater and surface water when bathing, showering, swimming and paddling (including in creeks and drains). Groundwater and surface water should NOT be used for swimming or paddling pools. Avoid eating home grown food produced in your area – including home-slaughtered meat, eggs, milk, poultry, fruit and vegetables.*"

Plans from the PMAP (2019) showing the management zones are attached in Appendix E.

Human Health Risk Zones

As part of a Human Health Risk Assessment completed by AECOM (2017) on behalf of the department of Defence, four human health risk zones were identified based on human health risk via exposure pathways to PFAS.

The site is not located within either of the four risk zones identified.

Ecological Risk Zones

As part of an Ecological Risk Assessment completed by AECOM (2018), six ecological risk zones were identified based on exposure pathways to PFAS.

The site is not located within either of the six ecological risk zones identified.

Groundwater and Surface Water Monitoring

The PMAP states that groundwater, surface water and sediment sampling on and off Base will occur every 6 months. The most recent report publicly available is the AECOM (2019) Interim Monitoring Event Report - June 2019 (AECOM, 2019).

There are no groundwater monitoring bores, or surface water/sediment sampling locations, on or immediately adjacent to the site. There are groundwater monitoring bores and surface water sampling locations to the north of the site, in hydraulically up-gradient locations. It is considered that the data from these hydraulically up-gradient bores are appropriate for assessing the potential for contaminated groundwater and/or surface water to be present on the site.

Plans from the AECOM (2019) report showing the location of the bores and sampling locations are attached in Appendix E.

Summary of Groundwater Results for Bores Closest to the Site

Bore ID	Approx. Distance & Direction from Site	PFOS (µg/L)	PFOA (µg/L)	PFOS + PFHxS (µg/L)
MW266S	2km north-northeast	<0.05	<0.05	<0.05
MW266D	2km north-northeast	0.06	<0.05	0.11
BWS236	2.9km north-east	0.03	<0.01	0.09
BWS219	2.9km north-east	<0.01	<0.01	<0.01
Criteria				
PFAS NEPM Human Health Drinking Water			0.56	0.07
PFAS NEPM Human Health Recreational Water			10	2

Note: results in bold indicate exceedance of the criteria. PFOS - Perfluorooctane Sulfonate; PFOA - Perfluorooctanoic Acid; PFHxS - Perfluorohexane sulfonate.

Summary of Surface Water Results for Sampling Locations Closest to the Site

Location ID	Approx. Distance & Direction from Site	PFOS (µg/L)	PFOA (µg/L)	PFOS + PFHxS (µg/L)
FC1A	1.3km north	0.16	<0.05	0.24
FC1B	1.3km north	0.19	<0.05	0.62
FCD4	1.3km north	0.26	<0.05	0.82
Criteria				
PFAS NEPM Human Health Drinking Water			0.56	0.07
PFAS NEPM Human Health Recreational Water			10	2

Note: results in bold indicate exceedance of the criteria. PFOS - Perfluorooctane Sulfonate; PFOA - Perfluorooctanoic Acid; PFHxS - Perfluorohexane sulfonate.

Summary of Sediment Results for Sampling Locations Closest to the Site

Location ID	Approx. Distance & Direction from Site	PFOS (mg/kg)	PFOA (mg/kg)	PFOS + PFHxS (mg/kg)
FC1A	1.3km north	0.0039	<0.0002	0.0041
FC1B	1.3km north	0.0024	<0.0002	0.0028
FCD4	1.3km north	0.0012	<0.0002	0.0012

Note: No criteria adopted for sediment, as currently no relevant criteria for sediments available. PFOS - Perfluorooctane Sulfonate; PFOA - Perfluorooctanoic Acid; PFHxS - Perfluorohexane sulfonate.

It is considered that the potential for PFAS contaminated groundwater, surface water and sediment to be present on the site is low, based on the following:

- The site is located in the southern tip of the Broader Management Area, indicating a low risk relative to the PFAS Management Area;
- The site is not within a human health, or ecological, risk zone, which indicates it is in an area where PFAS contamination was not considered to pose a human health or ecological risk;
- The nearest groundwater bores, located 2km or greater north-east of the site, showed concentrations of PFOS and PFOA below the adopted criteria, and a slight exceedance of PFOS + PFHxS above the drinking water criteria. Taking into account that concentrations decrease with distance to the south from the RAAF Base, these slight exceedances are not considered to pose a risk to the site;
- The nearest surface water and sediment sampling locations, located 1.3km north of the site, showed PFOS and PFOA below the adopted criteria, and PFOS + PFHxS above the drinking water criteria. These sample locations appear to be located within Fullerton Cove Ring Drain, adjacent to the Tidal Floodgate which outlets to Fullerton Cove. There are no drains that flow directly from this area south to the site, limiting contamination migration southwards via surface water drains. The site does not contain a permanent water body, although can be subjected to flooding at times. Based on this, it is considered unlikely that PFAS contaminated surface water and sediment would be impacting the site.

PFAS are currently subject to ongoing scientific research to assess the risk to human and ecological receptors. Adopted criteria used in this qualitative assessment could change in the future as could the risk posed by these contaminants.

3.4 NSW EPA Records & Environment Protection Licenses

Contaminated Land Records

A search of the NSW EPA database of notices issued under the Contaminated Land Management Act, 1997 (CLM Act) revealed there were no properties listed as having current and/or former notices within the suburb of Fullerton Cove.

A search of sites that have been notified to NSW EPA as contaminated (as of 11 September 2020) was also carried out. The search did not identify any properties within the suburb of Fullerton Cove.

A copy of the above searches is provided in Appendix F.

Environment Protection Licenses (EPLs)

The Protection of the Environment Operations (POEO) register under Section 308 of the POEO Act 1997, was searched for Environment Protection Licenses (EPLs) and notices for the suburb of Fullerton Cove, NSW. The search revealed the following properties listed as having current and/or former EPLs or notices:

Address	Company Name	Inferred Land Use	Distance and Direction from Site
18-20 Cox's Road, Fullerton Cove	Boral Resources (NSW) Pty Ltd	Sand Quarry	3km north-east
21 Cox's Road, Fullerton Cove	Coastal Sand and Quarry Products Pty Ltd Fullerton Cove Quarry Pty Ltd	Sand Quarry	2.8km north-east
397 Fullerton Cove Road, Fullerton Cove	Dart Energy Hunter Gas Pty Ltd	Underground Gas Extraction	3.2km north-east

Given the distance from the site of the properties with EPLs and/or Notices, it is considered unlikely that contamination from the properties (if any) would impact the site.

A copy of the above searches is provided in Appendix F.

NSW EPA PFAS Investigation Program

Based on a review of the NSW EPA Government PFAS Investigation Program (ref: https://www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program), the site is within the Broader Management Area of the Williamtown RAAF Base. This is discussed in Section 3.3 above.

NSW EPA Former Gasworks Sites

Based on a review of the NSW EPA website (ref: https://www.epa.nsw.gov.au/your-environment/contaminated-land/other-contamination-issues/former-gasworks-sites), no former gasworks have been identified in the Port Stephens Council area.

3.5 Section 10.7 Certificate

A Section 10.7 Certificate for the site was obtained from Port Stephens Council, and is presented in Appendix G. Relevant information is summarised below.

Table 3.3 - Summary of Section 10.7 Certificate

Zoning	*RU2 Rural Landscape*
Critical Habitat	*Port Stephens Local Environmental Plan 2013 does not identify the land as including or comprising critical habitat.*
Heritage	*The land is not identified as containing an item of environmental heritage significance under the provisions in Port Stephens Local Environmental Plan 2013.*
Mine Subsidence	*The land is not within a proclaimed Mine Subsidence District.*
Bushfire	*All of the land is identified as bushfire prone land in Council's records.*
Loose-fill Asbestos Insulation	*The land DOES NOT include any residential dwelling identified on the Loose-Fill Asbestos Insulation Register as containing loose-fill asbestos ceiling insulation. For further information, please contact Department of Fair Trading by telephoning 13 77 88 or go to their website at www.fairtrading.nsw.gov.au.*
Contaminated Land Information	*There are no prescribed matters under section 59(2) of the Contaminated Land Management Act 1997 to be disclosed.* *RAAF Base Williamtown PFAS Management Area* *The land is within the Williamtown RAAF Base Per- and Poly-Fluoroalkyl Substances (PFAS) Management Area. The Department of Defence is undertaking a long-term environmental investigation and assessment of the Williamtown RAAF Base site and surrounding areas as relates to PFAS contamination.* *The NSW Government recommends that residents living inside the Williamtown RAAF Base PFAS Management Area follow precautionary measures to minimise their exposure to PFAS chemicals originating from the RAAF Base. Details of the current precautionary advice is available from the NSW EPA at www.epa.nsw.gov.au or by phoning 131 555.*
Potential acid sulfate soils	No information was provided in Section 10.7 certificate.

3.6 Site Observations

A Qualtest Environmental Scientist visited the site on 10 November 2020. Selected site photographs are presented in Appendix H. The location of site features is shown on Figures 2 and 3, Appendix A.

The site can be divided into two areas, the northern portion which has been cleared and developed, and the southern, eastern and western portions which are undeveloped bushland. A summary of the site features in each area is outlined below.

Northern Portion

- Single-storey duplex residential buildings are located in the western side of the northern portion (see Photographs 1 and 2). The buildings appeared to be constructed from brick, fibreboard, colorbond steel, and tile roof. The buildings appeared to date from the 1980s, with some more modern appearing alterations.
- An above-ground swimming pool was located to the north-west of the residences. A concrete driveway was located north of the residences. Two concrete water tanks were located to the south of the residences.
- Two sheds are located in the eastern side of the northern portion. The larger shed was constructed of aluminium with a concrete floor (see Photograph 3). The smaller shed was constructed of timber and fibreboard, with a concrete floor and metal roof (see Photograph 4). In addition, a dilapidated demountable home was located between the two sheds (see Photograph 5).
- The smaller shed was observed to contain a lawnmower, fridges, chair, tools and equipment, and small quantities (<20L) of fuels, oils and paints in containers (see Photographs 6 and 7). A concrete water tank was adjacent to the shed.
- The larger shed was observed to contain a car undergoing repairs/restoration, chairs, bbq, cardboard boxes, tools and equipment, and small quantities (<20L) of fuels and oils in containers (see Photographs 8 and 9).
- Waste materials were present around the sheds, and typically comprised metal items and sheets, plastic items, whitegoods (i.e. microwave), timber furniture, plastic tarps, timber pallets, and mattresses and other soft furnishings (see Photographs 10 to 13).
- Between the residence and sheds is a lower-lying area, which was grassed and had some garden plants (see Photograph 14).

Southern, Eastern and Western Portions

- The area was vegetated with trees and shrubs (see Photographs 15 and 16).
- The southern and eastern area generally appeared to be lower lying than the area where the residences were constructed.
- An area had been fenced off in the eastern portion of the site, and was not accessible. Based on anecdotal information this area was being used by Optus to construct a mobile phone tower.

3.7 Anecdotal Information

A phone interview was held with the current site owner, Ms Christine Jordan on 1 October 2020. Information obtained from Ms Jordan is summarised below:

- Ms Jordon purchased the site in 1978 or 1979, with her husband.
- They purchased the site from LJ Hooker. The site was being sold as a search for minerals had been unsuccessful, and the site was not considered valuable from a sand mining perspective.
- They built the original house after purchasing the land. A secondary dwelling, joined to the original house, was constructed in the late 1980s. The secondary dwelling was rented for a while, and now a family live in it.
- The sheds located to the east of the house, were used for storage such as lawn mowers, tractor etc. Her husbands and sons did not carry out vehicle repairs or servicing on site.

- One shed was constructed of aluminium, which has rusted. The other shed was constructed of fibro, not asbestos. Qualtest note that testing of the material would be required to confirm if asbestos is present or not.
- Optus are building a mobile phone tower past the sheds (north-eastern portion of site).
- The site was not originally included in the PFAS management area, and then they extended it to include the site. She was told that the site was not contaminated.

3.8 Summary of Site History

The assessed uses of the site, based on the site history review, have been summarised below in approximate chronological order:

- The site was subjected to mineral exploration prior to 1979, but sand mining was not carried out on the site due to a lack of commercial grade ore;
- The site has been used for residential purposes since 1979, with sheds also used for storing equipment such as lawn mowers and tractor, tools, and materials and currently used for repair/restoration of a vehicle;
- Stockpiles of materials and wastes are present around the sheds, and based on aerial photographs materials have been stored around the sheds since at least the early 1990s.
- The area to the east and south of the residential area consists of bushland and has been largely left untouched since the 1950s.

3.9 Potential Offsite Sources of Contamination

The Williamtown RAAF Base was identified a potential offsite source of contamination, and is discussed in Section 3.3 above. No other offsite sources of contamination have been identified adjacent to and/or upgradient of the site.

3.10 Gaps in the Site History

Whilst the site history is reasonably comprehensive there are some gaps identified in the review as follows:

- Activities carried out on the site prior to 1979 are not well known.
- The contents of materials and wastes stored around the sheds in the past is not known, but likely to be similar to the current materials and wastes.
- It is not known if hazardous building materials (i.e. asbestos) was used to construct the buildings on site. Potential asbestos containing materials were observed (i.e. the smaller shed), but the site observations did not comprise a hazardous materials survey.

4.0 Preliminary Conceptual Site Model

Based on the results of the preliminary contamination assessment carried out on the site, a preliminary Conceptual Site Model (CSM) has been developed.

Table 4.1 – Preliminary Conceptual Site Model

AEC	COPC	Mechanism of Contamination	Potentially Affected Media	Human & Ecological Receptors	Potential mechanisms of exposure	Potential & Complete Exposure Pathways	Comments
1. Stored Equipment, Materials and Waste: • Construction materials/waste - concrete, steel/metals, timber; • Household waste and general waste - cardboard, whitegoods, furniture, mattresses and soft furnishings, plastic.	TRH, BTEX, PAH, Metals, Asbestos (CoPCs dependent on material/waste type)	• Top-down leaks/spills, flakes/fibres onto soil. • Leaching of soil contaminants to surface water and groundwater.	• Aesthetics • Underlying soils • Surface water • Groundwater	• Current site visitors. • Future construction workers & site users. • Offsite surface water – Fullerton Cove located approximately 500m west of the site.	• Direct dermal contact with contaminated soil and/or surface water. • Ingestion of contaminated soil and/or surface water. • Inhalation of asbestos fibres, or contaminated soil (as dust). • Inhalation of petroleum hydrocarbon vapours. • Leaching of soil contaminants to surface water and/or groundwater. • Surface water and groundwater discharge to Fullerton Cove located approximately 500m west of the site.	• Complete exposure pathway for current site visitors, future construction workers and site users (if contaminated and not remediated/ managed). • Incomplete exposure pathway for offsite surface water, due to surface water discharging greater than 500m from the site, and the localised nature of contamination (if any). • Incomplete exposure pathway for groundwater, due to 'top-down' localised nature of contamination (if any), and groundwater expected to be ~5m bgs.	Exposure pathway (excluding aesthetics) would be incomplete if waste & underlying soils are found to not be contaminated via sampling & analysis. Waste needs to be removed for aesthetics.

AEC	COPC	Mechanism of Contamination	Potentially Affected Media	Human & Ecological Receptors	Potential mechanisms of exposure	Potential & Complete Exposure Pathways	Comments
2. Sheds in northern portion of site: • Use of sheds for car repairs; • Storage of fuels, oils, paints.	TRH, BTEX, PAH, Metals	• Top-down leaks/spills, flakes/fibres onto soil. • Leaching of soil contaminants to surface water and groundwater.	• Aesthetics • Surface soils • Surface water • Groundwater	• Current site visitors. • Future construction workers & site users. • Offsite surface water – Fullerton Cove located approximately 500m west of the site.	• Direct dermal contact with contaminated soil and/or surface water. • Ingestion of contaminated soil and/or surface water. • Inhalation of contaminated soil (as dust). • Inhalation of petroleum hydrocarbon vapours. • Leaching of soil contaminants to surface water and/or groundwater. • Surface water and groundwater discharge to Fullerton Cove located approximately 500m west of the site.	• Complete exposure pathway for current site visitors, future construction workers and site users (if contaminated and not remediated/ managed). • Incomplete exposure pathway for offsite surface water, due to surface water discharging greater than 500m from the site, and the localised nature of contamination (if any). • Incomplete exposure pathway for groundwater, due to 'top-down' localised nature of contamination (if any), and groundwater expected to be ~5m bgs.	Exposure pathway (excluding aesthetics) would be incomplete if waste & underlying soils are found to not be contaminated via sampling & analysis. Waste needs to be removed for aesthetics.
3. Potential use of hazardous building materials: • Potential use of asbestos containing materials (ACM) in buildings; • No evidence of painted external (i.e. lead paints) surfaces was observed.	Asbestos	• Top-down.	• Surface soils	• Current site visitors. • Future construction workers & site users.	• Inhalation of asbestos fibres.	• Complete exposure pathway for current site visitors, future construction workers and site users (if asbestos present, and not remediated/ managed).	Exposure pathway would be incomplete if sampling & analysis does not identify asbestos, or asbestos containing materials are removed.
4. PFAS contaminated groundwater or surface water migrating from Williamtown RAAF Base.	PFAS	• Sub-surface groundwater migration; • Surface water migration via drains.	• Groundwater. • Surface water.	• Current site visitors. • Future construction workers & site users.	• Direct dermal contact with contaminated groundwater and/or surface water. • Ingestion of contaminated groundwater and/or surface water.	• Incomplete exposure pathway, available information indicates groundwater and surface water on site are unlikely to be contaminated with PFAS from the Williamtown RAAF Base.	PFAS are currently subject to ongoing scientific research to assess the risk to human and ecological receptors. Adopted criteria used in AECOM assessments could change in the future, as could the risk posed by these contaminants

5.0 Conclusions and Recommendations

The site history review showed the site was subjected to sand mining exploration prior to 1979, but was not sand mined due to a lack of commercial grade ore. Since 1979, the northern portion of the site had been used for residential purposes, with two sheds for storing equipment and tools. Materials and waste were observed surrounding the sheds. The southern, western and eastern portions of the site have remained as bushland since at least 1979.

Four Areas of Environmental Concern (AECs) were identified based on the site history and site observations, and surrounding land uses. The AECs related to: stored equipment, materials and waste; use of sheds for vehicle repairs and storage of oils/fuels/paints; potential use of hazardous building materials; and PFAS contaminated groundwater and surface water migrating from Williamtown RAAF Base.

The site is located in the southern tip of the Broader Management Area of the NSW EPA PFAS Management Area for the Williamtown RAAF Base. Based on a review of publicly available information, it is considered that the potential for PFAS contaminated groundwater, surface water and sediment to be present on the site is low.

The Conceptual Site Model (CSM) indicated that should soil contamination exist on the site, then a potential exposure pathway could exist to current and future site users.

Based on the site history and observations made during the site walkover, it is recommended that additional assessment, comprising soil sampling in the AECs identified, is carried out after removal of buildings and stored equipment and materials. It is recommended that a Hazardous Materials Survey is carried out for the buildings and structures on site, prior to demolition.

The investigation should include surface soil sampling under/adjacent to the residences, sheds, and observed equipment and waste. These assessments could be completed as part of site clean-up activities (i.e. during demolition of buildings and removal of waste) under a Contaminated Land Management Plan.

This report was prepared in general accordance with the relevant sections of the NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Land and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra (referred to as ASC NEPM 2013).

6.0 Limitations

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted practices and standards. To our knowledge, they represent a reasonable interpretation of the general site history of the site relevant to potential contamination.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

7.0 References

NSW Department of Primary Industries (Office of Water) Registered Groundwater Bore Map, accessed from http://allwaterdata.water.nsw.gov.au/water.stm, accessed on 9 November 2020.

NSW Land and Property Information, Spatial Information eXchange (SIX) Maps - Topographic Map, accessed from https://maps.six.nsw.gov.au/, accessed on 9 November 2020.

Department of Environment and Climate Change (2008) Acid Sulfate Soil Risk Mapping (Edition 3, 2008) for Part of the Lower Hunter River Catchment

NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Land.

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra (ASC NEPM 2013).

Troedson A.L & Hashimoto T.R. (2007) Nelson Bay 1:100,000 and 1:25,000 Coastal Quaternary Geology Map Series, Geological Survey of NSW

NSW ePlanning Spatial Viewer Portal (https://www.planningportal.nsw.gov.au/spatialviewer/), accessed on 6 November 2020

NSW Spatial Portal -Historical Imagery (https://portal.spatial.nsw.gov.au/portal/apps/, accessed on 6 November 2020

PFAS Management Area Plan (2019), ref: RAAF Base Williamtown, PFAS Management Area Plan, 27 May 2019 Revision 1

AECOM (2017) Off-Site Human Health Risk Assessment – December 2017, reference 60527153,1 December 2017

AECOM (2018) Ecological Risk Assessment – September 2018, reference 60527153, 7 September 2018

AECOM (2019) Interim Monitoring Event Report - June 2019, reference 60527153, dated 27 September 2019 (AECOM, 2019)

APPENDIX A:

Figures

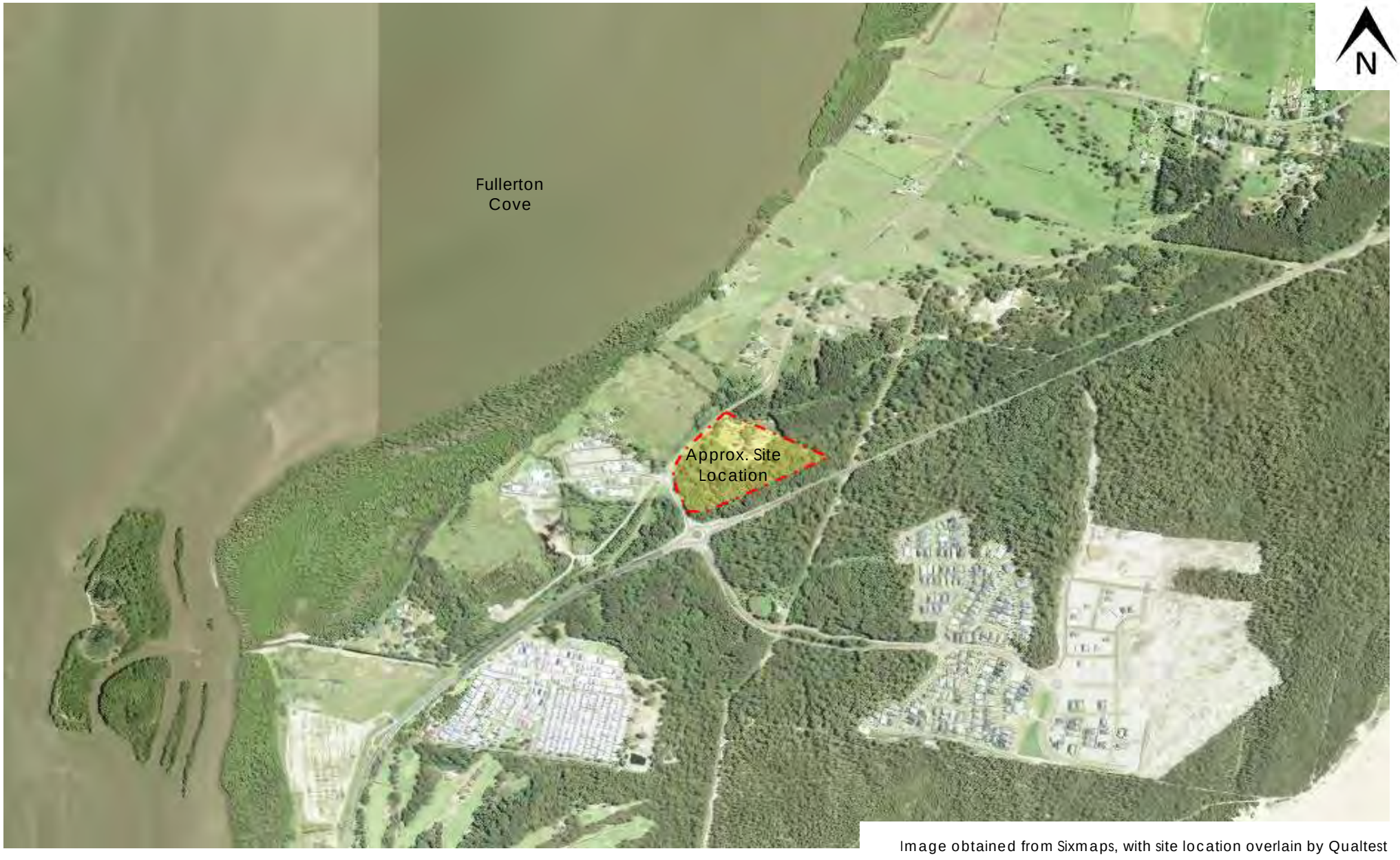


Image obtained from Sixmaps, with site location overlain by Qualtest

Qualtest
LABORATORY (NSW) PTY LTD

Client:	Ms Christine Jordon	Drawing No:	FIGURE 1
Project:	Preliminary Contamination Assessment	Project No:	NEW20P-0178-AA
Location:	42 Fullerton Cove Road, Fullerton Cove NSW	Scale:	N.T.S.
Title:	Site Location Plan	Date:	10/11/2020



Image obtained from Nearmaps, with features overlain by Qualtest

Qualtest LABORATORY (NSW) PTY LTD

Client:	Ms Christine Jordon	Drawing No:	FIGURE 2
Project:	Preliminary Contamination Assessment	Project No:	NEW20P-0178-AA
Location:	42 Fullerton Cove Road, Fullerton Cove NSW	Scale:	N.T.S.
Title:	Site Layout Plan	Date:	10/11/2020



Approx. Scale Bar

0m 10m 20m 30m 40m

Image obtained from Nearmaps, with features overlain by Qualtest

Qualtest LABORATORY (NSW) PTY LTD

Client:	Ms Christine Jordon	Drawing No:	FIGURE 3
Project:	Preliminary Contamination Assessment	Project No:	NEW20P-0178-AA
Location:	42 Fullerton Cove Road, Fullerton Cove NSW	Scale:	N.T.S.
Title:	Site Features Plan	Date:	10/11/2020

APPENDIX B:

Groundwater Bore Search

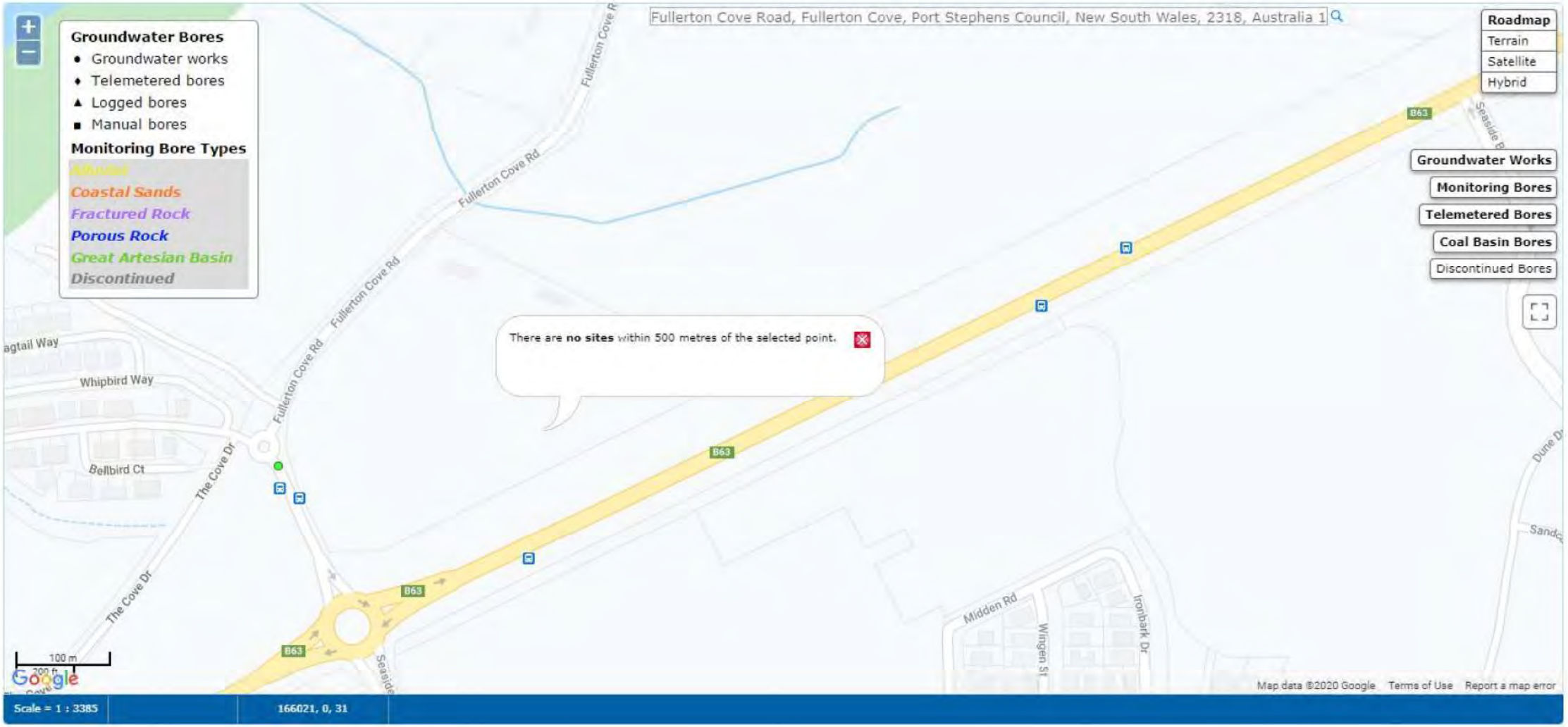
All Groundwater Site Details

ALL GROUNDWATER MAP

bookmark this page

All data times are Eastern Standard Time

Map | Info



Scale = 1 : 3385 | 166021, 0, 31

APPENDIX C:

Historical Titles

ADVANCE LEGAL SEARCHERS PTY LTD

(ACN 147 943 842)
ABN 82 147 943 842

18/36 Osborne Road,
Manly NSW 2095

Telephone: +612 9977 6713
Mobile: 0412 169 809
Email: search@alsearchers.com.au

09th November 2020

QUALTEST LABORATORY (NSW) PTY LTD
8 [redacted]

Attention: [redacted]

RE: **42 Fullerton Cove Road,**
Fullerton Cove
PO NEW20P-0178

Current Search

Folio Identifier 14/258848 (title attached)
DP 258848 (plan attached)
Dated 07th November 2020
Registered Proprietor:
[redacted]

Title Tree
Lot 14 DP 258848

Folio Identifier 14/258848

Certificate of Title Volume 13840 Folio 38

Certificate of Title Volume 13535 Folio 47

Certificate of Title Volume 11063 Folio 80

PA 46344

Conveyance Book 2873 No 922

New Trustee Book 2736 No 328

New Trustee Book 2575 No 294

Conveyance Book 555 No 295

****

Summary of Proprietor(s)
Lot 14 DP 258848

Year	Proprietor(s)
	(Lot 14 DP 258848)
2005 – todate	Christina Maria Jordan
(2020 – todate)	*(various current leases shown on Folio Identifier 14/258848)*
1995 – 2005	Paul Jordon Christina Maria Jordan
1993 – 1995	Ella Christine Hatch Paul Jordan, deputy superintendant Christina Maria Jordan, his wife
1987 – 1993	Paul Jordan, deputy superintendant Christina Maria Jordan, his wife Christopher Henry Miklea, fitter & turner
(1987 – todate)	*(various leases shown on Historical Folio 14/258848)*
	(Lot 14 DP 258848 – CTVol 13840 Fol 38)
1979 – 1987	Paul Jordan, deputy superintendant Christina Maria Jordan, his wife Christopher Henry Miklea, fitter & turner
1979 – 1979	Hooker Town Developments Pty Limited
	(Lot 2 DP 530095 – CTVol 11063 Fol 80)
1973 – 1979	Hooker Town Developments Pty Limited
1969 – 1973	June James, wife of Alan Bonython James, engineer welder Florence Caroline Jeffery, wife of Eugene Henry Jeffery, police sergeant Nancy Jean Smith, widow Ian Campbell Smith, farmer
	(Part Portion 19 Parish Stockton – Area 836 Acres 1 Rood 28 ¼ Perches – Conv Bk 2873 No 922)
1967 – 1969	June James, wife of Alan Bonython James, welder Florence Caroline Jeffery, wife of Eugene Henry Jeffery, police sergeant Nancy Jean Smith, widow Ian Campbell Smith, farmer

Cont.

Cont.

	(Part Portion 19 Parish Stockton – Area 836 Acres 1 Rood 28 ¼ Perches – New Trustee Bk 2736 No 328)
1965 – 1967	Douglas Stanley Smith, farmer / trustee Andrew William Swan, business manager / trustee Ian Campbell Smith, farmer / trustee Stanley William Smith, estate
1964 – 1965	Douglas Stanley Smith, farmer / trustee Andrew William Swan, business manager / trustee Stanley William Smith, estate
	(Part Portion 19 Parish Stockton – Area 836 Acres 1 Rood 28 ¼ Perches – New Trustee Bk 2575 No 294)
1961 – 1964	Eliza Linda Smith, single woman / executrix Douglas Stanley Smith, farmer / trustee Andrew William Swan, business manager / trustee Stanley William Smith, estate
1947 – 1961	Eliza Linda Smith, single woman / executrix Stanley William Smith, estate
1932 – 1947	Stanley William Smith, executor Eliza Linda Smith, single woman / executrix Stanley William Smith, estate
	(Part Portion 19 Parish Stockton – Conv Bk 555 No 295)
1873 – 1932	Stanley William Smith, grazier

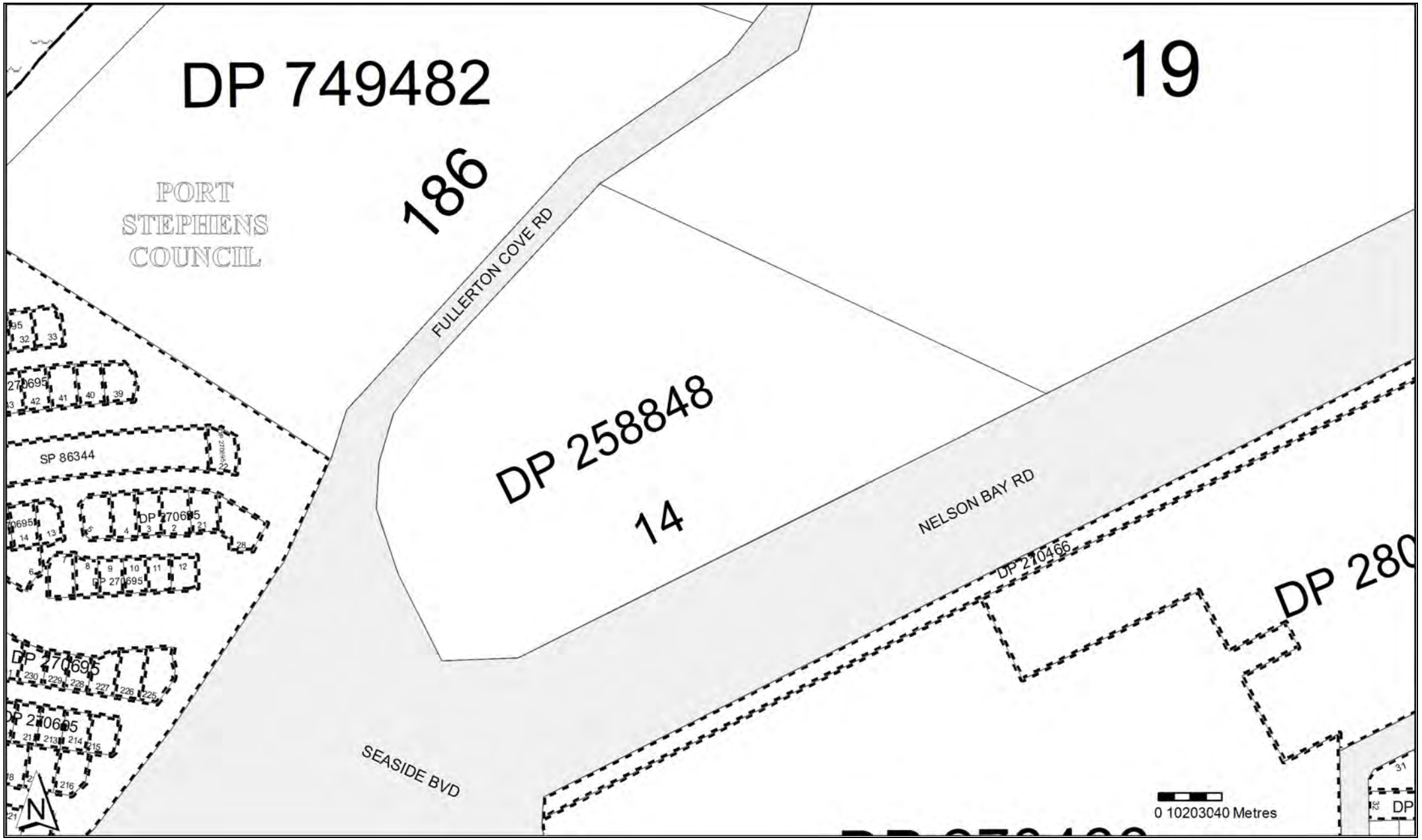
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LAND REGISTRY SERVICES

Cadastral Records Enquiry Report : Lot 14 DP 258848

Ref : NOUSER

Locality : FULLERTON COVE
Parish : STOCKTON
LGA : PORT STEPHENS
County : GLOUCESTER



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This information is provided as a searching aid only.Whilst every endeavour is made to ensure that current map, plan and titling information is accurately reflected, the Registrar General cannot guarantee the information provided. For ALL ACTIVITY PRIOR TO SEPTEMBER 2002 you must refer to the RGs Charting and Reference Maps

	Status	Surv/Comp	Purpose
DP270466			
Lot(s): 1			
DP258848	HISTORICAL	SURVEY	SUBDIVISION
DP270466	REGISTERED	SURVEY	COMMUNITY SUBDIVISION PLAN
DP270466	REGISTERED	SURVEY	COMMUNITY REPLACEMENT SHEET
DP280005	REGISTERED	SURVEY	PRECINCT PLAN
DP280008	REGISTERED	SURVEY	PRECINCT PLAN
DP280021	REGISTERED	SURVEY	PRECINCT PLAN
DP280033	REGISTERED	SURVEY	PRECINCT PLAN
DP280037	REGISTERED	SURVEY	PRECINCT PLAN
DP280050	REGISTERED	SURVEY	PRECINCT PLAN
DP280053	REGISTERED	SURVEY	PRECINCT PLAN
DP280054	REGISTERED	SURVEY	PRECINCT PLAN
DP280057	REGISTERED	SURVEY	PRECINCT PLAN
DP280058	REGISTERED	SURVEY	PRECINCT PLAN
DP280061	REGISTERED	SURVEY	PRECINCT PLAN
DP280063	REGISTERED	SURVEY	PRECINCT PLAN
DP280067	REGISTERED	SURVEY	PRECINCT PLAN
DP280072	REGISTERED	SURVEY	PRECINCT PLAN
DP280073	REGISTERED	SURVEY	PRECINCT PLAN
DP270695			
Lot(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 21, 22, 28, 31, 32, 33, 39, 40, 41, 42, 43, 211, 212, 213, 214, 215, 216, 217, 218, 221, 222, 225, 226, 227, 228, 229, 230, 231			
DP749482	HISTORICAL	SURVEY	SUBDIVISION
DP1091146	HISTORICAL	SURVEY	SUBDIVISION
DP1108060	HISTORICAL	SURVEY	SUBDIVISION
Lot(s): 31, 32, 33, 39, 40, 41, 42, 43, 211, 212, 213, 214, 215, 216, 217, 218, 221, 222, 225, 226, 227, 228, 229, 230, 231			
DP270695	HISTORICAL	SURVEY	COMMUNITY PLAN
Lot(s): 1, 225, 226, 227, 228, 229, 230, 231			
DP270695	HISTORICAL	SURVEY	COMMUNITY SUBDIVISION PLAN
Lot(s): 1			
DP270695	REGISTERED	SURVEY	COMMUNITY REPLACEMENT SHEET
DP1194569	REGISTERED	SURVEY	EASEMENT
DP280008			
Lot(s): 31, 32, 46			
DP258848	HISTORICAL	SURVEY	SUBDIVISION
DP270466	HISTORICAL	SURVEY	COMMUNITY PLAN
DP280072			
Lot(s): 27			
DP258848	HISTORICAL	SURVEY	SUBDIVISION
DP270466	HISTORICAL	SURVEY	COMMUNITY SUBDIVISION PLAN
DP270466	HISTORICAL	SURVEY	COMMUNITY PLAN
SP86344			
DP270695	HISTORICAL	SURVEY	COMMUNITY PLAN
DP749482	HISTORICAL	SURVEY	SUBDIVISION
DP1091146	HISTORICAL	SURVEY	SUBDIVISION
DP1108060	HISTORICAL	SURVEY	SUBDIVISION
SP88871	REGISTERED	COMPILATION	STRATA SUBDIVISION PLAN

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LAND REGISTRY SERVICES

Cadastral Records Enquiry Report : Lot 14 DP 258848

Ref : NOUSER

Locality : FULLERTON COVE **Parish :** STOCKTON

LGA : PORT STEPHENS **County :** GLOUCESTER

Plan	Surv/Comp	Purpose
DP258848	SURVEY	SUBDIVISION
DP270466	SURVEY	COMMUNITY PLAN
DP270466	SURVEY	COMMUNITY REPLACEMENT SHEET
DP270466	SURVEY	COMMUNITY SUBDIVISION PLAN
DP270695	SURVEY	COMMUNITY PLAN
DP270695	SURVEY	COMMUNITY REPLACEMENT SHEET
DP270695	SURVEY	COMMUNITY SUBDIVISION PLAN
DP280008	SURVEY	PRECINCT PLAN
DP280008	SURVEY	PRECINCT SUBDIVISION PLAN
DP606361	SURVEY	SUBDIVISION
DP749482	SURVEY	SUBDIVISION
SP86344	COMPILATION	STRATA PLAN

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Req:R928056 /Doc:CT 11063-080 CT /Rev:10-Jan-2011 /NSW LRS /Pgs:ALL /Prt:09-Nov-2020 12:17 /Seq:1 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

NEW SOUTH WALES

[redacted]ICATE OF TITLE

[redacted]OPERTY ACT, 1900, as amended.

Application No.46344

Vol. 11063 Fol. 80

ID Edition issued 3-6-1969

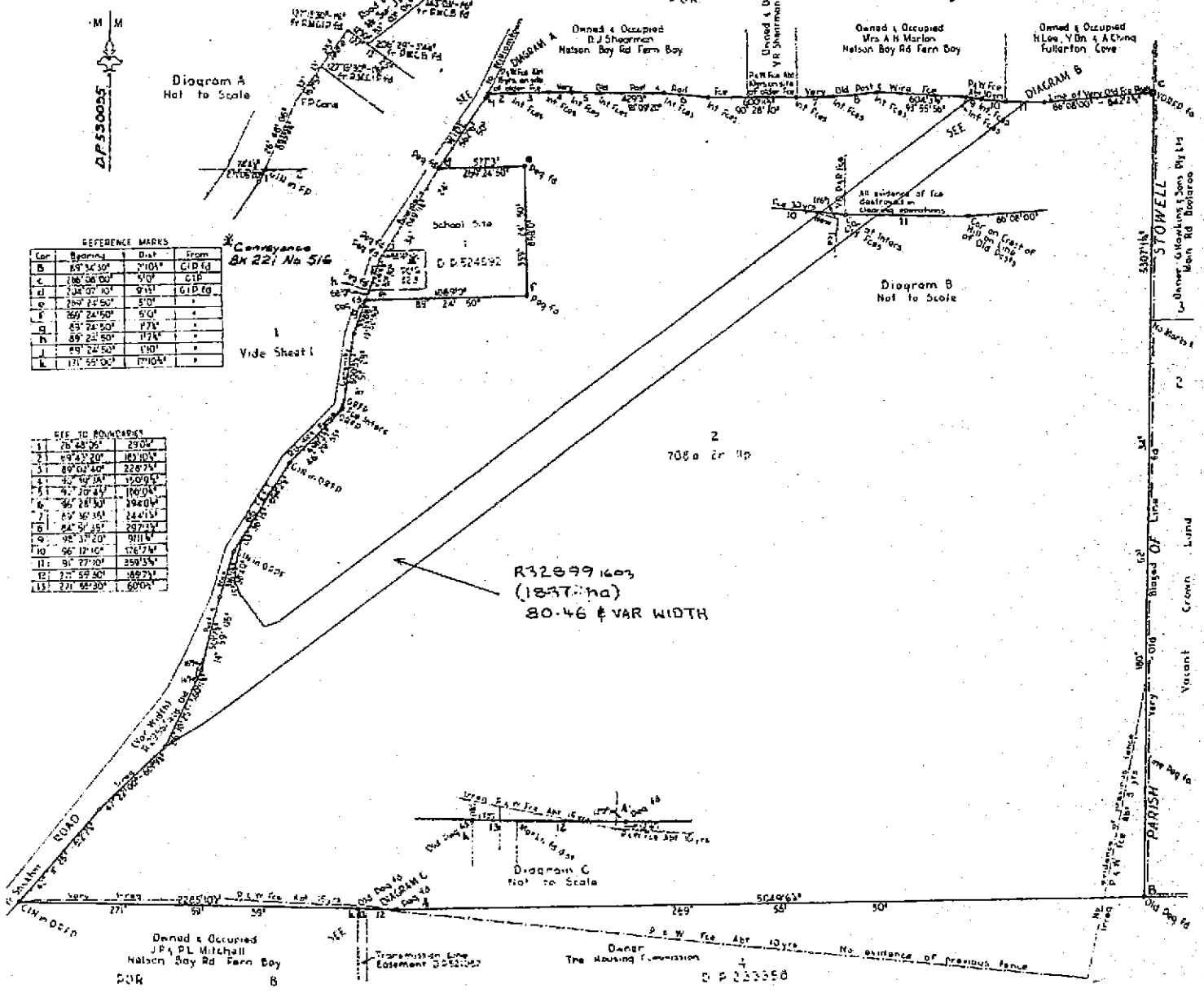
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness L. Bollinger

Registrar General.

CANCELLED

PLAN SHOWING LOCATION OF LAND



REFERENCE MARKS

Cor	Bearing	Dist	From
B	89° 36' 30"	2°10·0"	G I P fd
c	180° 36' 00"	5'0"	G I P
d	234° 07' 10"	9'11"	G I P fd
e	269° 23' 50"	5'0"	"
f	269° 24' 50"	5'0"	"
g	89° 24' 50"	5'7½"	"
h	89° 24' 50"	11'7½"	"
j	89° 24' 50"	5'10"	"
k	171° 55' 00"	17'10½"	"

BEE TO BOUNDARIES

1	76° 44' 05"	23'00"
2	89° 43' 20"	180'10½"
3	89° 00' 40"	228'3½"
4	32° 16' 15"	150'09½"
5	97° 20' 45"	199'04"
6	96° 28' 50"	394'08"
7	89° 36' 05"	244'11½"
8	84° 56' 45"	287'3½"
9	98° 31' 20"	91'11"
10	96° 12' 10"	176'7½"
11	91° 27' 10"	359'3½"
12	271° 59' 30"	489'2½"
13	271° 55' 30"	60'0½"

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 2 in Deposited Plan 530095 at Fullerton Cove in the Shire of Port Stephens Parish of Stockton and County of Gloucester being part of Portion 9 granted to John Ibbetson Hollingworth on 26-3-1840 and part of Portion 19 granted to James Smith on 29-4-1837.

FIRST SCHEDULE

~~IAN CAMPBELL SMITH, of Wallsend, Farmer, JUNE JAMES, wife of [illegible] Baython James, of Merewether, Engineer Welder, FLORENCE CAROLINE JEFFERY, wife of Eugene Henry Jeffery, of Waratah, Police Sergeant, and NANCY JEAN SMITH, of Eastwood, Widow, as Tenants in Common in equal shares.~~

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grants above referred to.

Registrar General

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

(Page 1) Vol. 11063 Fol. 80

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

Vol. 11063 Fol 80

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General
Hooker Town Developments Pty. Limited.	Transfer	N282843	29.1.1973.	13.6.1973.	

This deed is cancelled as to the whole ex road
New Certificates of Title have issued on 26-1-1978
for lots in Deposited Plan No. 593626 as follows:-
Lots 21-22 Vol. 13535 Fol. 46+47 respectively.

REGISTRAR GENERAL

NEW CERTIFICATE(S) OF TITLE ISSUING ON DP 593626
NO DEALING TO BE REGISTERED WITHOUT REFERENCE TO SURVEY DRAFTING BRANCH

Affected by R328 wide Gaz 1-2-1974 fol 338 S.P.B.
Refer N739421 (pt per DP 593626 ✱3/11/78.

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
~~Caveat~~	~~L 6[illegible]~~	~~[illegible]~~	~~CAVEAT~~	~~[illegible]~~		Withdrawn	N282842	
Resumption	N739421	26-2-1974	The land shown by Firm lines (18.37 ha) 80.46 & Var Width on Plan hereon is Public Road.	26-4-1974				

The residue of land in this folio comprises road in N/R N739421

REGISTRAR GENERAL

NOP

(Page 2 of 2 pages)

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Req:R928056 /Doc:CT 11063-080 CT /Rev:10-Jan-2011 /NSW LRS /Pgs:ALL /Prt:09-Nov-2020 12:17 /Seq:2 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

Req:R924220 /Doc:CT 13535-047 CT /Rev:12-Jan-2011 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:30 /Seq:1 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

CERTIFICATE OF TITLE

NEW SOUTH WALES

PROPERTY ACT, 1900

13535047

Appln. No.46344

Prior Title Vol.11063 Fol.80

Vol. 13535 Fol. 47

EDITION ISSUED

27 1 1978

(Page 1) Vol. 13535 Fol. 47

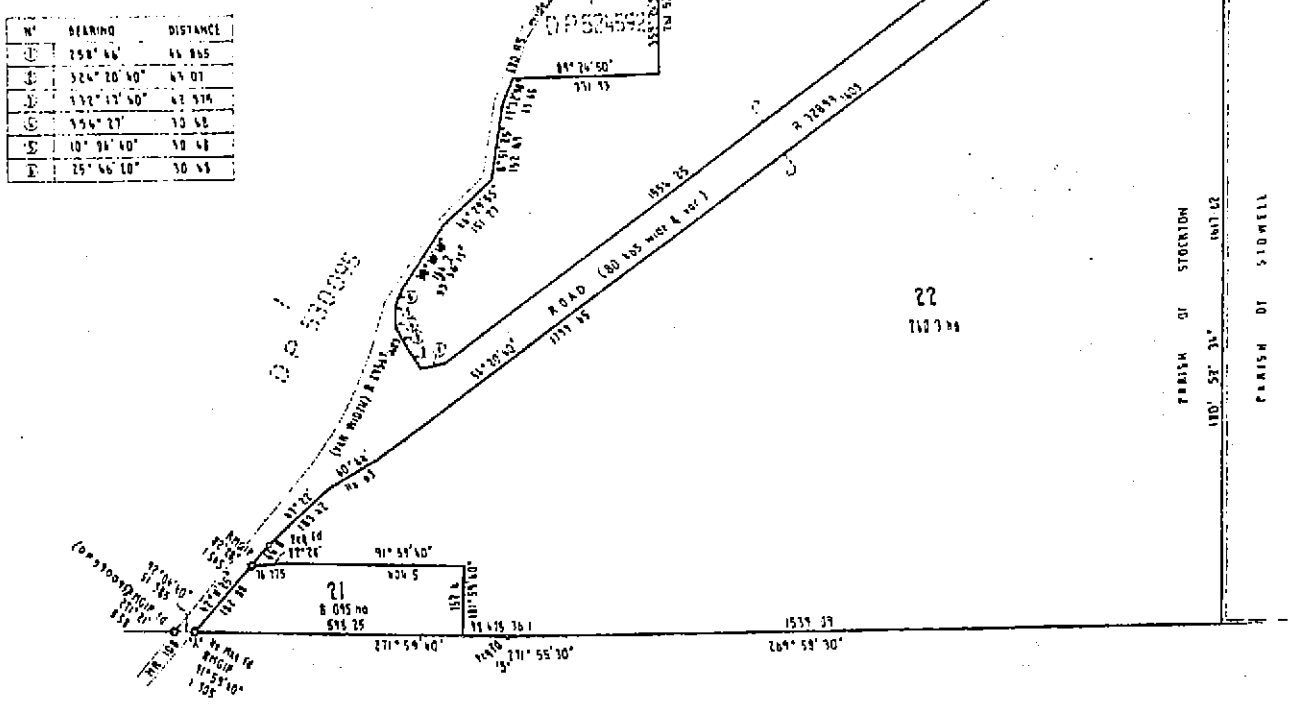
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Registrar General.

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES

CANCELLED



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 22 in Deposited Plan 593626 at Fullerton Cove in the Shire of Port Stephens Parish of Stockton and County of Gloucester being part of Portion 9 granted to John Ibbetson Hollingworth on 26-3-1840and part of Portion 19 granted to James Smith on 29-4-1837.

FIRST SCHEDULE

HOOKER TOWN DEVELOPMENTS PTY. LIMITED.

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grants above referred to.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

Vol. 13535 Fol. 47

Q754627 8.
CT 8-27
D1-258848
gj 14/3/79

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General

This deed is cancelled as to whole
New certificates of Title have issued on 18-4-1979
for lots in Deposited Plan No 258848 as follows:
Lots 10 to 16 Vol 13840 Fol 34 to 40 respectively.

REGISTRAR GENERAL

NEW CERTIFICATE(S) OF TITLE ISSUING ON D 258848
NO DEALING TO BE REGISTERED WITHOUT REFERENCE TO SURVEY DRAFTING BRANCH

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
Mortgage	Q754627	-----	to Interim Mortgage Finance Limited	5-7-1978				
Mortgage	Q754628	-----	to Angel Place Finance Limited	5-7-1978				

(Page 2 of 2 pages)

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Req:R924220 /Doc:CT 13535-047 CT /Rev:12-Jan-2011 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:30 /Seq:2 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

Req:R924210 /Doc:CT 13840-038 CT /Rev:01-Mar-2011 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:25 /Seq:1 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

WARNING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE REGISTRAR GENERAL'S OFFICE.

(Page 1) Vol. 13840 Fol. 38

[redacted]FICATE OF TITLE

NEW SOUTH WALES

[redacted]EAL PROPERTY ACT, 1900

13840038

Appln. No.46344

Prior Title Vol.13535 Fol. 47

Vol. 13840 Fol. 38

EDITION ISSUED

19 4 1979

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

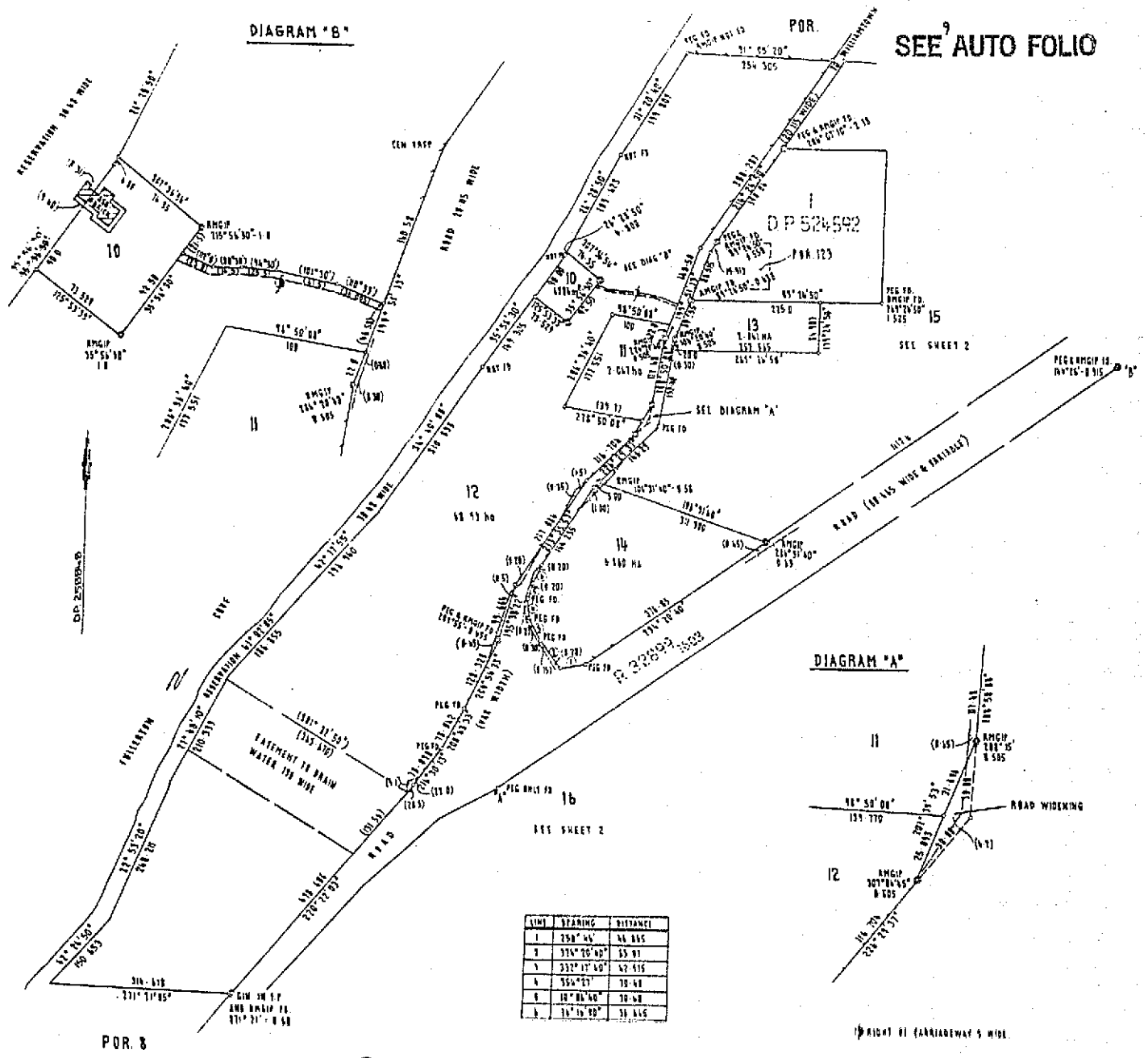
Registrar General.

REGISTRAR GENERAL NEW SOUTH WALES

CANCELLED

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES



LINE	BEARING	DISTANCE
1	258° 44'	44.845
2	324° 26' 40"	55.91
3	332° 17' 40"	42.435
4	354° 27'	30.48
5	18° 26' 40"	30.48
6	36° 16' 20"	38.845

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 14 in Deposited Plan 258848 at Fullerton Cove in the Shire of Port Stephens Parish of Stockton and County of Gloucester being part of Portion 19 granted to James Smith on 29-4-1837.

FIRST SCHEDULE

~~HOOKER TOWN DEVELOPMENTS PTY. LIMITED~~.

SECOND SCHEDULE

GRY 1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
~~2. Q754627 Mortgage to Interim Mortgage Finance Limited.~~ Discharged R340845
~~3. Q754628 Mortgage to Angel Place Finance Limited.~~ Discharged R340844
RY 4. DP258848 Restriction as to user.

RG 2/62 NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Vol. 13840 Fol. 38

R340846

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	Signature of Registrar General
Paul Jordan of Stockton, Deputy Superintendant and Christina Maria Jordan his wife and Christopher Henry Mikka of Swansea, Fitter and Turner as tenants in common.	Transfer	R340846	26-7-1979	

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	PARTICULARS	REGISTERED	Signature of Registrar General	CANCELLATION	
Covenant	R340846	created by Transfer R340846	26-7-1979			

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Req:R924210 /Doc:CT 13840-038 CT /Rev:01-Mar-2011 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:25 /Seq:2 of 2
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

Req:R924219 /Doc:DL AB880765 /Rev:04-Nov-2005 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:30 /Seq:1 of 1
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

Form: 03TA
Licence: 01-08-076
Licensee: Midware Systems
Bilbie Dan

TRANSMISSION APPLICATION

New South Wales
Section 93 Real Property Act 1900

AB880765A

PRIVACY NOTE: this information is legally required and will become part of the public record

STAMP DUTY — Office of State Revenue use only

(A) **LAND** — Torrens Title: FOLI IDENTIFIER 14/258848

(B) **REGISTERED DEALING** — Number: | Torrens Title:

(C) **LODGED BY** — Delivery Box: 30P | Name, Address or DX and Telephone: LJKANE & Co LLPN 123818G Reference (optional): BD : JORDAN | CODE: TA

(D) **DECEASED REGISTERED PROPRIETOR** — PAUL JORDAN

(E) **APPLICANT** — CHRISTINA MARIA JORDAN

(F) The applicant, being entitled as executor of the will of the deceased registered proprietor (who died on 15 July 2005) pursuant to Probate No. 116936/05 granted on 25/10/2005 to Christina Maria Jordan (a certified copy of which is lodged herewith) applies to be registered as proprietor of the estate or interest of the deceased registered proprietor in the abovementioned land.

DATE 25 / 10 / 2005

(G) I certify that the person(s) signing opposite, with whom I am personally acquainted or as to whose identity I am otherwise satisfied, signed this instrument in my presence.

Signature of witness:

Name of witness: Nicholas DAN

Address of witness: 11 Market St Newcastle

Certified correct for the purposes of the Real Property Act 1900 by the applicant.

Signature of applicant: C. Jordan

(H) **CONSENT OF EXECUTOR, ADMINISTRATOR OR TRUSTEE**

I,

of the deceased registered proprietor, consent to this application.

Signature of witness:

Name of witness:

Address of witness:

Signature of

Office use only c/a
Evidence sighted/sighted and returned:
All handwriting must be in block capitals.

Number additional pages sequentially

of CHRISTINE in legal discharge

Req:R924218 /Doc:DL 0609589 /Rev:26-Feb-2010 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:30 /Seq:1 of 1
© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs

97-01T

TRANSFER

Real Property Act, 1900

0
609589 M

(1)

Office o.

OFFICE OF STATE REVENUE
1994/95 STAMP DUTY (N.S.W. TREASURY) N8
DUTY $ 2-00 1ST REC № 8005000949

(A) LAND TRANSFERRED

Show no more than 20 References to Title.
If appropriate, specify the share transferred.

Folio Identifier 14/258848

(B) LODGED BY

L.T.O. Box	Name, Address or DX and Telephone
33H	THOMAS KENYON & SON DX 435 SYDNEY PHONE: (02) 283 1766 REFERENCE (max. 15 characters): 11 - Jordan

(C) TRANSFEROR ELLA CHRISTINE HATCH

(D) acknowledges receipt of the consideration of $50,000.00

and as regards the land specified above transfers to the Transferee an estate in fee simple

(E) subject to the following **ENCUMBRANCES** 1. ..... 2. ..... 3. .....

(F) TRANSFEREE

T TS (s713 LGA) TW (Sheriff)	PAUL JORDON of RMB 2132 Lot 14 Fullerton Road, Fullerton Cove in the State of New South Wales

(G) TENANCY:

(H) We certify this dealing correct for the purposes of the Real Property Act, 1900. **DATED** 31 August 1995

Signed in my presence by the Transferor who is personally known to me.

.....
Signature of Witness

C.R. McDONALD
Name of Witness (BLOCK LETTERS)

57 HUNTER ST NEWCASTLE
Address of Witness

E Hatch
Signature of Transferor

Signed in my presence by the Transferee who is personally known to me.

.....
Signature of Witness

C.R. McDONALD
Name of Witness (BLOCK LETTERS)

57 HUNTER ST NEWCASTLE
Address of Witness

P Jordan
Signature of Transferee

INSTRUCTIONS FOR FILLING OUT THIS FORM ARE AVAILABLE FROM THE LAND TITLES OFFICE

CHECKED BY (office use only)

Ausdoc Commercial and Law Stationers 1991

© Office of the Registrar-General /Src:GLOBALX /Ref:advlegs
Req:R924209 /Doc:DP 0258848 P /Rev:19-Jun-1992 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:24 /Seq:1 of 2

PLAN FORM 2 — Plan Drawing only to appear in this space — *OFFICE USE ONLY

Signatures and seals only.

THE COMMON SEAL OF HOOKER TOWN DEVELOPMENTS PTY. LIMITED WAS HEREUNTO AFFIXED BY AUTHORITY OF THE DIRECTORS PREVIOUSLY GIVEN IN THE PRESENCE OF:

DIRECTOR:

SECRETARY:

THE COMMON SEAL OF INTERIM MORTGAGE FINANCE LIMITED WAS HEREUNTO AFFIXED BY AUTHORITY OF THE DIRECTORS PREVIOUSLY GIVEN IN THE PRESENCE OF:

DIRECTOR:

SECRETARY:

THE COMMON SEAL OF ANGEL PLACE FINANCE LIMITED WAS HEREUNTO AFFIXED BY BY AUTHORITY OF THE DIRECTORS PREVIOUSLY GIVEN IN THE PRESENCE OF:

DIRECTOR:

SECRETARY:

Council Clerk's Certificate

I hereby certify that –

(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and

†(b) the requirements of section 348 of the †Metropolitan Water, Sewerage and Drainage Act, 1924, as amended. †Hunter District Water, Sewerage, and Drainage Act, 1938, as amended

have been complied with by the applicant in relation to the proposed SUBDIVISION (Insert "new road", "subdivision" or "consolidated lot") set out herein

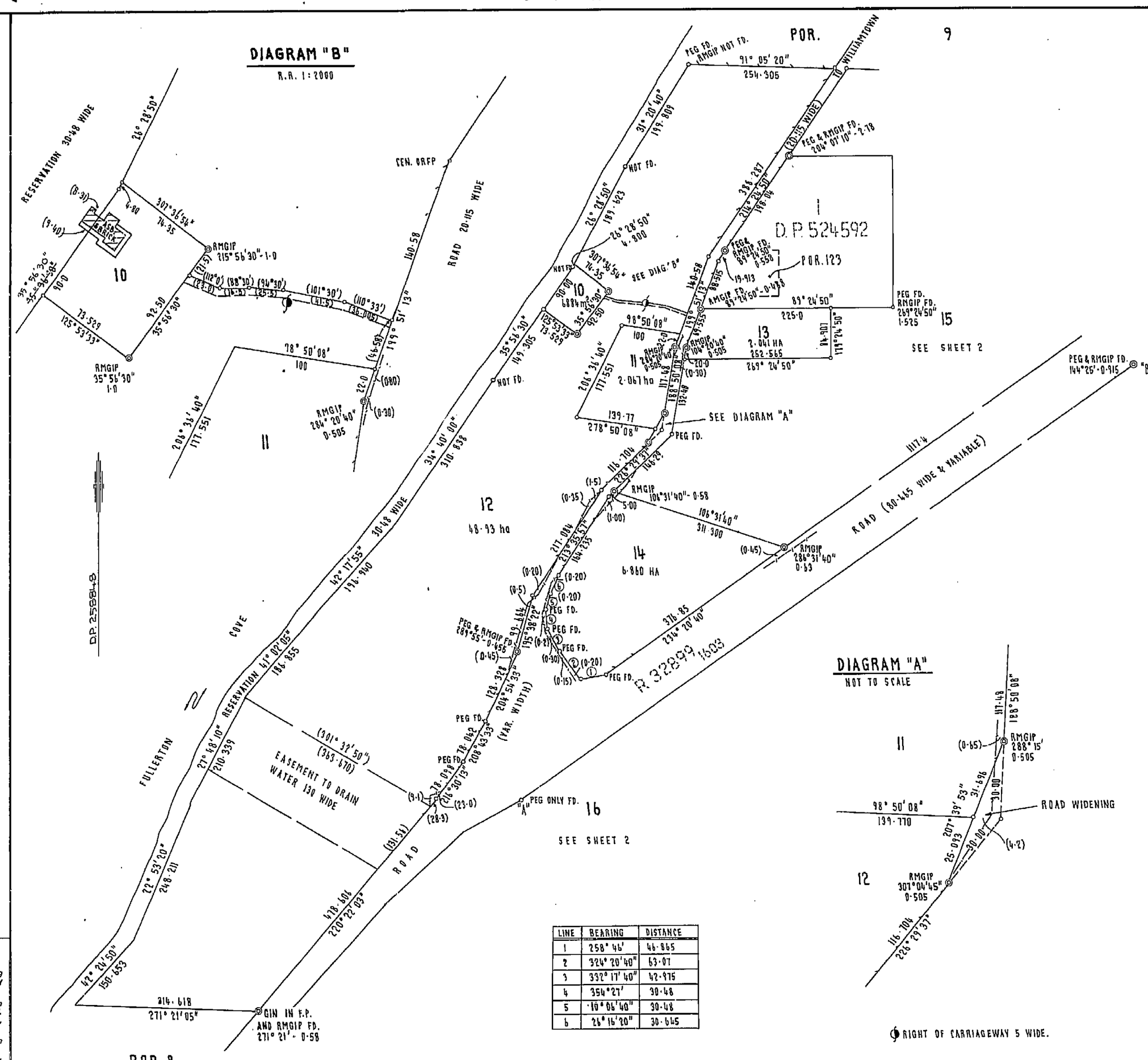
Subdivision No. 79/10

Date 8. FEBRUARY 1979

(Signature) ..... Council Clerk

*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the areas of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
†Delete if inapplicable.

DIAGRAM "B"
R.R. 1:2000



LINE	BEARING	DISTANCE
1	258° 46'	46·865
2	324° 20' 40"	63·07
3	332° 17' 40"	42·975
4	354° 27'	30·48
5	10° 06' 40"	30·48
6	24° 16' 20"	30·645

DIAGRAM "A"
NOT TO SCALE

D.P. 258848

Registered: 6·3·1979

C.A.: N°79/10 OF 8·2·1979

Title System: TORRENS

Purpose: SUBDIVISION

Ref. Map: U7257-1,-2,-5,-42

Last Plan: D.P.530095, D.P.593626

PLAN OF SUBDIVISION OF LOT 1 D.P. 530095 & LOT 22 D.P. 593626 AT FULLERTON COVE

Reduction Ratio 1: 5000
Lengths are in metres.

~~Muni~~/Shire ~~City~~: PORT STEPHENS

Locality: FULLERTON COVE

Parish: STOCKTON

County: GLOUCESTER

This is sheet 1 of my plan in 2 sheets.
(Delete if inapplicable).

I, JOHN MORRISON MONTEATH

of MONTEATH & POWYS, NEWCASTLE

a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan WITH RESPECT TO LOTS 10,11,13 & 14 THE FRONTAGE OF LOT 12 WITH OF LOT 11 is accurate and has been made †(1) by me (2) under my immediate supervision in accordance with the Survey Practice Regulations, 1933, and was completed on † 14TH JANUARY, 1979.

69/231

Signature

Surveyor registered under Surveyors Act, 1929, as amended. Datum Line of Azimuth: "A" - "B". †Strike out either (1) or (2). †Insert date of survey.

Panel for use only for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

IT IS INTENDED TO DEDICATE THE LAND MARKED "ROAD WIDENING" TO THE PUBLIC AS ROAD.

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT, 1919-1964 AS AMENDED IT IS INTENDED TO CREATE:

1. EASEMENT TO DRAIN WATER 130 WIDE.
2. RIGHT OF CARRIAGEWAY 5 WIDE.
3. RESTRICTION AS TO USER.

Table of mm

SURVEYOR'S REFERENCE: 69/231

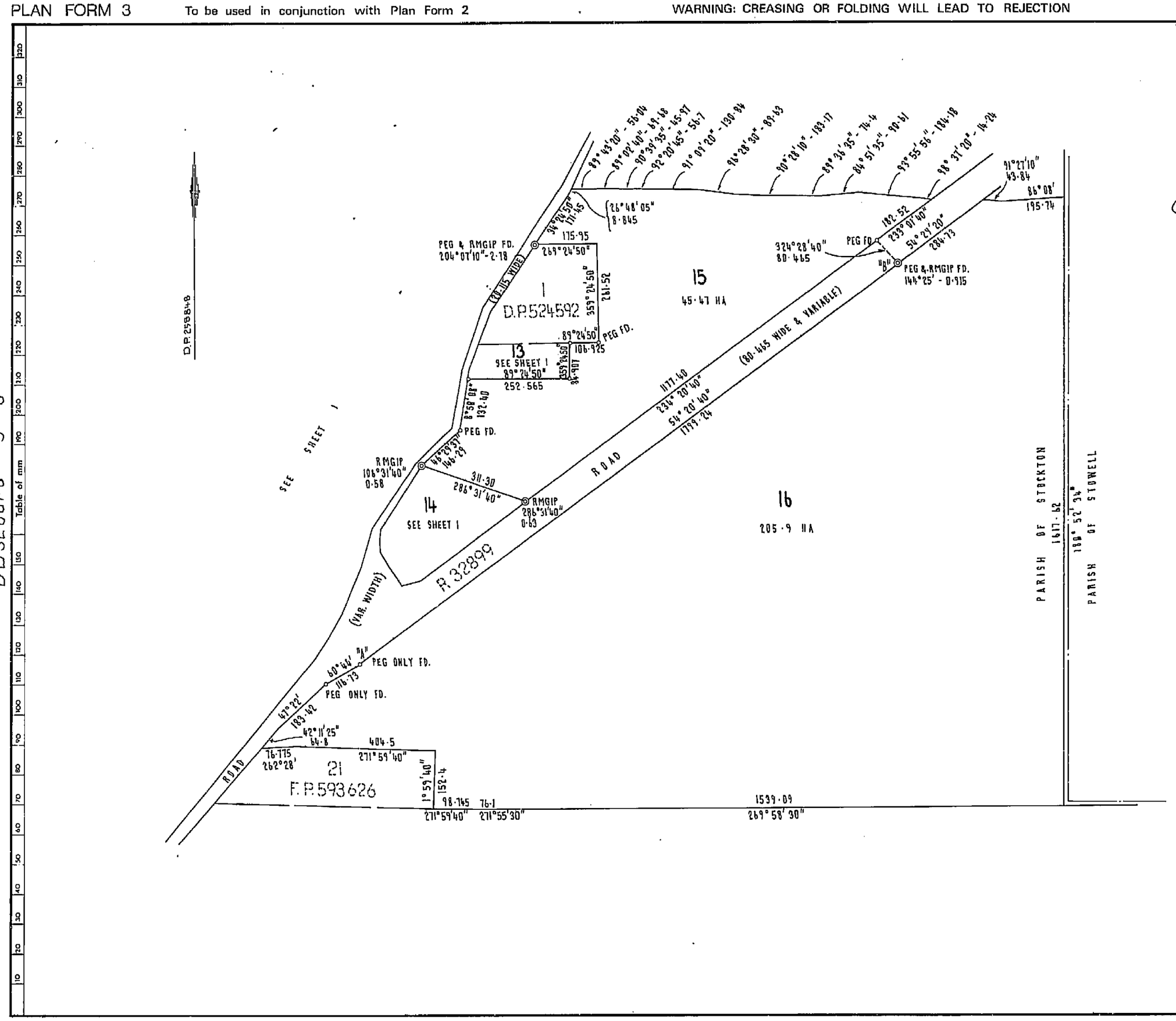
WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

I, Bruce Richard Davies, Registrar General for New South Wales, certify that this negative is a photograph made as a permanent record of a document in my custody this 9th day of March, 1979

DB 5288+8 sht 1 of 5 sht

Req:R924209 /Doc:DP 0258848 P /Rev:19-Jun-1992 /NSW LRS /Pgs:ALL /Prt:07-Nov-2020 11:24 /Seq:2 of 2
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PLAN FORM 3 To be used in conjunction with Plan Form 2 WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION * OFFICE USE ONLY



D.P. 258848

Registered: 6.3.1979

This is sheet 2 of my plan in 2 sheets dated 24TH JANUARY, 1979.

Surveyor registered under Surveyors Act 1929.

This is sheet 2 of the plan of 2 Sheets covered by my Certificate No. 79/10 of 8 February 1979

Council Clerk

Signatures and seals only.

Reduction Ratio 1: 8000

Lengths are in metres

Plan Drawing only to appear in this space

SURVEYOR'S REFERENCE: 69/231

I, Bruce Richard Davies, Registrar General for New South Wales, certify that this negative is a photograph made as a permanent record of a document in my custody this 9th day of March, 1979

D.P. 258848 2H 2 of 2

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
7/11/2020 11:24AM

FOLIO: 14/258848

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 13840 FOL 38

Recorded	Number	Type of Instrument	C.T. Issue
5/6/1987		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
7/10/1987		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
16/8/1993	I565584	APPLICATION FOR REPLACEMENT CERTIFICATE OF TITLE	EDITION 1
9/12/1993	I864181	TRANSMISSION APPLICATION	EDITION 2
16/10/1995	O609589	TRANSFER	
16/10/1995	O609590	CHANGE OF NAME	EDITION 3
22/7/1999	6014904	DEPARTMENTAL DEALING	
2/11/2005	AB880765	TRANSMISSION APPLICATION	EDITION 4
24/5/2012	AH5925	CAVEAT	
24/4/2014	AI529511	WITHDRAWAL OF CAVEAT	
5/2/2020	AP861428	LEASE	
5/2/2020	AP861432	LEASE	
5/2/2020	AP861444	LEASE	
5/2/2020	AP861445	LEASE	EDITION 5

*** END OF SEARCH ***

advlegs PRINTED ON 7/11/2020

Obtained from NSW LRS on 07 November 2020 10:24 AM AEST

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 14/258848

SEARCH DATE	TIME	EDITION NO	DATE
7/11/2020	11:24 AM	5	5/2/2020

LAND

LOT 14 IN DEPOSITED PLAN 258848
AT FULLERTON COVE
LOCAL GOVERNMENT AREA PORT STEPHENS
PARISH OF STOCKTON COUNTY OF GLOUCESTER
TITLE DIAGRAM DP258848

FIRST SCHEDULE

CHRISTINA MARIA JORDAN (TA AB880765)

SECOND SCHEDULE (7 NOTIFICATIONS)

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 DP258848 RESTRICTION(S) ON THE USE OF LAND
3 R340846 COVENANT
4 AP861428 LEASE TO OPTUS MOBILE PTY LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AP861428. EXPIRES: 20/10/2024.
5 AP861432 LEASE TO OPTUS MOBILE PTY LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AP861432. COMMENCES: 21/10/2024. EXPIRES: 20/10/2029.
6 AP861444 LEASE TO OPTUS MOBILE PTY LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AP861444. COMMENCES: 21/10/2029. EXPIRES: 20/10/2034.
7 AP861445 LEASE TO OPTUS MOBILE PTY LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AP861445. COMMENCES: 21/10/2034. EXPIRES: 20/10/2039.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

advlegs PRINTED ON 7/11/2020

Obtained from NSW LRS on 07 November 2020 10:24 AM AEST © Office of the Registrar-General 2020
* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. GlobalX hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900. Note: Information contained in this document is provided by GlobalX Pty Ltd, ABN 35 099 032 596, www.globalx.com.au an approved NSW Information Broker.

APPENDIX D:

Aerial Photographs

NEW20P-0178 - Aerial Photographs

1954



NEW20P-0178 - Aerial Photographs

1966





NEW20P-0178 - Aerial Photographs

1976



NEW20P-0178 - Aerial Photographs

1984





NEW20P-0178 - Aerial Photographs

1993





NEW20P-0178 - Aerial Photographs

2010





NEW20P-0178 - Aerial Photographs

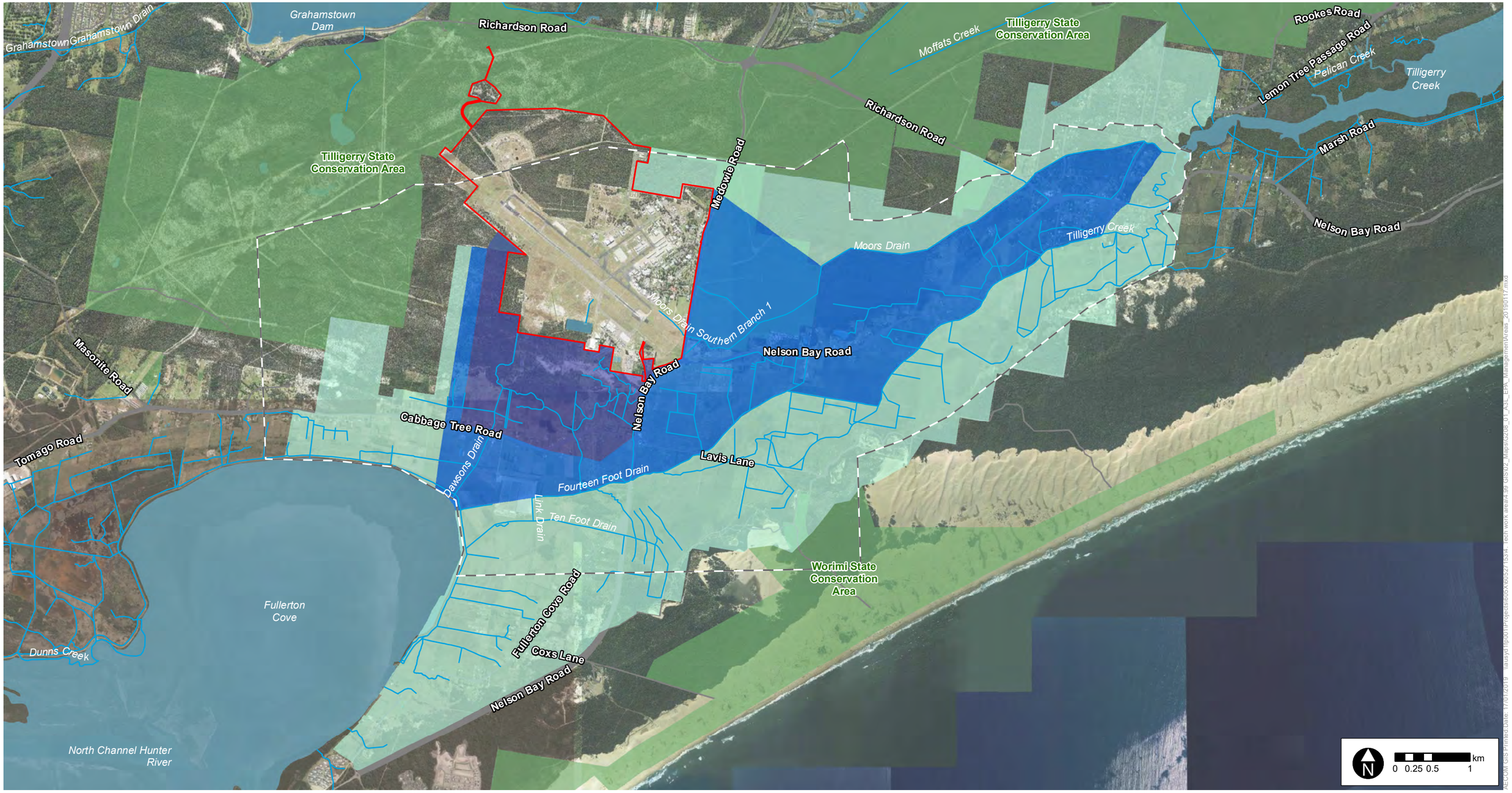
2020





APPENDIX E:

Williamtown RAAF Base PFAS Management Area Plans



KEY

- RAAF Base Williamtown
- NSW EPA Investigation Area
- Offsite open channel
- State Conservation Area

NSW EPA Management Areas

- Primary Management Zone
- Secondary Management Zone
- Broader Mangement Zone

AECOM

SCALE 1:50,000 | SIZE A3

SHEET 1 of 1 | COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE

Figure A: Williamtown Management Areas

PROJECT

RAAF BASE WILLIAMTOWN 2017 STAGE 2B ENVIRONMENTAL INVESTIGATION

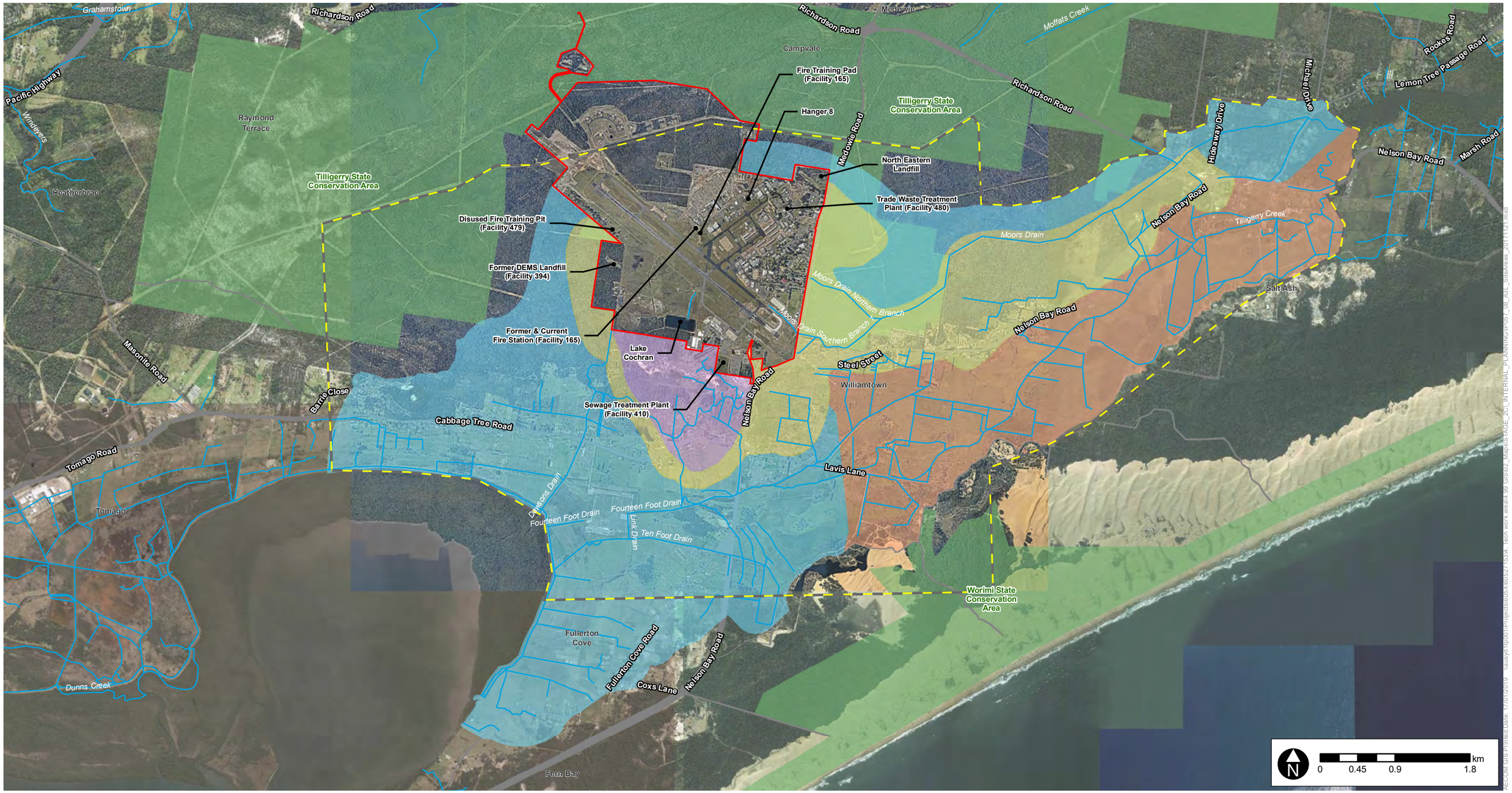
CLIENT

DEPARTMENT OF DEFENCE

Disclaimer Spatial data used under licence from Land and Property Management Authority, NSW © 2015.

AECOM makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness for purpose in relation to the map content.

AECOM GIS Printed Date: 17/01/2019 \\ausyd1fp001\Projects\60x60\52775344_Tech work area\4.99 GIS\02_Maps\02206_01_A3L_EPA_ManagementAreas_20190117.mxd



AECOM GIS Printed Date: 17/01/2019 \\ausyd1fp001\Projects\605X\60527\15314_tech work area\4.99 GIS\02_MapsIS\PAGE_2C_INTERNAL_PLANNING\P1057_08_A3L_SiteAreas_20171121.mxd

KEY

- RAAF Base Williamtown
- NSW EPA Investigation Area
- State Conservation Area
- Off-Site Open Channel
- Risk Zone A
- Risk Zone B
- Risk Zone C
- Risk Zone D

AECOM

SCALE 1:45,002

SIZE A3

SHEET **1 of 1**

COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE

Figure G: Human Health Risk Zones

PROJECT

RAAF BASE WILLIAMTOWN STAGE 2B ENVIRONMENTAL INVESTIGATION

CLIENT

DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- NSW EPA Investigation Area
- Offsite open channel
- State Conservation Area
- SEPP 14 wetland
- RAMSAR Wetland
- Assessment Area A
- Assessment Area B
- Assessment Area C1
- Assessment Area C2
- Assessment Area D
- Assessment Area E

IMPORTANT NOTE: Refer to Section 8.2 regarding data characteristics and uncertainties

AECOM

SCALE 1:145,000
SIZE A3
SHEET 1 of 1
COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE
Figure H: Ecological Risk Zones

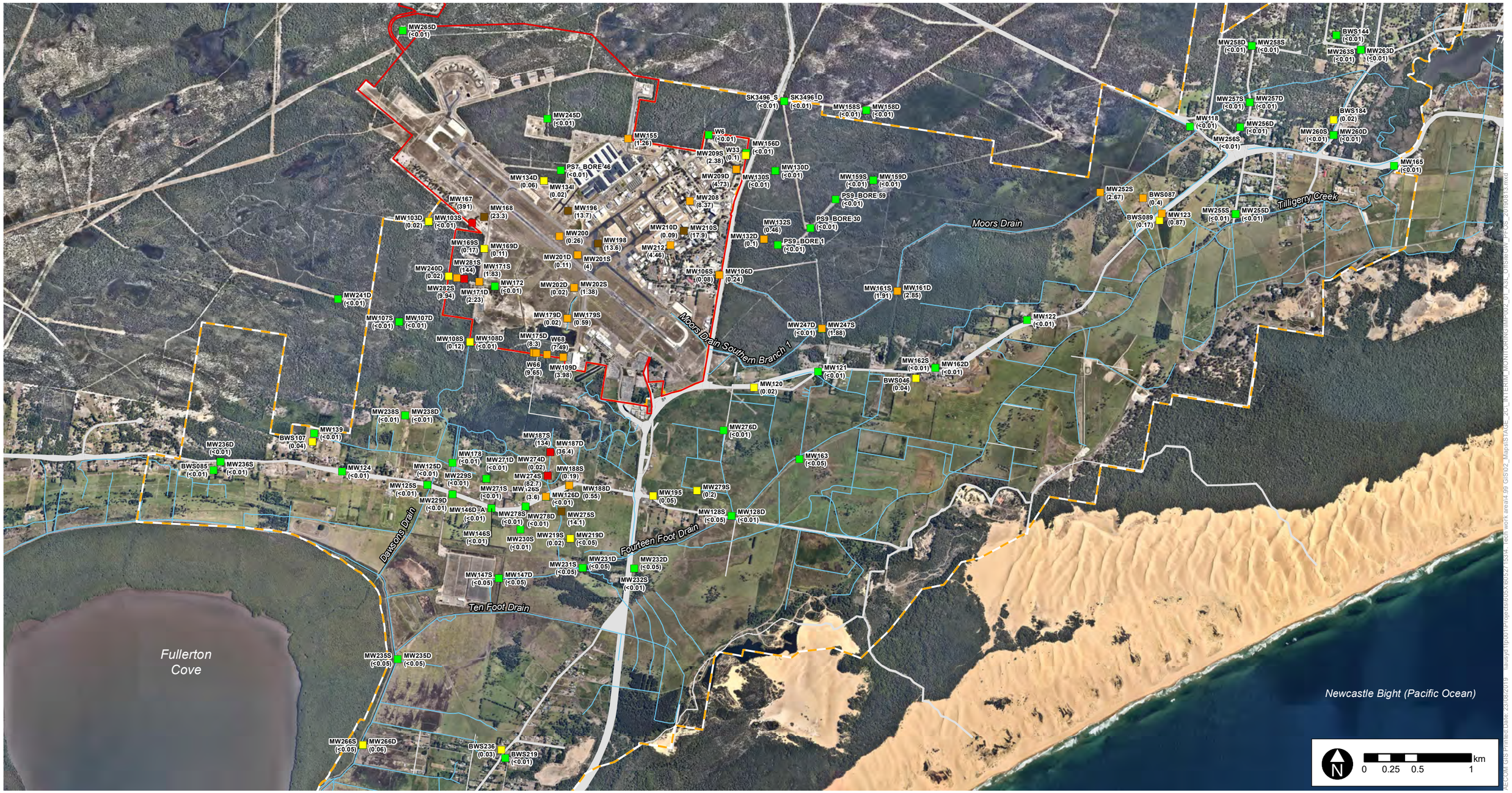
PROJECT
RAAF BASE WILLIAMTOWN 2017 STAGE 2B ENVIRONMENTAL INVESTIGATION

CLIENT
DEPARTMENT OF DEFENCE

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AECOM GIS Printed Date: 17/01/2019 \\ausyd1fp001\Projects\605X\60527153\4. Tech work area\4.99 GIS\02_Maps\STAGE_2C_INTERNAL_PLANNING\P057_15_A3L_SiteAreas_20190117.mxd



AECOM GIS Printed Date: 23/08/2019 \\aubyd1fp001\Projects\s005X\605271534 - tech work area\4.0\9 GIS\02_Maps\SPAGE_2C_INTERIM_MONITORING\IMP002_01_A3L_OffSiteGW_PFOS_20190813.mxd

KEY

- RAAF Base Williamtown
- Management Area
- Surface Water and Drainage Channels

Groundwater Sample Analytical Results - PFOS (µg/L)

- >50
- >10 to 50
- >0.2 to 10
- Limit of Reporting to 0.2
- <Limit of Reporting

AECOM

SCALE	1:35,000
SIZE	A3
SHEET	1 of 1
COORDINATE SYSTEM	GDA 1994 MGA Zone 56

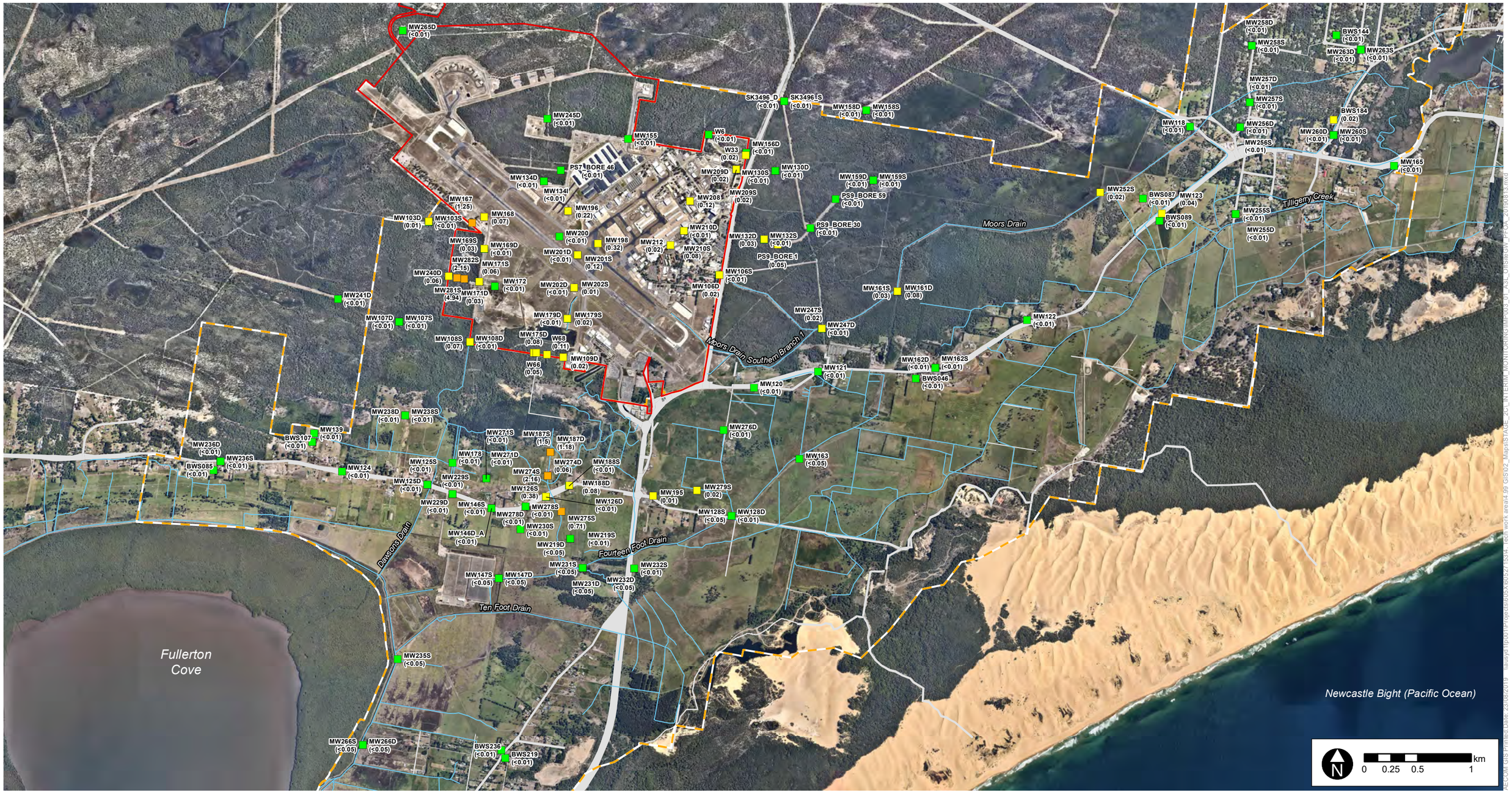
TITLE
FIGURE F2: GROUNDWATER ANALYTICAL RESULTS - PFOS (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

CLIENT
DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- Management Area
- Surface Water and Drainage Channels

Groundwater Sample Analytical Results - PFOA (µg/L)

- >50
- >10 to 50
- >0.56 to 10
- Limit of Reporting to 0.56
- <Limit of Reporting

AECOM

SCALE	1:35,000
SIZE	A3
SHEET	1 of 1
COORDINATE SYSTEM	GDA 1994 MGA Zone 56

TITLE
FIGURE F3: GROUNDWATER ANALYTICAL RESULTS - PFOA (OVERVIEW)

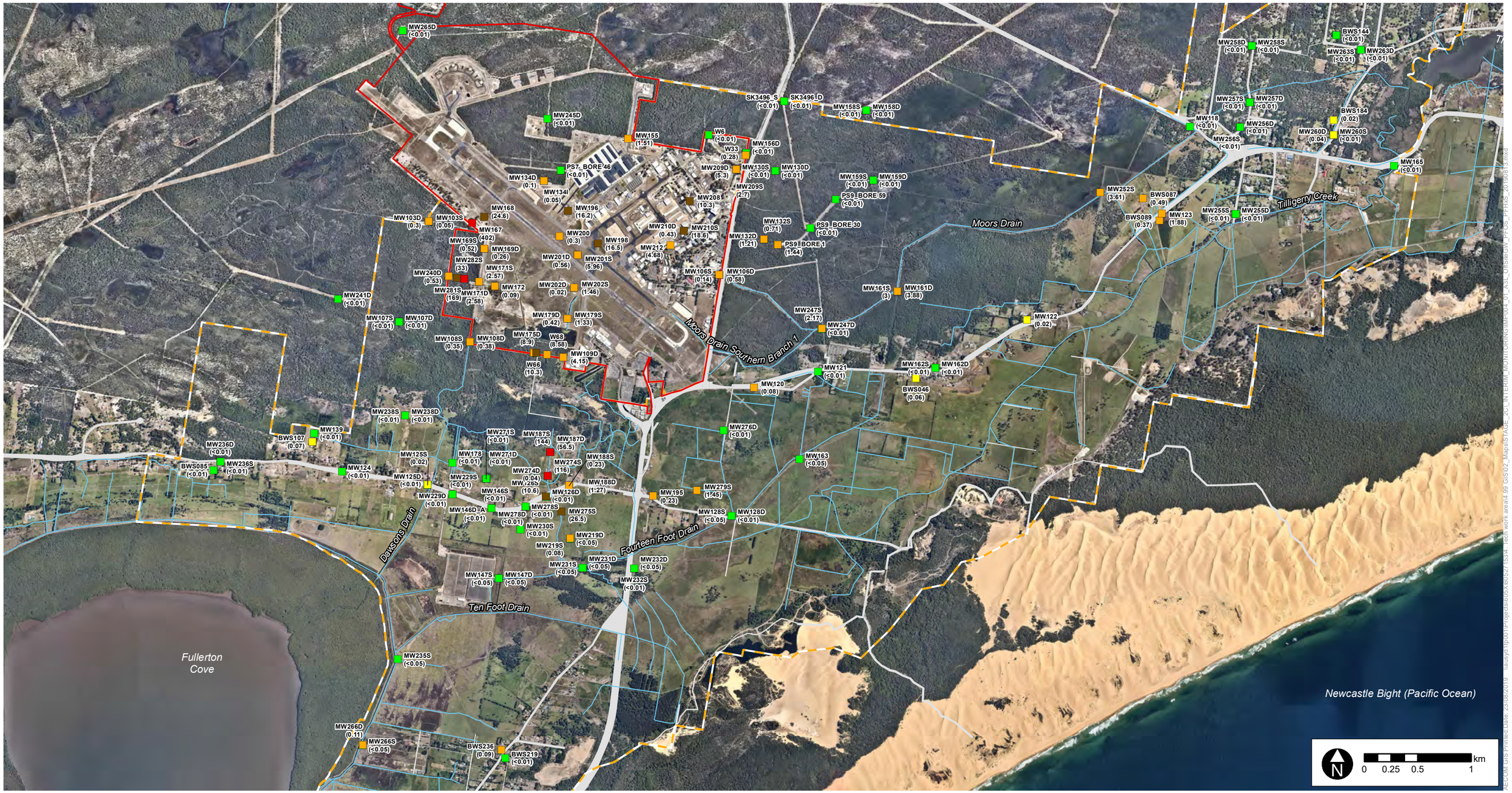
PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

CLIENT
DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- Management Area
- Surface Water and Drainage Channels

Groundwater Analytical Results - PFOS + PFHxS (µg/L)

- >50
- >10 - 50
- >0.07 - 10
- Limit of Reporting to 0.07
- <Limit of Reporting

AECOM

SCALE	1:35,000
SIZE	A3
SHEET	1 of 1
COORDINATE SYSTEM	GDA 1994 MGA Zone 56

TITLE

FIGURE F4: GROUNDWATER ANALYTICAL RESULTS - PFOS+PFHxS (OFFSITE OVERVIEW)

PROJECT

RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

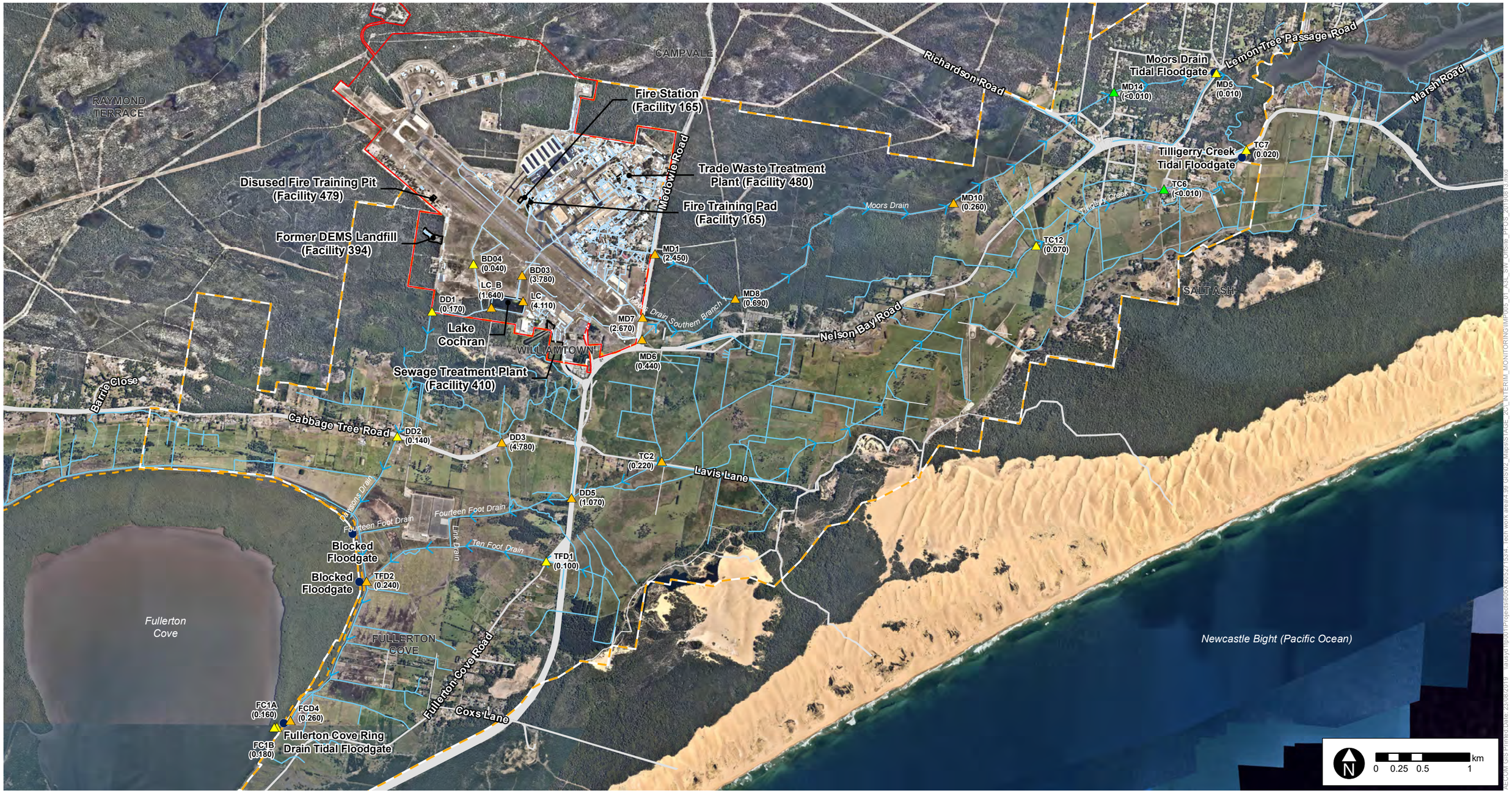
CLIENT

DEPARTMENT OF DEFENCE

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AECOM GIS Printed Date: 23/08/2019 \\ausyd1fp001\Projects\605x\60527534_Tech work area\4.99 GIS\02_Maps\SPAGE_2C_INTERIM_MONITORING\IMP004_01_A3L_OffsiteGW_PFOS_PFHxS_20190813.mxd



AECOM GIS Printed Date: 23/08/2019 \\ausyd1fp001\Projects\ENV\60527134\4. Tech work area\4.99 GIS\02_Mapping\PAGE_2C_INTERIM_MONITORING\IMP005_01_A3L_SW_Onsite_PFOS_20190813.mxd

KEY

- RAAF Base Williamtown
- Floodgate
- Fullerton Cove Ring Drain
- Offsite open channel and flow paths
- Management Area

Surface Water Analytical Results - PFOS (µg/L)

- >50
- >10 - 50
- >0.2 - 10
- Limit of Reporting to 0.2
- <Limit of Reporting

AECOM

SCALE 1:40,000 | SIZE A3

SHEET 1 of 1 | COORDINATE SYSTEM GDA 1994 MGA Zone 56

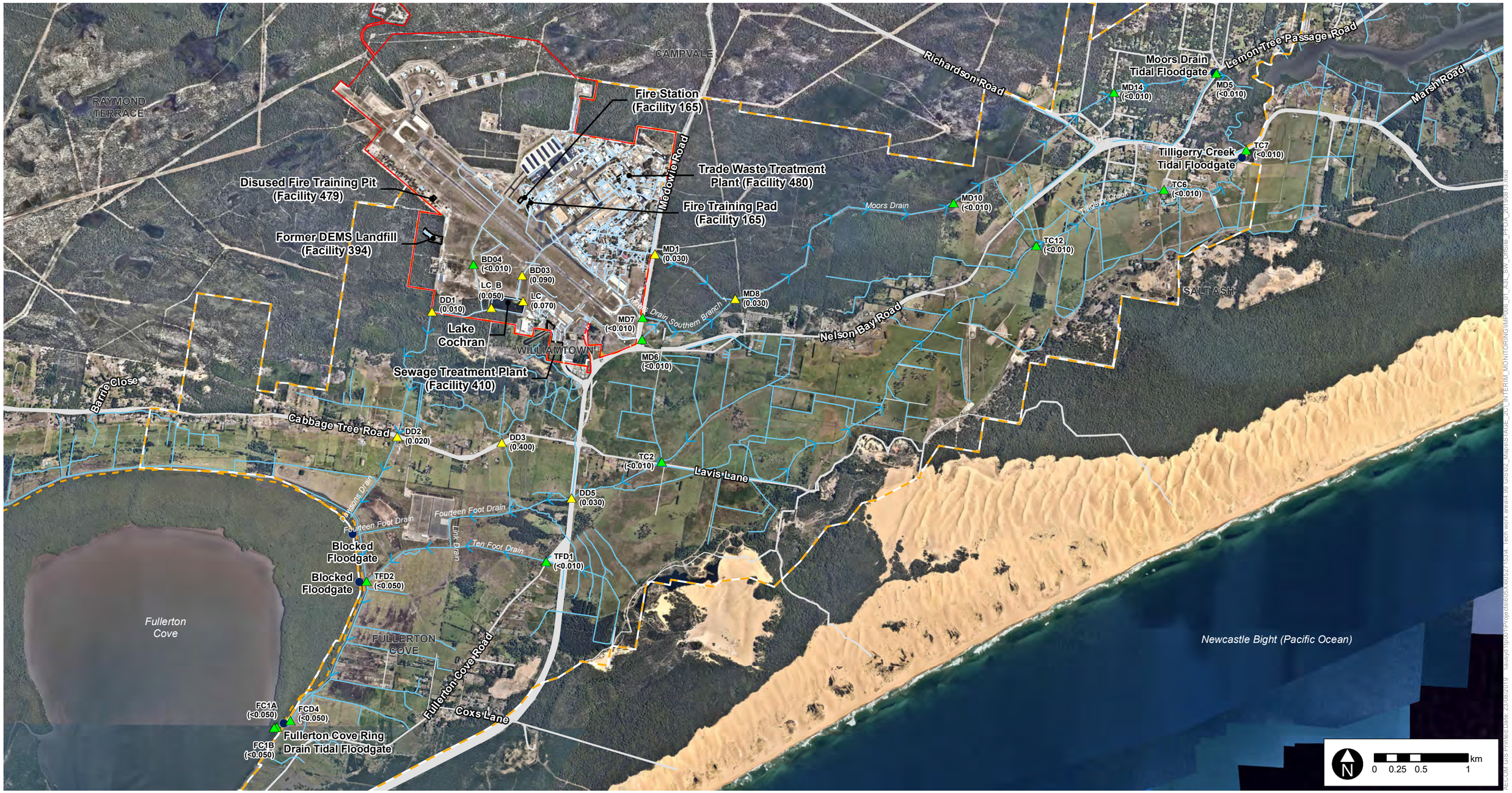
TITLE
FIGURE F5: SURFACE WATER ANALYTICAL RESULTS - PFOS (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

CLIENT
DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- Floodgate
- Fullerton Cove Ring Drain
- Offsite open channel and flow paths
- Management Area

Surface Water Analytical Results - PFOA (µg/L)

- >50
- >10 - 50
- >0.56 - 10
- Limit of Reporting to 0.56
- <Limit of Reporting

AECOM

SCALE 1:40,000 | SIZE A3

SHEET 1 of 1 | COORDINATE SYSTEM GDA 1994 MGA Zone 56

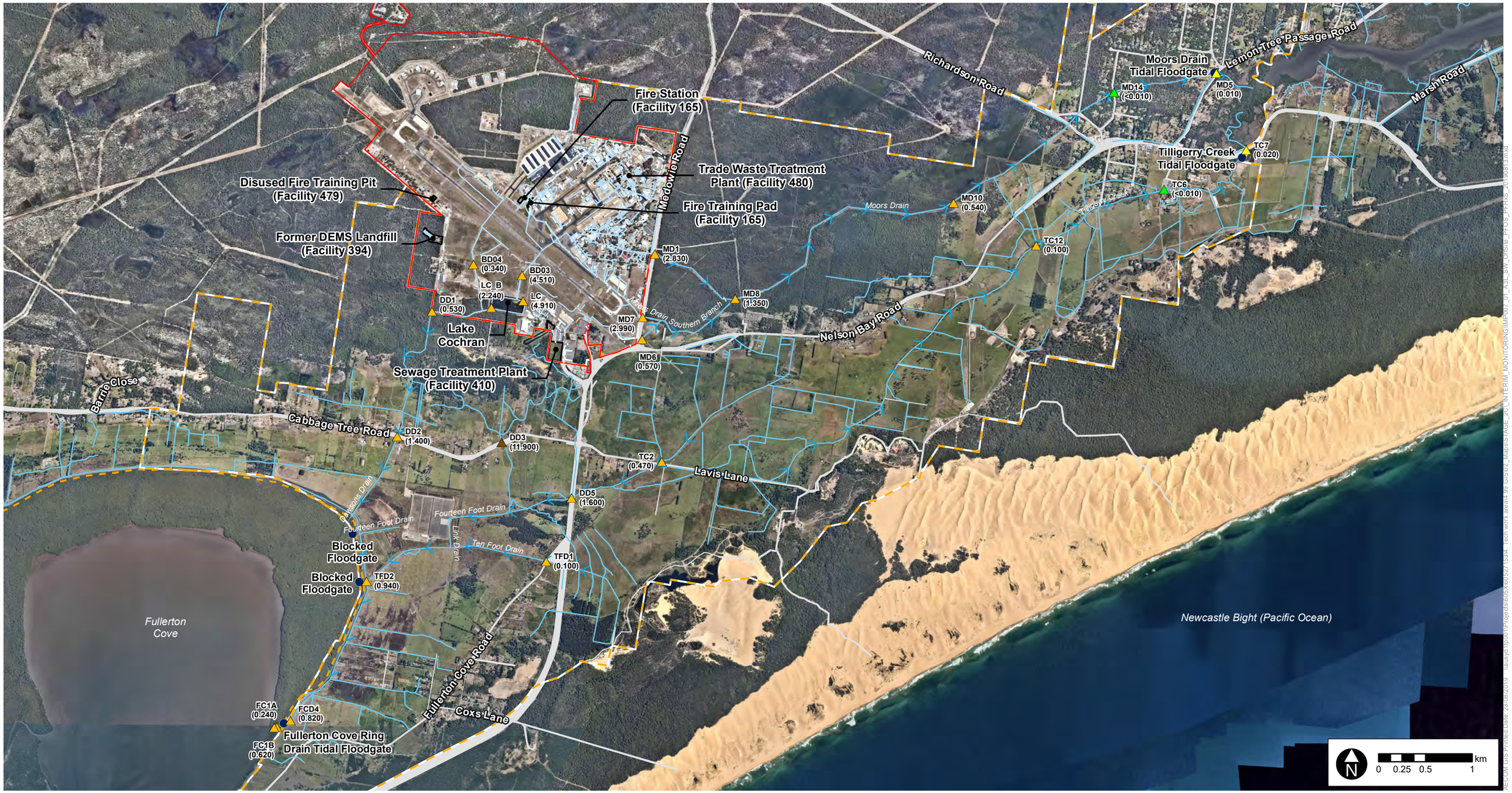
TITLE
FIGURE F6: SURFACE WATER ANALYTICAL RESULTS - PFOA (OFFSITE OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

CLIENT
DEPARTMENT OF DEFENCE

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KEY

- RAAF Base Williamtown
- Floodgate
- Fullerton Cove Ring Drain
- Offsite open channel and flow paths
- Management Area

Surface Water Analytical Results - PFOS + PFHxS (µg/L)

- >50
- >10 - 50
- >0.07 - 10
- Limit of Reporting to 0.07
- <Limit of Reporting

AECOM

SCALE 1:40,000
SIZE A3
SHEET 1 of 1
COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE
FIGURE F7: SURFACE WATER ANALYTICAL RESULTS - PFOS+PFHxS (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

CLIENT
DEPARTMENT OF DEFENCE

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Fire Station (Facility 165)
Trade Waste Treatment Plant (Facility 480)
Fire Training Pad (Facility 165)
Disused Fire Training Pit (Facility 479)
Former DEMS Landfill (Facility 394)
Lake Cochran
Sewage Treatment Plant (Facility 410)
Moors Drain Tidal Floodgate
Tilligerry Creek
Tilligerry Creek Tidal Floodgate
Moors Drain
Moors Drain Southern Branch
Parsons Drain
Fourteen Foot Drain
Ten Foot Drain
Blocked Floodgate
Blocked Floodgate
Fullerton Cove
Fullerton Cove Ring Drain Tidal Floodgate
Newcastle Bight (Pacific Ocean)

MD5 (<0.0002)
MD14 (0.00)
TC7 (0.00)
TC6 (<0.0002)
MD10 (0.01)
TC12 (0.02)
MD1 (0.13)
BD04 (0.00)
BD03 (0.04)
DD1 (0.00)
LC_B (0.05)
LC (0.02)
MD8 (0.00)
MD7 (0.01)
MD6 (0.07)
DD2 (0.00)
DD3 (0.01)
TC2 (0.01)
DD5 (0.03)
TFD1 (0.02)
TFD2 (0.01)
FC1A (0.00)
FCD4 (0.00)
FC1B (0.00)

N
0 0.25 0.5 1 km

AECOM GIS Printed Date: 23/08/2019 \\ausyd1fp001\Projects\605X\60527153\4 - Tech work area\4.99 GIS\02_Mapsl\STAGE_2C_INTERIM_MONITORING\IMP008_01_A3L_SD_PFOS_Offsite_20190813.mxd

KEY

- RAAF Base Williamtown
- Surface Water and Drainage Channels
- Management Area

Sediment Analytical Results - PFOS (mg/kg)

- >10
- >1 - 10
- >0.3 - 1
- Limit of Reporting to 0.3
- <Limit of Reporting

AECOM

SCALE 1:40,000
SIZE A3
SHEET 1 of 1
COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE
FIGURE F8: SEDIMENT ANALYTICAL RESULTS - PFOS (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING MAY 2019

CLIENT
DEPARTMENT OF DEFENCE

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Fire Station (Facility 165)
Trade Waste Treatment Plant (Facility 480)
Fire Training Pad (Facility 165)
Disused Fire Training Pit (Facility 479)
Former DEMS Landfill (Facility 394)
Lake Cochran
Sewage Treatment Plant (Facility 410)
Moors Drain Tidal Floodgate
Tilligerry Creek
Tilligerry Creek Tidal Floodgate
Moors Drain
Moors Drain Southern Branch
Parsons Drain
Fourteen Foot Drain
Ten Foot Drain
Blocked Floodgate
Blocked Floodgate
Fullerton Cove
Fullerton Cove Ring Drain Tidal Floodgate
Newcastle Bight (Pacific Ocean)

MD5 (<0.00)
MD14 (<0.00)
TC7 (<0.00)
TC6 (<0.00)
MD10 (<0.00)
TC12 (<0.00)
MD1 (0.00)
BD04 (0.00)
BD03 (0.00)
LC_B (0.00)
LC (<0.00)
DD1 (<0.00)
MD8 (<0.00)
MD7 (<0.00)
MD6 (<0.00)
DD2 (<0.00)
DD3 (0.00)
TC2 (<0.00)
DD5 (<0.00)
TFD1 (<0.00)
TFD2 (<0.00)
FC1A (<0.00)
FCD4 (<0.00)
FC1B (<0.00)

N
0 0.25 0.5 1 km

AECOM GIS Printed Date: 23/08/2019 \\ausyd1fp001\Projects\605X\60527153\4. Tech work area\4.99 GIS\02_Mapping\PAGE_2C_INTERIM_MONITORING\IMP009_01_A3L_SD_PFOA_Offsite_20190813.mxd

KEY

- RAAF Base Williamtown
- Surface Water and Drainage Channels
- Management Area

Sediment Analytical Results - PFOA (mg/kg)

- >10
- >1 - 10
- >0.3 - 1
- Limit of Reporting to 0.3
- <Limit of Reporting

AECOM

SCALE 1:40,000
SIZE A3
SHEET 1 of 1
COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE
FIGURE F9: SEDIMENT ANALYTICAL RESULTS - PFOA (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING MAY 2019

CLIENT
DEPARTMENT OF DEFENCE

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Fire Station (Facility 165)
Trade Waste Treatment Plant (Facility 480)
Fire Training Pad (Facility 165)
Disused Fire Training Pit (Facility 479)
Former DEMS Landfill (Facility 394)
Lake Cochran
Sewage Treatment Plant (Facility 410)
Moors Drain Tidal Floodgate
Tilligerry Creek Tidal Floodgate
Blocked Floodgate
Blocked Floodgate
Fullerton Cove Ring Drain Tidal Floodgate
Tilligerry Creek
Moors Drain
Moors Drain Southern Branch
Dawsons Drain
Fourteen Foot Drain
Ten Foot Drain
Fullerton Cove
Newcastle Bight (Pacific Ocean)
MD5 (<0.0002)
MD14 (0.0011)
TC7 (0.0025)
TC6 (<0.0002)
MD10 (0.009)
TC12 (0.0224)
MD1 (0.144)
MD8 (0.0018)
MD7 (0.0112)
MD6 (0.0769)
BD04 (0.005)
BD03 (0.0464)
LC_B (0.0571)
LC (0.0171)
DD1 (0.0034)
DD2 (0.0011)
DD3 (0.019)
TC2 (0.007)
DD5 (0.0321)
TFD1 (0.0208)
TFD2 (0.014)
FCD4 (0.0012)
FC1B (0.0028)
FC1A (0.0041)
N
0 0.25 0.5 1 km

AECOM GIS Printed Date: 23/08/2019 \\ausyd1fp001\Projects\605X\60527153\4. Tech work area\4.99 GIS\02_Mapping\PAGE_2C_INTERIM_MONITORING\IMP0101_01_A3L_SD_PFOS_PFHxS_Critsite_20190813.mxd

KEY

- RAAF Base Williamtown
- Surface Water and Drainage Channels
- Management Area

Sediment Analytical Results - PFOS + PFHxS (µg/L)

- >10
- >1 - 10
- >0.3 - 1
- Limit of Reporting to 0.3
- <Limit of Reporting

AECOM

SCALE 1:40,000
SIZE A3
SHEET 1 of 1
COORDINATE SYSTEM GDA 1994 MGA Zone 56

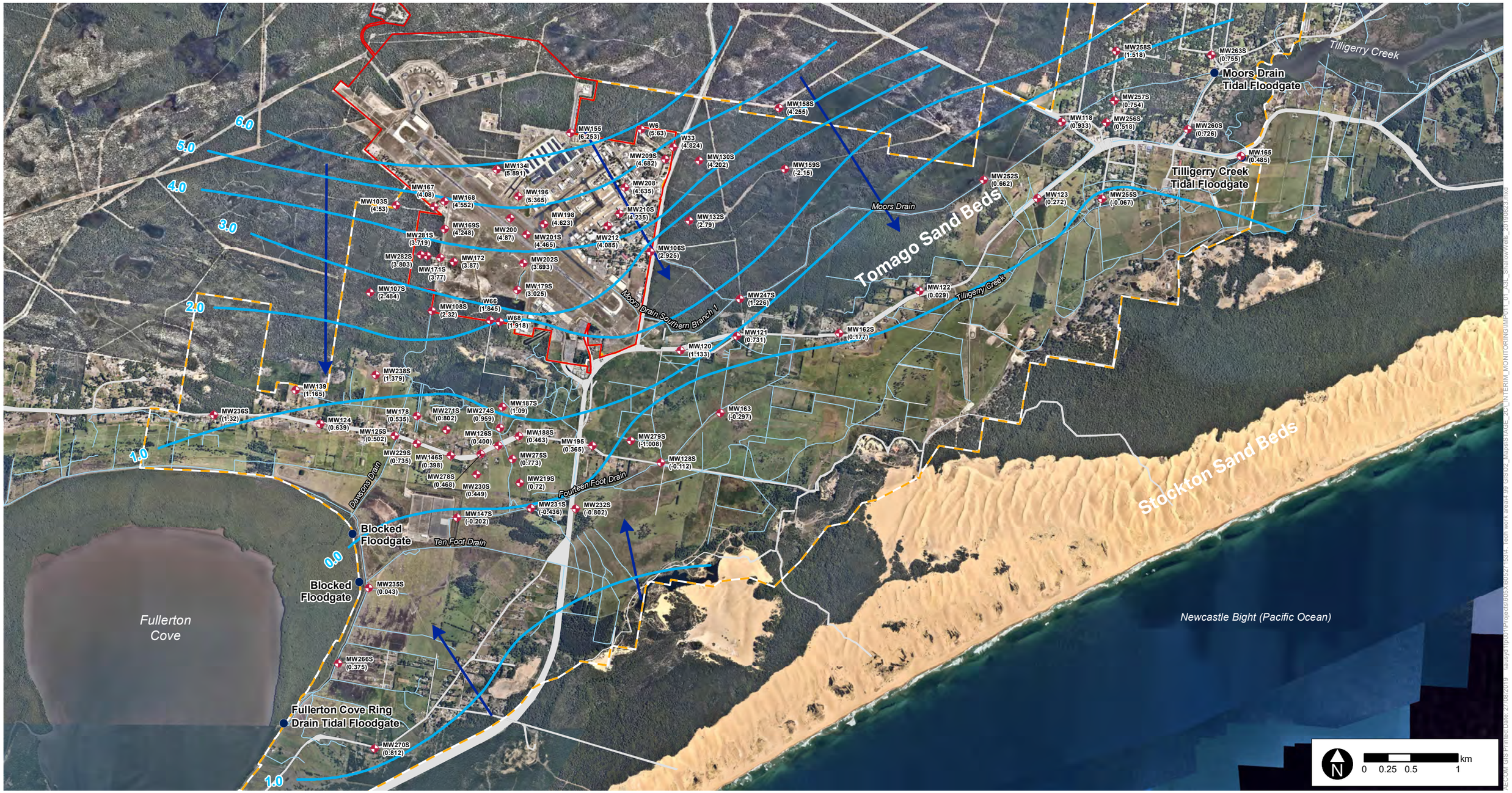
TITLE
FIGURE F10: SEDIMENT ANALYTICAL RESULTS - PFOS+PFHxS (OVERVIEW)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

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KEY

- RAAF Base Williamtown
- Surface Water and Drainage Channels
- Management Area
- Shallow Groundwater Monitoring Well
- Inferred Groundwater Flow Direction
- Groundwater Elevation Contour (mAHD)

AECOM

SCALE	1:40,000
SIZE	A3
SHEET	1 of 1
COORDINATE SYSTEM	GDA 1994 MGA Zone 56

TITLE
FIGURE F11: GROUNDWATER ELEVATIONS AND POTENTIOMETRIC CONTOURS (SHALLOW WELLS)

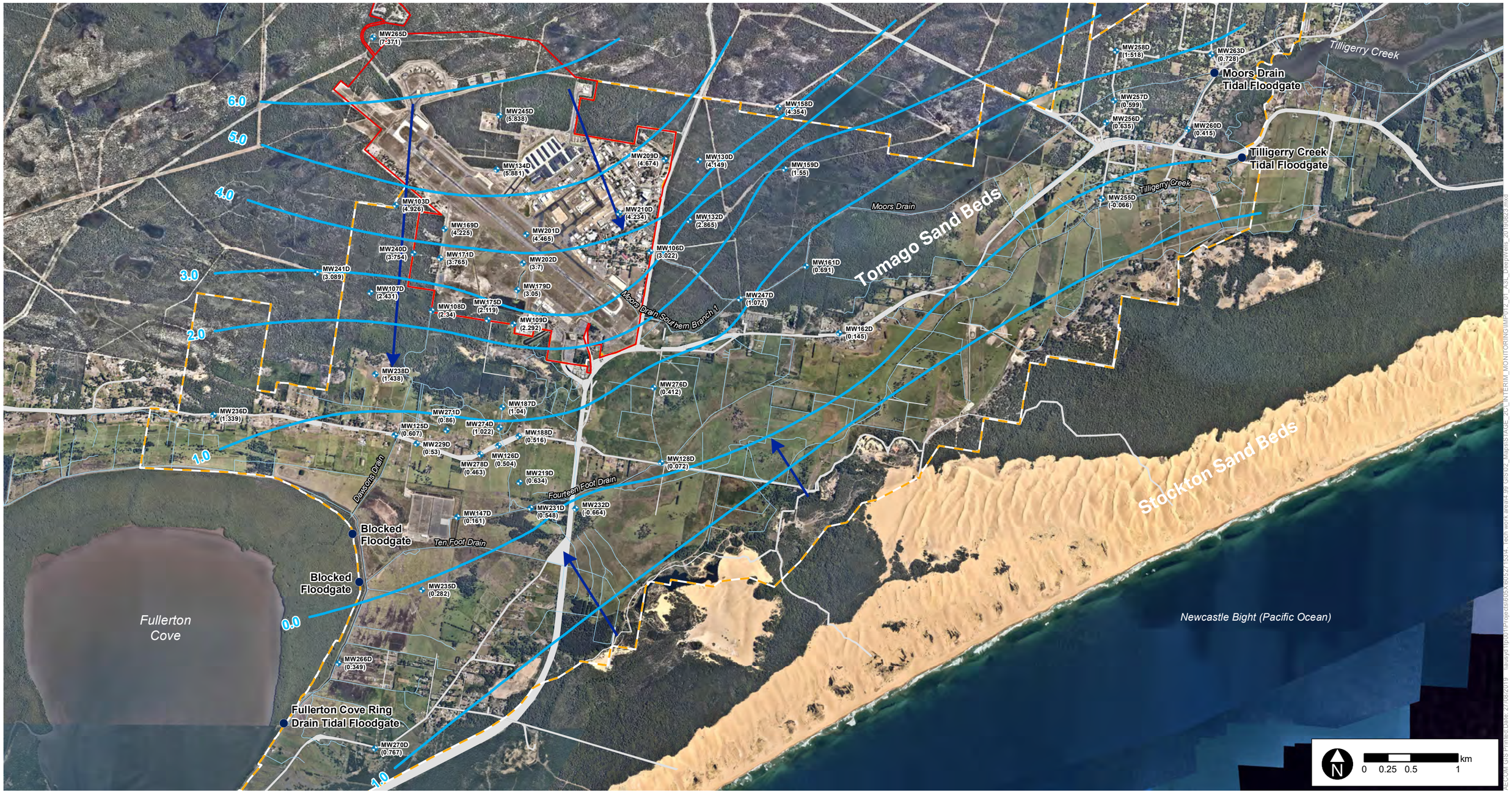
PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

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AECOM GIS Printed Date: 27/08/2019 \\ausyd1fp001\Projects\60552715\34_Tech work area\4.99 GIS\02_Mapsl\PAGE_2C_INTERIM_MONITORING\IMP012_01_A3L_DeepWells_20190823.mxd

KEY

- RAAF Base Williamtown
- Surface Water and Drainage Channels
- Management Area
- Deep Groundwater Monitoring Well
- Inferred Groundwater Flow Direction
- Groundwater Elevation Contour (mAHD)

AECOM

SCALE 1:40,000

SIZE A3

SHEET **1 of 1**

COORDINATE SYSTEM GDA 1994 MGA Zone 56

TITLE
FIGURE F12: GROUNDWATER ELEVATIONS AND POTENTIOMETRIC CONTOURS (DEEP WELLS)

PROJECT
RAAF BASE WILLIAMTOWN
INTERIM MONITORING EVENT - JUNE 2019

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APPENDIX F:

NSW EPA Records

Public registers

+ POEO Public Register
– Contaminated land record of notices
  - About the record of notices
  - List of notified sites
  - Tips for searching
  - Disclaimer
- Dangerous goods licences
- Pesticide licences
- Radiation licences

Home | Public registers | Contaminated land record of notices

Search results

Your search for: Suburb: FULLERTON COVE

Search Again | Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

6 November 2020

Public registers

– POEO Public Register
- Licences, applications and notices search
- Penalty notices search
- Enforceable undertakings search
- Enforceable undertakings media releases
- Exemptions and approvals search
- Prosecutions or civil proceedings search
- Terms of use: POEO public register
- Licensing FAQs
- List of licences
- Unlicensed premises regulated by the EPA

+ Contaminated land record of notices
- Dangerous goods licences
- Pesticide licences
- Radiation licences

Home | Public registers | POEO Public Register | Licences, applications and notices search

Search results

Your search for: **General Search** with the following criteria

Suburb - Fullerton Cove

returned 14 results

Export to excel | 1 of 1 Pages | Search Again

Number	Name	Location	Type	Status	Issued date
10132	BORAL RESOURCES (NSW) PTY LTD	18-20 COX'S LANE, FULLERTON COVE, NSW 2318	POEO licence	Issued	01 Dec 1999
1082387	BORAL RESOURCES (NSW) PTY LTD	18-20 COX'S LANE, FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	14 May 2008
1099923	BORAL RESOURCES (NSW) PTY LTD	18-20 COX'S LANE, FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	20 Apr 2009
1501486	BORAL RESOURCES (NSW) PTY LTD	18-20 COX'S LANE, FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	13 Dec 2011
20084	COASTAL SAND AND QUARRY PRODUCTS PTY LTD	21 Coxs Lane , FULLERTON COVE, NSW 2318	POEO licence	Surrendered	10 Apr 2012
1549121	COASTAL SAND AND QUARRY PRODUCTS PTY LTD	21 Coxs Lane , FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	13 Mar 2017
1552006	COASTAL SAND AND QUARRY PRODUCTS PTY LTD	21 Coxs Lane , FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	12 May 2017
1565147	COASTAL SAND AND QUARRY PRODUCTS PTY LTD	21 Coxs Lane , FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	28 May 2018
1575276	COASTAL SAND AND QUARRY PRODUCTS PTY LTD	21 Coxs Lane , FULLERTON COVE, NSW 2318	s.80 Surrender of a Licence	Issued	07 Mar 2019
1529292	DART ENERGY LIMITED	397 Fullerton Cove Road, FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	10 Apr 2015
3085765091	Fullerton Cove Quarry Pty Ltd	21 Coxs Lane , FULLERTON COVE, NSW 2318	Penalty Notice	Issued	06 Aug 2012
1524434	Fullerton Cove Quarry Pty Ltd	21 Coxs Lane , FULLERTON COVE, NSW 2318	s.58 Licence Variation	Issued	28 Oct 2014
20347	HUNTER GAS PTY LTD	397 Fullerton Cove Road, FULLERTON COVE, NSW 2318	POEO licence	Surrendered	01 May 2014
1566504	HUNTER GAS PTY LTD	397 Fullerton Cove Road, FULLERTON COVE, NSW 2318	s.80 Surrender of a Licence	Issued	16 Aug 2018

FORRESTERS BEACH	Caltex Service Station	The Entrance Rd Cnr Bellevue ROAD	Service Station	Regulation under CLM Act not required	-33.40057818	151.4687631
FORSTER	Caltex Service Station	16-18 Lake STREET	Service Station	Regulation under CLM Act not required	-32.18306967	152.5162492
FORSTER	Shell (Kneebone's) Service Station	2-6 The Lakes WAY	Service Station	Regulation under CLM Act not required	-32.1946108	152.5145662
FORSTER	Enhance (Former Mobil) Service Station	86-88 Macintosh STREET	Service Station	Regulation under CLM Act not required	-32.19079468	152.5154847
FREDERICKTON	Former Service station	2-4 Great North ROAD	Service Station	Regulation under CLM Act not required	-31.03513998	152.8794105
FRENCHS FOREST	Former BP Service Station	Russell AVENUE	Service Station	Regulation under CLM Act not required	-33.75018093	151.2245005
FRENCHS FOREST	Former 7-Eleven / Mobil Beacon Hill Service Station, Frenchs Forest	312 Warringah ROAD	Service Station	Regulation under CLM Act not required	-33.75129647	151.2469656
FRESHWATER	Prime Service Station Freshwater	117 Harbord ROAD	Service Station	Regulation under CLM Act not required	-33.77286748	151.2794354
FRESHWATER	Former Dry Cleaners	121 Wyndora AVENUE	Other Industry	Regulation under CLM Act not required	-33.77425321	151.2821553
GEORGETOWN	Former Caltex Service Station	4 Georgetown ROAD	Service Station	Regulation under CLM Act not required	-32.91121105	151.7319693
GERRINGONG	Gerringong Cooperative	18 Belinda STREET	Other Petroleum	Regulation under CLM Act not required	-34.74518835	150.8181054
GILGANDRA	United (Former Mobil) Service Station	13 Castlereagh STREET	Service Station	Regulation under CLM Act not required	-31.71715641	148.6581574
GILGANDRA	Former Mobil Depot	2 Federation STREET	Other Petroleum	Regulation under CLM Act not required	-31.70937362	148.6522102

APPENDIX G:

Section 10.7 Certificate

PORT STEPHENS COUNCIL

ABN 16 744 377 876

116 Adelaide Street, Raymond Terrace NSW 2324
PO Box 42, Raymond Terrace NSW 2324
Ph: (02) 4988 0255 Fax: (02) 4987 3612
Email: plancert@portstephens.nsw.gov.au
http://www.portstephens.nsw.gov.au

PLANNING CERTIFICATE PURSUANT TO SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

APPLICANT DETAILS:

QUALTES
8 IRONBARK CLOSE
WARABROOK NSW 2304

Reference:

Issue Date: **05/11/2020**

PROPERTY DESCRIPTION:

42 Fullerton Cove Road FULLERTON COVE NSW 2318 Parcel No: 14269
LOT: 14 DP: 258848

Disclaimer
Information contained in this certificate relates only to the land for which this certificate is issued on the day it is issued. This information is provided in good faith and Council shall not incur any liability in respect of any such advice. Council relies on state agencies for advice and accordingly can only provide that information in accordance with the advice. Verification of the currency of agency advice should occur. For further information, please contact Council by telephoning (02) 4988 0255 or email plancert@portstephens.nsw.gov.au.

Title Information
Title information shown on this Planning Certificate is provided from Council's records and may not conform to information shown on the current Certificate of Title. Easements, restrictions as to user, rights of way and other similar information shown on the title of the land are not provided on this planning certificate.

Inspection of the land
The Council has made no inspection of the land for the purposes of this Planning Certificate.

PART A: INFORMATION PROVIDED UNDER SECTION 10.7(2)

Matters contained in this certificate apply only to the land on the date of issue.

1. Names of relevant planning instruments and DCPs

(1) The name of each environmental planning instrument that applies to the development on the land.

State Environmental Planning Policies

State Environmental Planning Policy No 21 – Caravan Parks

State Environmental Planning Policy No 33 – Hazardous and Offensive Development

State Environmental Planning Policy No 36 – Manufactured Home Estates

State Environmental Planning Policy No 50 – Canal Estate Development

State Environmental Planning Policy No 55 – Remediation of Land

State Environmental Planning Policy No 64 – Advertising and Signage

State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development

State Environmental Planning Policy (Affordable Rental Housing) 2006

State Environmental Planning Policy (Building Sustainability Index BASIX) 2004

State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State Significant Precincts) 2005

State Environmental Planning Policy (Primary Production and Rural Development) 2019

State Environmental Planning Policy (Koala Habitat Protection) 2019

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (Coastal Management) 2018

Local Environmental Plan

Port Stephens Local Environmental Plan 2013

(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless Secretary has notified the Council that the making of the proposed instrument has been deferred indefinitely or has not been approved).

Draft State Environmental Planning Policies

No draft State Environmental Planning Policies affect the site the subject of this Certificate.

Draft Local Environmental Plan
No draft Local Environmental Plans currently exist which affect the site the subject of this certificate.

Development Control Plans
(3) The name of each development control plan that applies to the carrying out of development on the land.

Port Stephens Development Control Plan 2014.

2. Zoning and land use under relevant Local Environmental Plan(s)
What is the identity of the zoning for the land?

RU2 Rural Landscape

Land Use Table – RU2 Rural Landscape

(a) The land is zoned RU2 Rural Landscape under the provisions of Part 2 in the Port Stephens Local Environmental Plan 2013.

(b) **Item 2 – Permitted without consent**

Extensive agriculture; Home occupations; Intensive plant agriculture

(c) **Item 3 – Permitted with consent**

Agriculture; Airstrips; Animal boarding or training establishments; Aquaculture; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Dual occupancies; Dwelling houses; Eco-tourist facilities; Environmental facilities; Environmental protection works; Extractive industries; Farm buildings; Flood mitigation works; Forestry; Group homes; Helipads; Home-based child care; Home businesses; Home industries; Information and education facilities; Jetties; Landscaping material supplies; Plant nurseries; Recreation areas; Recreation facilities (outdoor); Roads; Roadside stalls; Rural industries; Tourist and visitor accommodation; Turf farming; Veterinary hospitals; Water recreation structures; Water supply systems

(d) **Item 4 - Prohibited**

Backpackers' accommodation; Hotel or motel accommodation; Serviced apartments; Any development not specified in item 2 or 3

(e) **Development Standard for the erection of a dwelling-house**

Clause 4.2B in the Port Stephens Local Environmental Plan 2013 includes a development standard that fixes a minimum land dimension for the erection of a dwelling-house. This clause applies to the land. The minimum lot size for the erection of a dwelling-house is identified on the Lot Size Map.

(f) Does the land include or comprise a critical habitat?
Port Stephens Local Environmental Plan 2013 does not identify the land as including or comprising critical habitat.

(g) Is the land in a heritage conservation area?
The land is not located within a heritage conservation area under the Port Stephens Local Environmental Plan 2013.

(h) Is an item of environmental heritage situated on the land?
The land is not identified as containing an item of environmental heritage significance under the provisions in Port Stephens Local Environmental Plan 2013.

Note. The land subject of this certificate does not have a site specific clause applying to it.

2A. Zoning and land use under *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*

Not applicable to the Port Stephens Local Government Area.

3. Complying Development
Whether or not the land to which the certificate relates is land on which complying development may be carried out under *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*?

Housing Code
Complying development under the General Housing Code MAY NOT be carried out on the land.

Inland Code
Complying development under the Inland Code MAY NOT be carried out on the land.

Rural Housing Code
Complying development under the Rural Housing Code MAY NOT be carried out on the land.

Low Rise Medium Denisty Housing Code
Complying development under the Low Rise Medium Density Housing Code MAY NOT be carried out on the land.

Greenfield Housing Code
Complying development under the Greenfield Housing Code MAY NOT be carried out on the land.

Housing Alterations Code
Complying development under the Housing Alterations Code MAY be carried out on the land.

General Development Code
Complying development under the General Development Code MAY be carried out on the land.

Commercial and Industrial Alterations Code
Complying development under the Commercial and Industrial alterations Code MAY be carried out on the land.

Commercial and Industrial (New Buildings and Additions) Code
Complying development under the Commercial and Industrial (new buildings and additions) code MAY NOT be carried out on the land.

Container Recycling Facilities Code
Complying development under the Container Recycling Facilities code MAY be carried out on the land.

Subdivisions Code
Complying development under the Subdivision Code MAY be carried out on the land.

Demolition Code
Complying development under the Demolition Code MAY be carried out on the land.

Fire Safety Code
Complying development under the Fire Safety Code MAY be carried out on the land.

Note. If the land is a lot to which the Housing Code, Rural Housing Code, Low Rise Medium Density Housing Code, Greenfield Housing Code, Housing Alterations Code, General Development Code, or Commercial and Industrial (New Buildings and Additions) Code (within the meaning of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* applies, complying development may be carried out on any part of the lot that is not affected by the provisions of clause 1.19 of that Policy

4. (Repealed)

4A. (Repealed)

4B. Annual charges under *Local Government Act 1993* for coastal protection services that relate to existing coastal protection works

The land is not subject to annual charges under section 496B of the *Local Government Act 1993* for coastal protection services relating to existing coastal protection works to which the owner (or any previous owner) of the land has consented.

Note. "existing coastal protection works" are works to reduce the impact of coastal hazards on land (such as seawalls, revetments, groynes and beach nourishment) that existed before the commencement of section 553B of the *Local Government Act 1993.*

5. Mine Subsidence
Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961* or within an area declared to be a mine subsidence district under the *Coal Mine Subsidence Compensation Act 2017*.

The land is not within a proclaimed or declared mine subsidence district.

6. Road widening and road realignment
Council's records indicate that the land the subject of this Certificate is not affected by any road widening or road realignment under:- (1) Section 25 of the Roads Act 1993; or (2) any environmental planning instrument; or (3) any resolution of the Council.

7. Council and other public authority policies on hazard risk restrictions
Council's records indicate that the land subject of this certificate IS NOT affected by RAAF Base Williamtown & Salt Ash Air Weapons Range 2025 Australian Noise Exposure

Forecast (10th August 2011) or the Aircraft Noise Planning Area under the Port Council Aircraft Noise Policy.

7A. Flood related development controls information

FLOOD PLANNING AREA - Development on the land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings or any other purpose is subject to flood related development controls. If you wish to apply for a Flood Certificate, please refer to Council's Flood Certificate Information on our website at www.portstephens.nsw.gov.au

8. Land reserved for acquisition

Whether or not any environmental planning instrument or proposed environmental planning instrument makes provision in relation to the acquisition of the land by a public authority, as referred to in Section 3.15 of the Environmental Planning and Assessment Act 1979 (the Act).

The Port Stephens Local Environmental Plan 2013 DOES NOT provide for the acquisition of this land, or part thereof, by a public authority as referred to in Section 3.15 of the Act.

9. Contributions plans

The name of each contributions plan applying to the land

* Port Stephens Local Infrastructure Contributions Plan 2020
* Port Stephens Fixed Local Infrastructure Contributions Plan 2020

.

Note. These documents specify development contributions required towards the cost of providing additional community services or facilities if a property is developed. They are available on request from Council or can be viewed www.portstephens.nsw.gov.au.

9A. Biodiversity certified land

If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect.

No

Note. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016*.

10. Biodiversity stewardship sites

If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage).

No

Note. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.

10A. Native vegetation clearing set asides

If the land contains a set aside area under section 60ZC of the *Local Land Services Act 2013*, a statement to that effect (but only if the council has been notified of the existence

of the set aside area by Local Land Services or it is registered in the public register under that section).

The land DOES NOT contain a set aside area under section 60ZC of the Local Land Services Act 2013.

11. Bush fire prone land

Whether or not some, all or none of the land is bush fire prone land.

All of the land is identified as bush fire prone land in Council's records. Further details of any applicable restrictions on development of the land may be obtained on application to Council. For further information, please contact Council's Duty Officer by telephoning 49880115.

12. Property vegetation plans

If the land is land to which a property vegetation plan under the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).

Council has not been notified of any Property Vegetation Plans under the Native Vegetation Act 2003 (and that continues in force) that affect the land to which this certificate applies.

13. Orders under *Trees (Disputes Between Neighbours) Act 2006*

Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).

The land is not affected by an order under the *Trees (Disputes Between Neighbours) Act 2006* (of which Council is aware).

14. Directions under Part 3A

Whether there is a direction by the Minister in force under section 75P(2)(c1) of the Act.

The land is not affected by a direction by the Minister, in force under section 75P(2)(c1) of the *Environmental Planning and Assessment Act 1979*.

15. Site compatibility certificates and conditions for seniors housing

If the land is land to which *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* applies:

(a) Whether or not Council is aware of a current site compatibility certificate (seniors housing), in respect of the proposed development on the land.

Council is not aware of a site compatibility certificate (seniors housing) issued in respect of the subject land.

(b) Whether or not any terms of a kind referred to in clause 18(2) of that Policy that have been imposed as a condition of consent to a development application granted after October 2007 in respect of the land.

No terms referred to in clause 18(2) of the policy have been imposed as a condition of development consent in respect of the land to which this certificate relates.

16. Site compatibility certificates for infrastructure, schools or TAFE establishments

Whether or not Council is aware of a valid site compatibility certificate (infrastructure) or site compatibility certificate (schools, or TAFE establishments) in respect of proposed development on the land.

Council is not aware of a valid site compatibility certificate (infrastructure) or site compatibility certificate (schools, or TAFE establishments) in respect of proposed development on the land.

17. Site compatibility certificates and conditions for affordable rental housing

(1) Whether or not Council is aware of a current site compatibility certificate (affordable rental housing) in respect of proposed development on the land.

Council is not aware of a current site compatibility certificate issued under *State Environmental Planning Policy (Affordable Rental Housing) 2009*.

(2) Whether or not any terms of a kind referred to in clause 17 (1) or 38 (1) of *State Environmental Planning Policy (Affordable Rental Housing) 2009* that have been imposed as a condition of consent to a development application in respect of the land.

The land is not affected by any terms of a kind (of which Council is aware) referred to in clause 17(1) or 38(1) of *State Environmental Planning Policy (Affordable Rental Housing) 2009* that have been imposed as conditions of consent to a development application granted after 11th October, 2007 in respect of the land.

18. Paper subdivison information

(1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot.
(2) The date of any subdivision order that applies to the land.
(3) Words and expressions used in this clause have the same meaning as they have in Part 16C of *Environmental Planning and Assessment Regulation 2000*.

Not applicable.

19. Site verification certificates

Whether or not Council is aware of a current site verification certificate, in respect of the land.

Council is not aware of a current site verification certificate in respect of the land.

20. Loose-fill asbestos insulation

Whether or not the land includes any residential premises (as defined in Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on a register of residential premises that contain or have contained loose-fill asbestos insulation.

The land DOES NOT include any residential dwelling identified on the Loose-Fill Asbestos Insulation Register as containing loose-fill asbestos ceiling insulation. For further information, please contact Department of Fair Trading by telephoning 13 77 88 or go to their website at www.fairtrading.nsw.gov.au.

21. Affected building notices and building product rectification orders

(a) Whether nor not there is any affected building notice of which the council is aware that is in force in respect of the land.
There is no affected building notice in force in respect of the land.

A statement of:

(b) Whether there is any building product rectification order of which the council is aware that is in force in respect of the land and has not been fully complied with.

No

(c) Whether any notice of intention to make a building product rectification order of which the council is aware has been given in respect of the land and is outstanding.

No

Additional matters

Note. The following matters are prescribed by section 59 (2) of the Contaminated Land Management Act 1997 as additional matters to be specified in a planning certificate:

(a) Whether or not the land to which the certificate relates is significantly contaminated land within the meaning of that Act.
(b) Whether or not the land to which the certificate relates is subject to a management order within the meaning of that Act.
(c) Whether or not the land to which the certificate relates is the subject of an approved voluntary management proposal within the meaning of the Act.
(d) Whether or not the land to which this certificate relates is subject to an ongoing maintenance order within the meaning of that Act.
(e) Whether or not the land to which the certificate relates is the subject of a site audit statement within the meaning of that Act – if a copy of such statement has been provided at any time to the local authority issuing the certificate.

There are no prescribed matters under section 59(2) of the Contaminated Land Management Act 1997 to be disclosed.

PART B: INFORMATION PROVIDED UNDER SECTION 10.7(5)

This information is provided in accordance with section 10.7(5) of the *Environmental Planning and Assessment Act 1979*. Section 10.7(6) states that Council shall not incur any liability in respect of advice provided in good faith pursuant to section 10.7(5) of the Act. If this information is to be relied upon, it should be independently checked.

Heritage

Port Stephens Council must take into consideration the likely effect of proposed development on the heritage significance of a heritage item, heritage conservation area, archaeological site or potential archaeological site, and on its setting, when determining an application for consent to

carry out development on land in its vicinity. Please contact Council's Development Assessment and Compliance Section by telephoning 49880115.

Aboriginal Archaelogy
When determining a development application on known or potential archaeological sites of both Aboriginal and non-Aboriginal heritage significance, Port Stephens Council must consider an assessment of how the proposed development would affect the conservation of the site and any relic known or reasonably likely to be located at the site. Please contact Council's Development Assessment and Compliance Section on 49880115 for more information.

Aircraft Noise
All areas of the Port Stephens Local Government area may be affected by aircraft noise from time to time. RAAF Base Williamtown – Newcastle Airport and Salt Ash Air Weapons Range are located within the Port Stephens Local Government Area. Further information can be obtained from the Commonwealth Department of Defence website and from the Port Stephens Council Strategy and Environment Section and you are advised to make further enquiries.

Wetlands
The land or part thereof, is identified as containing a wetland in Port Stephens Local Environmental Plan 2013. The wetland is identified on the wetland map in Port Stephens Local Environmental Plan 2013 and Clause 7.9 of Local Environmental Plan 2013 and applied to the land.

Koala Habitat
Parts of the Port Stephens Local government Area are affected by Koala Habitat and subject to the Port Stephens Comprehensive Koala Plan of Management 2002 made under State Environmental Planning Proposal No. 44. Further information can be obtained from Council's Strategy & Environment Section on 49880326 or email plancert@portstephens.nsw.gov.au.

Invasive Species
Parts of the Port Stephens Local Government Area contain plants that pose a risk according to the *Biosecurity Act 2015* which may restrict the use of the land. For further information please contact Council's Strategy & Environment Section on 4988 0326 or email weeds@portstephens.nsw.gov.au

RAAF Base Williamtown PFAS Management Area
The land is within the Williamtown RAAF Base Per- and Poly-Fluoroalkyl Substances (PFAS) Management Area. The Department of Defence is undertaking a long-term environmental investigation and assessment of the Williamtown RAAF Base site and surrounding areas as relates to PFAS contamination.

The NSW Government recommends that residents living inside the Williamtown RAAF Base PFAS Management Area follow precautionary measures to minimise their exposure to PFAS chemicals originating from the RAAF Base. Details of the current precautionary advice is available from the NSW EPA at www.epa.nsw.gov.au or by phoning 131 555.

Development consents relating to the land
Please contact Customer Relations on (02) 4988 0255, for any enquiries regarding development consent over the land in the past 5 years.

Issued by Port Stephens Council Development Services Group,
on behalf of **Wayne Wallis,General Manager**

APPENDIX H:

Site Photographs



Photograph 1 - Showing residences from rear (south side).



Photograph 2 - Showing residences and concrete driveway from front (north side).

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	1 and 2
	Title:	SITE PHOTOGRAPHS		



Photograph 3 - Showing larger metal shed.

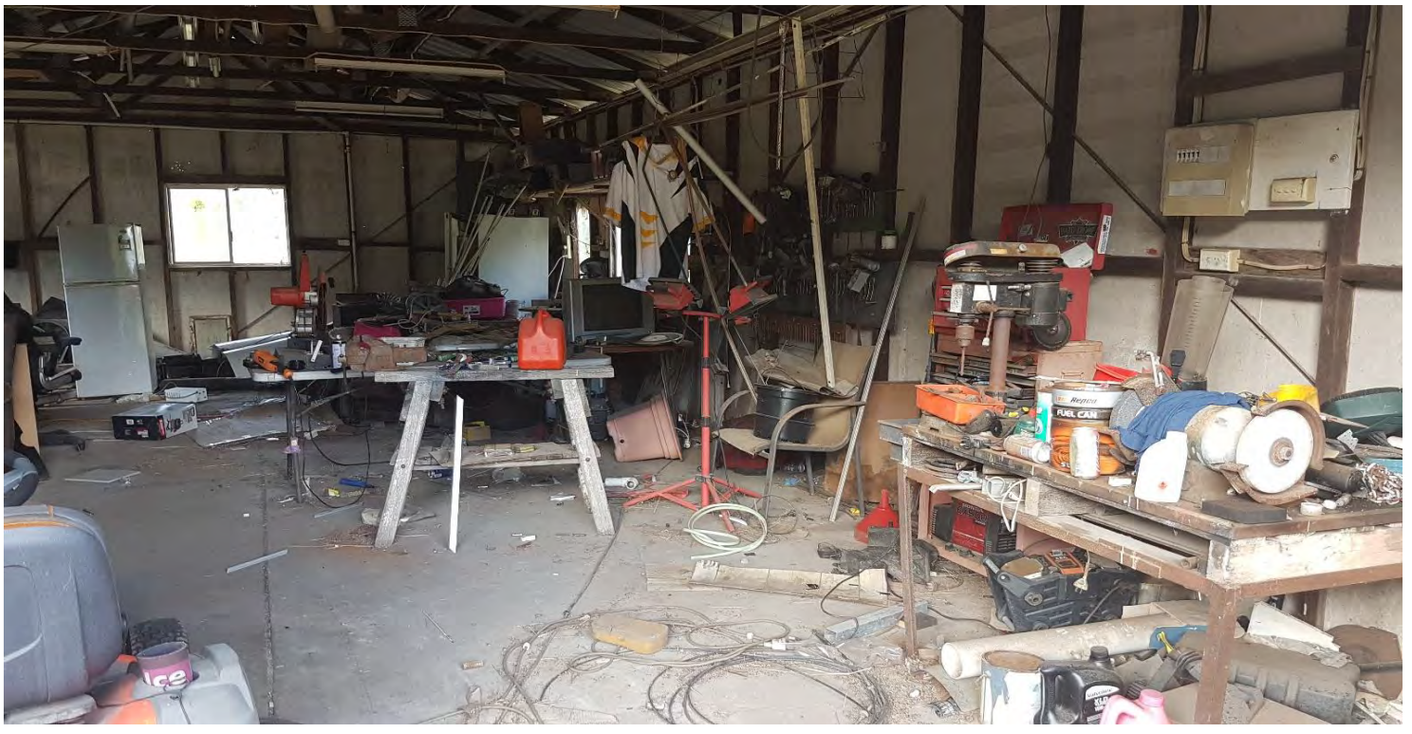


Photograph 4 - Showing smaller fibro shed.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	3 and 4
	Title:	SITE PHOTOGRAPHS		



Photograph 5 - Showing demountable home.



Photograph 6 - Showing inside smaller fibro shed.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	5 and 6
	Title:	SITE PHOTOGRAPHS		



Photograph 7 - Showing inside smaller fibro shed.



Photograph 8 - Showing inside larger metal shed.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	7 and 8
	Title:	SITE PHOTOGRAPHS		



Photograph 9 - Showing inside larger metal shed.



Photograph 10 - Showing waste materials around sheds.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	9 and 10
	Title:	SITE PHOTOGRAPHS		



Photograph 11 - Showing waste materials around sheds.



Photograph 12 - Showing waste materials around sheds.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	11 and 12
	Title:	SITE PHOTOGRAPHS		



Photograph 13 - Showing waste materials around sheds.



Photograph 14 - Showing low-lying area between sheds and residences

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	13 and 14
	Title:	SITE PHOTOGRAPHS		



Photograph 15 - Showing bushland to the south.



Photograph 16 - Showing bushland to the east.

Qualtest LABORATORY (NSW) PTY LTD	Client:	MS CHRISTINE JORDON	Project No:	NEW20P-0178-AA
	Project:	PRELIMINARY CONTAMINATION ASSESSMENT	Date:	10/11/2020
	Location:	42 FULLERTON COVE ROAD, FULLERTON COVE	No:	15 and 16
	Title:	SITE PHOTOGRAPHS		

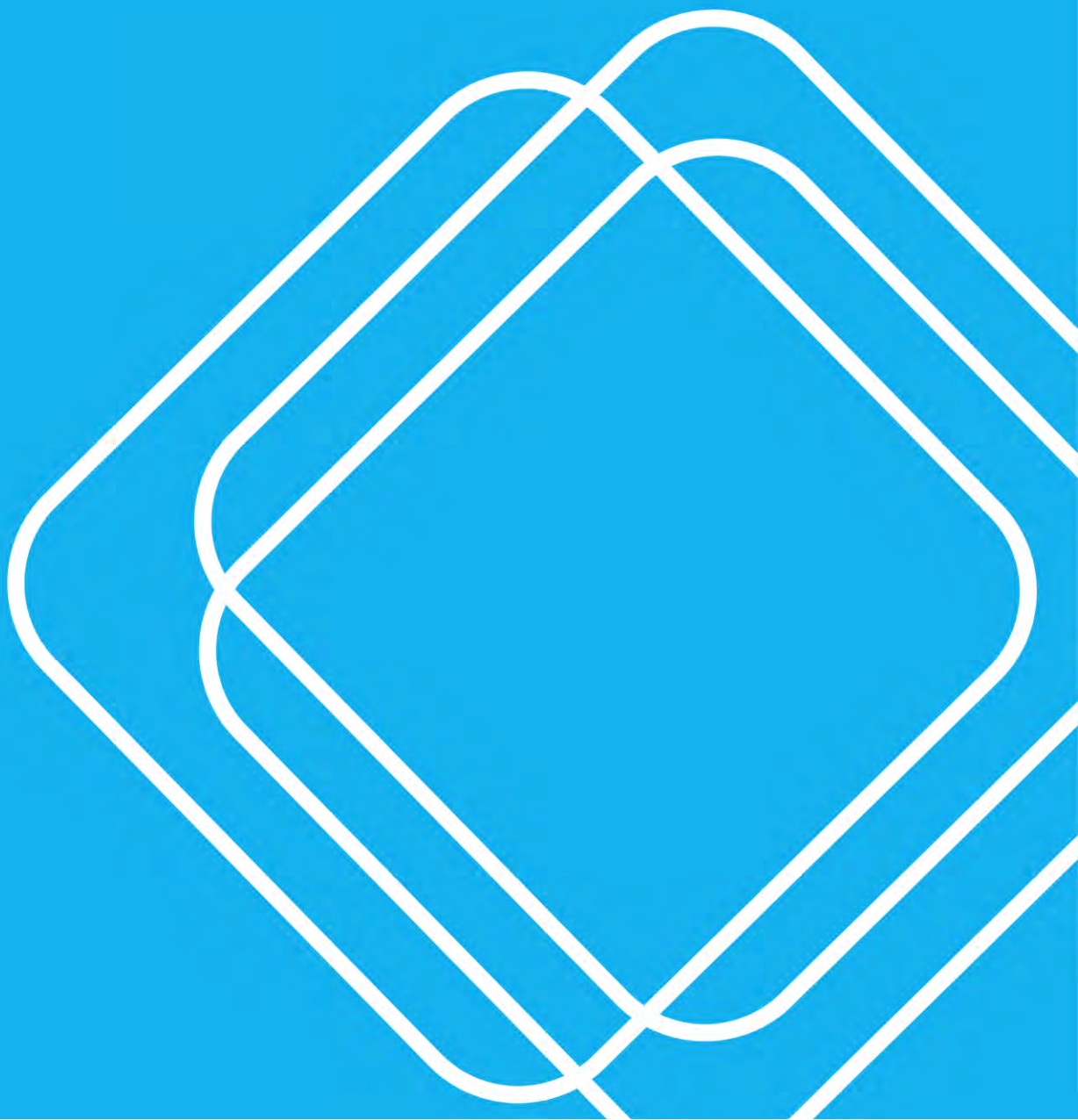
ATTACHMENT 9 – Traffic Impact Assessment

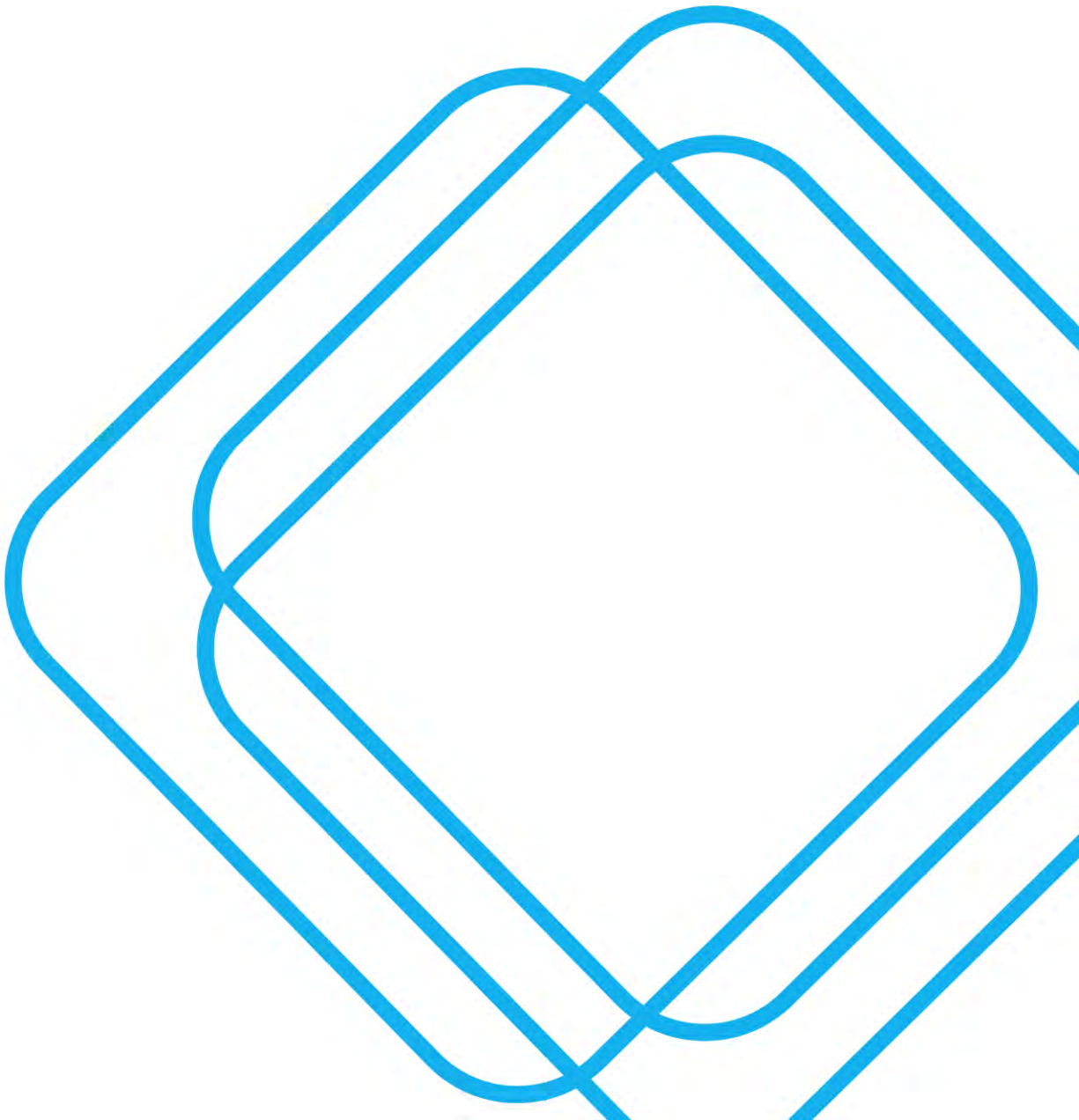
SCT Consulting

FULLERTON COVE RETAIL PLANNING PROPOSAL

Traffic and Transport Impact Assessment

28 APRIL 2022





Quality Assurance

Project:	Fullerton Cove Retail Planning Proposal		
Project Number:	SCT_00210		
Client:	Mrs. Christine Jordan	**ABN:**	N/A
Prepared by:	SCT Consulting PTY. LTD. (SCT Consulting)	**ABN:**	53 612 624 058

``

Quality Information	
Document name:	Fullerton Cove Retail Planning Proposal
Prepared:	Matthew Cen, Consultant
Reviewed:	Shawn Cen, Senior Consultant
Authorised:	Andy Yung, Director

Revision	Revision Date	Details
1.0	4 December 2020	Draft report
2.0	8 December 2020	Final report
3.0	10 December 2021	Final report – Updated to reflect yield increase
4.0	24 April 2022	Final report – Updated traffic modelling results
5.0	28 April 2022	Final report – Minor updates

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Executive Summary

Purpose of this report

SCT Consulting has been engaged by Monteath & Powys on behalf of Mrs. Christine Jordan to undertake a Traffic and Transport Impact Assessment to support the planning proposal for the site at 42 Fullerton Cove Road neighbourhood centre. The site would house a neighbourhood centre to provide day-to-day retail services for the residents in Fern Bay and Fullerton Cove.

The proposal

The subject site is bounded by Fullerton Cove Road to the northwest and Nelson Bay Road to the south, which covers a total area of around 6.7 hectares. The planning proposal would contain around 3,500m^2 supermarket and 2,000m^2 retail specialities in the northern part of the site covering an area of 2.5 hectares whereas the remaining 4.2 hectares would be rezoned as E2 Environmental Conservation. The estimated job increase would be 60 to 90 jobs for the retail development.

Future planning context

The Port Stephens Local Strategic Planning Statement (LSPS) 2040 sets out social, economic, and environmental planning priorities for land uses in Port Stephens. Transport initiatives in the LSPS aim to improve active and public transport connections from residential areas such as Fern Bay to major employment areas in Greater Newcastle such as Williamtown. This includes the provision of footpaths, shared paths, and end of trip facilities for cyclists in centres, as well as investigations for a ferry terminal at North Stockton / Fern Bay.

Council aims to improve the provision of pathways connections and missing links throughout Port Stephens as part of the Port Stephens Pathways Plan adopted in 2016. A shared path is proposed along Fullerton Cove Road between The Cove Drive to the south and Nelson Bay Road to the north of the site. Another shared path is proposed along Nelson Bay Road connecting Seaside Village to Fern Bay to the southwest. These paths align with the LSPS to provide better active transport connectivity across residential areas and to employment centres in the area.

The Fern Bay and North Stockton Strategy 2020 seeks to identify opportunities for Fern Bay and North Stockton to create a pedestrian focused place that offers housing diversity, a mixed-use town centre, connected open spaces and community facilities. Transport outcomes and directions identified to achieve this include the provision of cycleways and footpaths to increase the safety of active transport modes, widening of Nelson Bay Road to two lanes in each direction allowing for bus and access lanes, and increasing the quality of bus stops to promote public transport ridership. Providing bus stops with shelter, seating, signage, information, and lighting would increase the convenience and amenity of public transport passengers within the area and promote mode share.

Existing conditions

2016 Census Journey to Work data was analysed to determine current travel behaviour in the area during peak travel periods. The study area had a noticeable higher car mode share, 82 per cent, in comparison to the 75 per cent of the Hunter Region. Bus services had a smaller mode share of two per cent, but higher than the Hunter Region average (1%). Walking trips made up four per cent of trips which was also higher than that of the Hunter Region.

The main roads in the vicinity of the development include the B63 Nelson Bay Road, Fullerton Cove Road, The Cove Drive and Seaside Boulevard. A SIDRA Intersection 9 Network model has been prepared for key intersections on the edge of the precinct to understand the existing network performance and to test the impacts of the development. Intersection performance has been assessed for the weekday PM and weekend peak hours. Modelling indicates the current road network is operating at Level of Service A during the peak hours assessed.

The study area is located within walking distance of several bus stops on Fullerton Cove Road (300m) and Nelson Bay Road (600m). These bus stops are served by routes connecting to Newcastle, Newcastle Airport, and smaller residential areas such as Lemon Tree Passage and Fingal Bay. However, these services are infrequent and operate approximately once per hour.

Cycling infrastructure is provided along Nelson Bay Road, Seaside Boulevard, and on Fullerton Cove Road up to The Cove Drive. Continuous pedestrian footpaths are provided between The Cove Village and Seaside Village allowing pedestrian connectivity to the proposed development.

Transport assessment

The proposed development is estimated to generate 507 vehicle trips in the PM peak hour, and 672 vehicle trips in the weekend peak hour. The cumulative impacts of nearby developments and planning proposals were also considered in the assessment, generating a total of 1,400 and 1,658 vehicle trips during the PM and weekend peaks respectively. The intersection performance results under different scenarios in 2030 are listed in **Table ES1**. The network operates at satisfactory levels in all modelled periods and does not require any upgrades.

Table ES1 2033 intersection performance

Intersection	Scenario 2: 2033 With Background Traffic Growth, Do Nothing			Scenario 4: 2033 With Development, Do Nothing			Scenario 6: 2033 With Development and Cumulative Impacts, Do Nothing		
	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS
Weekday PM Peak									
Fullerton Cove Road / The Cove Drive	9.2s	A	0.031	9.2s	A	0.197	9.2s	A	0.222
Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard	16.2s	B	0.692	20.7s	B	0.816	37.4s	C	0.912
Weekend Peak									
Fullerton Cove Road / The Cove Drive	11.0s	A	0.028	11.0s	A	0.248	11.2s	A	0.267
Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard	15.1s	B	0.369	16.5s	B	0.482	17.7s	B	0.546

Both intersections operate at Level of Service A in all future scenarios, with the exception of Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard in 2033 under development and cumulative impacts. As a result, no upgrades are required to accommodate the future increase in volumes.

The current public transport network provides limited services to the site. Although there are bus stops within walking distance to the site, the frequency of routes serving these stops is approximately once per hour. The site will likely generate public transport demand which could be underserviced and would benefit from more frequent public transport services and quality bus stop amenities.

The active transport network around the planning proposal allows for walking and cycling to nearby residential precincts, The Cove Village and Seaside Village, and is considered sufficient to accommodate future pedestrian and cyclist demands after the delivery of the planned infrastructure along Nelson Bay Road.

Conclusion

The planning proposal is positively aligned with strategic planning and transport policy in the Hunter and Newcastle regions including the Hunter Regional Plan 2036, Greater Newcastle Metropolitan Plan 2036 and Port Stephens Local Strategic Planning Statement 2040. The development will promote economic activity and provide services closer to residential precincts in the area.

The planning proposal aligns with the active transport initiatives proposed by Hunter Regional Plan 2036 and the Port Stephens Pathways Plan 2016. The proximity of the planning proposal to residential dwellings promotes the opportunity for active transport by providing a destination accessible by walking and cycling.

Without infrastructure upgrades, the road network will have sufficient capacity to accommodate these additional trips alongside the cumulative impacts of nearby planning proposals and proposed developments. Future patrons of the neighbourhood centre would benefit from a footpath connection between the centre and the existing footpath network along Fullerton Cove Road.

1.0 Introduction

1.1 Background

Port Stephens Council has resolved that a planning proposal be prepared to rezone part of Lot 14 DP 258848 to B1 Neighbourhood Centre with the remaining area to rezone Environmental Conservation. The rezoning will enable the future use of the land zoned B1 for a neighbourhood centre in Fullerton Cove to provide day-to-day retail services for the residents in Fern Bay and Fullerton Cove. The subject site is bounded by Fullerton Cove Road to the northwest and Nelson Bay Road to the south as shown in **Figure 1–1**.

Figure 1–1 Study area



SCT Consulting has been engaged by Monteath & Powys on behalf of Mrs. Christine Jordan to undertake a Traffic and Transport Impact Assessment to support the planning proposal for the site at 42 Fullerton Cove Road neighbourhood centre.

The site covers a total area of around 6.7 hectares. The planning proposal would contain around 3,500m^2 supermarket and 2,000m^2 retail specialities in the northern part of the site covering an area of 2.5 hectares whereas the remaining 4.2 hectares would be rezoned as E2 Environmental Conservation. The estimated job increase would be 60 to 90 jobs for the retail development.

1.2 Purpose and scope of report

The purpose of this Traffic and Transport Impact Assessment is to support the planning proposal for 42 Fullerton Cove Road neighbourhood centre. The objectives of the assessment are to:

- Inform future planning controls to ensure a coordinated and efficient approach to land use planning, environmental management and transport infrastructure
- Ascertain the cumulative and regional traffic and transport impacts associated with future land-based demands associated with the rezoning
- Maximise efficiency and safety of the existing / proposed transport systems in proximity to the subject site.

The scope of this traffic and transport impact assessment is to:

- Review of relevant background documents and information including relevant state, regional and local planning policies, transport planning documents and parking Development Control Plan (DCP) and standards
- Update the desktop review of existing traffic and transport conditions including Census, Journey-to-work data, travel mode and existing network descriptions and performance
- Collection and analysis of weekday / weekend peak hour traffic data at Nelson Bay Road / Fullerton Cove Road (south), Nelson Bay Road / Fullerton Cove Road (north) and Fullerton Cove Road / The Cove Drive
- Determine net increase trip generation of the proposed development (based on the agreed development yield and parking provision)
- Distribution of the net trip generation to the surrounding road network based on the preferred access strategy and travel pattern
- Determine compliant parking numbers based on Council DCP requirements
- Undertake traffic modelling (in SIDRA) of the three surrounding intersections for two peak periods (one weekday PM and one weekend peak) for the following scenarios:
    - 2020 base case (existing traffic)
    - Future year base case
    - Future year base case + proposed development
    - Future year base case + proposed development + any infrastructure upgrades
    - Future year base case + proposed development + other planning proposals
    - Future year base case + proposed development + other planning proposals + any infrastructure upgrades
- Identify public and active transport measures and sustainable travel initiatives for the development.

1.3 Report structure

This report has been structured into the following sections:

- **Section 2** reviews the relevant strategic planning and transport planning context
- **Section 3** describes the existing transport conditions in and around the site for all modes of transport
- **Section 4** describes the proposed development including development yield and proposed transport network
- **Section 5** discusses the traffic and transport appraisal which covers the traffic modelling methodology; the likely trip generation from the development; the forecast traffic impacts; and the mitigation measures that have been tested
- **Section 6** presents the conclusions of the assessment.

2.0 Strategic Context

2.1 Site context

The 42 Fullerton Cove Road site is bounded by Fullerton Cove Road to the north and west and Nelson Bay Road to the south. It adjoins existing rural land to the east. The site's regional context is shown in **Figure 2–1**.

Figure 2–1 Site context



The site is currently zoned as RU2 Rural Landscape. The planning proposal seeks to rezone approximately 2.5 hectares to B1 Neighbourhood Centre with the remaining 4.2 hectares to be rezoned E2 Environmental Conservation to address the environmental constraints of the site.

The surrounding land uses are a mixture of rural, residential and environmental conservation zones. The neighbouring properties consist of residential and rural dwellings, rural activities including livestock grazing and a wedding venue with a guesthouse at Stanley Park House to the north. The nearest commercial development that offers day-to-day grocery items is Stockton IGA located 8 km to the south.

2.2 Hunter Regional Plan 2036

The Hunter Regional Plan 2036 provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions. The Hunter has a projected population to be 1.1 million by 2036. A few key directions were relevant to the site including:

- Integrate transport and land use planning to enhance public transport connectivity and improve employment accessibility. Focus the development to create compact communities that allow 95 per cent of people to live within 30 minutes of a strategic centre
- Enhance inter-regional linkages to support economic growth to ensure there are improved connections to jobs, study and centres for Hunter residents
- Grow the economy of Mid-coast and Port Stephens with actions to enhance links to regional services in Greater Newcastle and plan for and provide infrastructure and facilities that support the ageing population
- Create healthy built environments through good design to enhance the quality of neighbourhoods by integrating recreational walking and cycling networks into the design of new communities to encourage physical activity.

Implications for the site: The proposal would enable the development of a neighbourhood centre that supports economic growth and diversity within Fern Bay and Fullerton Cove. The transport networks, including cycling and walking paths, will be extended for both recreation and commuting, and enhanced inter-regional transport connections will bolster business and industry growth in the local area.

2.3 Greater Newcastle Metropolitan Plan 2036

The Greater Newcastle Metropolitan Plan 2036 specified key outcomes to improve connections to jobs, services and recreation by integrating land use and transport planning. It requires the City of Newcastle and Port Stephens Council to work together to coordinate housing and infrastructure development in Fern Bay to protect transport connections between the Newcastle Airport and Newcastle Port.

Figure 2–2 Greater Newcastle Vision 2036 (The red star denotes the site location)



Source: Greater Newcastle Metropolitan Plan, 2036

A series of development strategies were identified in Greater Newcastle Metropolitan Plan 2036 (**Figure 2–2**):

– Address changing retail consumer demand by undertaking public domain improvements

– Plan jobs closer to homes and enable small business growth in residential zones close to centres and transport connections

– Create great places and improve the amenity of centres and urban renewal corridors through placemaking initiatives that strengthen the connection between people and the places they share.

Implications for the site: The improved future connection on Nelson Road in the vicinity of the site promotes job growth and accessibility to services along the corridor with a targeted bus ride of 45 minutes between Newcastle City Centre and the airport. The site will benefit from improved public transport connections and become more closely connected with the Metro Core and Metro Heart of the Greater Newcastle.

2.4 Port Stephens Local Strategic Planning Statement 2040

The Local Strategic Planning Statement (LSPS) identifies the 20-year vision for land use in Port Stephens. It sets out social, economic, and environmental planning priorities for the future and identifies when they will be delivered.

Port Stephens offers a variety of diverse centres and neighbourhoods that connect residents, visitors and workers with their community, the environment and the opportunity for residents and visitors to use walking and cycling links to access local shops, schools, parks and sporting facilities. Port Stephens is the centre of an advanced transport network that provides easy local, regional and global connections and provides opportunities to export goods, services and skilled labour across Australia and the world. Major actions identified in Council's LSPS concerning transport include:

– Seek grant funding for infrastructure that supports healthy communities such as footpaths, shared paths and end of trip facilities for cyclists in centres

– Support investigations to establish a ferry terminal at North Stockton / Fern Bay

– Assess rezoning requests for consistency with the directions for transport infrastructure in local strategies

– Advocate for improved transport connections, including more active and public transport, from Raymond Terrace, Medowie and Fern Bay to major employment areas at Tomago and Williamtown and other centres in Greater Newcastle.

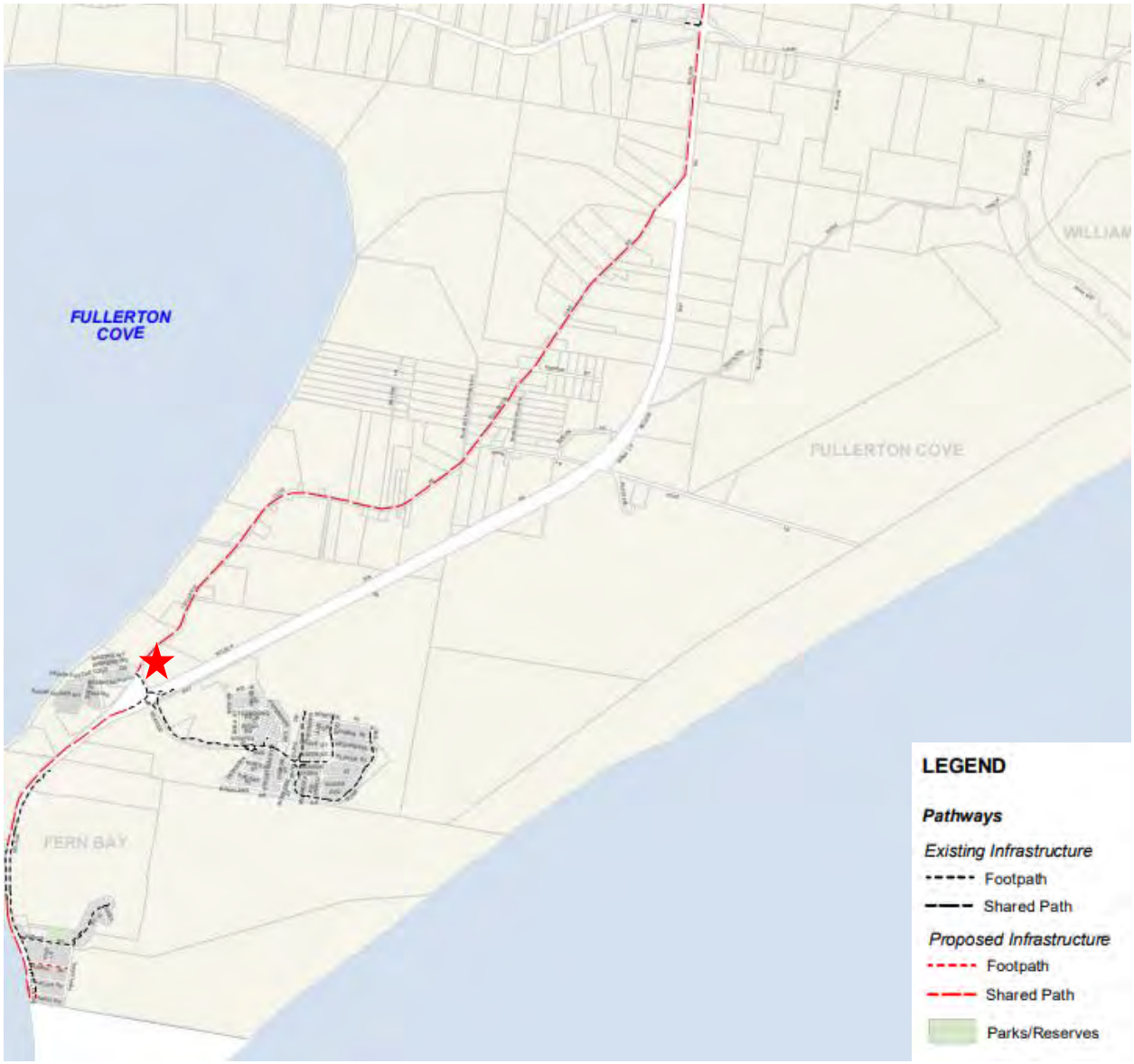
Implications for the site: The site would support planning for communities that can be accessed by public transport, walking and cycling such that it supports more active living and can help reduce car dependency, travel distance by car and congestion.

2.5 The Port Stephens Pathways Plan 2016

The Port Stephens Pathways Plan was adopted in 2016 showing existing footpaths and shared paths throughout Port Stephens as well as identifying locations for future pathways construction when funding becomes available. The identification of future pathway locations will allow Council to prioritise construction and apply for grant funding to assist Council in the provision of pathway connections and missing links.

As shown in **Figure 2–3**, a shared path would be proposed on Fullerton Cove Road from The Cove Drive to the south and connect with Nelson Bay Road to the north. A shared path would be also proposed on Nelson Bay Road southwest to Seaside Boulevard, which potentially connects the site with multiple residential developments in the vicinity of the site.

Figure 2–3 Pathways Plan for Fullerton Cove / Fern Bay (The red star denotes the site location)



Source: The Port Stephens Pathways Plan, 2016

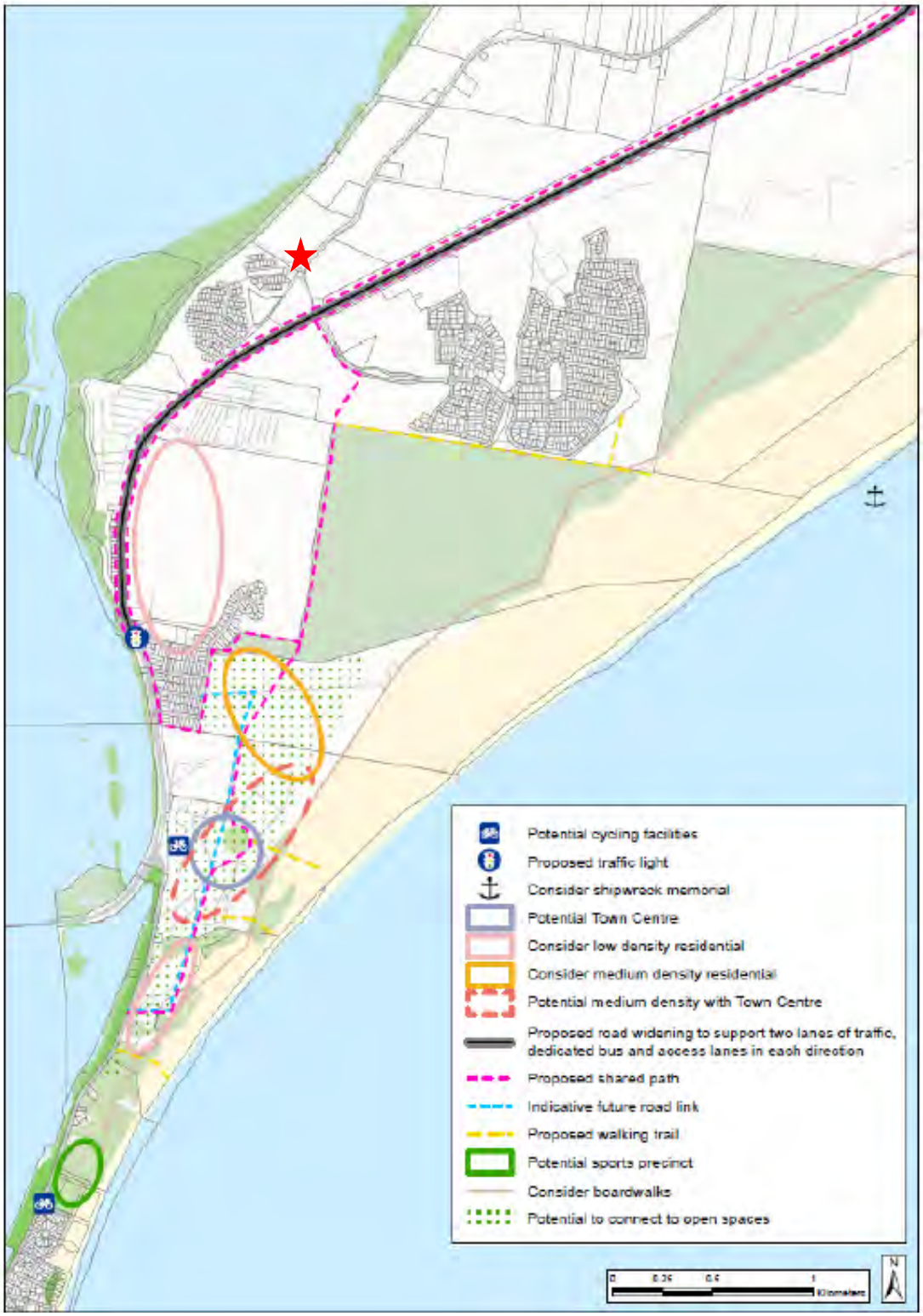
2.6 Fern Bay and North Stockton Strategy 2020

Port Stephens Council and City of Newcastle have developed the Fern Bay and North Stockton Strategy (the Strategy) to guide future development and ensure sufficient community infrastructure is provided for the growing community. The Strategy seeks to identify opportunities for Fern Bay and North Stockton to create a pedestrian focused place that offers housing diversity, a mixed-use town centre, connected open spaces and community facilities.

Below transport directions and outcomes are covered within the Strategy including (**Figure 2–4**):

- Safely connect people from homes to the mixed-use town centre and open spaces with footpaths and cycle paths
- Promote walking and cycling as part of everyday life
- Duplicate Nelson Bay Road to two lanes in each direction from Stockton to Newcastle Airport and allow shared path, bus and access lanes
- Increase opportunities for public transport use by providing high quality bus stops with shelter, seating, signage, information and lighting, forming part of the transport network enabling convenient and safe access within and from the Strategy Area.

Figure 2–4 Overall Structure Plan (The red star denotes the site location)



Source: Fern Bay and North Stockton Strategy, 2020

Implications for the site: The bus stops on both sides of Fullerton Cove Road in the location of the existing bus zones would be upgraded with seating and shelters whereas a shared path is proposed on Nelson Bay Road. These infrastructures promote public transport ridership and active transport mode share by potential customers of the site. The widening of Nelson Bay Road increases the capacity of this major transport corridor in the local area and mitigates the transport impact associated with the proposed development.

3.0 Existing Conditions

3.1 Travel behaviour

3.1.1 Census Journey to Work mode shares

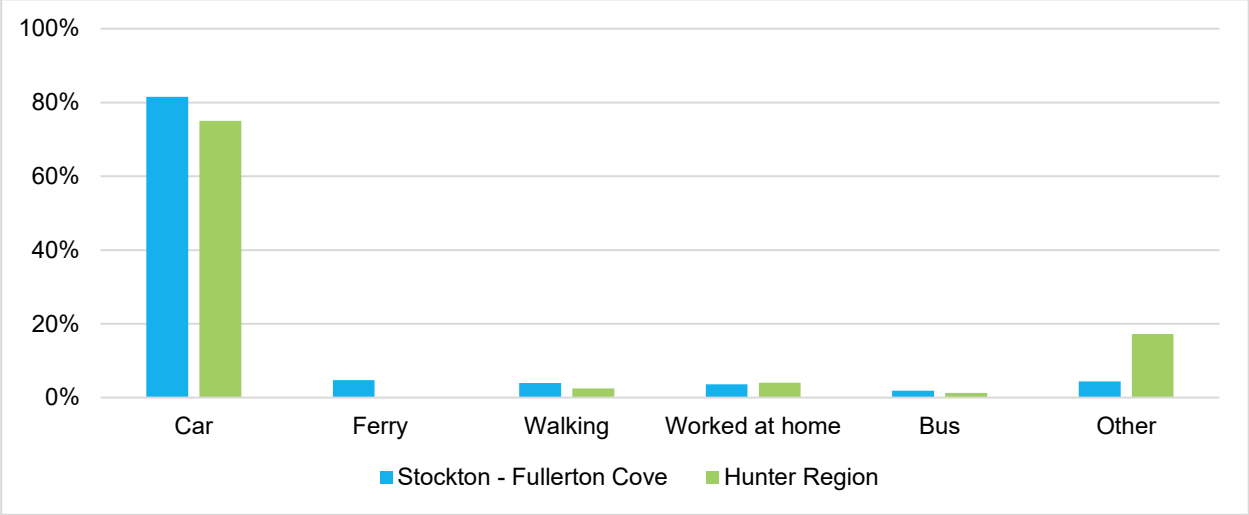
2016 Census Journey to Work data for the Stockton – Fullerton Cove Statistical Area level 2 (SA2) was analysed to determine the travel behaviour of the existing residents, as shown in **Figure 3–1**.

Figure 3–1 Study area for the journey to work analysis



The modes with the highest mode share are presented in **Figure 3–2**. The study area has a noticeable higher car mode share, 82 per cent, in comparison to the 75 per cent of the Hunter Region. Ferries and buses are the main public transport services in the area with five per cent of journeys being made by ferries to connect to Newcastle. Bus services have a smaller mode share of two per cent, but higher than the Hunter Region average (1%). Walking trips make up four per cent of trips which is also higher than that of the Hunter Region.

Figure 3–2 Comparison of Journey to Work mode shares between Stockton – Fullerton Cove and Hunter region



3.1.2 Household Travel Survey mode shares and trip lengths

The study area sits within the Newcastle Statistical Area level 3 (SA3), as shown in **Figure 3–3**. TfNSW Household Travel Survey data for this SA3 has been analysed to determine mode shares and average trip lengths. Unlike the Census Journey to Work data, Household Travel Survey data covers all trip purposes, not just commuting trips. However, as the survey sample size is much smaller, Household Travel Survey data is only available in higher geographies such as SA3s.

Figure 3–3 Study area for household travel survey analysis

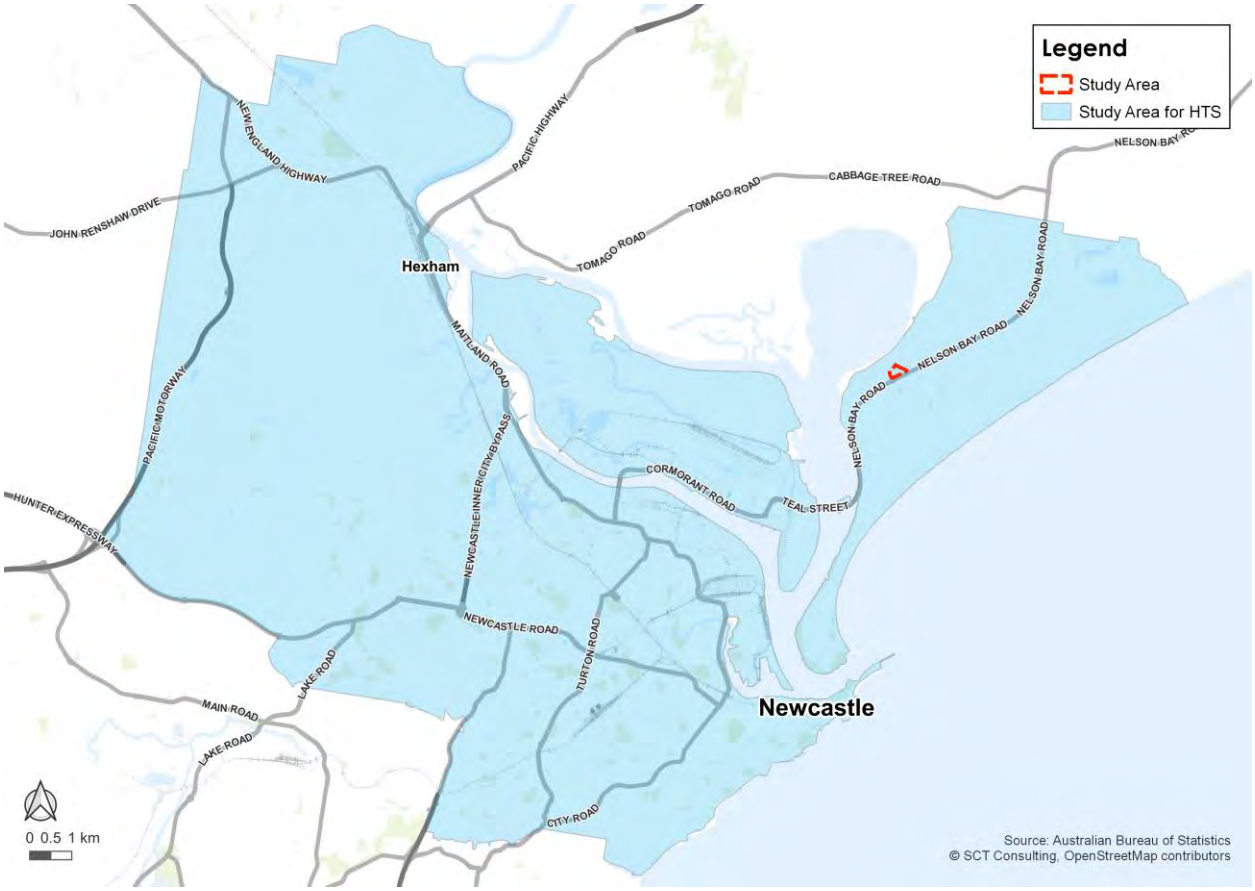


Table 3-1 and **Table 3-2** provide a summary of mode shares and trip purposes by residents of the Newcastle SA3 against the Hunter average. The average travel distance for each category is also listed.

Table 3-1 Household Travel Survey – residents in the Newcastle SA3, travel by mode

Mode of travel	Newcastle		Hunter	
	Percentage of total trips	Average distance	Percentage of total trips	Average distance
Vehicle Driver	62%	7 km	62%	11 km
Vehicle Passenger	15%	5 km	24%	9 km
Train	2%	128 km	1%	98 km
Bus	5%	6 km	3%	7 km
Walk Only	11%	1 km	8%	1 km
Other	5%	4 km	2%	6 km
Total	**100%**	**-**	**100%**	**-**

Source: TfNSW Household Travel Survey data by SA3, 2018/19

The study area had high vehicle drivers at 62 per cent but a low percentage of vehicle passengers, reflecting very high car dependency and low vehicle occupancy rate in Newcastle. Train and bus mode shares were almost twice the Hunter regional level with an average travel distance of 128 km likely to commute to Sydney CBD.

Table 3-2 Household travel survey – residents in the Newcastle SA3, travel by purpose

Trip purpose	Newcastle		Hunter	
	Percentage of total trips	Average distance	Percentage of total trips	Average distance
Commute	20%	15 km	29%	30 km
Work related business	3%	27 km	10%	28 km
Education/childcare	8%	6 km	4%	17 km
Shopping	22%	7 km	13%	14 km
Personal business	9%	5 km	8%	18 km
Social/recreation	21%	6 km	22%	18 km
Serve passenger	15%	5 km	13%	15 km
Other	2%	5 km	1%	15 km
Total	**100%**	**-**	**100%**	**-**

Source: TfNSW Household Travel Survey data by SA3, 2018/19

For almost all modes and trip purposes, the average distance travelled by residents of the Newcastle SA3 was even shorter than the Hunter region, reflecting relatively shorter travel distance to jobs, services and activities. A major feature of the trips in Newcastle is that shopping and education trips almost doubled the average level while the travel distance was less than half of the Hunter Region level, indicating a higher density in Newcastle.

3.2 Road network and classification

The main roads in the vicinity of the study area include the B63 Nelson Bay Road, Fullerton Cove Road, The Cove Drive and Seaside Boulevard. The road network surrounding the proposed neighbourhood centre is shown in **Figure 3–4**.

Figure 3–4 Road network around the site



The characteristics of the roads surrounding the subject site are:

– **Nelson Bay Road** is the primary movement corridor in the area providing connections to Kooragang and Mayfield to the south, and Nelson Bay to the far north. It is a state road (B63) and is a single lane carriageway with a posted speed limit of 70 km/h and 100km/h. There is a dual lane roundabout at the intersection of Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard, which provides the main access to the proposed neighbourhood centre. Footpaths with crossing facilities at the refuge islands are provided on all approaches of the roundabout.

– **Fullerton Cove Road** is a north-south local road running parallel to Nelson Bay Road through Fullerton Cove. It is a single lane road with a posted speed limit of 70 km/h, primarily serving as access to sparse residential properties.

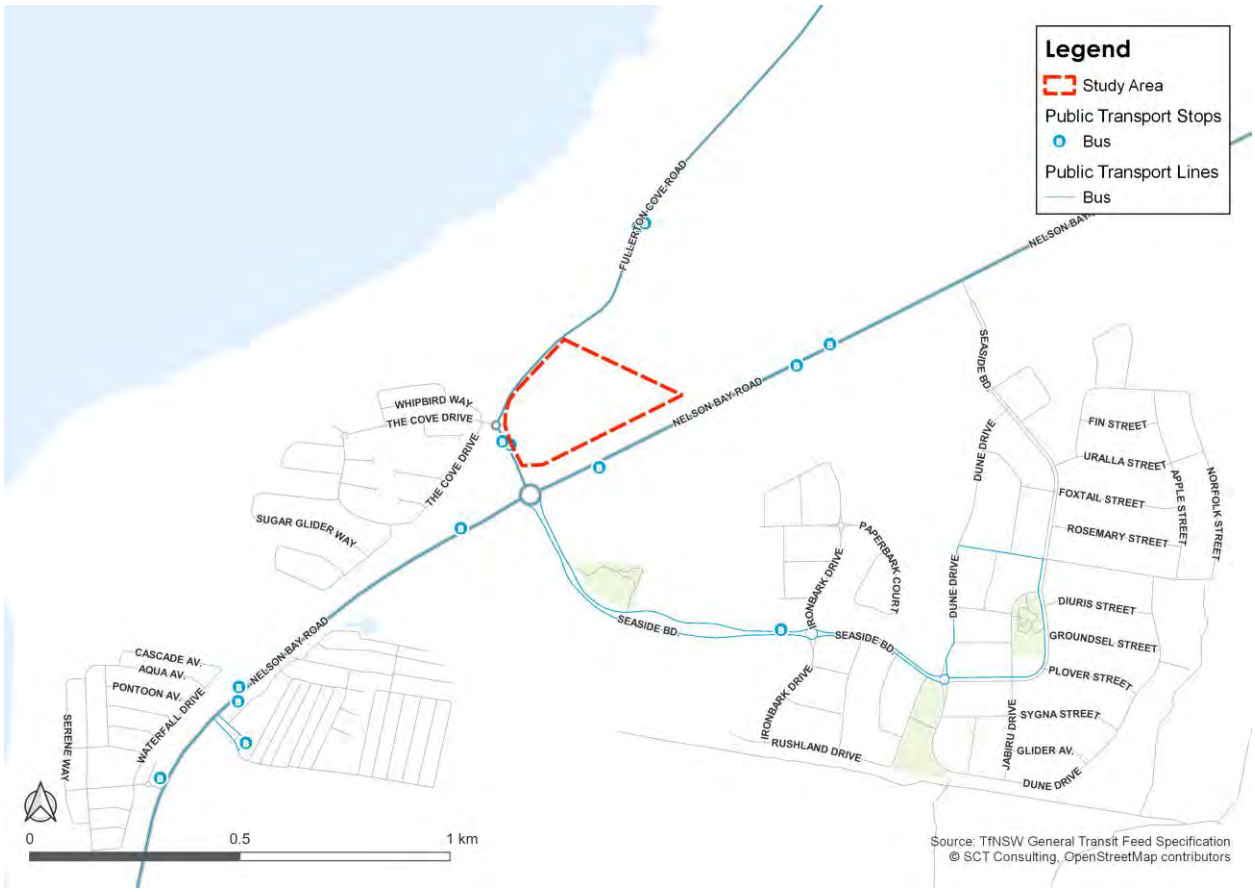
– **The Cove Drive** is a local loop road providing access to a pocket of low-density residential development to the west of the proposed neighbourhood centre.

– **Seaside Boulevard** is a local road to provide access to Seaside Fern Bay residential precinct. The road is a single lane dual carriageway with a posted speed limit of 60 km/h, running through the precinct before connecting back to Nelson Bay Road further north (at a left-in left-out intersection). There is a wide shoulder on both sides of the road utilised as informal on-street parking. There is a small off-street carpark and four on-street parking spaces outside Bluebird Early Education Centre.

3.3 Public transport network

Public transport facilities around the site are shown in **Figure 3–5**.

Figure 3–5 Public transport around the site



The site is located within walking distance of several bus stops on Fullerton Cove Road (300m) and Nelson Bay Road (600m) that are serviced by Routes 130, 131, 136 and 138.

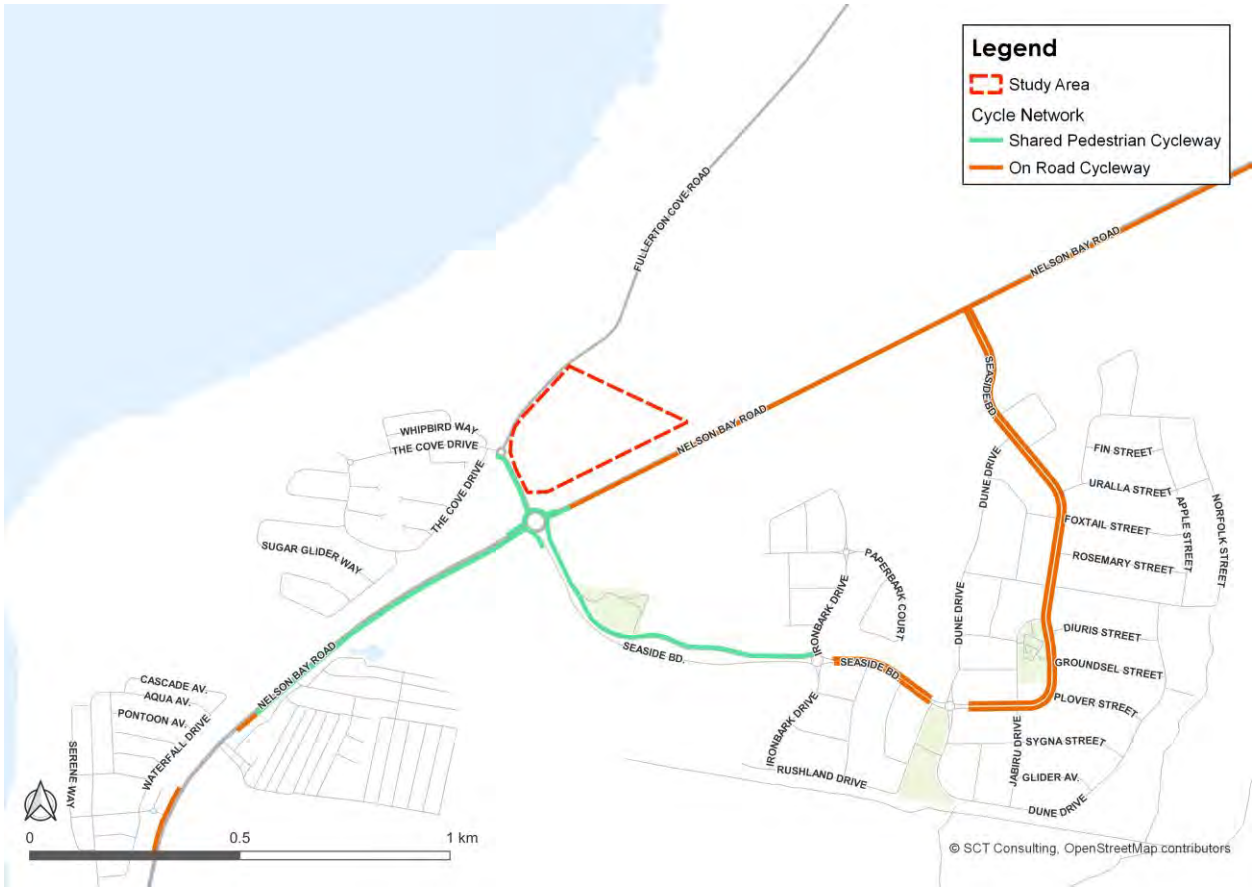
Routes 130 and 131 provide connections to Newcastle and Fingal Bay whereas Route 138 provides connections to Newcastle, Newcastle Airport and Lemon Tree Passage. Route 136 provides a connection to Raymond Terrace and Stockton, from which a ferry service can be used to connect to Newcastle. However, these bus services are infrequent, with some services operating only four times daily in each direction and others operating once per hour. Further rail connections can be made from Newcastle with some residents commuting to Sydney CBD via the CCN Central Coast and Newcastle Line.

3.4 Active transport network

Shared pedestrian cycleways are available on all approaches to the Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard intersection to varying lengths. Pedestrian refuge islands are provided as part of the roundabout approaches. The pedestrian footpath extends further south along Nelson Bay Road. A shared pedestrian cycleway is also provided alongside Seaside Boulevard into the precinct from Nelson Bay Road. This continues as an on-road cycleway on the shoulders of Seaside Boulevard.

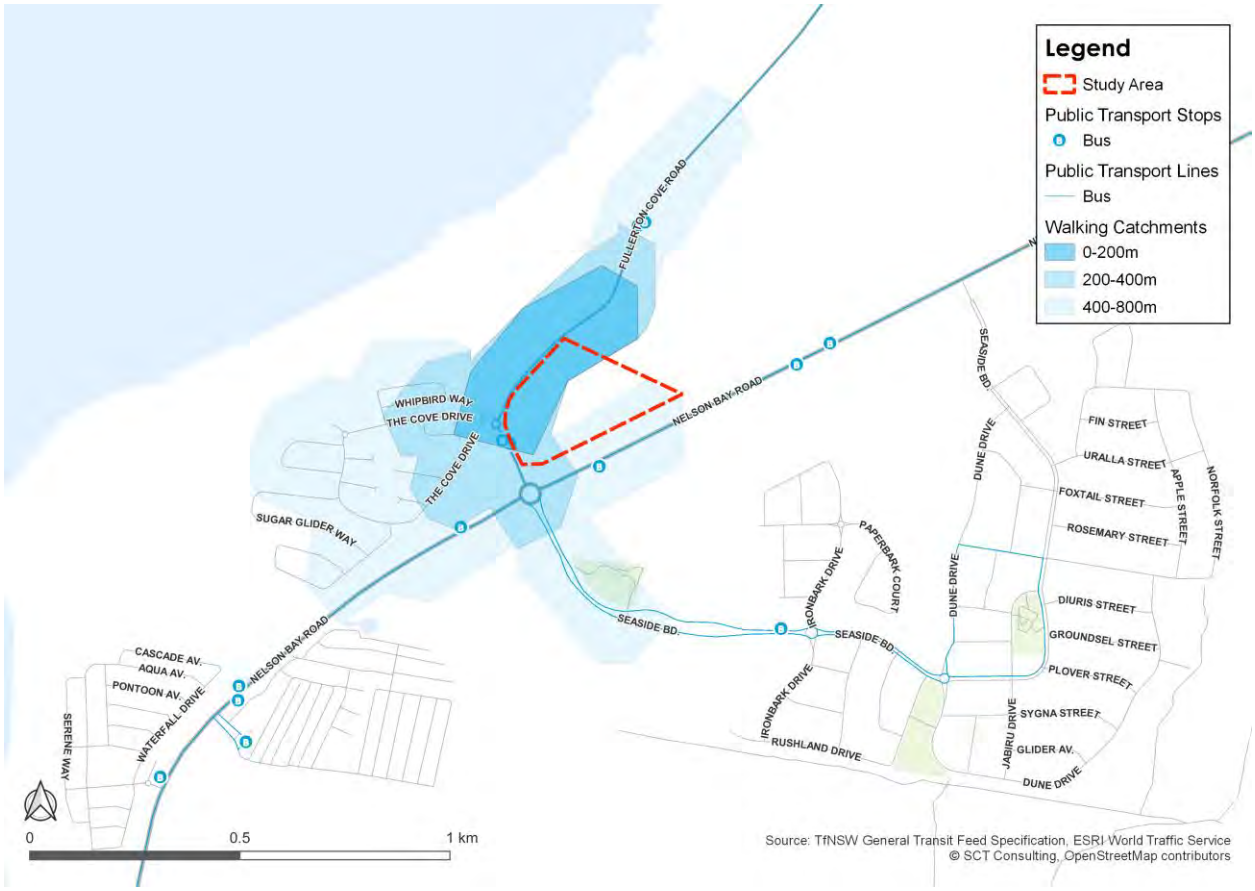
The cycleway network in the area primarily consists of the shared pedestrian cycleways and on road cycleways on road shoulders (**Figure 3–6**). There are some on road cycleways spanning across bus bays on Nelson Bay Road and an on-road cycleway shoulder north of Nelson Bay Road / Seaside Boulevard / Fullerton Cove Road roundabout. The Seaside Village also provides on-road cycleways on the road shoulders of Seaside Boulevard.

Figure 3–6 Bicycle network around the site



There is currently little walkability in the vicinity of the study area due to the sparse density of the area and rural characteristics (**Figure 3–7**). Whilst there are bus stops within walking distance of the development, the bus services at these stops are infrequent. Footpaths are provided on Fullerton Cove Road between The Cove Drive and Nelson Bay Road, however, do not extend north beyond The Cove Drive. The 800m catchment covers almost the whole of The Cove Village residential precinct to the west of the proposed development.

Figure 3–7 Walking distances to / from the site



Overall, walking and cycling infrastructure is currently limited and disconnected, and therefore likely to be under-used.

3.5 Existing traffic conditions

A SIDRA Network model has been prepared for key intersections on the edge of the precinct to understand the existing network performance and to test the impacts of the development. Intersection performance has been assessed for the weekday PM peak hour and weekend peak hour, for the intersections shown in **Figure 3–8**.

Figure 3–8 Intersections assessed



Both modelled intersections are roundabouts:

– Fullerton Cove Road / The Cove Drive

– Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard

3.5.1 Key assumptions for base year model

Key assumptions used to develop the base year model are discussed below:

3.5.1.1 Traffic survey count data

Traffic survey counts were conducted on the modelled intersections on Thursday 19 November 2020 and Saturday 21 November 2020. Based on these surveys, the following peak periods have been defined:

– Weekday PM peak hour: 4pm to 5pm

– Weekend peak hour: 11am to 12pm.

3.5.1.2 Site layouts

Intersection layouts were derived from a combination of Nearmap imagery and Google Streetview.

3.5.2 Intersection level of service

Intersection Level of Service (LoS) is a typical design tool used by traffic engineers to identify when roads are congested. The Level of Service as defined in TfNSW Traffic Modelling Guidelines is provided in **Table 3-3**.

Table 3-3 Level of Service definitions

Level of Service	Average delay per vehicle (seconds)	Performance explanation
A	Less than 14.5	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory
D	42.5 to 56.4	Operating near capacity
E	56.5 to 70.4	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.
F	70.5 or greater	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.

Source: Roads and Maritime Services (2002), Traffic Modelling Guidelines

In addition, the following other measure of performance is included to complement Level of Service:

– **Degree of Saturation (DoS):** a measure of the volume / capacity for the worst turning movement at the intersection. DoS is 1 implies the turning movement is at capacity.

3.5.3 2020 intersection performance

The outcomes of the intersection modelling are presented in **Table 3-4** based on a modelling assessment by SIDRA Intersection 9 software.

Table 3-4 Existing (2020) intersection performance

Intersection	Weekday PM peak			Weekend peak		
	Delay	LoS	DoS	Delay	LoS	DoS
Fullerton Cove Road / The Cove Drive	9.2s	A	0.031	11.0s	A	0.028
Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard	15.2s	B	0.574	15.0s	B	0.306

The SIDRA results show that the network currently performs at a Level of Service B at all intersections and in both peak periods with minimal average delay.

A summary of the detailed SIDRA modelling outputs is included in **Appendix A**.

4.0 The Planning Proposal

4.1 Proposed development

The planning proposal seeks to enable the development of a neighbourhood centre comprising a supermarket, specialty retail shops, and associated car parking and landscaping. The neighbourhood centre will provide day-to-day retail services to the local community which is currently underserviced in Fern Bay and Fullerton Cove. Currently, the nearest commercial development is Stockton IGA located 8 km south of the site.

The total Gross Floor Area (GFA) for the site is shown in **Table 4-1**.

Table 4-1 Proposed yield of the planning proposal

Use		Yield
Commercial	Retail	3,500m^2 GFA
	Specialty Retail	2,000m^2 GFA
Total		**5,500m^2 GFA**

It should be noted that the yields are the best and most realistic estimates at the time of preparing this report and will continue to evolve as the planning proposal develops. The best estimate yields are prepared for the purpose of undertaking the traffic assessment pre-gateway determination.

4.2 Proposed transport network

The proposed transport network needs to cater for the travel characteristics of the proposed land uses as well as integrate appropriately with the surrounding network.

4.2.1 Road network

The site will have frontage onto Fullerton Cove Road which will provide private and heavy vehicle access to the site. It is expected the majority of traffic would be expected to access the site via the roundabout of Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard.

4.2.2 Active transport network

As discussed in **Section 3.4**, there are shared pedestrian cycleways on all approaches to the Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard roundabout. However, these paths provide poor active transport connectivity as they are currently disconnected from any pedestrian destinations. The path on Fullerton Cove Road currently stops at The Cove Drive. According to strategic planning discussed in **Section 2.5** and **2.6**, there are opportunities to extend the share paths further along Fullerton Cove Road to the site and Nelson Bay Road, providing a continuous pedestrian and cycleway connection to the site from The Cove Village and Seaside Village.

4.3 Proposed parking provision

In accordance with *Port Stephens Council Development Control Plan (DCP) 2014*, shops are required to provide on-site parking at a rate of one car space per 20m^2 GFA with one accessible car space for every 30 car spaces. The on-site parking requirements of the site, with a retail yield of 5,500m^2 GFA, is summarised in **Table 4-2** below.

Table 4-2 Required on-site parking provision

Parking type	Required provision
General car spaces	266 car spaces
Accessible car spaces	9 car spaces
Total	**275 car spaces**

Source: Port Stephens Council, 2014

5.0 Traffic and Transport Impact Appraisal

This section assesses the impact of the proposed structure plan on the transport network. The future year for the assessment is assumed to be 2033, a 10-year window for completion of the development assumed to be 2023.

5.1 Modelling scenarios

The Traffic Impact Assessment has tested the following future year scenarios:

1. **2020 Base Year:** This scenario examines the performance of the current road network
2. **2033 With Background Growth, Do Nothing:** This scenario examines the impact of background traffic growth only, with no changes to the road network
3. **2033 With Background Growth and Network Upgrades (if needed):** This scenario identifies necessary upgrades to the surrounding road network, to alleviate the impact of background traffic growth only, such that acceptable performance is achieved for all intersections
4. **2033 With Development, Do Nothing:** This scenario examines the impact of the full delivery of the Planning Proposal (including the background traffic growth), with no changes to the road network
5. **2033 With Development, and Further Network Upgrades (if needed):** This scenario identifies necessary upgrades to the surrounding road network, to alleviate the impact of background traffic growth and the delivery of the Planning Proposal, such that acceptable performance is achieved for all intersections
6. **2033 With Development and Cumulative Impacts, Do Nothing:** This scenario examines the impact of the full delivery of the Planning Proposal and the cumulative impact of nearby proposals outlined in **Section 5.4** with no changes to the road network
7. **2033 With Development, Cumulative Impacts and Further Network Upgrades (if needed):** This scenario identifies necessary upgrades to the surrounding road network, to alleviate the impact of background traffic growth, the delivery of the Planning Proposal and cumulative impacts of nearby proposals, such that acceptable performance is achieved for all intersections

5.2 Background traffic growth

Background traffic growth was analysed based on extrapolation of traffic growth between 2006 and 2019, taken from three nearby TfNSW permanent traffic counters:

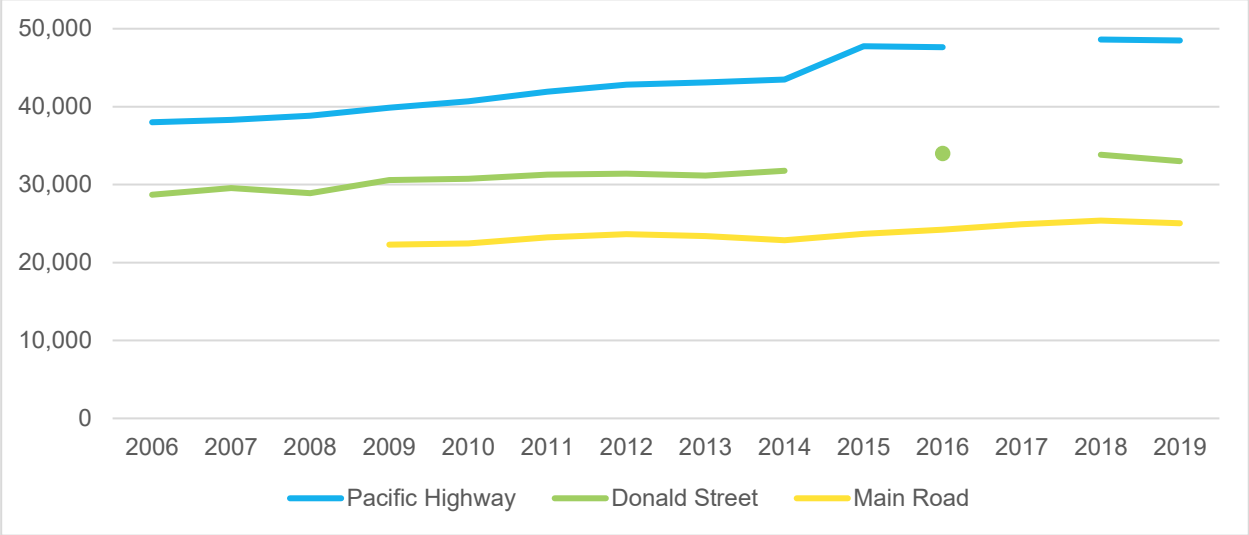
– Pacific Highway, Tomago

– Donald Street, Hamilton

– Main Road, Glendale

Data for 2020 has been deliberately excluded due to the COVID-19 pandemic. The results are shown in **Figure 5–1**.

Figure 5–1 Average weekday traffic volumes in the Newcastle (both directions), by permanent counter location



Source: TfNSW Traffic Volume Viewer, 2020

Note: Data shown contains gaps where data was unavailable in one or both directions.

There is slight growth across all three sites in the area between 2006 and 2019, with a sudden increase in growth rate between 2014 and 2015 along the Pacific Highway. The average annual growth rate across the area was found to be 1.5%. This growth rate was applied to Nelson Bay Road traffic volumes observed in 2020 as general background traffic growth to understand traffic volumes and potential impacts at the peak hours of 2033.

5.3 Trip generation and distribution

Trip generation rates used for these developments were based off Roads and Maritime Services *Guide to Traffic Generating Developments (October 2002)* and *Technical Direction (August 2013)*.

The *Technical Direction* recommends shopping centre retail trip generation rates as 12.3 and 16.3 vehicles per 100m^2 Gross Leasable Floor Area (GLFA) for Thursday and Saturday peak hours.

Residential trip generation rates were derived from the *Technical Direction*. Unfortunately, weekend trip generation rates were not available for rural low-density residential development. A scaling factor was calculated from high density residential rates in Charlestown and Wollongong to convert a PM peak rate to a weekend peak rate and applied to the low density residential PM rate of 0.78 vehicle trips per dwelling as recommended by the *Technical Direction*. The low density residential for the weekend peak was calculated to be 0.51 vehicle trips per dwelling.

The recommended vehicle trip generation rates are summarised in **Table 5-1**.

Table 5-1 Trip generation assumptions

Land use	Weekday PM peak	Weekend peak
Retail	12.3 vehicles / 100m^2 GLFA	16.3 vehicles / 100m^2 GLFA
Low Density Residential	0.78 vehicles / dwelling	0.51 vehicles / dwelling

The total trip generation for the proposed neighbourhood centre is presented in **Table 5-2**.

Table 5-2 Total net vehicle trip generation for Fullerton Cove Neighbourhood Centre

Land use	Weekday PM peak hour (In / out proportion)	Weekend peak hour (In / out proportion)	Total net vehicle trips		
			Yield	Weekday PM peak	Weekend peak
Retail	12.3 vehicles / 100m^2 GLFA (50% / 50%)	16.3 vehicles / 100m^2 GLFA (50% / 50%)	4,125m^2 GLFA	507	672

Note: GFA was converted into GLFA using a factor of 75% in accordance with Roads and Maritime Services *Guide to Trip Generating Developments (October 2002)*.

The proposed neighbourhood centre at Fullerton Cove will be serving an existing catchment that is currently going to Stockton IGA as the nearest supermarket. Hence the majority of the trips that would be attracted to the new centre / supermarket would be on the network and going towards Stockton. Therefore, the overall net increase in traffic on the overall road network would be marginal. For the purpose of the traffic impact assessment and modelling, we would assess the trips generated by the new centre as completely new trips (as shown in **Table 5-2**) as a worst case.

Trip distribution for the site was based on the residential area of nearby residential precincts. Due to the purely retail nature of the site, it was assumed the larger the residential precinct, the greater the travel demand from the area. A similar distribution process was performed for the North Stockton Precinct (considered as cumulative impacts assessment discussed in **Section 5.4**). The travel destinations for each retail centre and associated weights are summarised in **Table 5-3** .

Table 5-3 Traffic distribution for Fullerton Cove Neighbourhood Centre and North Stockton Precinct

Destination	Proposed Neighbourhood Centre Travel Demand Proportion	North Stockton Precinct Travel Demand Proportion
Seaside Village	45%	20%
Fern Bay	30%	20%
Cove Village	10%	5%
Fullerton Cove / Williamtown / Anna Bay	15%	5%
Stockton	-	50%
Total	**100%**	**100%**

The travel demand of destinations for other residential developments (considered as cumulative impacts assessment discussed in **Section 5.4)** were taken from the Stockton Rifle Range Planning Proposal Transport Study Report by Better Transport Futures (October 2018). **Table 5-4** presents the assumed travel proportions for other residential developments.

Table 5-4 Traffic distribution for residential developments

Destination	Residential Travel Demand Proportion
Newcastle	55%
Stockton	15%
Williamtown	30%
Total	**100%**

Source: Better Transport Futures, 2018

5.4 Diverted trips

The *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments* (Austroads 2020) outlines in Commentary 8 the following three types of trips:

– New trips

– Diverted drop-in trips

– Undiverted drop-in trips

For shopping centres between 3,000m^2 and 20,000m^2 in size, **Table C8 2** outlines 50% of traffic generation are diverted trips, trips that were already being made but have detoured to access the new development. To account for this, some through traffic along Nelson Bay Road was diverted to the development at Nelson Bay Road / Fullerton Cove Road. Hence one of these diverted through trips becomes one trip entering the centre and one trip leaving the centre. Both the entering trip and leaving trip are assumed to occur within the same hour given the small scale of the

centre and the duration of stay will be within an hour, as a worst case for the traffic assessment. In total, 58 trips were diverted during the PM peak and 76 trips were diverted during the weekend peak.

5.5 Cumulative impacts

Council has received several planning proposals applying to the area around the Fullerton Cove and Stockton area. A review of those planning proposals has been undertaken to understand the likely impact of these proposed developments on the road network around the site.

5.5.1 Fern Bay Seaside Village

The Fern Bay Seaside Village is a low-density residential development located just south east of the site. The precinct consists of approximately 947 lots of which less than 25 lots are yet to be developed. The main access road into the precinct is via Seaside Boulevard, intersecting Nelson Bay Road at the roundabout south of the site. It is likely that these lots will be completed in the future and thus will have additional traffic impacts on the road network surrounding the planning proposal.

5.5.2 Proposed Stockton Rifle Range Site

The Stockton Rifle Range is proposed to be redeveloped into low and medium density residential properties by Defence Housing Australia. Currently, the area is a surplus Defence site on the Stockton Peninsula, located approximately 2 km south of the proposed neighbourhood centre. The Rifle Range is proposed to have a yield of 318 residential dwellings, a mix of apartments, townhouses, courtyard and cluster homes, and eco houses. The neighbourhood centre is likely to draw some demand from the residential development due to its proximity and increase traffic demand along Nelson Bay Road.

5.5.3 George Street and Coxs Lane, Fullerton Cove

The George Street and Cox Lane Planning Proposal seek to develop 33 lots of residential dwellings. The planning proposal is located on George Street, north of the proposed Fullerton Cove Neighbourhood Centre. Both George Street and Coxs Lane connect to Fullerton Cove Road and residents of the development will likely generate trips to the neighbourhood centre. This travel demand will likely result in increased traffic volumes along Fullerton Cove Road north of the site.

5.5.4 North Stockton Precinct

The Fern Bay and North Stockton Strategy, released by Port Stephens Council and the City of Newcastle in April 2020, proposes a potential town centre in North Stockton located south of Fern Bay. This development would provide a new local centre of 4,000-6,500m^2 including a large format supermarket of 2,800-3,200m^2 and complementary specialty floor space. Due to the size of the potential town centre, it will likely attract residents from Seaside Village and The Cove Village. This places potential pressure on the two roundabouts south of the neighbourhood centre as residents will travel southbound along Nelson Bay Road towards the town centre.

5.5.5 Cumulative Traffic Impact summary

The nearby planning proposals and potential developments above are likely to place additional pressure on the road network around the site in the future. The additional trips generated by these developments are presented in **Table 5-5**. The trip generation rates used to calculate these trips were outlined in **Section 5.3**.

Table 5-5 Additional trips generated

Site	Location	Yield	Additional trips	
			Weekday PM	Weekend
Fern Bay Seaside Village	Fullerton Cove	25 lots	20	13
Stockton Rifle Range	Fern Bay	318 lots	248	162
George Street and Coxs Lane	Fullerton Cove	33 lots	26	17
North Stockton Precinct	North Stockton	6,500m^2 GFA	600	795

5.6 Road network impacts

The performance of the intersections under each modelling scenario is shown in **Table 5-6**. In all future scenarios, both intersections experience minimal average delay in both the weekday PM and weekend peak periods. Both intersections perform at Level of Service A with the exception of Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard which performs at Level of Service B in 2033 with development traffic and cumulative impacts from other developments in the area. As performance is satisfactory (above Level of Service C as specified by Transport for NSW), no upgrades are required on the network to service the increase in volumes.

As no upgrades were required in any future scenario (background growth, proposed development as part of the Planning Proposal and the cumulative impacts of other committed developments), Scenarios 3, 5 and 7 were not required to be assessed and hence omitted from **Table 5-6**.

A summary of the detailed SIDRA modelling outputs is included in **Appendix A**

Table 5-6 2033 Intersection performance

Intersection	Scenario 2: 2033 With Background Traffic Growth, Do Nothing			Scenario 4: 2033 With Development, Do Nothing			Scenario 6: 2033 With Development and Cumulative Impacts, Do Nothing		
	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS
Weekday PM Peak									
Fullerton Cove Road / The Cove Drive	9.2s	A	0.031	9.2s	A	0.197	9.2s	A	0.222
Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard	16.2s	B	0.692	20.7s	B	0.816	37.4s	C	0.912
Weekend Peak									
Fullerton Cove Road / The Cove Drive	11.0s	A	0.028	11.0s	A	0.248	11.2s	A	0.267
Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard	15.1s	B	0.369	16.5s	B	0.482	17.7s	B	0.546

5.7 Public transport impacts

The potential customers resulting from the proposal would be located within a short walking distance to bus stops on Fullerton Cove Road between The Cove Drive and Nelson Bay Road, and on Nelson Bay Road. There is currently a heavy reliance on private vehicles in the area, however, with improved future connectivity on Nelson Bay Road and bus stops upgrade on Fullerton Cove Road, the access to the site could be beneficial by a more frequent bus service connecting residential precincts to local retail and shops.

5.8 Active transport impacts

With the growing need for active transport accessibility and better connectivity within the precinct, it will be important to ensure a safe, quality and well-connected footpaths and cycle path system around the site to promote sustainable transport use.

The delivery of future pedestrian paths and cycleways, as part of The Port Stephens Pathways Plan 2016, along Nelson Bay Road and Fullerton Cove Road will improve the attractiveness of active transport modes to the site. Continuous footpath infrastructure will connect the site to pedestrian demand from The Cove Village and Seaside Village. The cycleways along Nelson Bay Road would allow cyclists from residential areas further south of the precinct in areas such as Fern Bay. The pedestrian and cycling generated by the precinct during the peak periods are therefore considered to be at a level able to be accommodated by the existing and planned infrastructure. However, future patrons of the neighbourhood centre would benefit from a footpath connection between the centre and the existing footpath network along Fullerton Cove Road.

6.0 Conclusion

6.1 Conclusion

This traffic and transport impact assessment concludes that:

- The planning proposal is positively aligned with strategic planning and transport policy in the Hunter and Newcastle regions including the Hunter Regional Plan 2036, Greater Newcastle Metropolitan Plan 2036 and Port Stephens Local Strategic Planning Statement 2040. The development will promote economic activity and provide services closer to residential precincts in the area.
- The planning proposal aligns with the active transport initiatives proposed by Hunter Regional Plan 2036 and the Port Stephens Pathways Plan 2016. The proximity of the planning proposal to residential dwellings promotes the opportunity for active transport by providing a destination accessible by walking and cycling.
- Bus stops are provided within walking distance to the site on Fullerton Cove Road and Nelson Bay Road. However, the services at these stops are infrequent and would underservice the future public transport demand generated by the site. More frequent services and better bus stop amenities would greatly benefit residents travelling to and from the site and promote local mode shift onto public transport.
- The planning proposal is estimated to generate 507 vehicle trips in the PM peak and 672 vehicle trips in the weekend peak from the 5,500m^2 GFA development.
- Without infrastructure upgrades, the road network will have sufficient capacity to accommodate these additional trips alongside the cumulative impacts of nearby planning proposals and proposed developments.
- Future patrons of the neighbourhood centre would benefit from a footpath connection between the centre and the existing footpath network along Fullerton Cove Road.
- The study concluded that the impacts of the planning proposal are at a level able to be accommodated by the existing and planned infrastructure.

APPENDIX A

SIDRA Modelling Outputs

MOVEMENT SUMMARY

Site: 1PM [FUL_COV_20_PM_BY (Site Folder: PM Peak)]

Network: N101 [PM BY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	24	0.0	24	0.0	0.031	5.7	LOS A	0.1	1.1	0.02	0.62	0.02	44.2
23	R2	24	21.7	24	21.7	0.031	9.2	LOS A	0.1	1.1	0.02	0.62	0.02	67.2
Approach		48	10.9	48	10.9	0.031	7.5	LOS A	0.1	1.1	0.02	0.62	0.02	65.3
NorthEast: Fullerton Cove Road (NE)														
24	L2	29	10.7	29	10.7	0.023	5.5	LOS A	0.1	0.8	0.07	0.56	0.07	68.6
26	R2	1	0.0	1	0.0	0.023	9.1	LOS A	0.1	0.8	0.07	0.56	0.07	68.0
Approach		31	10.3	31	10.3	0.023	5.6	LOS A	0.1	0.8	0.07	0.56	0.07	68.5
NorthWest: The Cove Drive														
27	L2	1	0.0	1	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	67.5
28	T1	11	0.0	11	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	37.7
Approach		12	0.0	12	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	56.6
All Vehicles		91	9.3	91	9.3	0.031	6.3	LOS A	0.1	1.1	0.04	0.57	0.04	66.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2PM [NEL_FUL_20_PM_BY (Site Folder: PM Peak)]

Network: N101 [PM BY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	112	3.8	112	3.8	0.138	10.4	LOS A	0.8	5.4	0.73	0.77	0.73	60.1
22	T1	2	100.0	2	100.0	0.079	11.9	LOS A	0.4	2.8	0.71	0.84	0.71	47.5
23	R2	40	7.9	40	7.9	0.079	14.1	LOS A	0.4	2.8	0.71	0.84	0.71	85.2
Approach		154	6.2	154	6.2	0.138	11.4	LOS A	0.8	5.4	0.72	0.79	0.72	71.8
NorthEast: Nelson Bay Road (NE)														
24	L2	55	0.0	55	0.0	0.283	6.0	LOS A	1.6	11.4	0.48	0.51	0.48	65.3
25	T1	1107	1.1	1107	1.1	0.574	6.4	LOS A	4.5	31.8	0.54	0.50	0.54	68.7
26	R2	4	0.0	4	0.0	0.574	12.3	LOS A	4.5	31.8	0.56	0.50	0.56	68.0
26u	U	4	0.0	4	0.0	0.574	15.2	LOS B	4.5	31.8	0.56	0.50	0.56	80.8
Approach		1171	1.1	1171	1.1	0.574	6.4	LOS A	4.5	31.8	0.54	0.50	0.54	68.6
NorthWest: Fullerton Cove Road														
27	L2	3	0.0	3	0.0	0.057	10.0	LOS A	0.2	1.8	0.66	0.82	0.66	90.3
28	T1	5	20.0	5	20.0	0.057	9.1	LOS A	0.2	1.8	0.66	0.82	0.66	46.5
29	R2	29	7.1	29	7.1	0.057	15.1	LOS B	0.2	1.8	0.66	0.82	0.66	57.8
Approach		38	8.3	38	8.3	0.057	13.9	LOS A	0.2	1.8	0.66	0.82	0.66	63.4
SouthWest: Nelson Bay Road (SW)														
30	L2	42	7.5	42	7.5	0.330	4.6	LOS A	2.2	15.9	0.24	0.38	0.24	62.7
31	T1	982	1.7	982	1.7	0.476	5.2	LOS A	3.9	27.9	0.25	0.43	0.25	90.2
32	R2	220	2.9	220	2.9	0.476	11.2	LOS A	3.9	27.9	0.25	0.47	0.25	58.1
32u	U	12	0.0	12	0.0	0.476	14.1	LOS A	3.9	27.9	0.25	0.47	0.25	67.5
Approach		1256	2.1	1256	2.1	0.476	6.3	LOS A	3.9	27.9	0.25	0.44	0.25	87.1
All Vehicles		2618	2.0	2618	2.0	0.574	6.8	LOS A	4.5	31.8	0.41	0.49	0.41	76.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1PM_FY [FUL_COV_33_PM_FY (Site Folder: PM Peak)]

Network: N101 [PM FY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	24	0.0	24	0.0	0.031	5.7	LOS A	0.1	1.1	0.02	0.62	0.02	44.2
23	R2	24	21.7	24	21.7	0.031	9.2	LOS A	0.1	1.1	0.02	0.62	0.02	67.2
Approach		48	10.9	48	10.9	0.031	7.5	LOS A	0.1	1.1	0.02	0.62	0.02	65.3
NorthEast: Fullerton Cove Road (NE)														
24	L2	29	10.7	29	10.7	0.023	5.5	LOS A	0.1	0.8	0.07	0.56	0.07	68.6
26	R2	1	0.0	1	0.0	0.023	9.1	LOS A	0.1	0.8	0.07	0.56	0.07	68.0
Approach		31	10.3	31	10.3	0.023	5.6	LOS A	0.1	0.8	0.07	0.56	0.07	68.5
NorthWest: The Cove Drive														
27	L2	1	0.0	1	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	67.5
28	T1	11	0.0	11	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	37.7
Approach		12	0.0	12	0.0	0.009	3.6	LOS A	0.0	0.3	0.11	0.39	0.11	56.6
All Vehicles		91	9.3	91	9.3	0.031	6.3	LOS A	0.1	1.1	0.04	0.57	0.04	66.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2PM_FY [NEL_FUL_33_PM_FY (Site Folder: PM Peak)]

Network: N101 [PM FY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	112	3.8	112	3.8	0.166	14.8	LOS B	1.0	7.1	0.82	0.85	0.82	59.4
22	T1	2	100.0	2	100.0	0.095	14.1	LOS A	0.5	3.6	0.78	0.90	0.78	46.5
23	R2	40	7.9	40	7.9	0.095	15.7	LOS B	0.5	3.6	0.78	0.90	0.78	84.7
Approach		154	6.2	154	6.2	0.166	15.0	LOS B	1.0	7.1	0.81	0.86	0.81	71.2
NorthEast: Nelson Bay Road (NE)														
24	L2	55	0.0	55	0.0	0.341	6.1	LOS A	2.0	14.5	0.50	0.52	0.50	65.3
25	T1	1344	1.2	1344	1.2	0.692	7.5	LOS A	6.5	45.9	0.61	0.54	0.62	68.6
26	R2	4	0.0	4	0.0	0.692	12.8	LOS A	6.5	45.9	0.64	0.54	0.65	67.9
26u	U	4	0.0	4	0.0	0.692	15.6	LOS B	6.5	45.9	0.64	0.54	0.65	80.7
Approach		1407	1.1	1407	1.1	0.692	7.5	LOS A	6.5	45.9	0.60	0.54	0.61	68.5
NorthWest: Fullerton Cove Road														
27	L2	3	0.0	3	0.0	0.065	12.3	LOS A	0.3	2.2	0.71	0.85	0.71	89.8
28	T1	5	20.0	5	20.0	0.065	10.2	LOS A	0.3	2.2	0.71	0.85	0.71	45.9
29	R2	29	7.1	29	7.1	0.065	16.2	LOS B	0.3	2.2	0.71	0.85	0.71	56.9
Approach		38	8.3	38	8.3	0.065	15.1	LOS B	0.3	2.2	0.71	0.85	0.71	62.6
SouthWest: Nelson Bay Road (SW)														
30	L2	42	7.5	42	7.5	0.385	4.6	LOS A	2.8	20.1	0.26	0.38	0.26	62.5
31	T1	1192	1.7	1192	1.7	0.555	5.7	LOS A	5.2	36.8	0.27	0.42	0.27	90.2
32	R2	220	2.9	220	2.9	0.555	11.3	LOS A	5.2	36.8	0.28	0.45	0.28	58.1
32u	U	12	0.0	12	0.0	0.555	14.1	LOS A	5.2	36.8	0.28	0.45	0.28	67.6
Approach		1465	2.0	1465	2.0	0.555	6.6	LOS A	5.2	36.8	0.28	0.43	0.28	87.6
All Vehicles		3064	1.9	3064	1.9	0.692	7.5	LOS A	6.5	45.9	0.46	0.51	0.46	76.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1PM_Dev [FUL_COV_33_PM_FY + Dev (Site Folder: PM Peak)] — Network: N101 [PM FY + Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	24	0.0	24	0.0	0.197	5.8	LOS A	1.1	7.6	0.12	0.64	0.12	41.2
23	R2	264	2.0	264	2.0	0.197	9.2	LOS A	1.1	7.6	0.12	0.64	0.12	67.3
Approach		288	1.8	288	1.8	0.197	8.9	LOS A	1.1	7.6	0.12	0.64	0.12	67.0
NorthEast: Fullerton Cove Road (NE)														
24	L2	269	1.2	269	1.2	0.188	5.3	LOS A	1.1	8.0	0.08	0.57	0.08	68.5
26	R2	27	0.0	27	0.0	0.188	9.1	LOS A	1.1	8.0	0.08	0.57	0.08	67.9
Approach		297	1.1	297	1.1	0.188	5.7	LOS A	1.1	8.0	0.08	0.57	0.08	68.4
NorthWest: The Cove Drive														
27	L2	27	0.0	27	0.0	0.036	4.7	LOS A	0.2	1.2	0.40	0.51	0.40	67.3
28	T1	11	0.0	11	0.0	0.036	4.8	LOS A	0.2	1.2	0.40	0.51	0.40	34.8
Approach		38	0.0	38	0.0	0.036	4.8	LOS A	0.2	1.2	0.40	0.51	0.40	66.6
All Vehicles		623	1.4	623	1.4	0.197	7.1	LOS A	1.1	8.0	0.12	0.60	0.12	67.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2PM_Dev [NEL_FUL_33_PM_FY + Dev (Site Folder: PM Peak)]

Network: N101 [PM FY + Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	112	3.8	112	3.8	0.210	17.1	LOS B	1.4	9.9	0.91	0.93	0.91	58.7
22	T1	62	3.4	62	3.4	0.270	10.4	LOS A	1.5	11.1	0.88	0.94	0.88	48.0
23	R2	40	7.9	40	7.9	0.270	17.4	LOS B	1.5	11.1	0.88	0.94	0.88	85.6
Approach		214	4.4	214	4.4	0.270	15.2	LOS B	1.5	11.1	0.90	0.93	0.90	67.7
NorthEast: Nelson Bay Road (NE)														
24	L2	55	0.0	55	0.0	0.403	7.3	LOS A	2.7	18.9	0.67	0.63	0.67	65.0
25	T1	1335	1.2	1335	1.2	0.816	12.0	LOS A	13.5	95.1	0.84	0.84	1.09	68.0
26	R2	84	0.0	84	0.0	0.816	17.8	LOS B	13.5	95.1	0.90	0.91	1.23	67.2
26u	U	4	0.0	4	0.0	0.816	20.7	LOS B	13.5	95.1	0.90	0.91	1.23	80.2
Approach		1478	1.1	1478	1.1	0.816	12.2	LOS A	13.5	95.1	0.84	0.84	1.08	67.9
NorthWest: Fullerton Cove Road														
27	L2	63	0.0	63	0.0	0.512	16.3	LOS B	3.4	23.8	0.87	1.01	1.12	89.8
28	T1	125	0.8	125	0.8	0.512	13.3	LOS A	3.4	23.8	0.87	1.01	1.12	45.4
29	R2	89	2.4	89	2.4	0.512	19.9	LOS B	3.4	23.8	0.87	1.01	1.12	56.8
Approach		278	1.1	278	1.1	0.512	16.1	LOS B	3.4	23.8	0.87	1.01	1.12	68.2
SouthWest: Nelson Bay Road (SW)														
30	L2	142	2.2	142	2.2	0.445	5.4	LOS A	3.1	22.3	0.49	0.50	0.49	60.9
31	T1	1141	1.8	1141	1.8	0.642	6.4	LOS A	5.9	41.8	0.54	0.52	0.54	89.7
32	R2	220	2.9	220	2.9	0.642	12.1	LOS A	5.9	41.8	0.56	0.53	0.56	57.3
32u	U	12	0.0	12	0.0	0.642	14.9	LOS B	5.9	41.8	0.56	0.53	0.56	66.5
Approach		1515	1.9	1515	1.9	0.642	7.2	LOS A	5.9	41.8	0.54	0.52	0.54	86.4
All Vehicles		3484	1.7	3484	1.7	0.816	10.5	LOS A	13.5	95.1	0.71	0.72	0.83	74.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1PM_All [FUL_COV_33_PM_FY + All Dev (Site Folder: PM Peak)]

Network: N101 [PM FY + All Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	40	0.0	40	0.0	0.222	5.8	LOS A	1.3	8.9	0.13	0.64	0.13	41.3
23	R2	288	1.8	288	1.8	0.222	9.2	LOS A	1.3	8.9	0.13	0.64	0.13	67.3
Approach		328	1.6	328	1.6	0.222	8.8	LOS A	1.3	8.9	0.13	0.64	0.13	66.9
NorthEast: Fullerton Cove Road (NE)														
24	L2	273	1.2	273	1.2	0.203	5.4	LOS A	1.2	8.8	0.14	0.55	0.14	68.4
26	R2	27	0.0	27	0.0	0.203	9.2	LOS A	1.2	8.8	0.14	0.55	0.14	67.9
Approach		300	1.1	300	1.1	0.203	5.7	LOS A	1.2	8.8	0.14	0.55	0.14	68.4
NorthWest: The Cove Drive														
27	L2	27	0.0	27	0.0	0.052	4.9	LOS A	0.3	1.8	0.42	0.52	0.42	67.2
28	T1	26	0.0	26	0.0	0.052	4.9	LOS A	0.3	1.8	0.42	0.52	0.42	34.5
Approach		54	0.0	54	0.0	0.052	4.9	LOS A	0.3	1.8	0.42	0.52	0.42	65.4
All Vehicles		682	1.2	682	1.2	0.222	7.2	LOS A	1.3	8.9	0.16	0.59	0.16	67.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2PM_All [NEL_FUL_33_PM_FY + All Dev (Site Folder: PM Peak)]

Network: N101 [PM FY + All Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	176	2.4	176	2.4	0.386	37.4	LOS C	2.8	19.9	0.98	1.02	1.06	57.4
22	T1	62	3.4	62	3.4	0.326	12.5	LOS A	1.9	14.1	0.92	0.97	0.96	46.5
23	R2	41	7.7	41	7.7	0.326	19.5	LOS B	1.9	14.1	0.92	0.97	0.96	84.9
Approach		279	3.4	279	3.4	0.386	29.2	LOS C	2.8	19.9	0.96	1.00	1.02	64.7
NorthEast: Nelson Bay Road (NE)														
24	L2	55	0.0	55	0.0	0.451	8.3	LOS A	3.2	22.3	0.75	0.70	0.75	64.9
25	T1	1421	1.1	1421	1.1	0.912	23.2	LOS B	24.2	170.9	0.94	1.11	1.64	66.7
26	R2	84	0.0	84	0.0	0.912	26.5	LOS B	24.2	170.9	1.00	1.26	1.95	65.2
26u	U	4	0.0	4	0.0	0.912	29.3	LOS C	24.2	170.9	1.00	1.26	1.95	78.7
Approach		1564	1.0	1564	1.0	0.912	22.8	LOS B	24.2	170.9	0.93	1.11	1.63	66.6
NorthWest: Fullerton Cove Road														
27	L2	63	0.0	63	0.0	0.608	20.2	LOS B	4.5	31.9	0.92	1.08	1.32	88.2
28	T1	125	0.8	125	0.8	0.608	17.2	LOS B	4.5	31.9	0.92	1.08	1.32	43.3
29	R2	108	1.9	108	1.9	0.608	23.6	LOS B	4.5	31.9	0.92	1.08	1.32	53.7
Approach		297	1.1	297	1.1	0.608	20.2	LOS B	4.5	31.9	0.92	1.08	1.32	65.3
SouthWest: Nelson Bay Road (SW)														
30	L2	182	1.7	182	1.7	0.487	5.5	LOS A	3.6	25.5	0.52	0.51	0.52	60.7
31	T1	1165	1.7	1165	1.7	0.701	6.6	LOS A	7.0	49.7	0.58	0.53	0.58	89.5
32	R2	296	2.1	296	2.1	0.701	12.2	LOS A	7.0	49.7	0.60	0.54	0.60	57.1
32u	U	12	0.0	12	0.0	0.701	15.0	LOS B	7.0	49.7	0.60	0.54	0.60	66.2
Approach		1655	1.8	1655	1.8	0.701	7.5	LOS A	7.0	49.7	0.57	0.53	0.57	85.4
All Vehicles		3795	1.5	3795	1.5	0.912	16.4	LOS B	24.2	170.9	0.78	0.85	1.10	73.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1WE [FUL_COV_20_WE_BY (Site Folder: WE Peak)]

Network: N101 [WE BY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	19	0.0	19	0.0	0.028	5.7	LOS A	0.1	0.9	0.02	0.63	0.02	43.5
23	R2	24	4.3	24	4.3	0.028	9.1	LOS A	0.1	0.9	0.02	0.63	0.02	67.6
Approach		43	2.4	43	2.4	0.028	7.6	LOS A	0.1	0.9	0.02	0.63	0.02	66.0
NorthEast: Fullerton Cove Road (NE)														
24	L2	17	6.3	17	6.3	0.015	5.4	LOS A	0.1	0.5	0.10	0.57	0.10	68.4
26	R2	1	0.0	1	0.0	0.015	9.2	LOS A	0.1	0.5	0.10	0.57	0.10	67.8
26u	U	1	0.0	1	0.0	0.015	11.0	LOS A	0.1	0.5	0.10	0.57	0.10	69.1
Approach		19	5.6	19	5.6	0.015	6.0	LOS A	0.1	0.5	0.10	0.57	0.10	68.5
NorthWest: The Cove Drive														
27	L2	3	0.0	3	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	67.5
28	T1	20	0.0	20	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	37.7
Approach		23	0.0	23	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	59.6
All Vehicles		85	2.5	85	2.5	0.028	6.2	LOS A	0.1	0.9	0.06	0.55	0.06	66.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2WE [NEL_FUL_20_WE_BY (Site Folder: WE Peak)]

Network: N101 [WE BY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	111	2.9	111	2.9	0.102	6.0	LOS A	0.4	3.2	0.52	0.60	0.52	60.7
22	T1	2	50.0	2	50.0	0.047	6.8	LOS A	0.2	1.3	0.53	0.73	0.53	49.1
23	R2	33	0.0	33	0.0	0.047	11.9	LOS A	0.2	1.3	0.53	0.73	0.53	86.3
Approach		145	2.9	145	2.9	0.102	7.4	LOS A	0.4	3.2	0.52	0.63	0.52	71.4
NorthEast: Nelson Bay Road (NE)														
24	L2	8	0.0	8	0.0	0.151	5.3	LOS A	0.8	5.4	0.36	0.45	0.36	65.4
25	T1	624	1.7	624	1.7	0.306	5.2	LOS A	1.8	13.0	0.36	0.45	0.36	68.9
26	R2	5	0.0	5	0.0	0.306	11.6	LOS A	1.8	13.0	0.37	0.45	0.37	68.3
26u	U	15	28.6	15	28.6	0.306	15.0	LOS B	1.8	13.0	0.37	0.45	0.37	80.2
Approach		653	2.3	653	2.3	0.306	5.4	LOS A	1.8	13.0	0.36	0.45	0.36	69.2
NorthWest: Fullerton Cove Road														
27	L2	11	0.0	11	0.0	0.043	7.3	LOS A	0.2	1.2	0.53	0.72	0.53	91.4
28	T1	3	33.3	3	33.3	0.043	7.5	LOS A	0.2	1.2	0.53	0.72	0.53	48.0
29	R2	23	0.0	23	0.0	0.043	13.3	LOS A	0.2	1.2	0.53	0.72	0.53	60.5
Approach		37	2.9	37	2.9	0.043	11.1	LOS A	0.2	1.2	0.53	0.72	0.53	77.1
SouthWest: Nelson Bay Road (SW)														
30	L2	37	2.9	37	2.9	0.211	4.5	LOS A	1.2	8.3	0.21	0.38	0.21	62.9
31	T1	604	1.6	604	1.6	0.303	4.7	LOS A	1.9	13.3	0.20	0.44	0.20	90.3
32	R2	152	1.4	152	1.4	0.303	11.2	LOS A	1.9	13.3	0.20	0.48	0.20	58.2
32u	U	8	0.0	8	0.0	0.303	14.0	LOS A	1.9	13.3	0.20	0.48	0.20	67.6
Approach		801	1.6	801	1.6	0.303	6.0	LOS A	1.9	13.3	0.20	0.45	0.20	86.7
All Vehicles		1636	2.0	1636	2.0	0.306	6.0	LOS A	1.9	13.3	0.30	0.47	0.30	76.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1WE_FY [FUL_COV_33_WE_FY (Site Folder: WE Peak)]

Network: N101 [WE FY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	19	0.0	19	0.0	0.028	5.7	LOS A	0.1	0.9	0.02	0.63	0.02	43.5
23	R2	24	4.3	24	4.3	0.028	9.1	LOS A	0.1	0.9	0.02	0.63	0.02	67.6
Approach		43	2.4	43	2.4	0.028	7.6	LOS A	0.1	0.9	0.02	0.63	0.02	66.0
NorthEast: Fullerton Cove Road (NE)														
24	L2	17	6.3	17	6.3	0.015	5.4	LOS A	0.1	0.5	0.10	0.57	0.10	68.4
26	R2	1	0.0	1	0.0	0.015	9.2	LOS A	0.1	0.5	0.10	0.57	0.10	67.8
26u	U	1	0.0	1	0.0	0.015	11.0	LOS A	0.1	0.5	0.10	0.57	0.10	69.1
Approach		19	5.6	19	5.6	0.015	6.0	LOS A	0.1	0.5	0.10	0.57	0.10	68.5
NorthWest: The Cove Drive														
27	L2	3	0.0	3	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	67.5
28	T1	20	0.0	20	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	37.7
Approach		23	0.0	23	0.0	0.018	3.6	LOS A	0.1	0.6	0.11	0.39	0.11	59.6
All Vehicles		85	2.5	85	2.5	0.028	6.2	LOS A	0.1	0.9	0.06	0.55	0.06	66.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2WE_FY [NEL_FUL_33_WE_FY (Site Folder: WE Peak)]

Network: N101 [WE FY (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	111	2.9	111	2.9	0.108	6.8	LOS A	0.5	3.6	0.57	0.65	0.57	60.6
22	T1	2	50.0	2	50.0	0.050	7.4	LOS A	0.2	1.4	0.58	0.76	0.58	48.8
23	R2	33	0.0	33	0.0	0.050	12.3	LOS A	0.2	1.4	0.58	0.76	0.58	86.2
Approach		145	2.9	145	2.9	0.108	8.1	LOS A	0.5	3.6	0.57	0.67	0.57	71.3
NorthEast: Nelson Bay Road (NE)														
24	L2	8	0.0	8	0.0	0.182	5.3	LOS A	0.9	6.7	0.37	0.45	0.37	65.4
25	T1	758	1.7	758	1.7	0.369	5.3	LOS A	2.3	16.6	0.38	0.45	0.38	68.9
26	R2	5	0.0	5	0.0	0.369	11.7	LOS A	2.3	16.6	0.39	0.45	0.39	68.3
26u	U	15	28.6	15	28.6	0.369	15.1	LOS B	2.3	16.6	0.39	0.45	0.39	80.2
Approach		786	2.1	786	2.1	0.369	5.5	LOS A	2.3	16.6	0.38	0.45	0.38	69.1
NorthWest: Fullerton Cove Road														
27	L2	11	0.0	11	0.0	0.046	8.0	LOS A	0.2	1.3	0.57	0.74	0.57	91.3
28	T1	3	33.3	3	33.3	0.046	8.0	LOS A	0.2	1.3	0.57	0.74	0.57	47.8
29	R2	23	0.0	23	0.0	0.046	13.7	LOS A	0.2	1.3	0.57	0.74	0.57	60.2
Approach		37	2.9	37	2.9	0.046	11.6	LOS A	0.2	1.3	0.57	0.74	0.57	76.9
SouthWest: Nelson Bay Road (SW)														
30	L2	37	2.9	37	2.9	0.245	4.5	LOS A	1.4	10.0	0.21	0.38	0.21	62.9
31	T1	734	1.6	734	1.6	0.352	4.8	LOS A	2.3	16.5	0.21	0.43	0.21	90.3
32	R2	152	1.4	152	1.4	0.352	11.2	LOS A	2.3	16.5	0.21	0.47	0.21	58.3
32u	U	8	0.0	8	0.0	0.352	14.0	LOS A	2.3	16.5	0.21	0.47	0.21	67.7
Approach		931	1.6	931	1.6	0.352	5.9	LOS A	2.3	16.5	0.21	0.44	0.21	87.3
All Vehicles		1899	1.9	1899	1.9	0.369	6.0	LOS A	2.3	16.6	0.32	0.47	0.32	76.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1WE_Dev [FUL_COV_33_WE_FY + Dev (Site Folder: WE Peak)]

Network: N101 [WE FY + Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	19	0.0	19	0.0	0.248	5.9	LOS A	1.4	10.1	0.16	0.64	0.16	40.9
23	R2	343	0.3	343	0.3	0.248	9.3	LOS A	1.4	10.1	0.16	0.64	0.16	67.2
Approach		362	0.3	362	0.3	0.248	9.1	LOS A	1.4	10.1	0.16	0.64	0.16	67.1
NorthEast: Fullerton Cove Road (NE)														
24	L2	336	0.3	336	0.3	0.243	5.4	LOS A	1.6	11.1	0.12	0.56	0.12	68.4
26	R2	36	0.0	36	0.0	0.243	9.2	LOS A	1.6	11.1	0.12	0.56	0.12	67.9
26u	U	1	0.0	1	0.0	0.243	11.0	LOS A	1.6	11.1	0.12	0.56	0.12	69.1
Approach		373	0.3	373	0.3	0.243	5.7	LOS A	1.6	11.1	0.12	0.56	0.12	68.4
NorthWest: The Cove Drive														
27	L2	39	0.0	39	0.0	0.059	5.2	LOS A	0.3	2.1	0.46	0.55	0.46	67.2
28	T1	20	0.0	20	0.0	0.059	5.2	LOS A	0.3	2.1	0.46	0.55	0.46	34.2
Approach		59	0.0	59	0.0	0.059	5.2	LOS A	0.3	2.1	0.46	0.55	0.46	66.2
All Vehicles		794	0.3	794	0.3	0.248	7.2	LOS A	1.6	11.1	0.16	0.59	0.16	67.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2WE_Dev [NEL_FUL_33_WE_FY + Dev (Site Folder: WE Peak)]

Network: N101 [WE FY + Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	111	2.9	111	2.9	0.157	8.5	LOS A	0.8	5.5	0.69	0.78	0.69	60.2
22	T1	82	1.3	82	1.3	0.128	5.4	LOS A	0.7	4.8	0.68	0.64	0.68	51.3
23	R2	33	0.0	33	0.0	0.128	12.0	LOS A	0.7	4.8	0.68	0.64	0.68	87.5
Approach		225	1.9	225	1.9	0.157	7.8	LOS A	0.8	5.5	0.69	0.71	0.69	67.5
NorthEast: Nelson Bay Road (NE)														
24	L2	8	0.0	8	0.0	0.238	6.7	LOS A	1.4	10.1	0.60	0.57	0.60	65.1
25	T1	744	1.7	744	1.7	0.482	6.7	LOS A	3.8	26.7	0.65	0.59	0.65	68.4
26	R2	112	0.0	112	0.0	0.482	12.9	LOS A	3.8	26.7	0.68	0.59	0.68	67.6
26u	U	15	28.6	15	28.6	0.482	16.5	LOS B	3.8	26.7	0.68	0.59	0.68	79.7
Approach		879	1.9	879	1.9	0.482	7.7	LOS A	3.8	26.7	0.65	0.59	0.65	68.5
NorthWest: Fullerton Cove Road														
27	L2	91	0.0	91	0.0	0.457	9.9	LOS A	2.8	19.6	0.74	0.88	0.85	91.6
28	T1	162	0.6	162	0.6	0.457	8.9	LOS A	2.8	19.6	0.74	0.88	0.85	47.9
29	R2	103	0.0	103	0.0	0.457	15.5	LOS B	2.8	19.6	0.74	0.88	0.85	60.6
Approach		356	0.3	356	0.3	0.457	11.1	LOS A	2.8	19.6	0.74	0.88	0.85	72.3
SouthWest: Nelson Bay Road (SW)														
30	L2	169	0.6	169	0.6	0.300	5.5	LOS A	1.8	12.7	0.47	0.52	0.47	61.2
31	T1	667	1.7	667	1.7	0.433	5.6	LOS A	3.1	21.7	0.48	0.53	0.48	89.7
32	R2	152	1.4	152	1.4	0.433	12.0	LOS A	3.1	21.7	0.49	0.53	0.49	57.5
32u	U	8	0.0	8	0.0	0.433	14.8	LOS B	3.1	21.7	0.49	0.53	0.49	66.7
Approach		997	1.5	997	1.5	0.433	6.6	LOS A	3.1	21.7	0.48	0.53	0.48	85.5
All Vehicles		2457	1.5	2457	1.5	0.482	7.7	LOS A	3.8	26.7	0.60	0.62	0.62	74.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1WE_All [FUL_COV_33_WE_FY + All Dev (Site Folder: WE Peak)]

Network: N101 [WE FY + All Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Fullerton Cove Road (SE)														
22	T1	40	0.0	40	0.0	0.267	5.9	LOS A	1.6	11.3	0.16	0.63	0.16	41.1
23	R2	352	0.3	352	0.3	0.267	9.3	LOS A	1.6	11.3	0.16	0.63	0.16	67.3
Approach		392	0.3	392	0.3	0.267	8.9	LOS A	1.6	11.3	0.16	0.63	0.16	67.0
NorthEast: Fullerton Cove Road (NE)														
24	L2	344	0.3	344	0.3	0.264	5.5	LOS A	1.7	12.2	0.19	0.55	0.19	68.4
26	R2	36	0.0	36	0.0	0.264	9.3	LOS A	1.7	12.2	0.19	0.55	0.19	67.8
26u	U	1	0.0	1	0.0	0.264	11.2	LOS A	1.7	12.2	0.19	0.55	0.19	69.0
Approach		381	0.3	381	0.3	0.264	5.9	LOS A	1.7	12.2	0.19	0.55	0.19	68.3
NorthWest: The Cove Drive														
27	L2	39	0.0	39	0.0	0.081	5.3	LOS A	0.4	2.9	0.48	0.55	0.48	67.2
28	T1	41	0.0	41	0.0	0.081	5.3	LOS A	0.4	2.9	0.48	0.55	0.48	34.0
Approach		80	0.0	80	0.0	0.081	5.3	LOS A	0.4	2.9	0.48	0.55	0.48	65.1
All Vehicles		853	0.2	853	0.2	0.267	7.2	LOS A	1.7	12.2	0.21	0.59	0.21	67.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 2WE_All [NEL_FUL_33_WE_FY + All Dev (Site Folder: WE Peak)]

Network: N101 [WE FY + All Dev (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

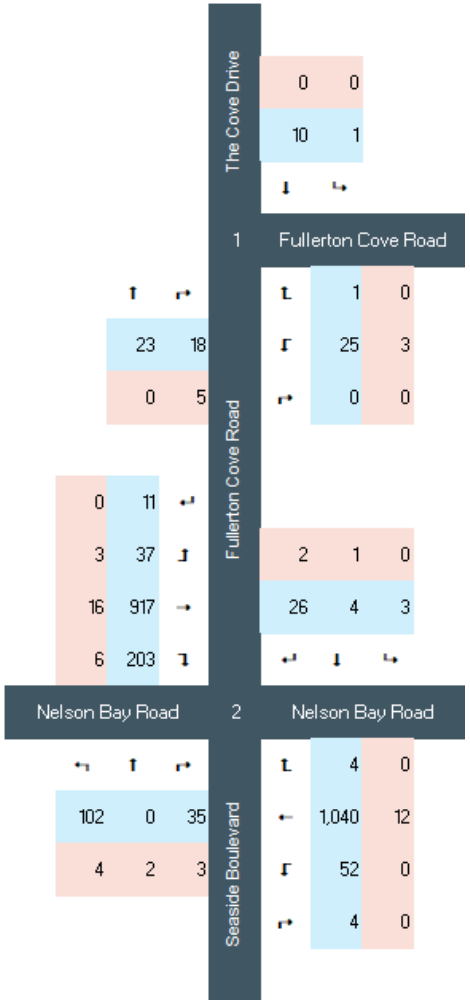
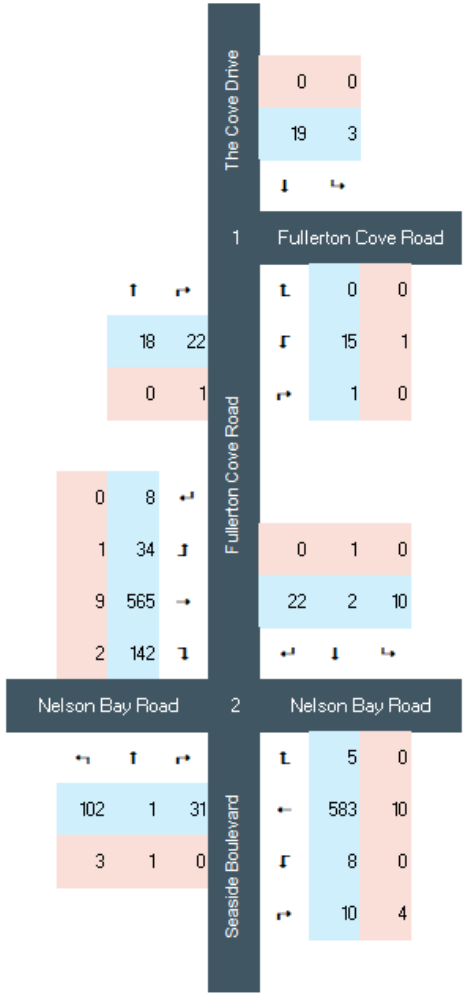
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Seaside Boulevard														
21	L2	198	1.6	198	1.6	0.239	8.9	LOS A	1.4	9.9	0.76	0.79	0.76	60.1
22	T1	82	1.3	82	1.3	0.187	6.7	LOS A	1.0	6.7	0.74	0.76	0.74	50.7
23	R2	35	0.0	35	0.0	0.187	13.4	LOS A	1.0	6.7	0.74	0.76	0.74	87.2
Approach		315	1.3	315	1.3	0.239	8.8	LOS A	1.4	9.9	0.75	0.78	0.75	65.6
NorthEast: Nelson Bay Road (NE)														
24	L2	8	0.0	8	0.0	0.270	7.6	LOS A	1.7	12.0	0.68	0.64	0.68	65.0
25	T1	791	1.6	791	1.6	0.546	8.0	LOS A	4.9	34.6	0.75	0.68	0.78	68.2
26	R2	112	0.0	112	0.0	0.546	14.1	LOS A	4.9	34.6	0.79	0.70	0.83	67.4
26u	U	16	26.7	16	26.7	0.546	17.7	LOS B	4.9	34.6	0.79	0.70	0.83	79.6
Approach		926	1.8	926	1.8	0.546	8.9	LOS A	4.9	34.6	0.76	0.69	0.79	68.4
NorthWest: Fullerton Cove Road														
27	L2	91	0.0	91	0.0	0.545	11.9	LOS A	3.8	26.7	0.82	0.98	1.04	90.7
28	T1	162	0.6	162	0.6	0.545	11.0	LOS A	3.8	26.7	0.82	0.98	1.04	46.7
29	R2	133	0.0	133	0.0	0.545	17.4	LOS B	3.8	26.7	0.82	0.98	1.04	58.8
Approach		385	0.3	385	0.3	0.545	13.4	LOS A	3.8	26.7	0.82	0.98	1.04	70.4
SouthWest: Nelson Bay Road (SW)														
30	L2	199	0.5	199	0.5	0.351	5.6	LOS A	2.2	15.7	0.50	0.53	0.50	61.0
31	T1	714	1.6	714	1.6	0.506	5.7	LOS A	3.9	27.6	0.52	0.55	0.52	89.6
32	R2	240	0.9	240	0.9	0.506	12.1	LOS A	3.9	27.6	0.53	0.56	0.53	57.2
32u	U	8	0.0	8	0.0	0.506	14.9	LOS B	3.9	27.6	0.53	0.56	0.53	66.3
Approach		1161	1.3	1161	1.3	0.506	7.1	LOS A	3.9	27.6	0.52	0.55	0.52	84.0
All Vehicles		2787	1.3	2787	1.3	0.546	8.7	LOS A	4.9	34.6	0.67	0.68	0.71	74.1

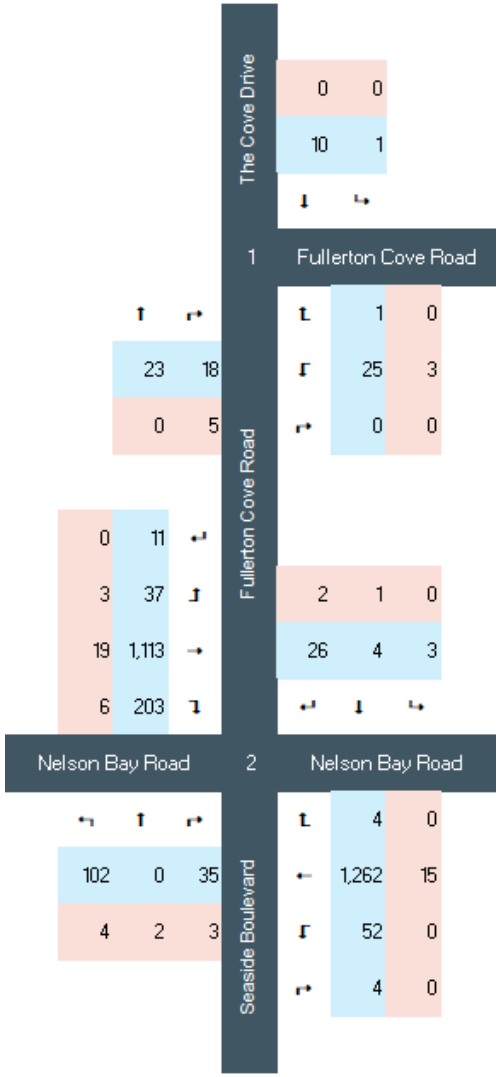
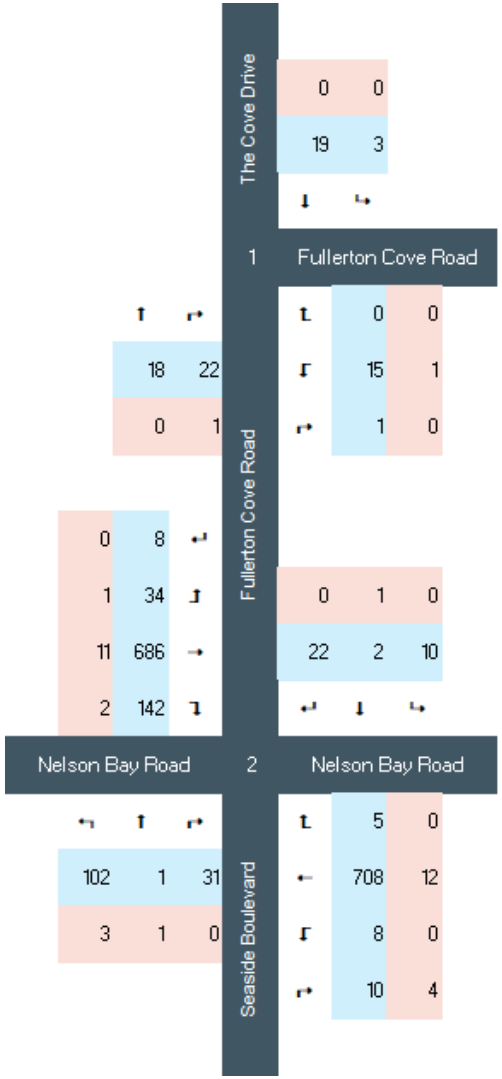
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

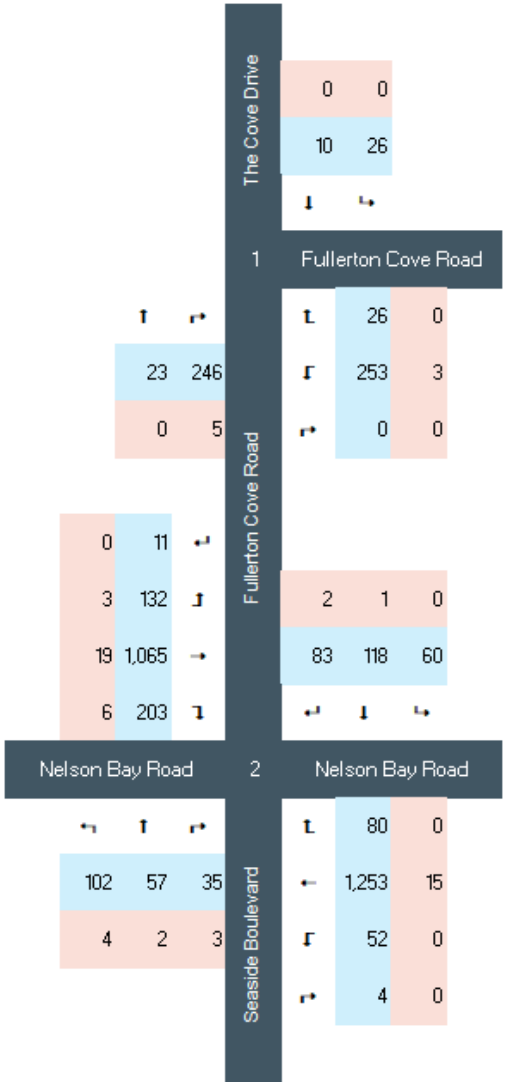
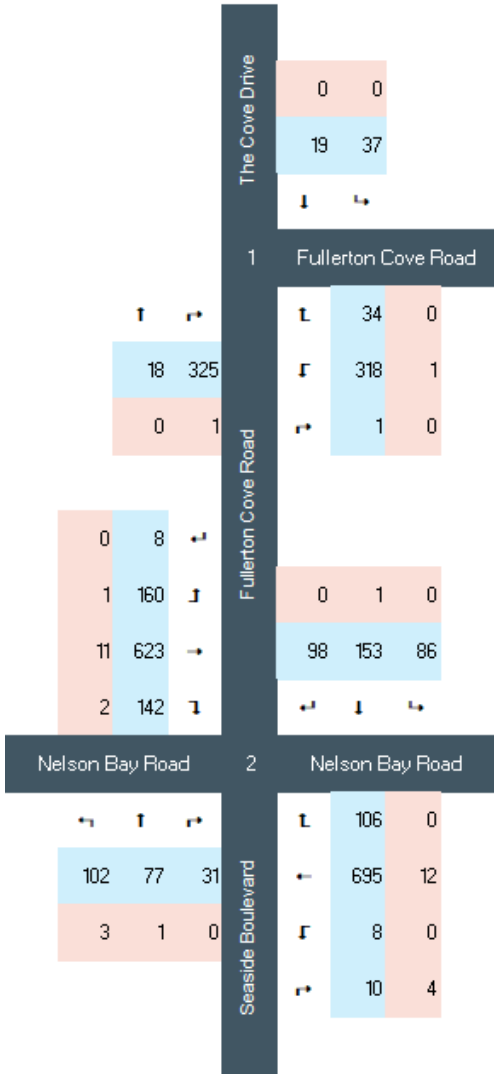
APPENDIX B

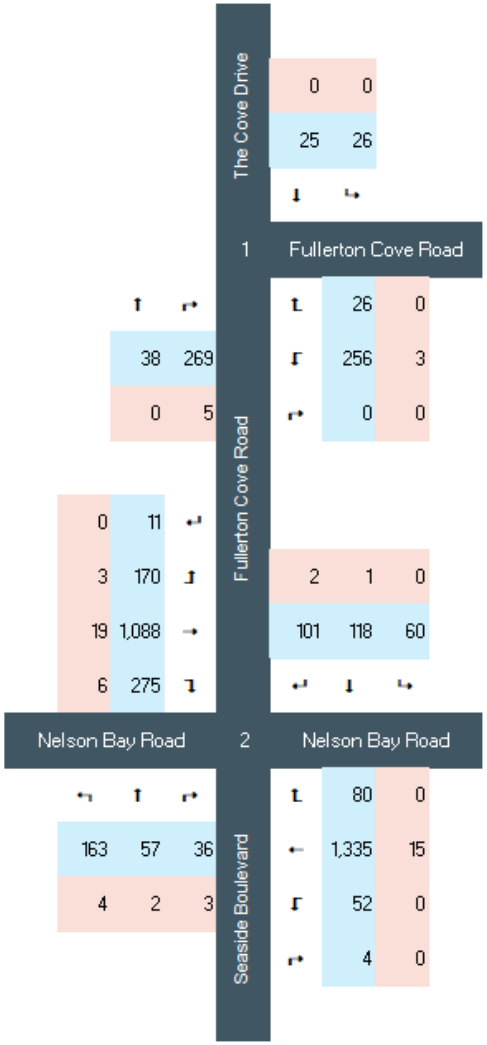
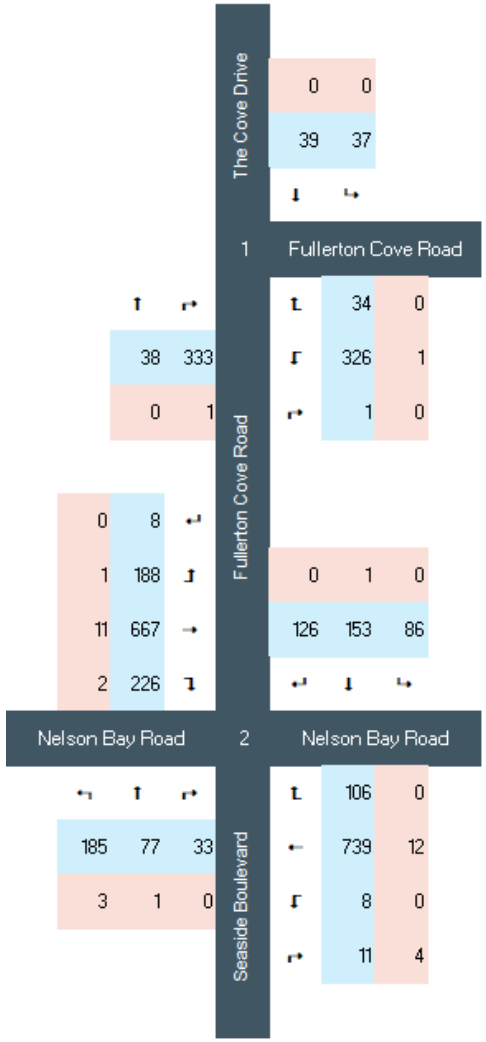
Roundabout Turning Movements

Table B-1 Roundabout turning movements

Scenario	PM Peak	Weekend Peak
Scenario 1: 2020 Base Year		

Scenario	PM Peak	Weekend Peak
Scenario 2: 2033 With Background Traffic Growth, Do Nothing		

Scenario	PM Peak	Weekend Peak
Scenario 4: 2033 With Development, Do Nothing		

Scenario	PM Peak	Weekend Peak
Scenario 6: 2033 With Development and Cumulative Impacts, Do Nothing		

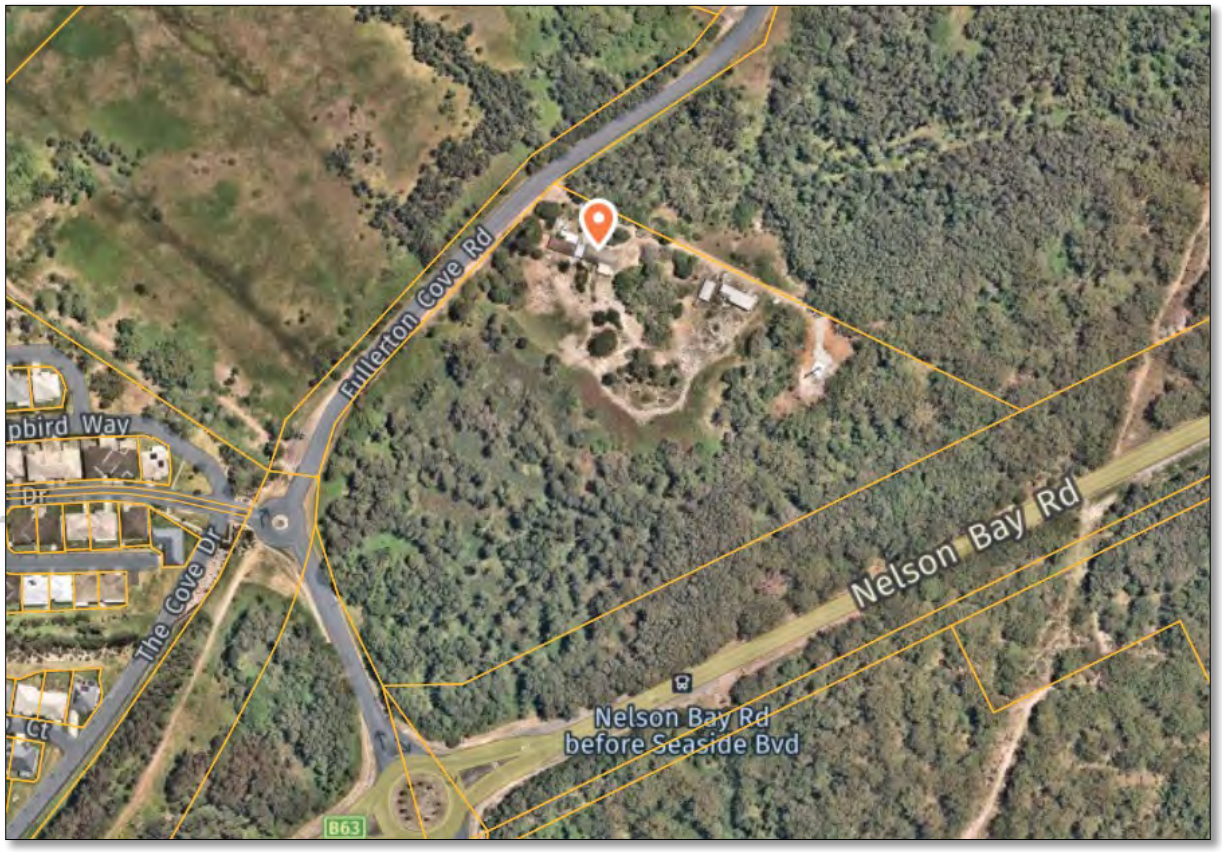

SCT
Consulting

ATTACHMENT 10 – Strategic Bushfire Study

STRATEGIC BUSHFIRE STUDY

42 Fullerton Cove Road, Fullerton Cove

Christine Jordan



Bushfire Planning Australia

Stuart Greville
Accredited Bushfire Practitioner
BPAD-26202
✆ 0400 917 792
✉ stuart@bfpa.com.au

Ref: 2028
Version: FINAL – February 2021

Disclaimer and Limitation

This report is prepared solely for Christine Jordan (the 'Client') for the specific purposes of only for which it is supplied (the 'Purpose'). This report is not for the benefit of any other person; either directly or indirectly and is strictly limited to the purpose and the facts and matters stated in it and will not be used for any other application.

This report is based on the site conditions surveyed at the time the document was prepared. The assessment of the bushfire threat made in this report is made in good faith based on the information available to Bushfire Planning Australia at the time.

The recommendations contained in this report are considered to be minimum standards and they do not guarantee that a building or assets will not be damaged in a bushfire. In the making of these comments and recommendations it should be understood that the focus of this document is to minimise the threat and impact of a bushfire.

Finally, the implementation of the adopted measures and recommendations within this report will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Document Status: 2028 – Strategic Bushfire Study

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Katrina Mukevski	2 February 2021
2	Draft	Draft for Client Review	Stuart Greville	5 February 2021
3	Final	Final for Submission	Stuart Greville	18 February 2021

Certification

As the author of this Bushfire Threat Assessment (BAR), I certify this BAR provides the detailed information required by the NSW Rural Fire Service under Clause 44 of the Rural Fires Regulation 2013 and Appendix 2 of Planning for Bushfire Protection 2019 for the purposes of an application for a bush fire safety authority under section 100B(4) of the Rural Fires Act 1997.



Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 18 February 2021

In signing the above, I declare the report is true and accurate to the best of my knowledge at the time of issue.

Executive Summary

Bushfire Planning Australia (BPA) has been engaged by Christine Jordan (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for a proposed neighbourhood centre at 42 Fullerton Cove Road, Fullerton Cove.

This SBS found the site is exposed to a moderate to high bushfire hazard to the north east and south. The predominant vegetation surrounding the site is consistent with a *coastal swamp forest* vegetation formation as described in the NSW Rural Fire Service document Planning for Bushfire Protection 2019 (PBP 2019). The SBS concludes that the hazard identified can be successfully mitigated by applying the requirements of PBP 2019.

In summary, the following key recommendations have been designed to enable any future proposed development to achieve the aims and objectives of PBP 2019:

1. The entire site shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be established as shown in **Figure 16** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
3. Access shall be provided in accordance with Table 5.3b of PBP 2019;
4. Vegetation within road verges and stormwater basins to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity (and considered unmanaged);
5. All future buildings are to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
6. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019;
7. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (February 2021).

Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

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Appendices

Appendix A: Proposed Land Use Zone Map
Appendix B: AHIMS Search Results

Terms and Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419-2005	Australian Standard – Fire Hydrant Installations
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BAR	Bushfire Assessment Report
BCA	Building Code of Australia
BC Act	NSW Biodiversity Act 2016
BMP	Bush Fire Management Plan
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPLM	Bush Fire Prone Land Map
BPM	Bush Fire Protection Measures
DoE	Commonwealth Department of the Environment
DPI Water	NSW Department of Primary Industries – Water
EPA Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
OPA	Outer Protection Area
OEH	NSW Office of Environment and Heritage
PBP 2019	Planning for Bushfire Protection 2019
PSC	Port Stephens Council
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RFS	NSW Rural Fire Service
TSC Act	NSW Threatened Species Conservation Act 1995 (as repealed)

1. Introduction

Bushfire Planning Australia (BPA) has been appointed by Christine Jordan (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for a proposed neighbourhood centre at 42 Fullerton Cove Road, Fullerton Cove ("the site").

The assessment aims to provide a strategic bushfire risk assessment which considers and assesses the bushfire hazard and associated potential bushfire threat relevant to the proposed development on a landscape scale. The assessment outlines the minimum mitigative measures which would be required in accordance with the SBS, provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) and the *Rural Fires Regulation 2013*.

1.1. Aims and Objectives

This SBS aims to assess the bushfire threat and recommends a series of bushfire protection measures that aim to minimise the risk of adverse impact of bush fires on life, property and the environment.

This assessment has been undertaken in accordance with Chapter 4 of *Planning for Bushfire Protection 2019,* the Section 9.1 Ministerial Directions and clause 44 of the *Rural Fires Regulation 2013*. This assessment also addresses the aim and objectives of PBP 2019, being:

- The protection of human life and the minimisation of impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment; and
- Afford buildings and their occupants protection from exposure to a bushfire;
- Provide a defendable space to be located around buildings;
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevents the likely fire spread to buildings;
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- Provide for ongoing management and maintenance of BPMs; and
- Ensure that utility services are adequate to meet the needs of firefighters.

1.2. Strategic Bushfire Planning

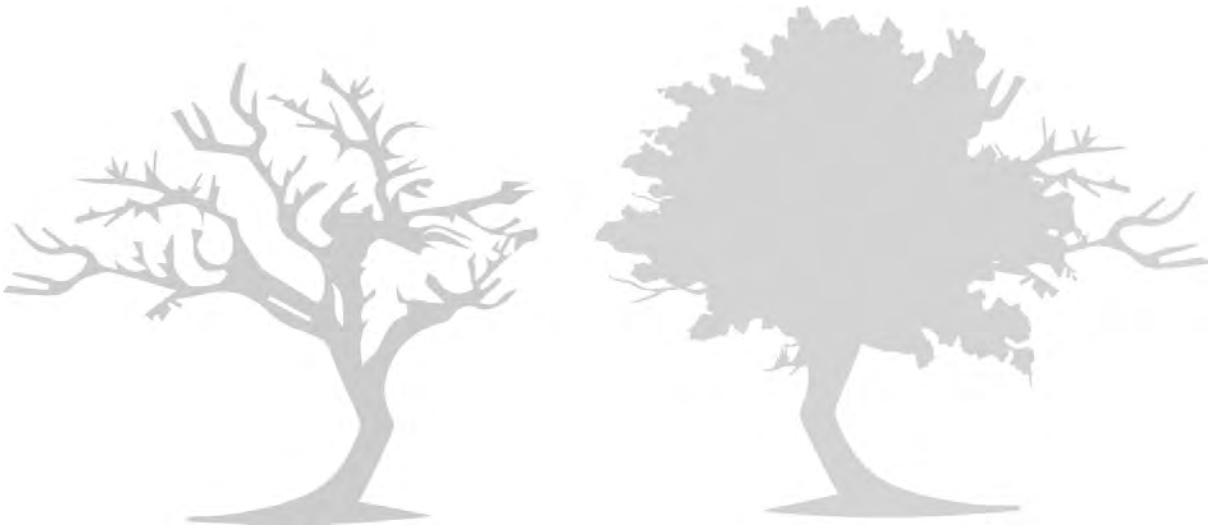
This report supports an application for a strategic development proposal and therefore provides a Strategic Bush Fire Study (SBS) in accordance with Chapter 4 of Planning for Bush Fire Protection 2019. The SBS responds to high level guidance regarding the need to assess the appropriateness of future development sites prior to creating development expectations.

The SBS reviews the bushfire context within a radius of 2km, which for site this size is considered to be an appropriate distance. The 2km bushfire context provides a picture of the surrounding landscape, vegetation communities and topography. Along with an assessment of the road network and emergency management framework, the SBS reviews the appropriateness of the proposed land use. The SBS also makes recommendations for appropriate bushfire protection measures required for future subdivision applications on the site.

In undertaking the SBS and BAR within this report, it can be demonstrated that the proposal meets the requirements of the Section 9.1(2) Direction 4.4 Planning for Bush Fire Protection. In particular:

- the proposed development can provide appropriate asset protection zones within resultant property boundaries (APZ) of inner protection area (IPA) in accordance with the calculated requirements under PBP 2019. A BAL contour plan is submitted to demonstrate this.
  - The IPA is bounded by a perimeter road which circumscribes the hazard side of the land intended for development.

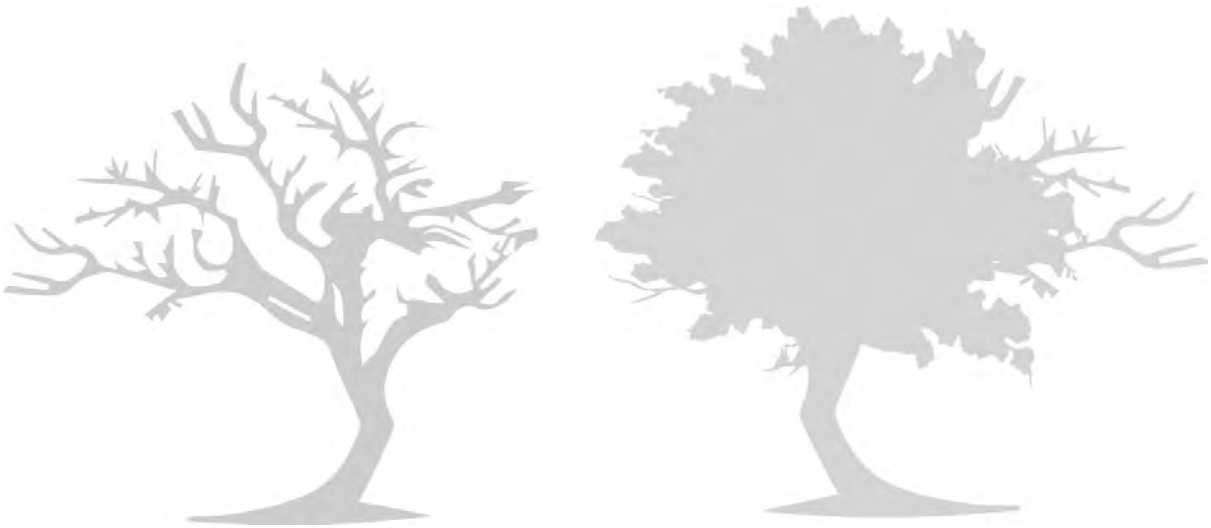
- the proposed development contains provisions for a two-way perimeter road around the entire development, providing access to/from all lots within the resultant subdivision. The perimeter road links directly to a main distributor road within the public road network.
- the proposed development will provide adequate water supply for firefighting purposes via a connection to the reticulated water system,
- the perimeter of the area of land interfacing the hazard is minimised by the perimeter road which provides hardstand APZ around the perimeter of the development,
- introduce controls on the placement of combustible materials in the Inner Protection Area.



2. Site Description

Table 1: Site Description

Address	42 Fullerton Cove Road, Fullerton Cove
Title	Lot 14 DP 258848
LGA	Port Stephens Council
Subject Site/ Study Area	6.7 ha
Development Site	2.5 ha
Land Use Zone	RU2 Rural Landscape
Bushfire Prone Land	YES – Vegetation Category 1, 2 and Vegetation Buffer (**Figure 2**)
Context	Large peri-urban with single dwelling
Topography	Generally low lying and undulating across the site
Fire History	No evidence of recent fire history directly impacting site



Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 1

Site Location

BUSHFIRE PLANNING AUSTRALIA



Subject Site

SOURCE:
Base Map © Department of Customer Service 2020
© Commonwealth of Australia (Geoscience Australia) 2016. Creative Commons Attribution 4.0 International Licence.

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File:FullertonCove_Fig1_Locality_201030 Date: 30/10/2020

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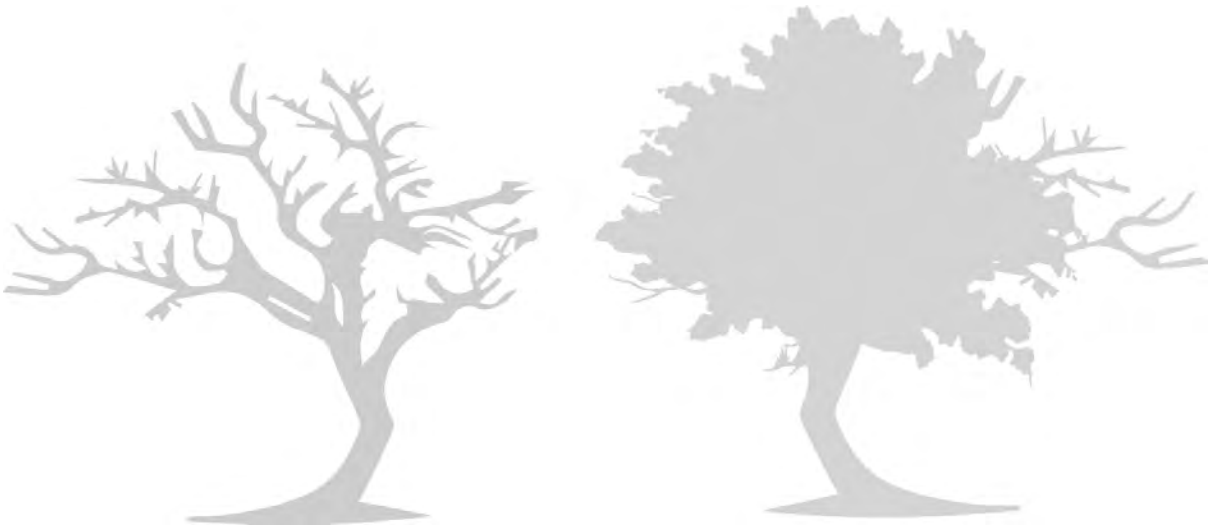
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2.1. Bushfire Prone Land

Bushfire activity is prevalent in landscapes that carry fuel and the two predominant bushfire types are grassland and forest fires. Factors such as topographic characteristics and quantity of fuel loads influence the intensity and spread of fire. The scale of a bushfire hazard is tailored to the characteristics of the hazard, the size and characteristics of the affected population, types of land use exposed to bushfire, predicted development growth pressures and other factors affecting bushfire risk.

Figure 2 demonstrates that the site is almost entirely mapped as Vegetation Category 1 and Vegetation Buffer. There is a small portion of the west side of the site which is mapped as Vegetation Category 2.



Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 2

NSW Bush Fire Prone Land

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer
Watercourse

Bushfire Prone Land

Vegetation Category 1
Vegetation Category 2
Vegetation Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
NSW Bush Fire Prone Land: NSW Rural Fire Service 2018
Aerial Photo: NearMap 02/09/20

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2.2. Fire History

As confirmed during the site inspection, there is no evidence of recent bushfires at the site.

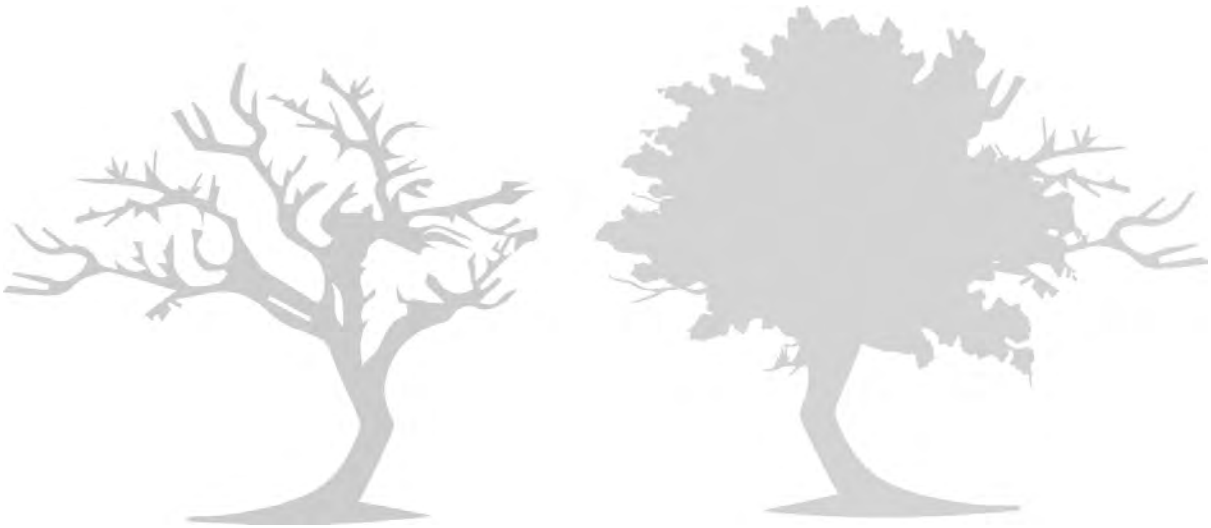
In late December 2018, a bushfire occurred along the eastern side of Nelson Bay, surrounding the Seaside Fern Bay residential estate. Prompt intervention by emergency services ensured the fire did not escalate into an uncontrolled event.

2.3. Proposed Development

This report is prepared in support of a Planning Proposal to rezone the cleared and disturbed areas of the site from RU2 Rural Landscape to B1 Neighbourhood Centre and E2 Environmental Conservation.

The intended outcome of the Planning Proposal is to convert cleared and rehabilitated land into a single lot purposed for local shops and small scale neighbourhood centre to service the local community.

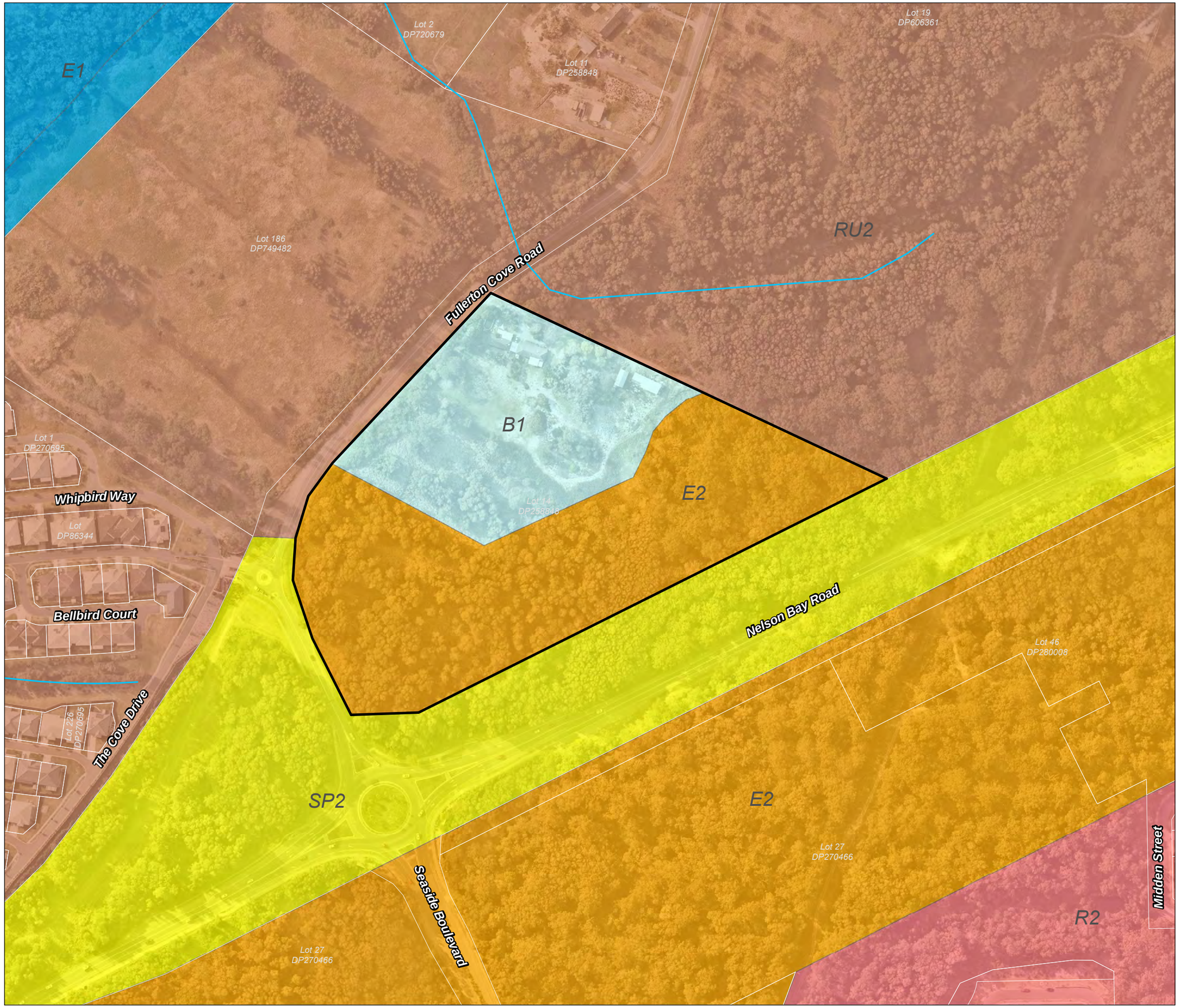
The conceptual zoning plan is contained in **Appendix A** and shown in **Figure 3.**



Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

Figure 3

Proposed Zoning



BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- Watercourse
- B1
- E1
- E2
- R2
- RU2
- SP2

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Zoning: Department of Planning, Industry and Environment 2020 (with subject lot zoning modified by BPA 30/10/20)

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File:FullertonCove-Fig8-ProposedZoning-201030 Date: 30/10/2020

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3. Bushfire Hazard Assessment

The bushfire hazard assessment will involve quantitative and qualitative assessments of the site. The quantitative assessment includes a detailed site inspection to record and review vegetation communities, slope and aspect both within and surrounding the site. The qualitative assessment will be based on the known bushfire behaviour of the subject land.

3.1. Vegetation Assessment

Vegetation classification over the site and surrounding area has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent (NearMap historical series);
- Site Inspections 5 November 2020 by Stuart Greville (BPA);
- Lower Hunter Vegetation Mapping 2013 VIS_ID 4513 - Keith Formations - **Figure 4**.
- Greater Hunter Native Vegetation Mapping v4.0 VIS ID 3855 - **Figure 6**; and

In accordance with Appendix 1 of PBP 2019, an assessment of the vegetation over a distance of 140m in all directions from the site was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the development footprint.

For the purposes of the SBS, vegetation to a distance of 2km from the site has also been assessed. This is discussed in section 4 of this report.



Plate 1: Approximate zone boundary indicated by the tree line



Plate 2: Location of Optus telecom tower looking South



Plate 3: Location of Optus telecom tower looking North



Plate 4: Typical vegetation formation surrounding the site *(Coastal swamp forest)*



Plate 5: *Coastal swamp forest* on north side of Fullerton Cove Road



Plate 6: *Coastal swamp forest* north of subject site



Plate 7: Property future development site opposite Fullerton Cove Road *(grassland)*

Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 4

Vegetation (Keith)

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer
Watercourse
Dry Sclerophyll Forests (Shrubby sub-formation)
Forested Wetlands
Saline Wetlands

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Vegetation: Lower Hunter Vegetation Mapping 2013 VIS_ID 4513

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File:FullertonCove-Fig3-VegKeith-201030 Date: 30/10/2020

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Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 5

Vegetation (Keith)

BUSHFIRE PLANNING AUSTRALIA

2km

1km

Subject Site

Watercourse

Dry Sclerophyll Forests (Shrubby sub-formation)

Forested Wetlands

Saline Wetlands

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 24/06/20
Vegetation: Lower Hunter Vegetation Mapping 2013 VIS_ID 4513

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File:FullertonCove-Fig3-VegKeith-2Km-210203 Date: 3/02/2021

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Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 6

Vegetation (Greater Hunter)

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer
Watercourse
Cleared / Managed land
Coastal Floodplain Wetlands
Coastal Swamp Forests

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Vegetation Formation: Greater Hunter Native Vegetation Mapping v4.0. VIS ID 3855

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A3 Scale: 1:2,500

File:FullertonCove-Fig4-VegHunter-201030 Date: 30/10/2020

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Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

Figure 7

Vegetation (Greater Hunter)

BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- Watercourse
- Cleared / Managed Land
- Coastal Dune Dry Sclerophyll Forests
- Coastal Floodplain Wetlands
- Coastal Swamp Forests
- Mangrove Swamps
- Saltmarshes
- South Coast Sands Dry Sclerophyll Forests

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 24/06/20
Vegetation Formation: Greater Hunter Native Vegetation Mapping v4.0. VIS ID 3855

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3.2. Slope Assessment

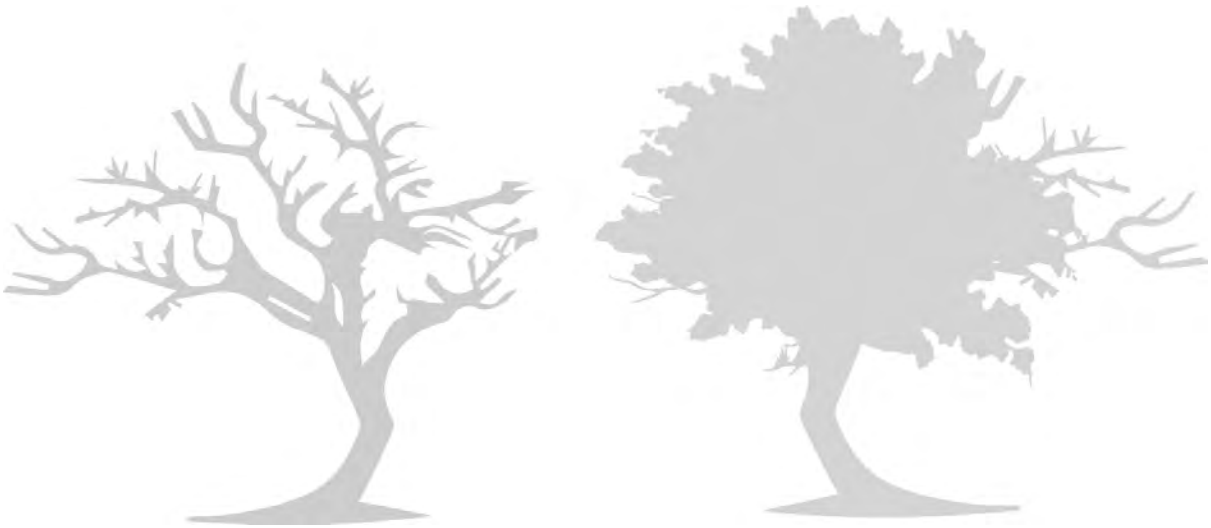
The slope assessment was undertaken as follows:

- Review of LiDAR point cloud data – including DEM (NSW LPI).

An assessment of the slope over a distance of 140m in the hazard direction from the site boundary was undertaken. The effective slope was then calculated under the classified vegetation where there was a fire run greater than 50m. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

A series of figures were produced that demonstrate the slope within 140m of the site and also out to 2km from the subject site in several formats, including:

- Digital Elevation Model – **Figure 8** and **9**; and
- Slope analysis – **Figure 10** and **11**.



Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 8

Elevation

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer
Contour (2m)
Contour (0.5m)
Watercourse

Elevation
High : 10m
Low : 0m

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014

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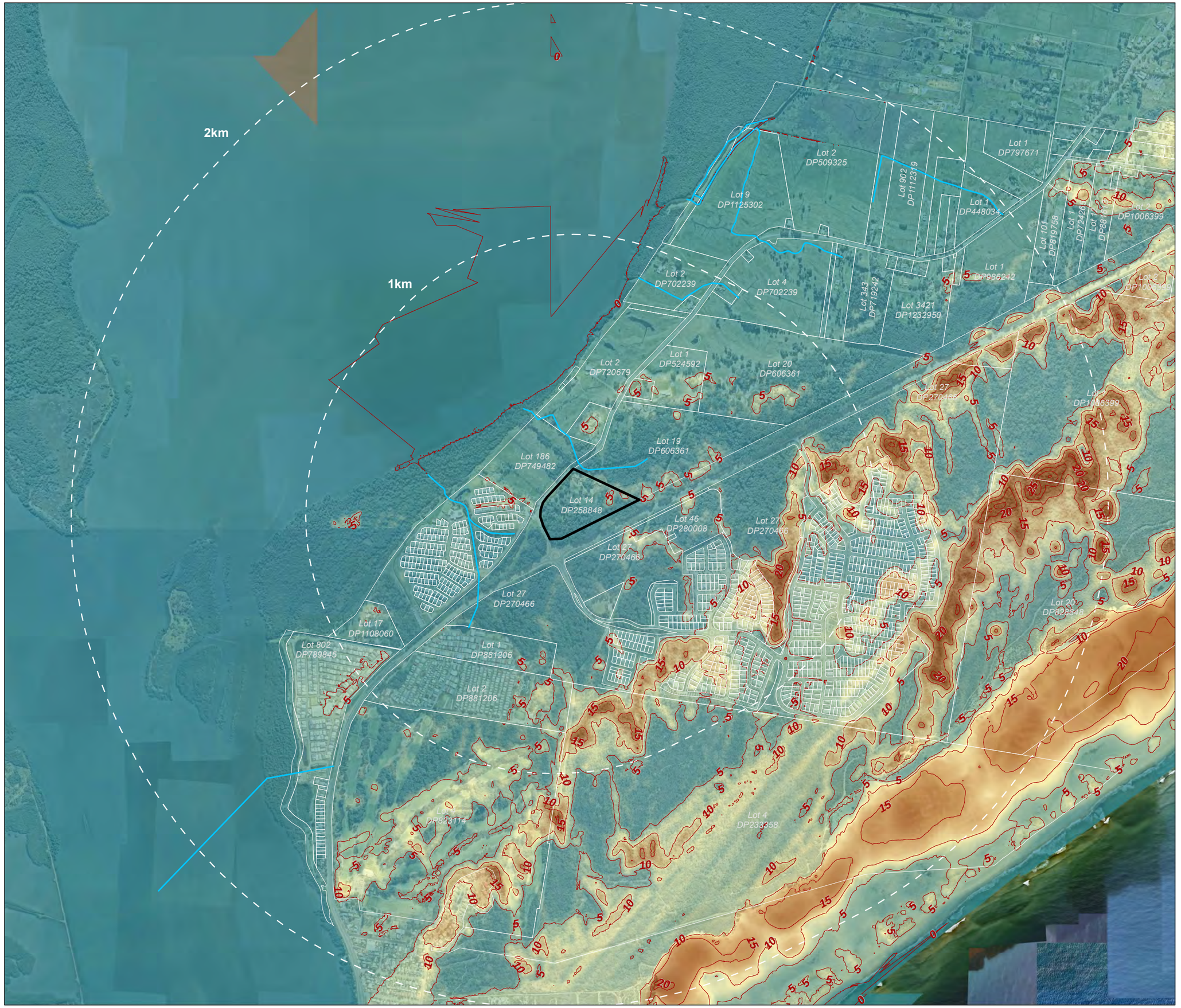
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File:FullertonCove-Fig5-Elevation-201030 Date: 30/10/2020

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Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 9

Elevation

BUSHFIRE PLANNING AUSTRALIA

Subject Site
Contour (5m)
Watercourse

Elevation (AHD)
High : 30.3m
Low : -0.4

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014

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A3 Scale: 1:15,000

File:FullertonCove-Fig5-Elevation-2Km-210203 Date: 3/02/2021

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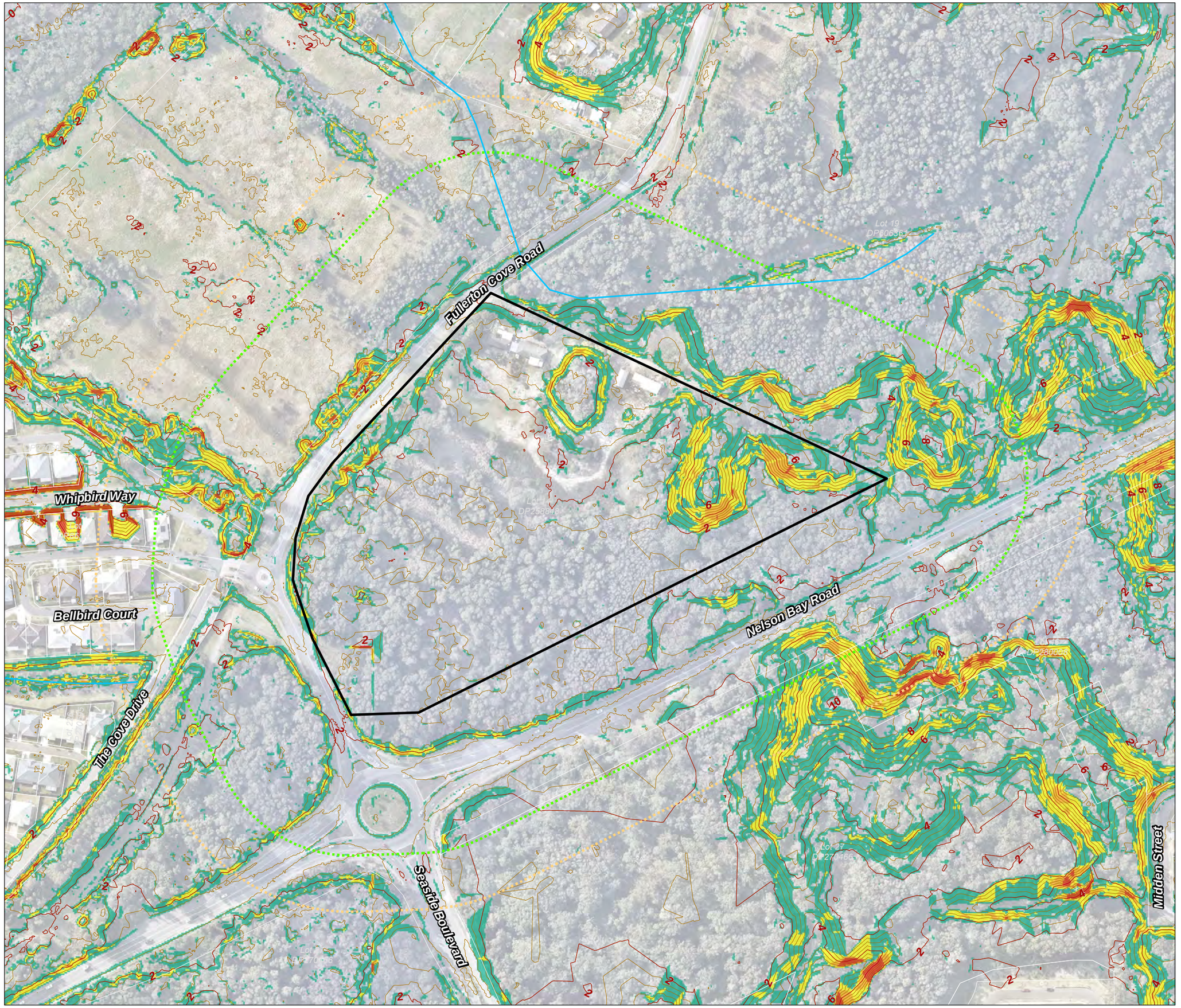
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Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 10

Slope Analysis: LiDAR



BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- 100m Buffer
- 140m Buffer
- Contour (2m)
- Contour (0.5m)
- Watercourse

Slope

- 0° - 5°
- 5° - 10°
- 10° - 15°
- 15° - 20°
- >20°

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014

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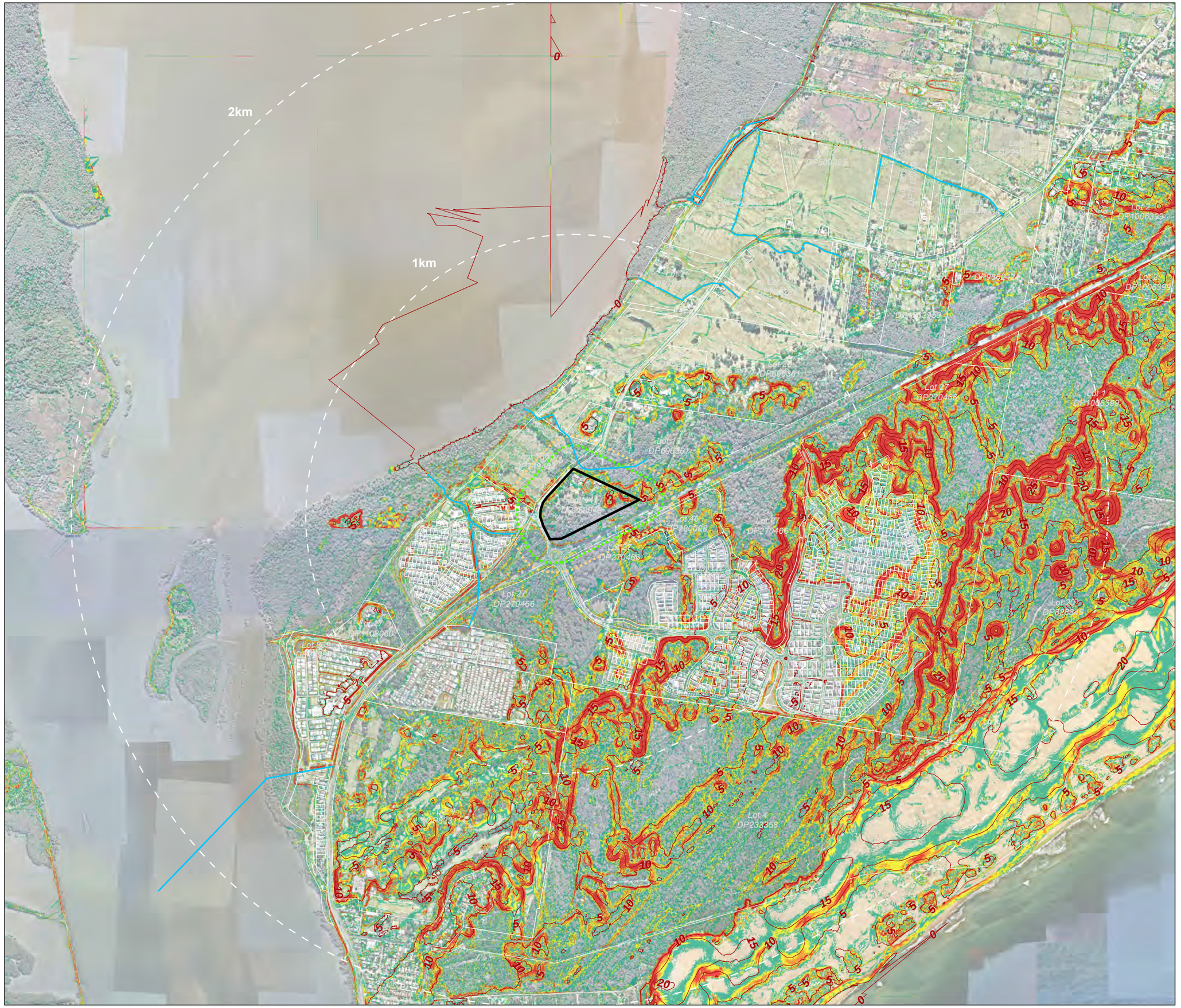
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File:FullertonCove-Fig6-SlopeLiDAR-201030 Date: 30/10/2020

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Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 11

Slope Analysis: LiDAR

BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- 100m Buffer
- 140m Buffer
- Contour (5m)
- Watercourse

Slope

- 0° - 5°
- 5° - 10°
- 10° - 15°
- 15° - 20°
- >20°

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 24/06/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014

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File:FullertonCove-Fig6-SlopeLiDAR-2Km-210203 Date: 3/02/2021

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3.3. Vegetation Results

Vegetation communities have been plotted for a distance of 2km based on existing vegetation communities mapping and some ground truthing carried out on and around the development site.

The ground truthing survey confirmed the majority of the vegetation is *Coastal Swamp Forest* which is very typical of the east coast location of the development site. The *Coastal Swamp Forest* has such a dense canopy that the shrub understorey beneath the canopy is limited in its development (Keith, 2004), meaning that its fuel load is lower than the overall fuel load for the forest category it sits in within PBP 2019. The vegetation class and effective slope in all directions is shown in **Figure 12** and **Table 2.**

The unmanaged and greatest vegetation hazard is situated to the north east of the site. The fuel loads to the south of the site are also relatively high however is punctuated by Nelson Bay Road and Fullerton Cove Road (to the south). The lowest fuel loads are to the north and west of the site where much of the land is occupied by large residential land holdings with grassed grounds. A development application has been submitted for the vacant property to the north west of the site seeking consent for a manufactured home estate.

Vegetation on site, within the area subject to the rezoning has been cleared surrounding the dwelling and multiple outbuildings.

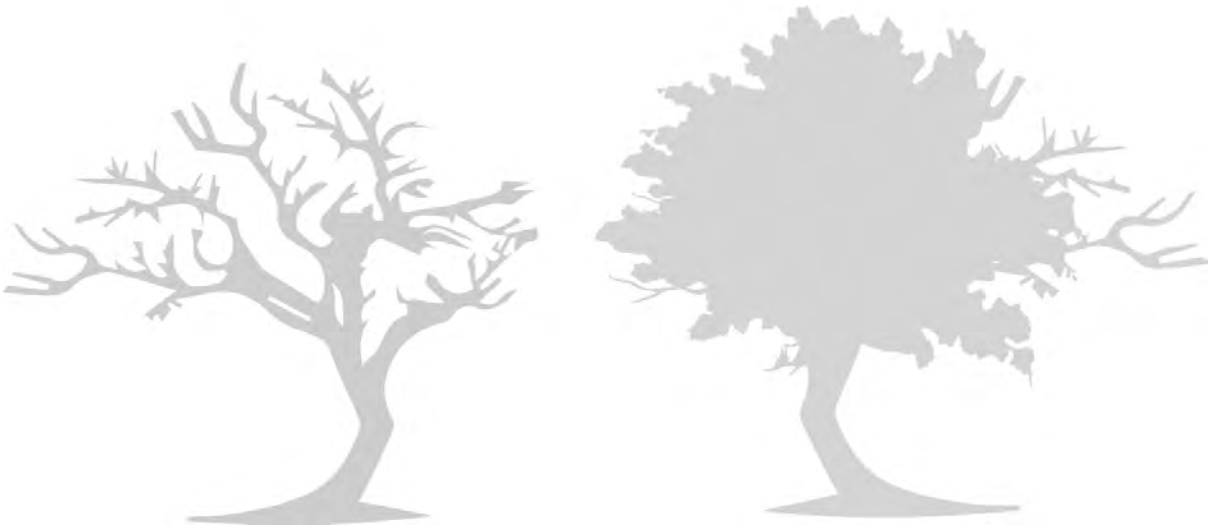
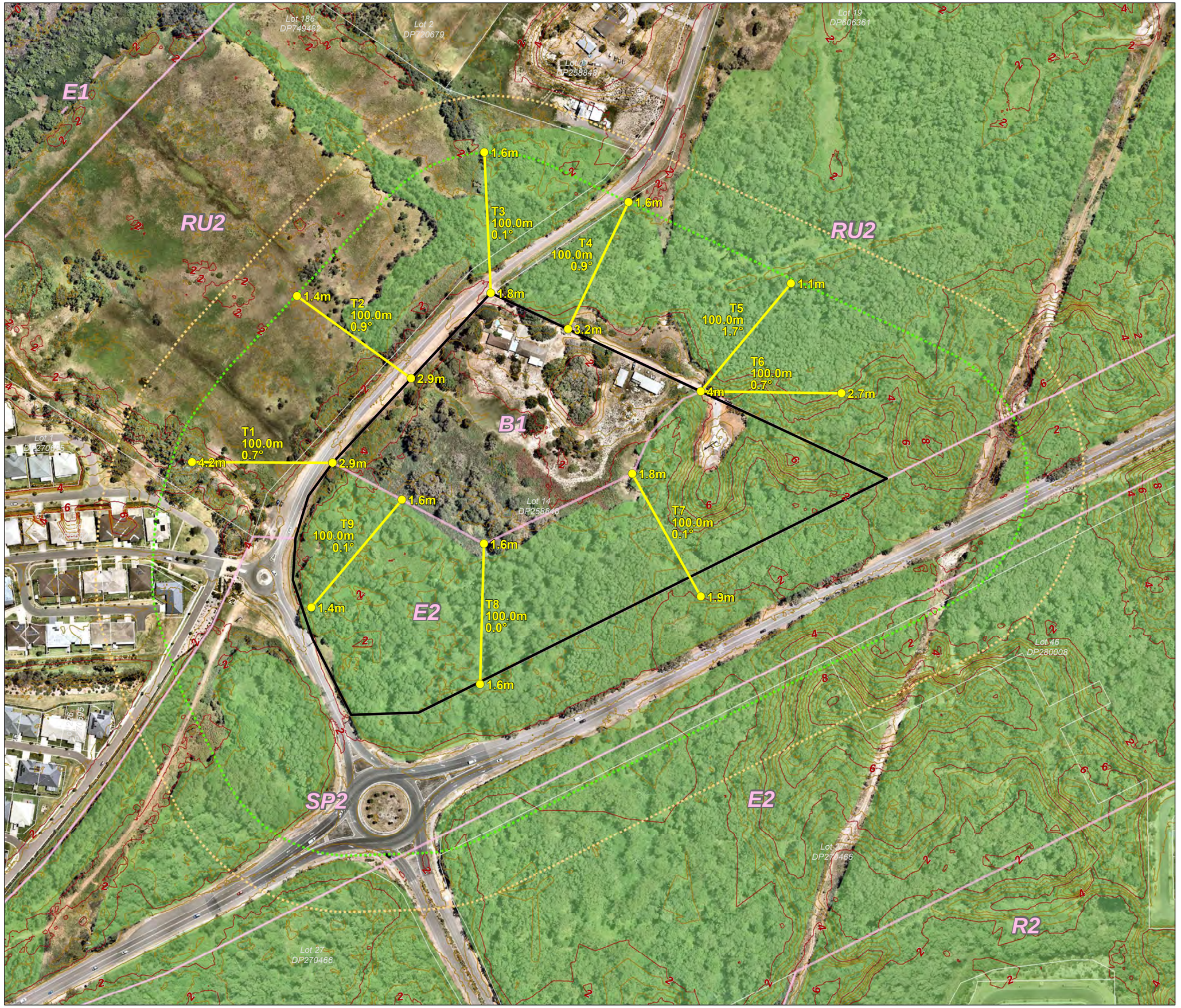


Table 2: Slope and Vegetation Assessment Results

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T1	Cleared / low threat vegetation	**Grassland**	0.7° Upslope
T2	Cleared / low threat vegetation	**Grassland**	0.9° Downslope
T3	Cleared / low threat vegetation / forest	**Forest (Coastal Swamp Forest)**	0.1° Downslope
T4	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	0.9° Downslope
T5	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	1.7° Downslope
T6	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	0.7° Downslope
T7	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	0.1° Upslope
T8	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	0.0° No slope
T9	Unmanaged remanent vegetation	**Forest (Coastal Swamp Forest)**	0.1° Downslope



Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

Figure 12

Slope & Vegetation Assessment

BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- 100m Buffer
- 140m Buffer
- RL
- Transect
- Contour (2m)
- Contour (0.5m)
- Zone boundary
- Cleared / Managed Land
- Forest (Coastal Swamp Forest)

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 28/11/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014
Zoning: Department of Planning, Industry and Environment 2020 (with subject lot zoning modified by BPA 30/10/20)

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:FullertonCove-Fig7-SlopeVeg-210203 Date: 3/02/2021

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3.4. Significant Environmental Features

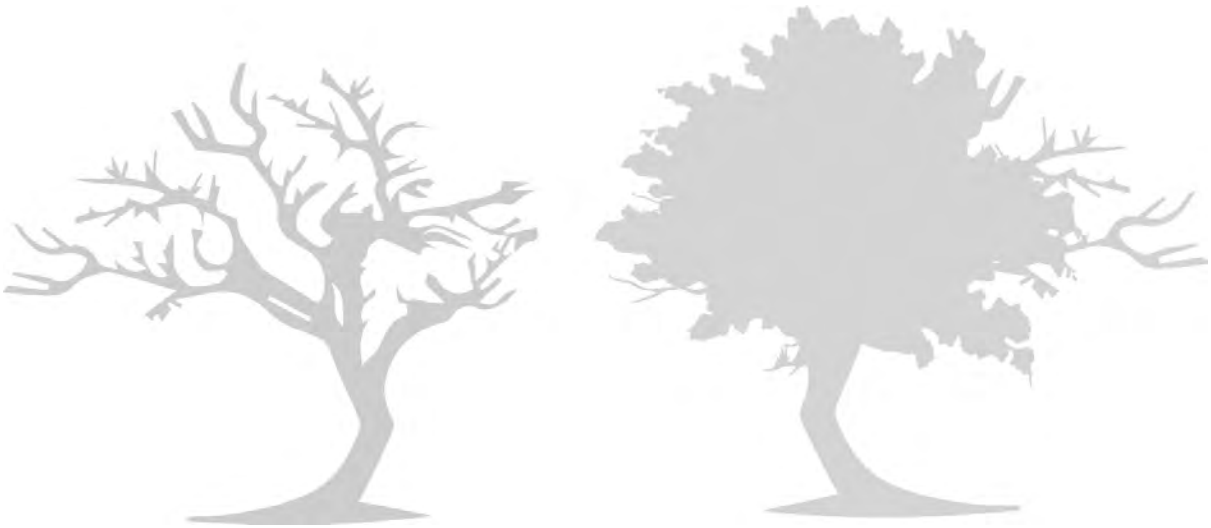
It is expected further biodiversity investigations will be undertaken to identify and assess the potential impacts on any significant environmental features. Should any of the recommended bushfire protection measures have an unacceptable impact on a significant environmental feature, consultation with the project ecologist and the relevant stakeholders will be carried out to negotiate an acceptable outcome.

3.5. Threatened Species, populations or ecological communities

The area of the site to be affected by the proposed development has been identified to avoid impact on any threatened species, population or EEC. All bushfire mitigation measures; including APZs will consider the existing and potential biodiversity values to avoid impact where possible.

3.6. Aboriginal Objects

A search of the AHIMS database (results contained in **Appendix B**) revealed there an Aboriginal site within 50m of the development site. However, the proposed development does not include any physical works as part of the rezoning. Therefore, it is unlikely there will be any impact on Aboriginal sites.



4. Bushfire Strategic Study

As this site is identified for a new neighbourhood centre development, the strategic principles in PBP 2019 must be addressed. This bushfire strategic study aims to assess the macro-scale bushfire context for new neighbourhood centre development on the site. It will create a risk profile for new development and assess the appropriateness of the proposed land uses in this area. The study will also look at the emergency response profile for the site, including the road network.

The Land Use Planning for Disaster Resilient Communities published in 2020 by the Australian Institute for Disaster Resilience focusses on reducing disaster risk by improving strategic planning processes. The focus is on reducing both vulnerability and exposure of commnunities to natural hazard scenarios. This SBS seeks to assess and respond to the vulnerability and exposure of the proposed community by establishing the strategic bush fire planning context of the development site. The SBS incorporates a climate change factor into the risk assessment process with a view to build resilience into the resultant development.

The bushfire strategic study responds to the principles within the National Emergency Risk Assessment Guidelines of establishing the context and then assessing the risk. The risk assessment process follows the following process:

- Risk identification
- Risk analysis
- Risk evaluation
- Risk treatment

To undertake this risk assesment, the issues identified within Table 4.2.1 of PBP 2019 will be addressed. A determination will be made as to whether the resultant bushfire protection measures for subdivisions in PBP 2019 are the appropriate measures to mitigate the identified risk. Key to the risk profiling of the site is a landscape scale assessment of vegetation communities, the exposure and vulnerability of proposed land uses and an evaluation of the evacuation options available.

4.1. Bushfire Landscape Assessment

A bushfire landscape assessment is required by PBP 2019 to consider the likelihood of a bushfire approaching the site and the potential impact on life and property in the context of the broader surrounding landscape.

Fire behaviour has been assessed on a 2-kilometre scale. This distance is considered a reasonable scale by which to assess fire behaviour within the landscape for this particular site. It is a large enough distance to assess the variation in vegetation and the predominant vegetation class. It is also a large enough distance to assess the topographic conditions which may affect the behaviour of a bushfire approaching the site. **Figures 5 and 7** shows a visual representation of the landscape assessment.

4.1.1. Vegetation

Vegetation communities have been plotted for a distance of 2km based on existing vegetation communities mapping and some ground truthing carried out on and around the development site. The vegetation is a mix of communities which are typical around the NSW east coast.

Immediately adjoining the site is an area of Coastal Swamp Forest (forest) which surrounds the site but also extends to the north east of site across a large area; running either side of Nelson Bay Road. The Coastal Swamp Forest has a shrubby sub-formation with prominent layers of sclerophyll shrubs and broad-leaved paperbarks with tree heights of up to 20m (Keith, 2004). The boggy ground is heavily clothed in leaf litter, interspersed with patches of sedges and ferns, temporary pools of water and bare ground; associated with a high watertable.

The lower lying surface differentiates the vegetation structure compared to the neighbouring Coastal Dune DSF, which suggests a slightly higher overall fuel load. The vegetation mapping shows the transition to the Coastal Dune DSF to the east and north east of the site, as the vegetation rises up to the coastal sand plains.

Vegetation on site, within the area subject to the rezoning has been cleared and is heavily modified.

The overall landscape assessment is that the highest fuel loads are situated outside of the area of the site to be rezoned and to the north and north east of the site in the Coastal Swamp Forest. These fuel loads are punctuated by Nelson Bay Road. The fuel loads to the south of the site are also relatively high. The lowest fuel loads are to the west of the site where much of the land is occupied is cleared, or occupied by the Cove; a manufactured home estate.

4.1.2. Topography

The topography of the land surrounding the site is best described as flat; with varying degrees of low lying land that is partially inundated with water due to the high watertable. Slopes have been assessed in detail to 140m surrounding the site and there are no slopes steeper than approximately 1°. The Slope Analysis LiDAR (**Figures 10** and **11**) shows the land surrounding the site is generally flat, with very little relief. Given that the topography is very uniform, the rate of spread of any bushfire approaching the site would by consistent, only varying during to the prevailing winds.

4.1.3. Weather

The site is situated within the Lower Hunter NSW RFS weather district and the Bureau of Meteorology's Hunter Forecast Area. The Lower Hunter NSW RFS weather district is given a Fire Danger Index (FDI) of 100. The fire danger period generally runs from October to March.

On the East coast of Australia, the hottest fires approach from the West or North West under strong winds. The Westerly aspect is therefore the most high-risk aspect, however fires can approach from any direction. Due to the limited vegetation between the site and the west, a fire from the west is possible but unlikely to cause damage due to the lack of fuel and presence of Fullerton Cove. being fuelled by a colder, more moist breeze from the ocean and because there is not enough vegetation in this direction for a fire to become fully developed prior to reaching the site.

A fire from the south is possible. If a fire ignites in the vegetation to the south, it would be fuelled by southerly winds which tend to be colder. The rate of spread would therefore be limited. A fire which has originated to the south west and been fuelled by westerly winds and then subject to a southerly wind change would be the most dangerous scenario from a southerly direction. History has shown that these fires catch firefighters by surprise and can be difficult to suppress. A fire from the North is also possible under a Northerly or North Easterly wind.

4.1.4. Bushfire history

Across the Lower Hunter BFMC area, fire agencies attend an average of approximately 200 bush, grass and/or scrub fires per year. The main sources of ignition in the Lower Hunter BFMC area are fire escape from legal or illegal fires (mainly prior to the introduction of the bush fire danger period), arson, and lightning strikes.

Section 2.2 above stated that there is no history of bushfire at the site itself and minor fire history in areas surrounding the site.

There is limited data available regarding the other fires, suffice to say that there has not been an event which threatens the site's location.

4.1.5. Overall landscape assessment

The highest fire risk aspects are the north easterly and southerly aspects of the site. Due to the rural landholdings and broken *forest* vegetation to the east, leading into *forest* vegetation as it approaches the site, a fire originating to the east of the site would slow down. The rate of spread of the fire would weaken as it approaches the site.

Vegetation to the north east is more dense forested vegetation carrying a higher fuel load. If the Lower Hunter experiences higher rainfall prior to the bushfire season and the fuel loads increase, we should assume as a worst case that the current fuel loads may be higher. The land has very little relief and no steeper slopes have been recorded. Nonetheless, given the fuel loadings, we should assume that the highest bushfire risk comes from the north east. It is worth noting that the vegetation to the south is fragmented by the Seaside Fern Bay estate and the Bayway Village. This would have the effect of slowing the rate of spread of any fire approaching the site from this direction. The topography closest to the eastern side of the site also shows that any fire would approach on a cross-slope which would not be as fast moving as if it was travelling upslope.

4.2. Land Use Assessment

The planning proposal is to rezone part of the site to B1 Neighbourhood Centre use. Whilst the primary objective for the B1 is provide a range of small-scale retail, business and other uses that typically wouldn't contain a residential component, certain housing is permitted in the B1 zone such as *shop-top housing*. Accordingly, the bushfire hazard assessment has been undertaken assuming residential land use is permitted within the B1 zone.

Figure 10 indicates the required asset protection zones (APZ) for residential uses under PBP 2019 can be provided for future residential development. The development needs to show that all residential uses are provided with an APZ which is commensurate with a radiant heat level greater than 29kW/m^2. This would also mean that future dwellings would not have a Bushfire Attack Level (BAL) greater than BAL-29. The BAL contour plan shows that at an FDI of 100, which is currently required by PBP 2019 for this location, future residential dwellings are able to be sited to ensure they can comply with PBP 2019.

It is recommended that any future development; commercial or residential is provided with a perimeter road (up to 8m wide) around the development. The perimeter road provides a hardstand APZ which will never be overgrown so constitutes managed land. The hardstand APZ provides an effective fire break, slowing the spread of a fire towards the development and also provides a platform for response from emergency services.

Based on the landscape assessment, the areas of the site subject to the highest bushfire risk profile are the north east and south. The risk is reduced somewhat by the way in which the vegetation is fragmented by surrounding residential land uses and major roads, which would have the impact of slowing the rate of spread of an approaching fire.

Any vegetation retained within the site boundaries (and B1 zone) will need to be managed to ensure there is no increase in the bushfire risk over and above what has been taken into consideration in this assessment. A Plan of Management will need to be prepared for any land which is retained for environmental conservation. The Plan of Management will need to detail who will be responsible for the maintenance of any on-site vegetation and will need to outline a management regime as necessary to ensure there is no fire path created into the site.

Taking all of the above into consideration, the site is considered to be appropriate for the proposed mixed use development.

4.3. Access and Egress

Access and egress to the site will need to be appropriate for both emergency services attending and residents evacuating and will need to meet the requirements of PBP 2019.

The site takes its main access from Fullerton Cove Road and a perimeter road can be provided around the entirety of the new development. The perimeter road would be required to be up to 8m wide as per the requirements of PBP 2019 and would enable two-way access via a through road for occupants to evacuate whilst emergency services are responding.

The proposed junction onto Fullerton Cove Road is a key juncture and needs to be appropriately engineered so that traffic can flow freely, even under emergency conditions.

The landscape assessment shows that a bushfire is most likely to approach from either the north east or south of the site, with the highest bushfire risk being from the north east. The likely direction of travel in evacuation is therefore to the south of the proposed development towards the settlements of Fern Bay and Stockton. Stockton is approximately 6km south along Nelson Bay Road, taking approximately 5 minutes to travel. Williamtown is approximately 6km to the north, taking approximately 5 minutes to travel. There are facilities in both of these settlements which could be used for shelter.

There may be other people heading south on Nelson Bay Road from the small communities to the north of the site and from further afield such as Nelson Bay; particularly in peak holiday periods. An additional 40-60 traffic movements are anticipated from the proposed development, assuming that 80% of occupants on the site (employees, customers or residents) follow the advice to leave when a bushfire approaches the site. It is not expected that these additional traffic movements would result in traffic congestion on Nelson Bay Road.

A secondary access which provides an alternative route for residents evacuating and/or emergency services attending would typically be required. However, as the residential use is likely to be secondary to the primary commercial/ retail land use, a single access may be acceptable. Should a second access be provide, the secondary access would need to be realistic evacuation route which provides an alternate egress onto Fullerton Cove Road. Given the are of the site to be zoned for operational use is less than 200m, it may not be practical to provide a secondary access. Investigations into the provision of this alternate access/egress should be carried out. Solutions which provide alternative egress for residents and other occupants of the site evacuating, whilst providing unrestricted access for emergency services attending is recommended.

There is a Neighbourhood Safer Place (NSP) to the east of the site in the Seaside Fern Bay Residential Estate, which is approximately 2km or a 3 minute drive north of the site. A NSP is a place of last resort so cannot be relied on in the event of a bushfire but if there is a need for a place of shelter, having a NSP within driving distance is positive.

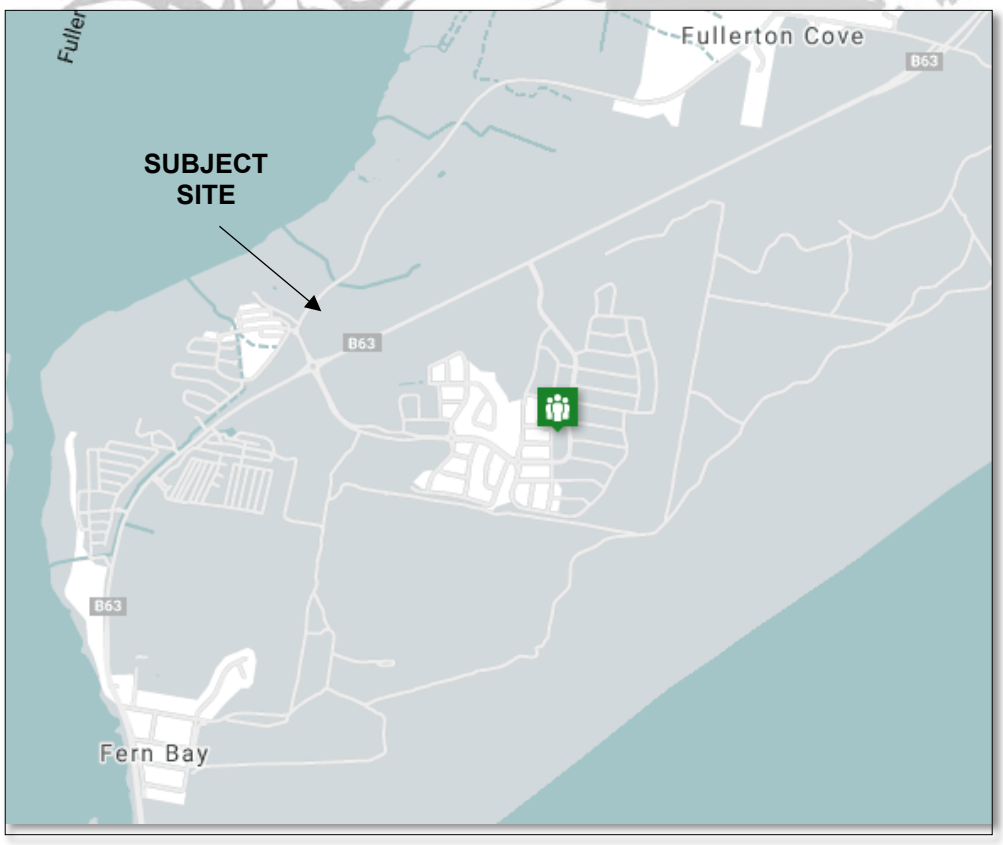


Figure 13: Neighbourhood Safer Place (NSW RFS)

4.4. Emergency Services

There is a NSW Fire & Rescue Station at Hereford Street, Stockton approximately 7.2km or 8 minutes drive away from the site. Any local bushfire events would be controlled by the NSW RFS Lower Hunter Fire Control Centre at Metford. Fire suppression would be undertaken by local NSW RFS brigades, supported by NSW Fire & Rescue.

There would be an increase in demand for emergency services in responding to the proposed development so it is recommended that liaison takes place with the Local Emergency Management Committee (LEMC) to ensure that they have an understanding of the proposed additional community and its emergency response requirements.

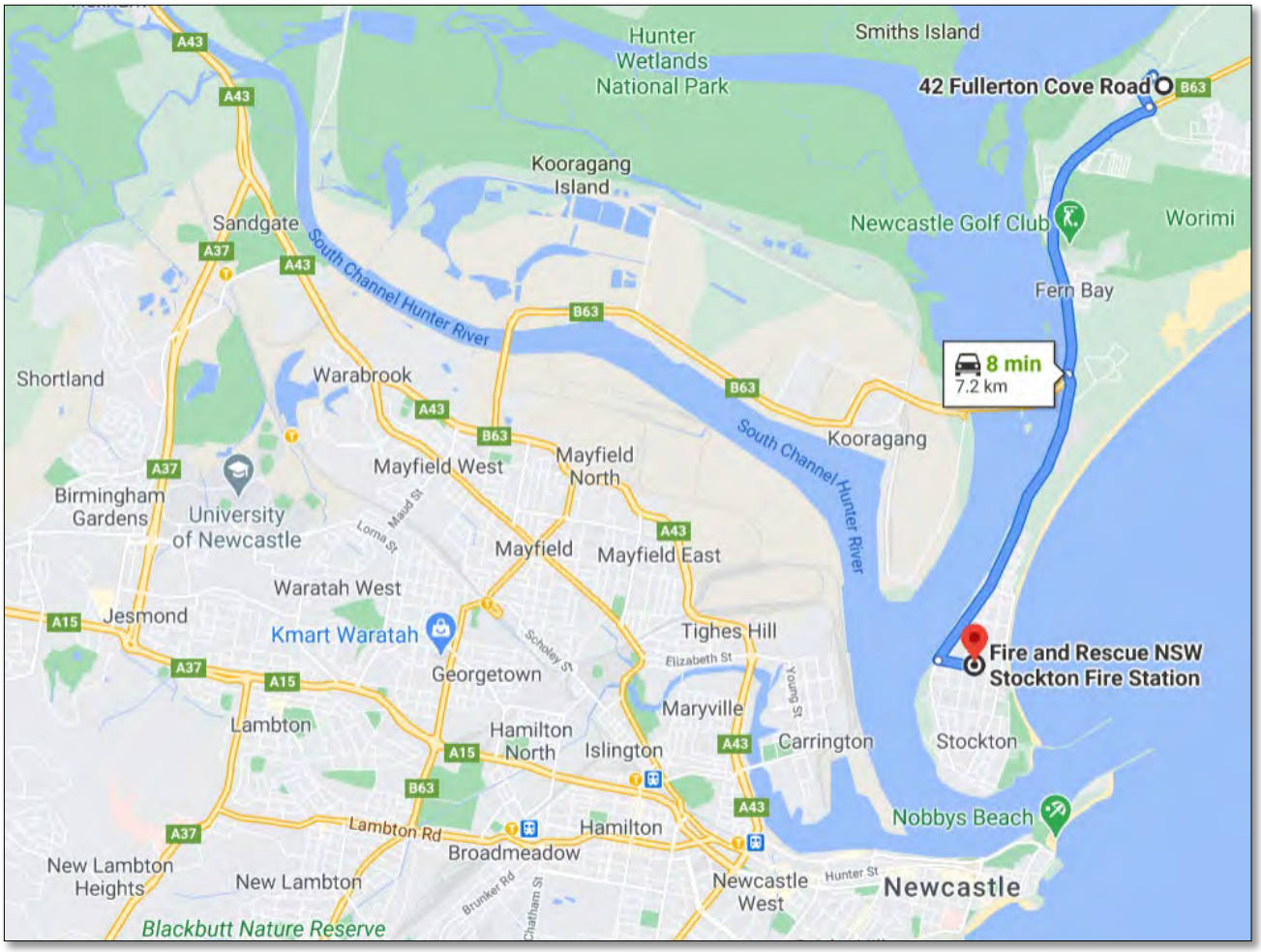


Figure 14: Fire and Rescue NSW - Stockton Fire Station

4.5. Infrastructure

Electricity supply to the proposed development will be underground and therefore posing no threat to life or occupants. Future development applications will be able to meet the acceptable solutions and performance criteria of PBP 2019, ensuring that the location and design of gas and electricity services does not lead to ignition of surrounding bushland or the fabric of buildings.

A water supply connection will be taken from the reticulated town supply. This supply will be required to meet the acceptable solutions and performance criteria of PBP 2019.

4.6. Adjoining Land

The Bush Fire Risk Management Plan (BFRMP) in place for the site's location is Lower Hunter BFRMP. The BFRMP identifies assets at risk and sets out a five-year mitigation program.

The Port Stephens/ Nelson Bay area is a popular tourist destination. Many of the surrounding land uses are tourism related and the population swells with the influx of visitors during the summer season. Emergency response needs to take into consideration the unpredictability of tourists and plan evacuations carefully.

The area is also characterised by a number of rural communities spread throughout the Fullerton Cove and Williamtown area. Many rural communities in this area are multiple occupancies which are of particular concern due to lack of water supply, APZ management and access.

The proposed land use does not pose any further threat to adjoining land uses than already exists. Given the low-density nature of the proposed development, there would not be significant additional pressure on local emergency services.

If we were to undertake an assessment of the residential use of the site under the BFRMP Guidelines (NSW RFS), the asset type would be a Human settlement. We would then need to assess the likelihood of a fire occurring and the consequence if a fire occurred to determine the level of bush fire risk.

Utilising the fire history assessment carried out, the likelihood of a fire occurring is considered 'Possible'. There have been few ignitions in this area, which have not occurred on a frequent basis. The possibility of any fire which occurs spreading and reaching assets is mitigated through compliance with PBP 2019 and the other measures recommended within this SBS. The need for a vegetation management plan for any regrowth within the site and avoidance of any corridors which might create a fire path will limit the ability of fire to carry towards assets.

Following the landscape assessment given above, the threat level is determined to be 'High'. This level has been derived using the following assessment. The vegetation category with the highest fuel load in proximity to this site is *forest.* The slopes in proximity to the site are low. The separation distance provided by compliance with PBP 2019 will provide moderate-good separation from the hazard.

The vulnerability for the site is considered to be 'Low vulnerability'. The properties resulting from the proposal will be subject to conditions of development consent to be prepared, including maintenance of APZ. The proposal will only go ahead if the access and egress to the site is engineered to meet an adequate level. Should the development proceed without adequate access and egress in line with PBP 2019 and this SBS, the development would be subject to 'Medium vulnerability', which would be acceptable. The water supply will be adequate and all new residential buildings (shop top housing) will be required to meet the current construction standards for building in bush fire areas (AS3959).

Taking into account the 'High' threat level and 'Low' vulnerability level, the consequence rating derived at for the site is 'moderate'. With a 'moderate' consequence rating and a 'possible' likelihood rating, the development has a 'medium' level of bush fire risk. Under the BFRMP Guidelines, this risk rating results in 'action may not be required'.

This level is considered appropriate for new development, given that mechanisms can be put in place through development consent to allow for increased bushfire protection through increased APZs, education programs and improved water supply. These mechanisms should negate the need for further mitigation treatment into the future.

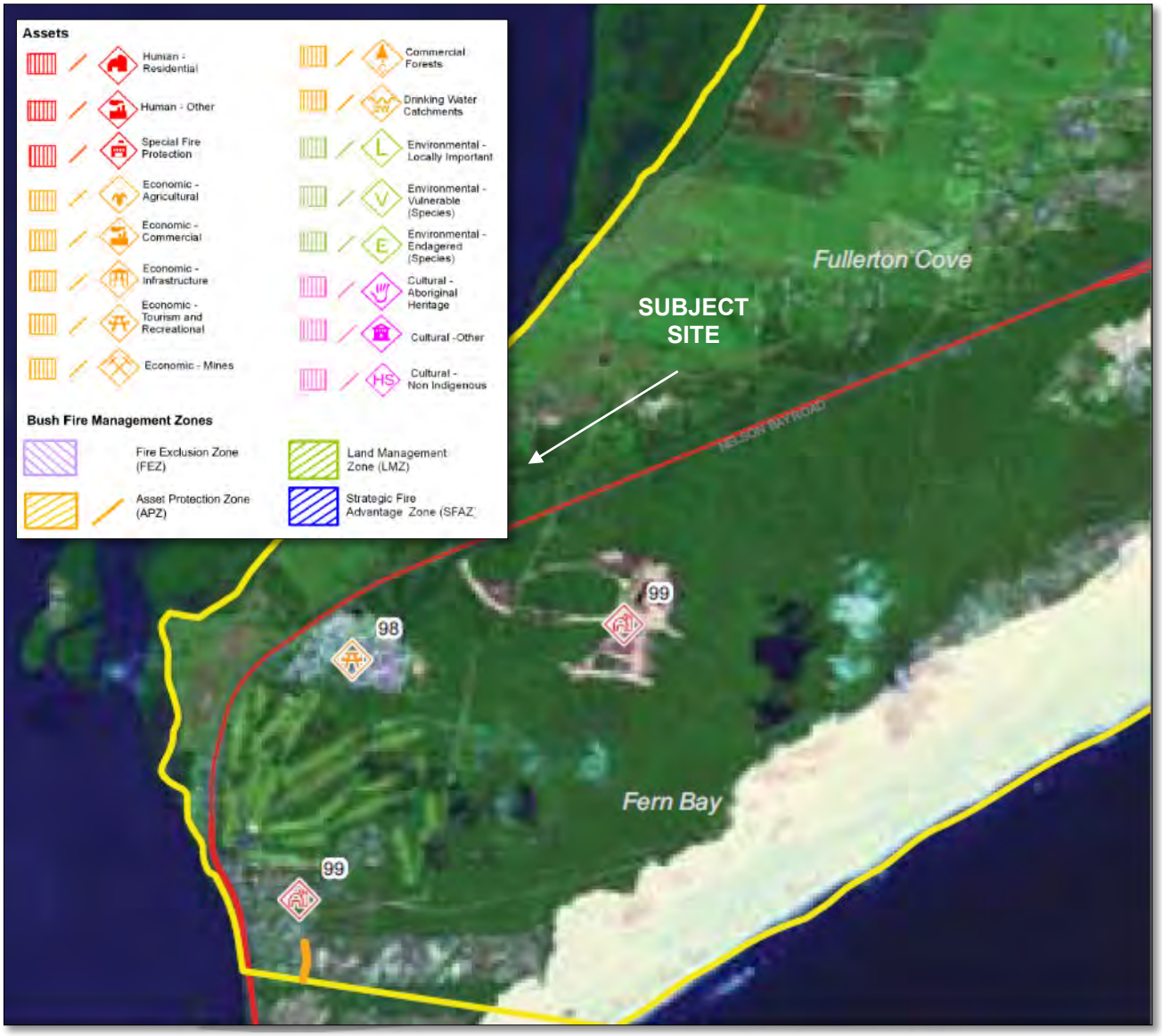


Figure 15: Lower Hunter BFRMP 2009

4.7. Strategic bushfire study conclusions

The landscape, vegetation and topographic studies show that this site is subject to a high bushfire threat which can be mitigated through compliance with PBP 2019 and additional measures which are outlined below. Although the threat is high, it has been concluded that the vegetation composition and fragmented nature would have the effect of slowing the rate of spread of any bushfire on approach to the site.

Following the NSW RFS BFRMP Guidelines, the proposed development receives a 'Medium' risk rating. This risk rating is dependent upon access and egress to the site being provided in accordance with PBP 2019, ensuring safe movement into and away from the site by residents and emergency services during a bush fire event. This is significant because if adequate access and safe movement cannot be achieved, the risk rating would jump to 'High' and the development would require action to mitigate this risk into the future.

Subject to the following recommendations, the land use is considered to be appropriate:

- Asset protection zones will be fully contained within future lot boundaries and will not rely on adjoining land;
- The capacity of the road network must be sufficient to deal with the proposed new uses in an emergency situation; this will include provision of road upgrades to the junction with Fullerton Cove Road to enable free traffic movement in the event of an emergency;
- Details of the proposed development should be provided to the LEMC to enable awareness in emergency response; and
- A vegetation plan of management should be prepared to ensure that the regrowth of vegetation on site does not create corridors which can carry fire from the vegetation surrounding the site towards assets on site.

5. Bushfire Risk and Mitigation

5.1. Asset Protection Zones – Acceptable Solution

An APZ is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an inner protection area (IPA) and an outer protection area (OPA). In this instance the entire APZ and the balance of the development site shall be managed as an IPA.

5.1.1. Determining the Appropriate Setbacks

To achieve compliance with the performance criteria for APZs (Table 5.3a), development is able to provide the required APZs outlined in Table A1.12.2 of PBP 2019. An APZ of **24**m has been recommended for this site.

Refer to **Table 3** for the recommended APZs.

Table 3: Required and Recommended Asset Protection Zones

Transect	Vegetation Classification (PBP 2019)	Slope Class	PBP 2019 FDI 100 Table A1.12.2
T1	**Grassland**	Upslope	10m
T2	**Grassland**	Upslope	10m
T3	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	29m
T4	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	29m
T5	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	29m
T6	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	29m
T7	**Forest (Coastal Swamp Forest)**	Upslope	24m
T8	**Forest (Coastal Swamp Forest)**	Flat	24m
T9	**Forest (Coastal Swamp Forest)**	>0° - 5° Downslope	29m

Any new developments shall be provided with sufficient separation distance to minimise the bushfire risk to an acceptable level.

Lot 186
DP749482

RU2

RU2

Lot 19
DP605861

Fullerton Cove Road

24 m

B1

Lot 14
DP258848

24 m

24 m

E2

E2

SP2

SP2

Lot 14 DP 258848
42 Fullerton Cove Road,
Fullerton Cove

Figure 16

Asset Protection Zone

BUSHFIRE PLANNING AUSTRALIA

Subject Site
Contour (2m)
Contour (0.5m)
Watercourse
Zone boundary
Asset Protection Zone

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 28/11/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014
Zoning: Department of Planning, Industry and Environment 2020 (with subject lot zoning modified by BPA 30/10/20)

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Meters

A3 Scale: 1:1,000

File:FullertonCove-Fig10-APZ-210203 Date: 3/02/2021

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5.2. Landscaping and Vegetation Management

In APZs and IPAs, the design and management of the landscaped areas in the vicinity of buildings have the potential to improve the chances of survival of people and buildings. Reduction of fuel does not require the removal of all vegetation. Trees and plants can provide some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns.

Generally landscaping in and around a bushfire hazard should consider the following:

- Priority given to retaining species that have a low flammability;
- Priority given to retaining species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season;
- Priority given to retaining smooth barked species over stringy bark; and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Landscaping within APZs and IPAs should give due regard to fire retardant plants and ensure that fuel loads do not accumulate as a result of the selected plant varieties.

The principles of landscaping for bushfire protection aim to:

- Prevent flame impingement on dwellings;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

Avoiding understorey planting and regular trimming of the lower limbs of trees also assists in reducing fire penetration into the canopy. Rainforests species such as Syzygium and figs are preferred to species with high fine fuel and/or oil content.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage ground fire to spread up to, and then through the crown of trees.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs.

Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to ‘replace’ any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles have been recommended to help minimise the chance of such works contributing to the potential hazard on site.

Specific requirements for the management of vegetation and landscaping around vulnerable developments and within the APZ the following conditions apply:

- Within 10m of a building, flammable objects such as plants, mulches and fences must not be located close to vulnerable parts of the building such as windows, decks and eaves;
- Trees must not overhang the roofline of the building, touch walls or any other elements of a building;
- Grass should be no more than 100mm in height. All leaves and vegetation debris are to be removed at regular intervals (rake leaves and twigs from grass every week during the fire season);

- Establish lawn substitutes including non-flammable ground covers such as decorative stone or gravel;
- Plants greater than 100m in height at maturity must not be placed directly in front of a window or other glass features;
- Tree canopy separation of 2 metres and overall canopy cover no more than 15% at maturity;
- Preference should be given to smooth barked and evergreen trees;
- Shrubs should not be located under trees;
- Shrubs should not form more than 10% ground cover; and
- Provide a reliable and sufficient water supply and installation of sprinkler systems to create a well-watered landscape.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is reiterated again that it is essential that any landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

5.3. Access

In the unlikely event of a serious bushfire, it will be essential to ensure that adequate ingress / egress and the provision of defendable space are afforded in the subdivision layout. All buildings must have direct access to a public road. Section 5.3.2 of PBP 2019 requires a development to provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate.

A two-way through road shall be provided with two separate egress routes. Where possible, perimeter roads are provided where the lots do not adjoin existing or future development.

All new roads are safe, all-weather and provide good access to all parts of the site; and a compliant water supply will be available for emergency services.

Overall, it is considered the existing and proposed road network provides safe operational access for emergency service personnel and is also appropriate for evacuation purposes.

5.4. Services – water electricity and gas

5.4.1. Water

Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 – 2005. Hydrants are not to be located within any road carriageway.

All sites within the proposed development shall be connected to the internal reticulated water supply.

5.4.2. Electricity

All electricity services will be located underground.

5.4.3. Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1592-2002. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

5.5. Construction Standards: Bushfire Attack Level

All buildings must satisfy the Performance Requirements of the National Construction Code: Building Code of Australia (BCA). Part 2.3 of Volume 2 of the BCA applies to dwellings located within designated bushfire areas, which are defined as:

> *Land which has been designated under a power in legislation as being subject, or likely to be subject to, bushfires.*

Accordingly, all forthcoming habitable buildings must satisfy the requirements of Part 3.7.4 of the BCA. The *Deemed-to-Satisfy* (DTS) provision of the BCA can only be achieved if dwellings in bushfire prone areas are constructed in accordance with Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas*. Alternatively, the DTS provisions can also be achieved if the habitable building is constructed in accordance with the NASH Standard 'Steel Framed Construction in Bushfire Areas'.

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2018, and accordingly the designer/architect should be made aware of this recommendation.

The determinations of the appropriate bushfire attack level (BAL) is based on the maximum potential radiant heat exposure. BALs are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the BAL is derived by assessing the:

- Relevant FDI = 100;
- Flame temperature = 1090K;
- Slope = variable;
- Vegetation classification = *forest*; and
- Building location.

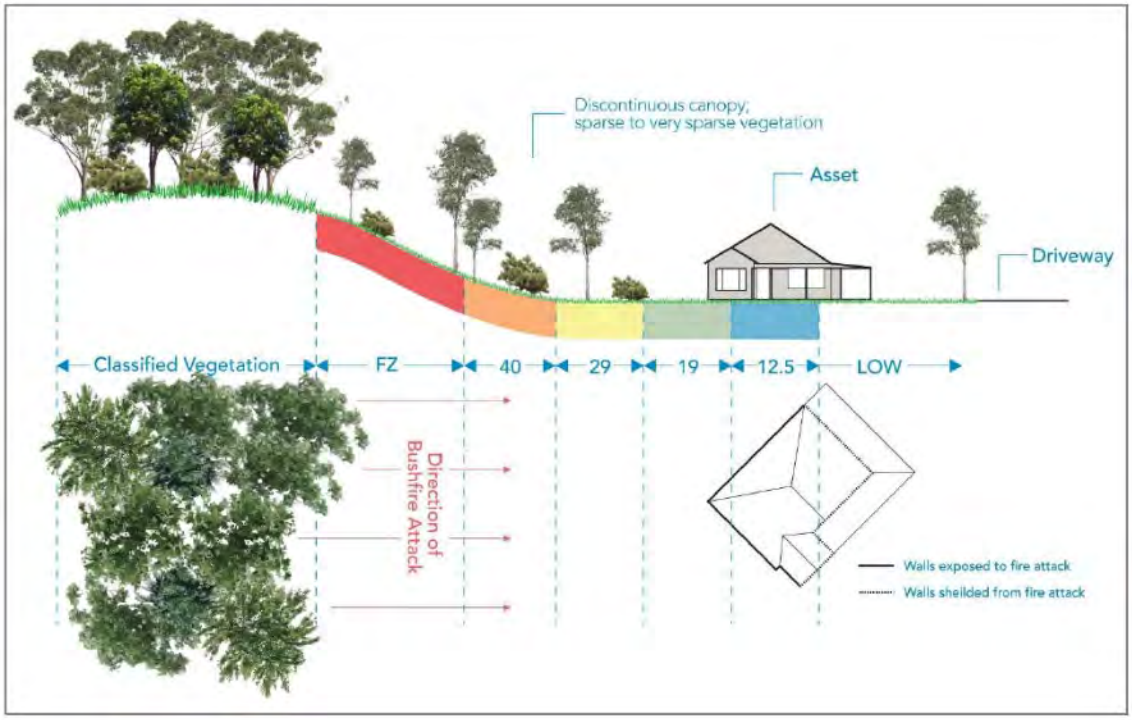


Figure 17: Bushfire Attack Level

Lot 186
DP749482

RU2

RU2

Lot 19
DP605861

Fullerton Cove Road

B1

Lot 14
DP258848

24m

24m

24m

E2

E2

SP2

SP2

Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

Figure 18

BAL Contour Plan

BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- Contour (2m)
- Contour (0.5m)
- Watercourse
- Zone boundary
- Asset Protection Zone

Required Bushfire Attack Levels (AS3959-2018)

- BAL - FZ
- BAL - 40
- BAL - 29
- BAL - 19
- BAL - 12.5

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 28/11/20
Surface analysis: Derived from Newcastle201409-LID1-AHD_3866362_56_0002_0002_1m © Department Finance, Services and Innovation 2014
Zoning: Department of Planning, Industry and Environment 2020 (with subject lot zoning modified by BPA 30/10/20)

N
W E
S

0 25 50
Meters

A3 Scale: 1:1,000

File:FullertonCove-Fig9-BALs-210203 Date: 3/02/2021

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6. Conclusion and Recommendations

Bushfire Planning Australia (BPA) has been engaged by Christine Jordan (the 'Client') to undertake a Strategic Bushfire Study (SBS) and Bushfire Assessment Report (BAR) for the proposed neighbourhood centre.

This SBS found the site is exposed to a moderate to high bushfire hazard to the north east and south. The predominant vegetation surrounding the site is consistent with a *coastal swamp forest* vegetation formation. The SBS concludes that the hazard identified can be successfully mitigated by applying the requirements of PBP 2019.

In summary, the following key recommendations have been designed to enable any future proposed development to achieve the aims and objectives of PBP 2019:

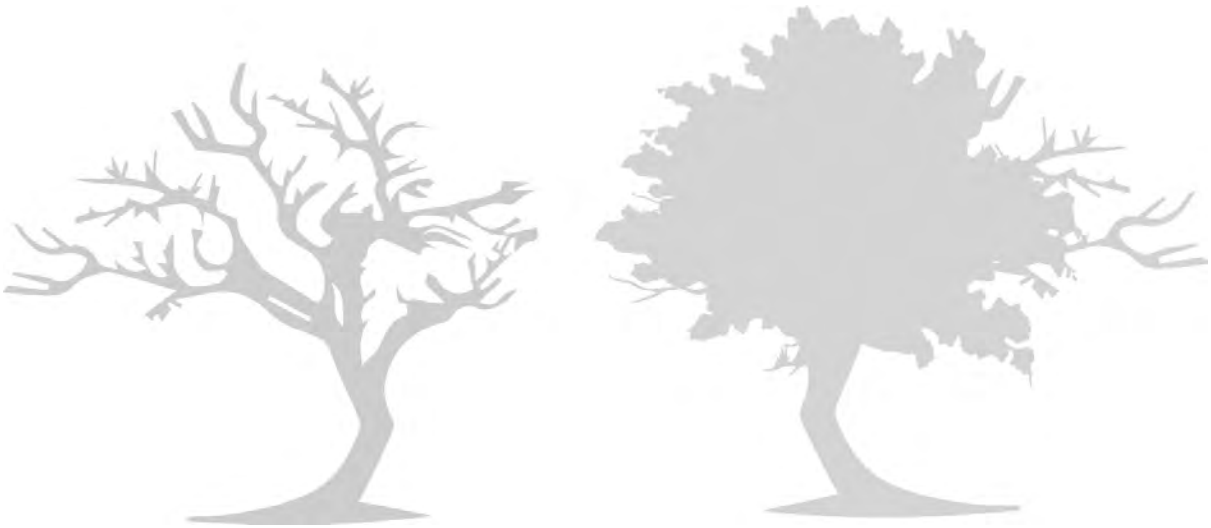
1. The entire site shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be established as shown in **Figure 16** and maintained as outlined Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
3. Access shall be provided in accordance with Table 5.3b of PBP 2019;
4. Vegetation within road verges and stormwater basins to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity (and considered unmanaged);
5. All future buildings are to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
6. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019;
7. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (February 2021).

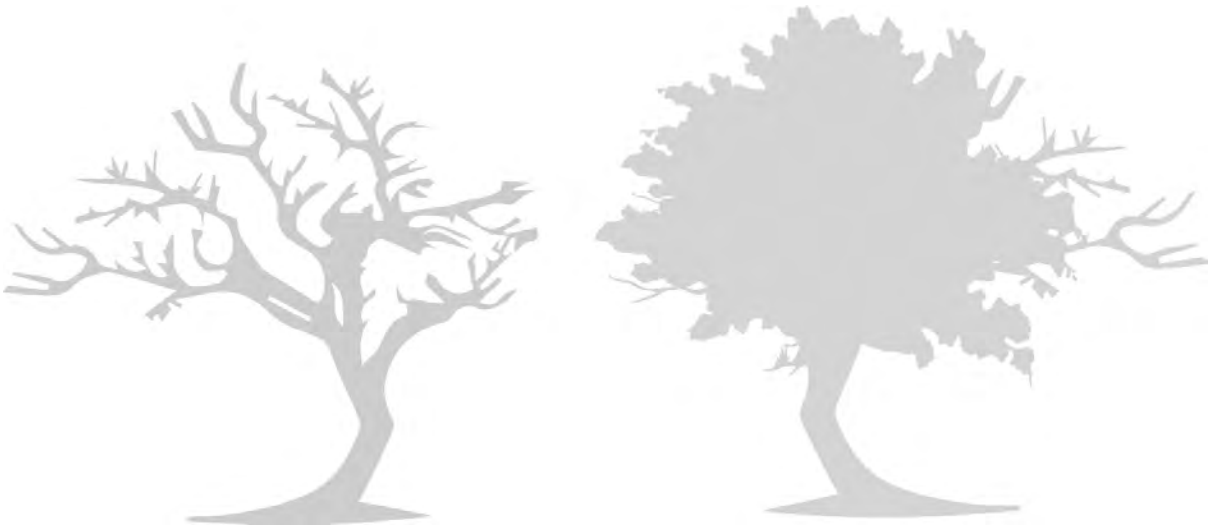
Should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

7. References

- Douglas, G 2017. Property Protection from Extreme Bushfire Events under the Influence of Climate Change. Submitted for the degree of Doctor of Philosophy at Western Sydney University.
- Dunlop, M., & Brown, P.R. 2008. Implications of climate change for Australia's National Reserve System: A preliminary assessment. Report to the Department of Climate Change, February 2008. Department of Climate Change, Canberra, Australia.
- NSW Rural Fire Service (2005). *Standards for Asset Protection Zones*. NSW Rural Fire Service.
- NSW Rural Fire Service (2019). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.
- Ramsay, GC and Dawkins, D (1993). *Building in Bushfire-prone Areas – Information and Advice*. CSIRO and Standards Australia.
- Rural Fires and Environmental Assessment Legislation Amendment Act 2002.
- Standards Australia (2018). AS 3959 – 2018: Construction of Buildings in Bushfire-prone Areas.



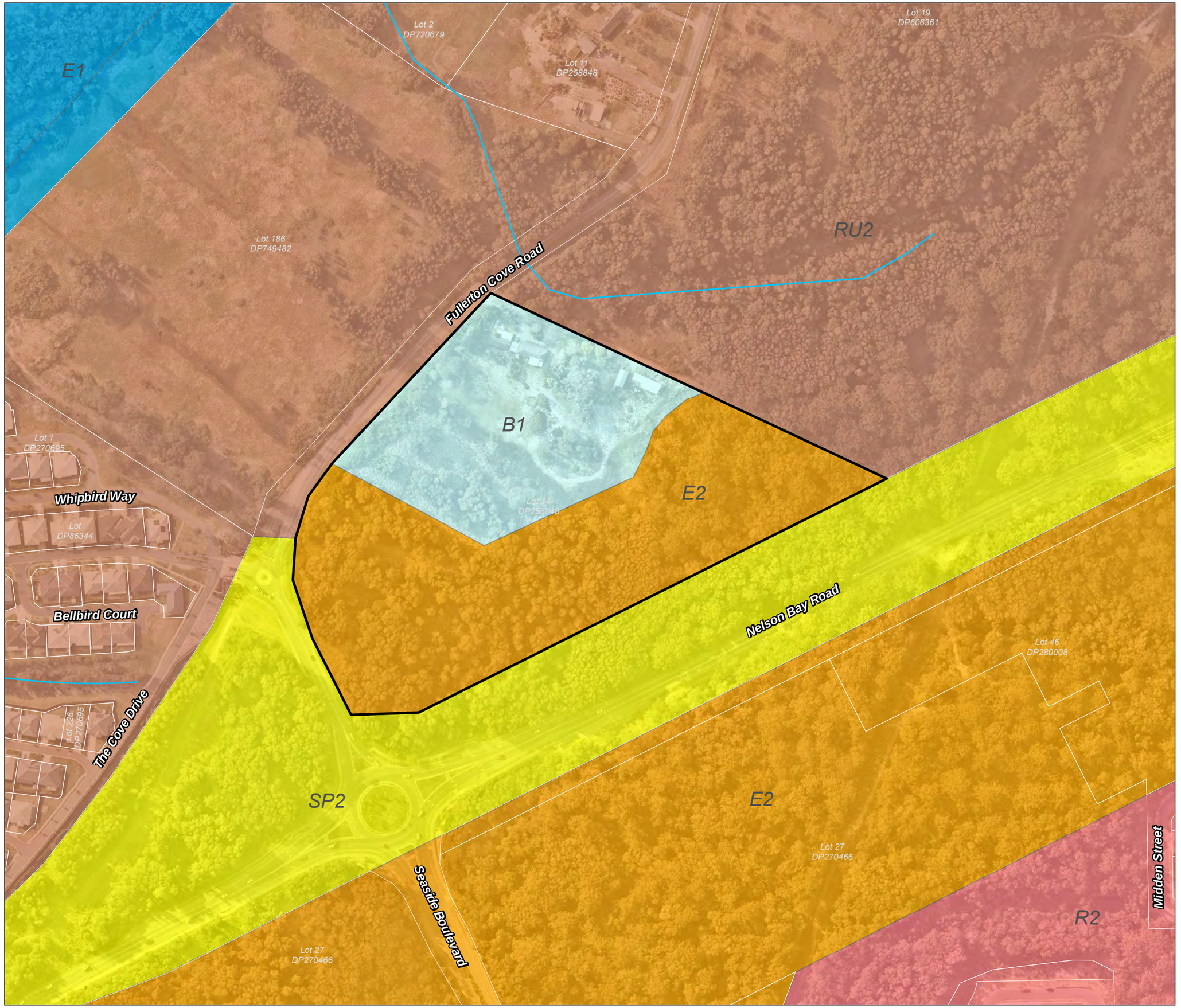
Appendix A: Proposed Land Use Zone Map



Lot 14 DP 258848
42 Fullerton Cove Road, Fullerton Cove

Figure 3

Proposed Zoning



BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- Watercourse
- B1
- E1
- E2
- R2
- RU2
- SP2

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2020
Watercourse: GeoScience Australia 2015
Aerial Photo: NearMap 02/09/20
Zoning: Department of Planning, Industry and Environment 2020 (with subject lot zoning modified by BPA 30/10/20)

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

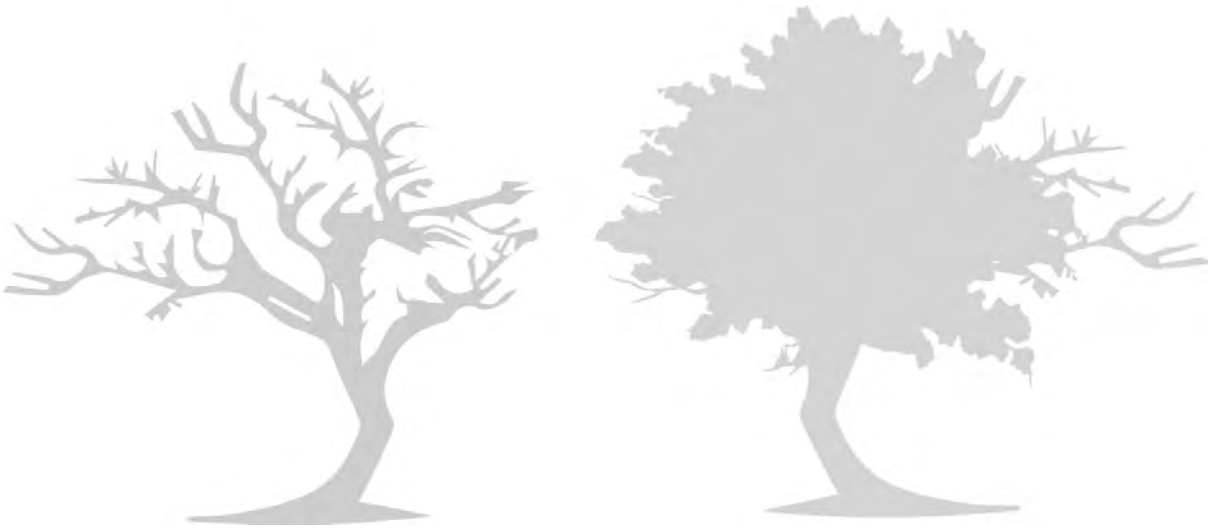
File:FullertonCove-Fig8-ProposedZoning-201030 Date: 30/10/2020

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Appendix B: AHIMS Search Results



AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 2028

Client Service ID : 565059

[redacted]

Date: 02 February 2021

[redacted]

Attention: [redacted]

Email: [redacted]com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 14, DP:DP258848 with a Buffer of 50 meters, conducted by Katrina Greville on 02 February 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

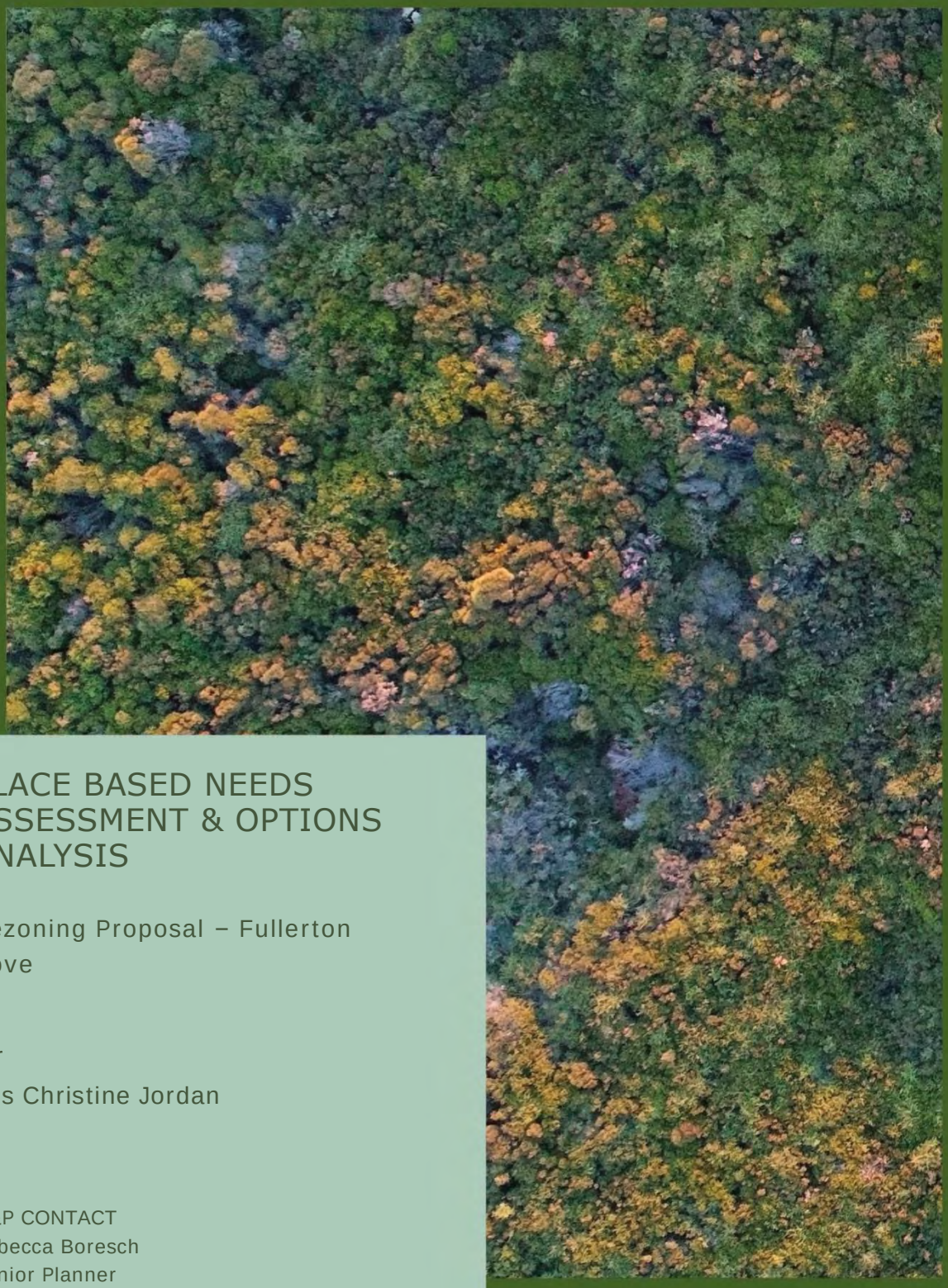
3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

ATTACHMENT 11 – Options Analysis

Monteath
& Powys

M&P



PLACE BASED NEEDS ASSESSMENT & OPTIONS ANALYSIS

Rezoning Proposal – Fullerton Cove

for

Mrs Christine Jordan

M&P CONTACT
Rebecca Boresch
Senior Planner

P (02) 4926 1388
M 0412 667 552
r.boresch@monteathpowys.com

monteathpowys.com.au

Monteath
& Powys

M & P

Our Ref:	15/0477
Project	42 Fullerton Cove Road – Rezoning Proposal
Client	Mrs Christine Jordan
Author	Rebecca Boresch Senior Planner B U&R P RPIA
Signature	[redacted]
Reviewer	
Signature	

This report was prepared by Monteath & Powys Pty Ltd.

Document Control					
Revision	Date	Revision Details	Author	Verifier	Approver
0	19/01/2022	Draft	RB	AP	AP
	07/02/2022	Final	RB	RB	RB

ABN 94 000 861 110 13/125 Bull Street Newcastle West NSW 2302 info@monteathpowys.com.au
P (02) 4926 1388 PO Box 2270 Dangar NSW 2309 monteathpowys.com.au

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4. EXISTING OPTIONS 5
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1. INTRODUCTION

1.1 OVERVIEW

As part of the current planning proposal, Port Stephens Council has requested an Options Analysis (OA) to review if the subject site should retain the current 1,500m² Gross Floor Area (GFA) proposed or if it is best suited to support a full format supermarket and additional retail GFA of 3,200m² to meet the day to day needs of the community.

1.2 BACKGROUND

The current planning proposal was submitted in April 2017 pending completion of the Fern Bay and North Stockton Strategy (FBNSS), which was adopted in April 2020. The strategy identified the subject site as an option to support the proposed North Stockton commercial centre. Based on community representation, the need for a supermarket within the locality was further confirmed to Council during the exhibition process for the strategy.

The viability of a neighbourhood centre with a GFA 1,500m² was queried during further studies being completed for the site and an addendum to the abovementioned strategy was completed in June 2021. The addendum confirmed that the current GFA of 1,500m² would not be viable in the longer term. A greater GFA would be required on the subject site to make the development viable in the medium to longer term and could be completed without affecting the viability of the future North Stockton commercial centre.

1.3 PROPONENT

Mrs Christine Jordan
C/- Monteath & Powys
PO Box 2270
DANGAR NSW 2309

Contact:

Rebecca Boresch
Phone: 02 4926 1388

The Owner(s):

Land ownership of the site is detailed in Table 1 below.

Table 1: Land Ownership of the Site

LOT	SECTION	DP	OWNER DETAILS
42 Fullerton Cove Road, Fullerton Cove			
14	-	258848	Mrs Christine Jordan

1.4 PURPOSE OF THIS REPORT

The purpose of this report is to assist Council to review the proposal strategically, consider the options and deliverables required for a local centre at the subject site, with a GFA greater than 1,500m² to inform their decision to update the Gateway Determination and proceed with the rezoning proposal.

This report will complete an assessment of the following strategic considerations as requested by Council:

- Spatial factors.
- Social factors.
- Economic factors.
- Walkability.
- Connectivity.
- Built Form.
- Public transport.
- Access and movement.
- Colocation of infrastructure.

The assessment will review the FBNSS and its insight into the locality, current constraints, and potential future infrastructure requirements for the area and discuss how the changes proposed will impact the options identified in the FBNSS.

2. THE PROPOSAL

2.1 SUMMARY OF PROPOSAL

The planning proposal intends to amend the Port Stephens Local Environmental Plan 2021 (LEP) to enable the development of a Local Centre in Fullerton Cove to provide for the day to day needs of the residents in Fullerton Cove and Fern Bay. The proposed changes comprise of:

- Rezone part of Lot 14 DP 258848 from RU2 Rural Landscape to E2 Environmental Conservation.
- Rezone part of Lot 14 DP 258848 from RU2 Rural landscape to B1 Neighbourhood Centre.
- Remove minimum lot size requirement of the proposed B1 zone from AB2 20 hectares.
- Introduce a height of building limit of 9 metres to the B1 zone.
- Introduce a new local provision limiting future retail development to a maximum gross floor area of 5,000 square metres.

The site has an area of 6.7 hectares of which 2.4 hectares is proposed to be rezoned as B1 Neighbourhood Centre. It is anticipated that the proposal will provide 60 - 90 ongoing jobs within the locality.

The proposal will facilitate and enable several community benefits to be achieved without significant adverse environmental impacts. The benefits include:

- An opportunity for increased day to day convenience retail options and accessibility for the Fern Bay - Fullerton Cove residents.
- Provide facilities in a location that reduces the numbers and length of vehicle trips, reducing travel times, and the costs associated with travelling to convenience shopping.
- The creation of new jobs and employment opportunities.
- It provides convenience accessible by existing public transport services and other active and passive travel methods i.e., residents can walk or cycle to obtain general day to day grocery items.
- Allow for the management and protection of biodiversity, key vegetation communities and environmental values of the site.
- The proposal can be developed in a cost-effective manner with the upgrading of trunk infrastructure to support the development, as required; and
- The proposal is compatible with the aims and objectives of the PSLEP 2013.

3. EMPLOYMENT ZONE REFORMS

The NSW Government is undertaking zoning reforms that will potentially change the zone prior to gazettal. These changes provide new categorisations to former Business and Industrial Zones to enable employment uses in areas. The new references have been included alongside the current references throughout. It is anticipated that the B1 Neighbourhood Centre is likely to become an E1 Local Centre.

The preferred zonings will be confirmed with the amendment to the Gateway Determination.

4. EXISTING OPTIONS

The FBNSS discusses potential and preferred locations for a new retail centre. The study noting that the Stockton Residential Site is the most preferred location being more accessible for residents of Stockton, especially with future residential development identified as part of the overall future development within the Newcastle Local Government Area. Whilst the Stockton Residential Site may be more centrally located for future development in Stockton, it is not as accessible to the Fern Bay and Fullerton Cove residents within the Port Stephens Local Government Area; both in terms of accessibility, and inability to fulfil the current market demand for these residents in the short to medium term.

At the time of the Gateway Determination, there was B1 zoned land located within the Fern Bay Seaside Estate. The extent of this land and the Fullerton Cove were sufficient to cater for the under supply of 2,700m² identified for the area. In October 2020, the Seaside land was rezoned to R1, leaving no immediate options available other the current proposal for 42 Fullerton Cove Road.

5. CASE FOR CHANGE

It was noted when undertaking community engagement, marketing, and through a revised retail analysis by Hill PDA, that the proposal in its current form would not be economically viable in the longer term. A larger GFA is required to fulfil the current undersupply of retail including the Stockton (2,700m²) and fulfil the short to medium demand of the Port Stephens residents, enabling future diversification of the site once the larger Stockton Centre is complete.

Further investigation has confirmed that a neighbourhood supermarket as previously proposed will not be viable to meet the needs of the community, is not compatible with the current market requirements, or the future viability once the Stockton precinct is operational.

Supporting documentation has been revised confirming that an increased GFA of 3,500² - 4,500m² can be supported and is consistent with the Ministerial Directions. The proposal will be updated and provided to DPE with a request to modify the Gateway determination for 5,500m² of GFA to enable a full line supermarket and associated retail, leaving the remaining 18,500m² for other permissible uses (i.e., service station, tavern, childcare centre, takeaway food and drink, multi-dwelling housing, etc.). This figure provides for the current under supply and enables diversification and redevelopment of the complex once the Stockton site is operational, rationalising economic impacts for both locations. The revised proposal for Fullerton Cove will then go to Council for consideration and public exhibition once these reports have been received.

The revised Stockton Fern Bay Commercial Lands Study 2021 (Hill PDA, 2021) confirmed that the operation of both the proposed development of the Fullerton Cove site and the future Stockton commercial centre can be viable in the longer term and will depend on the format of the primary centre, being Stockton in this instance, and the ability of a secondary centre to diversify in the future.

The past 24 months has reiterated the importance of suitable local retail centres to a community and the format changes occurring within retail industry. When COVID-19 restrictions prevented residents from leaving their LGA, the residents of Fern Bay and Fullerton Cove were restricted in being able to reach a full format supermarket. When further limited to within 5kms of their residence, this further restricted the ability to purchase groceries. With online ordering, click and collect and delivery options becoming more popular, the larger supermarket retailers are considering Customer Fulfilment Centre offerings in their growth strategies to reduce costs and for consumer convenience (Woolworths Group, 2022). This is important to note given the proximity of the future Stockton Commercial Centre in respect to this proposal.

To confirm whether the increase GFA identified for the subject site is suitable, consideration of numerous strategic values and infrastructure requirements is needed. The headings below provide detail of each of these factors to determine if the case for change and the subject as a secondary centre is valid.

5.1 PEOPLE AND PLACE

In considering the above case for change understanding people and place is important in reviewing the options analysis and the current analysis of the Fern Bay and North Stockton Strategy 2020 (FBNSS). This includes a review of spatial, social, economic factors.

Spatial factors/Priorities

The site is located in a central location for Port Stephens residents living in the Fullerton Cove and Fern Bay catchment whist being close enough for Stockton residents in the short to medium term.

The location and offerings the proposal can provide will assist in achieving the priorities of residents identified within the liveability research commission for Council, in particular:

- Access to neighbourhood amenities.
- Local businesses that provide for daily needs.
- Locally owned and operated businesses.

It is noted within the FBNSS that a neighbourhood centre is identified for the Fern Bay Area and with the rezoning of the Seaside land to residential, the subject site is the most centrally located and accessible from Nelson Bay Road, in lieu of the Stockton Centre.

Social factors/Priorities

The total population of the Stockton to Fullerton Cove statistical area from the 2020 Census was 8839 (Commonwealth of Australia, 2022). This is an increase of 1204 residents since 2016. At the time of this analysis, the 2020 data is unavailable to confirm the breakdown within the individual localities. Based on the 2016 Census the total population was 7,635. Of this total, 4,160 were living in Stockton, 2,763 were living in Fern Bay and 566 in Fullerton Cove. It must be noted that significant development within the area has occurred within the Fern Bay and Fullerton Cove localities since this time with development within Stockton remaining mostly stable. The increase is consistent with the growth identified with the FBSS and the Hill PDA report.

The place-based census completed by Port Stephens Council identified a number of underperforming elements residents see as priorities to improve and increase the liveability of the localities. Several of these can be improved through the development of the site and enabling an increase in GFA associated with the supermarket and associated retail, in particular:

LIVEABILITY PRIORITY	HOW THE PROPOSAL CONTRIBUTES TO IMPROVEMENTS
Access to neighbourhood amenities (cafes, shops, health and wellness centres)	Potential to provide these amenities in the short to medium term to the majority of the residents in the Fern Bay area and diversify when the Stockton Centre becomes operational.
Local businesses that provide for daily needs (grocery stores, pharmacy, banks)	The intended overall outcome of the planning proposal is to facilitate the timely delivery of smaller retail offerings suitable for pharmacies, smaller bank branch, or childcare centre, anchored by a full format supermarket to provide for the day to day needs of residents.
Locally owned and operated businesses	Potential for locally operated business such as a cafes, takeaway food and drink, medical consulting rooms, professional offices or taverns to become established.

LIVEABILITY PRIORITY	HOW THE PROPOSAL CONTRIBUTES TO IMPROVEMENTS
Walking / jogging / bike paths that connect to communal amenity (shops, parks)	The development of the site can consider shared pathway options in association with the FBSS, government funding and Council's contribution plans.
Things to do in the evening (bars, dining, cinema, live music)	Subject to further investigation the proposal could enable development of a local pub, tavern, wine bar or the like, providing a local meeting place.
Connectivity (proximity to other neighbourhoods, employment centres, shops)	The site provides suitable connectivity to all localities (Stockton, Fern Bay and Fullerton Cove), via access from Nelson Bay Road. Footpaths provide direct connection to the Fern Bay Seaside Estate and Bayway Village neighbourhoods.
Access and safety of walking, cycling and / or public transport (signage, paths, lighting)	It is noted that the volume of traffic along Nelson Bay Road exceeds the ability to use the crossing methods generally used for shared pathways on a roundabout or intersection treatments (i.e., pedestrian crossings, islands, raised pavements). Potential for shared pathway overpass or similar for users of a shared pathway to cross and connect to shared pathways and public transport routes safely.
Sustainable urban design (water sensitive design, transport-oriented design, sustainable building design, density).	The rezoning represents a valuable opportunity to manage future development of the site in a logical and sustainable manner, allowing for the introduction of development of a suitable scale and nature while at the same time safeguarding sensitive ecological areas from inappropriate development. There are currently public transport routes along Fullerton Cove Road. Intervals of these routes can be modified as there is an increase in demand with bus stops revisited and upgraded within the design phase as part of a future development application for the supermarket in alignment with Council's infrastructure delivery plan.

Economic Factors

At present, residents are serviced by a local corner store and an IGA in Stockton. A neighbourhood supermarket, childcare centre and medical centre were previously approved at 43 Seaside Boulevard in August 2016. This consent did not commence, and the land has since been rezoned for residential purposes. The existing day-to-day options available to Fern Bay and Fullerton Cove residents are small convenience options in Stockton (GFA 600m^2) or Salt Ash (GFA 450m^2). The extent of supermarket options to residents are noted within the table below.

SUPERMARKET	DISTANCE	EST TIME OF TRAVEL (CAR / BUS)
IGA, Stockton	7.8kms	10 minutes / 28 minutes
FoodWorks, Salt Ash	14.2kms	12 minutes / 28 minutes
Woolworths, Warabrook	13.5kms	16 minutes / 45 minutes
ALDI, Mayfield	13.0kms	16 minutes / 31 minutes
Woolworths, Mayfield	13.2kms	17 minutes / 33 minutes
FoodWorks, Raymond Terrace	21.8kms	19 minutes / 55 minutes
Woolworths, Raymond Terrace North	20.8kms	18 minutes / 61 minutes
ALDI, Raymond Terrace North	21.7kms	19 minutes / 63 minutes
Coles, Medowie	16.3kms	15 minutes / 42 minutes
Woolworths, Medowie	16.2kms	15 minutes / 41 minutes
Coles, Tanilba Bay	25.4kms	21 minutes / 77 minutes
Coles Marketown, Newcastle West	17.7kms	24 minutes / 42 minutes

As indicated within the table above, the impact on Fullerton Cove and Fern Bay residents by the lack of basic supermarket facilities is considered significant. Employment and economic benefits to the community are being expended externally. With little to no current opportunity to meet these needs or provide for the changing dynamic and trends of supermarket services within the area, within the short to medium term this clearly identifies the need for the rezoning.

The Hill PDA confirms the outgoing expenditure leaving the Local Government Area (LGA) is significant even with a low growth scenario with an estimated $102 million being spent outside of the LGA. The provision of a new supermarket and centre in this location is intended to complement the centres hierarchy identified within the FBNSS. That is, it will provide a convenient and accessible location for residents to buy most of their food and groceries, but not to the extent that the proposal will impact adversely on the economic viability of this or other centres.

Walkability

At present access to the site is car dependent. The current walkability from the site to Fern Bay to the site is reasonable 20 minutes and within 1,000 metres. This can be improved once the duplication of Nelson Bay Road has been completed and includes the shared pathway identified with the FBNSS and a potential pedestrian overpass. There are a number of over 55 residential developments within the vicinity of the site that will benefit greatly from this location. From these locations the site can be recognised as being accessible being between 100 – 800 metres from these developments.

Connectivity

With Fullerton Cove Road having direct access off Nelson Bay Road, the location is ideal to capture through trips off the highway whilst being accessible for local traffic. The duplication of Nelson Bay Road and shared pathway from Fern Bay as identified within the FBNSS will assist with connectivity. Works to enable pedestrian / cycleway across Nelson Bay Road will be required.

Consideration of general shared pathway design elements such as raised platform crossings and clear road markings, on this roundabout may not be feasible given the volume of traffic and classification of the road. A shared pathway overpass may require further considerations to be determined as part of infrastructure upgrades and future development of the site.

Built Form

The site is relatively flat, with the portion identified for development being predominantly clear of vegetation. These features are conducive to commercial development based on the environmental investigations completed. Future development of the site will be similar in scale to existing development within the locality and will be consistent with the development standards and development controls that apply to the new zoning and relevant land use.

Public Transport

Public transport within the Port Stephens LGA is limited to bus routes in and around the localities of Fullerton Cove, Fern Bay. These links extend to the remainder of the Port Stephens LGA, to Stockton and other locations in around Newcastle. Within 100 metres of the site there are three active bus stops. Within 800 metres there are eight active bus stops. Routes 136 and 137 run along Fullerton Cove Road with a stop to the west of the site before Nelson Bay Road. There are between 30 minutes to 1 hour between buses. Along Nelson Bay Road, to the south of the site there is a stop before Seaside Boulevarde and a stop before Fullerton Cove Road. These stops form part of Routes 130, 131 and a number of school services.

At present the number of buses and departures are limited. Discussions can be held with Hunter Buses to provide additional services and / or number of departures once the rezoning has been completed and a development application with Council has been submitted for the supermarket.

Access and Movement

Accessibility from Fullerton Cove across Nelson Bay Road is only achievable by car or public transport. On this basis, residents of Fullerton Cove and Fern Bay localities are reliant on private cars for access and movement within the LGA and externally which can be confirmed by the ABS data. Infrastructure such as shared pathways, that encourage passive recreation and connections are not yet in place. Provision of this infrastructure is noted within the FBNSS, and the Port Stephens Local Strategic Planning Statement linking Fern Bay to North Stockon. No link between Fullerton Cove to these precincts have been identified, assuming due to the constraints posed by Nelson Bay Road.

Without a shared pathway link, Fullerton Cove residents would be reliant on public transport and private vehicles to access the Stockton Commercial Centre, provides an accessible centre that would not have been available to the over 55's population living within the locality.

Colocation of Infrastructure

Enquiries with Hunter Water and a review of Dial Before You Dig responses, confirms the location of services in and around the site are sufficient for development and have potential for colocation.

6. CONCLUSION

On review of the strategic considerations requested by Council, the subject site being 42 Fullerton Cove Road, Fullerton, is considered the most suitable location to support a Local Centre to provide retail services for the day to day needs of the Fern Bay and Fullerton Cove residents. To do nothing leaves the community under serviced and money being spent outside of the LGA. There are no other viable locations with the ability to be developed within the short to medium term, with access to Nelson Bay Road and located between Fullerton Cove Road and Fern Bay. Relevant investigations of the site confirm the suitability, community support for the site is strong and by increasing the GFA to 5,500m² to include a 3,200m² full line supermarket and associated retail will provide economic growth and employment opportunities within the LGA within the short to medium term.

The proposal ensures the needs of the community are meet, the centre can remain viable and enables diversification of the centre once the Stockton Commercial Centre becomes operational. There is no reason for Council not to support the proposal.

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Monteath
& Powys

ABN 94 000 861 110

13/125 Bull Street
Newcastle West NSW 2302

PO Box 2270
Dangar NSW 2309

P (02) 4926 1388
info@monteathpowys.com.au

monteathpowys.com.au