



PLANNING PROPOSAL

COFFS HARBOUR CITY COUNCIL

Bark Hut Road, Woolgoolga
Part Lot 202 DP 874273

VERSION 1 – Pre-Exhibition
September 2019

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INTRODUCTION

Planning Proposal

The preparation of a Planning Proposal is the first step in making an amendment to the *Coffs Harbour Local Environmental Plan 2013* (LEP 2013). A Planning Proposal is a document that explains the intended effect and justification for the proposed amendment. Under the *Environmental Planning and Assessment Act 1979*, Council must prepare and submit a Planning Proposal to the Department of Planning, Industry and Environment for consideration of an amendment to LEP 2013.

This Planning Proposal has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* and the NSW Department of Planning, Industry and Environment's *A guide to preparing planning proposals 2018* and *A guide to preparing local environmental plans 2018*.

It explains the intended effects of a proposed amendment to LEP 2013 to enable low density residential development on land at Bark Hut Road Woolgoolga.

Purpose of Planning Proposal

The purpose of this Planning Proposal is to amend LEP 2013 to allow low density residential development on part of Lot 202 DP 874273. The Planning Proposal will:

- rezone the subject land from Zone RU2 Rural Landscape to Zone R2 Low Density Residential,
- amend the relevant lot size map accordingly,
- create an additional “key sites” clause within LEP 2013 and create a new key sites map accordingly, and
- enable the development of the land for low density residential purposes, subject to the preparation of a development control plan that will ensure that any development of the area occurs in an orderly, logical and sustainable manner.

Property details

This Planning Proposal applies to part of Lot 202 DP 874273, being an allotment comprising two portions, separated by public open space land. Lot 202 DP 874273 includes a northern portion; referenced in Figure 1 as ‘Bark Hut Road Planning Area’ and a southern portion; referenced in Figure 1 as ‘Newmans Road Planning Area’. This Planning Proposal applies to the Bark Hut Road Planning Area (the subject land) only and consideration of the Newmans Road Planning Area is subject to a separate Planning Proposal.



Figure 1: Locality Map: Lot 202 DP 874273

Site location, context and setting

The subject land has an area of 16.4 hectares and is located approximately 23 km north of Coffs Harbour and 1.4 km northwest of Woolgoolga. The subject land is located in close proximity to the established residential areas of Woolgoolga and Safety Beach and a Large Lot Residential precinct is also located to the west. The subject land is situated immediately west of Solitary Islands Way (the former Pacific Highway) and is accessed by Bark Hut Road. The land is currently zoned RU2 Rural Landscape under LEP 2013 and the zones of land in the immediate vicinity are shown in Figure 2.

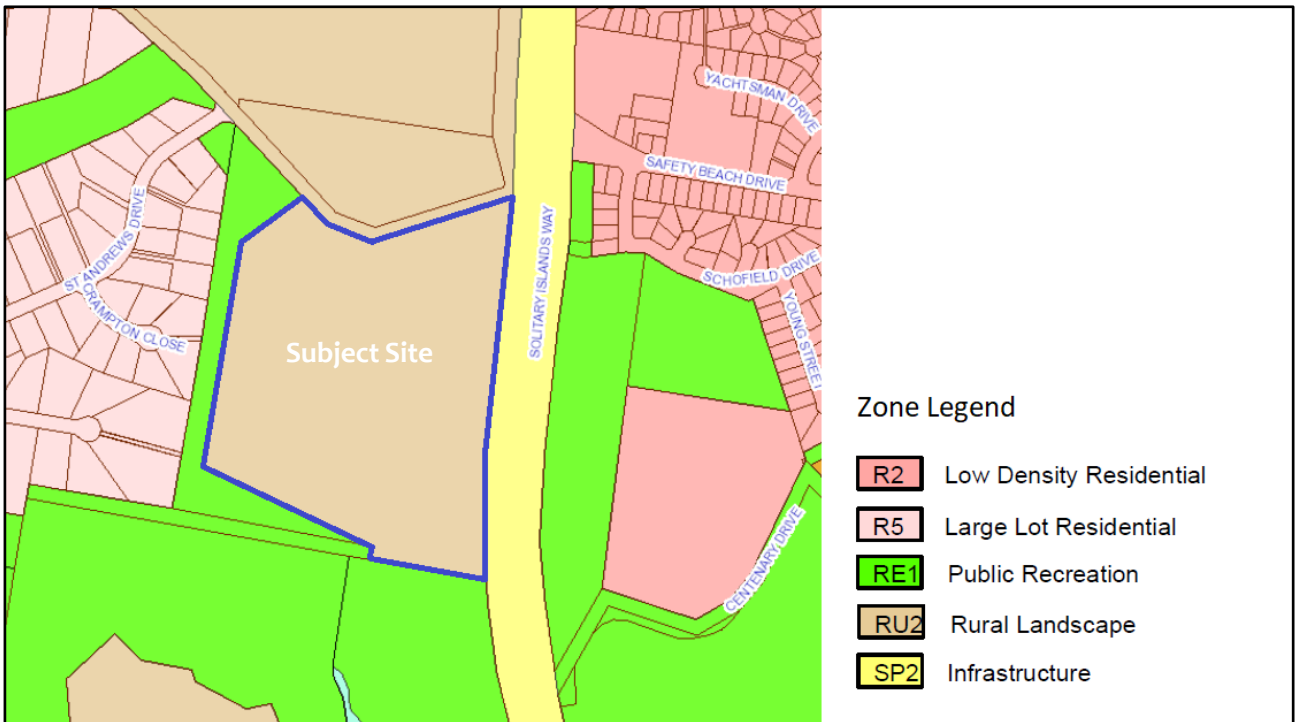


Figure 2: Current Land Use Zones – Coffs Harbour LEP 2013

An aerial photograph of the subject land is shown in Figure 3.



Figure 3: Aerial Photograph of the Subject land

Concept low density residential subdivision

A conceptual masterplan and low density residential subdivision lot layout is included in Appendix A. The Proponent's indicative 180 lot subdivision concept for the site is shown in Figure 4 below:



Figure 4: concept low density residential subdivision

Note:

The concept masterplan submitted by the proponent with the application to amend Coffs Harbour LEP 2013 for the subject site is not endorsed by Council. Detailed masterplanning for the subject site is to be addressed as part of any subsequent development application for the land.

PART 1 – OBJECTIVES OR INTENDED OUTCOMES

The objectives and intended outcomes of this Planning Proposal are to:

- Amend LEP 2013 to permit low density residential development on the subject land, subject to the preparation of a development control plan for the Woolgoolga North West growth area;
- Ensure that Woolgoolga North West is developed in accordance with sound planning and design principles; and
- Ensure that the rezoning is consistent with the broad strategic direction for the locality as described by North Coast Regional Plan 2036 and Council’s LGMS (2008).

PART 2 – EXPLANATION OF PROVISIONS

The intended outcomes of the Planning Proposal will be achieved by making the following amendments to LEP 2013 maps:

- Amend the Coffs Harbour Land Zoning Map (Sheet LZN_005F) over Part Lot 202 DP 874273, Newmans Road, Woolgoolga to change land currently zoned RU2 Rural Landscape to Zone R2 Low Density Residential;
- Amend the Coffs Harbour Minimum Lot Size Map (Sheet LSZ_005F) over Part Lot 202 DP 874273, Newmans Road, Woolgoolga to change land currently subject to minimum lot size provision AB – 40ha to F – 400 sqm; and
- Introduce a new Coffs Harbour Key Sites Map (KYS_005F).

All of the above amendments to LEP 2013 maps are shown in Part 4 (mapping) of this Planning Proposal.

A “key sites” clause is also included in this planning proposal. As further outlined in Part 3 of this planning proposal, the land is included within Council’s Local Growth Management Strategy 2008 – Urban Lands Component as a “possible future urban investigation” area and at the time, was given a long term priority (after 2031). The land is also within the growth area boundary for Woolgoolga, mapped in the *North Coast Regional Plan 2036*. Due to the long-term priority given to the land and the significant dwelling capacity earmarked for the area (see figure 4), it is appropriate to masterplan the area and prepare a site specific Development Control Plan chapter within Coffs Harbour Development Control Plan 2015, as well as an associated Developer Contributions Plan for Woolgoolga North West. Part 7 of Coffs Harbour LEP 2013 is proposed to include a “key sites” clause similar to the following:

Development on certain land at Woolgoolga North West (Part Lot 202 DP 874273, Bark Hut Road Woolgoolga)

1. The objectives of this clause are:
 - a) to ensure the subject land is developed in accordance with sound planning and design principles, and
 - b) to ensure development is carried out in an orderly, structured manner and is sympathetic of the constraints to the land and surrounding land uses.
2. This clause applies to land identified as “Woolgoolga North West” on the Key Sites Map.

3. Development consent must not be granted for development on land to which this clause applies unless a development control plan that provides for the matters specified in subclause (4) has been prepared for the land.
4. The development control plan must provide for the following:
 - a) masterplan to guide future development within Woolgoolga North West,
 - b) the appropriate use of land for residential development and infrastructure provision having regard to the environmental and other constraints of Part Lot 202 DP 874273 (such as bush fire, water quality, Aboriginal heritage and surrounding land uses particularly agricultural activities including but not limited to associated buffer requirements to minimize impacts from dust, noise and spray drift),
 - c) subdivision layout,
 - d) pedestrian and cycleway connectivity within future development and to adjoining public reserve areas,
 - e) an integrated traffic management strategy which ensures the safe and efficient movement of traffic within the development and onto adjoining land, and
 - f) the management, protection and (where appropriate) rehabilitation of high conservation value land.
5. Subclause (3) does not apply to development for any of the following purposes:
 - a) a subdivision for the purpose of a realignment of boundaries that does not create additional lots,
 - b) a subdivision of land if any of the lots proposed to be created are to be reserved or dedicated for public open space, public roads or any other public or environmental protection or management purpose,
 - c) a subdivision of land in a zone in which erection of structures is prohibited,
 - d) development of land that is of a minor nature only, if the consent authority is of the opinion that the carrying out of the proposed development would be consistent with the objectives of the zone in which the land is situated.

PART 3 – JUSTIFICATION

Section A – Need for the Planning Proposal

1. Is the Planning Proposal a result of any strategic study or report?

This Planning Proposal has been prepared in response to a landowner's request and is accompanied by a number of detailed environmental studies, which are included as attachments. The subject site is included in Council's Local Growth Management Strategy 2008 – Urban Lands Component as a “possible future urban investigation” area. At the time, the investigation of this land for urban purposes was given a long-term priority (after 2031). The land is also included in the Coffs Harbour Draft Local Growth Management Strategy currently being prepared by Council and is shown within the growth area boundary for Woolgoolga, as mapped in the *North Coast Regional Plan 2036*.

A detailed Residential Land Demand Analysis accompanies this Planning Proposal (refer Appendix B), which concluded that:

It is estimated that there is only three years of serviced residential zoned land supply available to the market within the Study Area, including land that is currently not being developed and subject to owner intents and commercial viabilities.

As mentioned above, Council is currently undertaking a review of the Local Growth Management Strategy. Peer review of this Planning Proposal has identified that it is consistent with the objectives of the Draft Local Growth Management Strategy ‘Strategic Approach’, particularly:

- The subject land is identified within the Woolgoolga north-west growth area in the LGMS as a high priority 1-4 years land release program.
- Residential demand for the entire Woolgoolga North West growth area indicates that there is capacity for additional 1030 total dwelling yield (see figure 5).
- The LGMS also identifies that greenfield developments should carefully consider environmental constraints, water sensitive design and walkability.

Ensuring there is sufficient residential zoned land to meet present and future demand is also an important consideration in maintaining housing affordability.

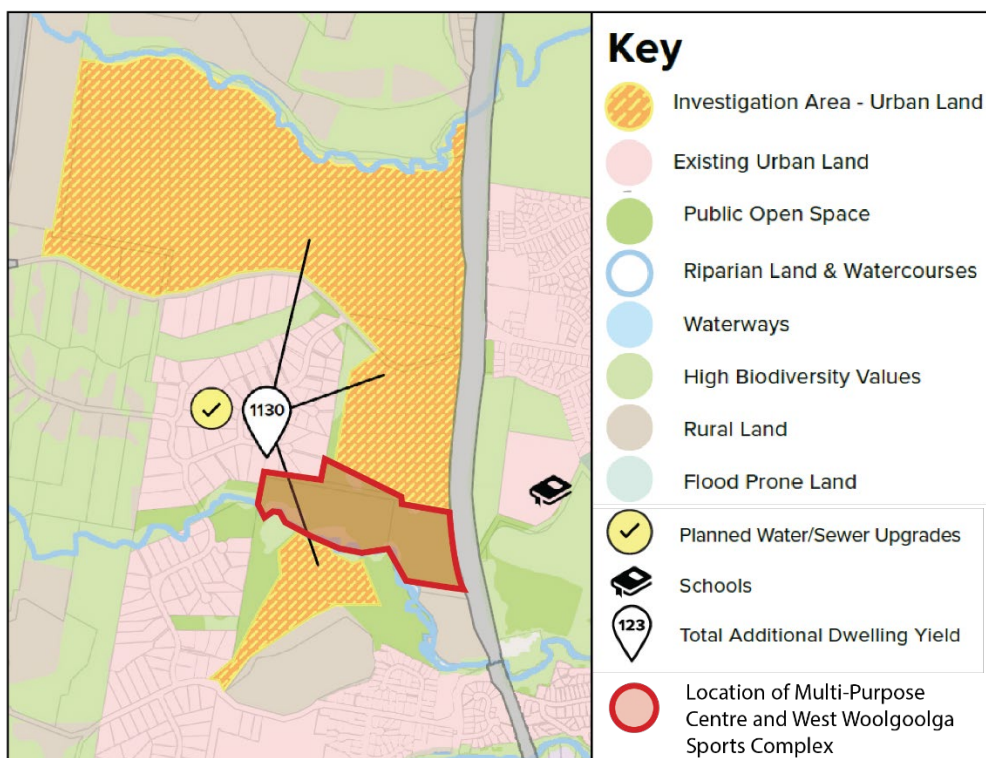


Figure 5: Draft LGMS - Dwelling Capacity in NW Woolgoolga

2. Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

This Planning Proposal is not an overall review of the City controls proposed through the preparation of an LGA wide LEP review. Therefore, a site specific Planning Proposal accompanied by relevant environmental planning studies is the only way of achieving the release of additional residential land at Woolgoolga North West. Achieving the intended outcomes outlined in this Planning Proposal is also

dependent on the preparation of a masterplan for Woolgoolga North West, for inclusion within a site-specific Development Control Plan chapter within Coffs Harbour Development Control Plan 2015 and an associated Developer Contributions Plan.

3. Is there a net community benefit?

The rezoning of the subject land enables the development of approximately 180 low density residential lots within a 16.4 ha portion of the site proposed to be zoned R2 Low Density Residential.

Net Community Benefit Criteria are identified in the NSW Government's publication *The Right Place for Business and Services*. This policy document has a focus on ensuring growth within existing centres and minimising dispersed trip-generating development. It applies most appropriately to Planning Proposals that promote significant increased residential areas or densities, or significant increased employment areas or the like.

A net community benefit test (NCBT) analyses the potential social and economic impact to the Woolgoolga community arising from the Planning Proposal and assesses whether the site is suitable for rezoning and will provide positive benefits to the community. A summary of potential benefits and costs is outlined below.

The 'base case' is that the land remains under its present RU2 Rural Landscape zoning.

Potential benefits versus Base Case

- Increasing land for housing supply in the Woolgoolga North West locality by approximately 180 lots suitable for detached low density dwellings.
- Contributing to the stock of unconstrained land for vernacular housing.
- Meeting the forecasted population increase for the Coffs Coast area by increasing the supply of unconstrained residential land to the Woolgoolga area.

Costs of future development versus Base Case

- Short-term increase in heavy vehicle traffic during the construction phase of the subdivision. Appropriate mitigation measures would need to be implemented.
- Short-term adverse impacts on environmental amenity during the construction process. Appropriate mitigation measures would need to be implemented.
- Loss of rural land. Although the site is not currently used for agricultural purposes and holds little agricultural potential, it is noted that adjacent land to the north is currently used for intensive plant agricultural activities. Appropriate mitigation measures would need to be implemented and it is noted that the key sites clause contained within this Planning Proposal includes reference to the establishment of appropriate buffer requirements within subsequent Development Control Plan provisions.

The associated negative impacts of the proposal are considered to be manageable. The Planning Proposal will deliver land for housing in accordance with projected lot yields for the area and therefore is likely to provide a net community benefit.

Section B – Relationship to strategic planning framework

4. Is the Planning Proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including exhibited draft strategies)?

North Coast Regional Plan 2036

The *North Coast Regional Plan 2036* applies to the Coffs Harbour LGA. The land is identified as an Urban Growth Area in the *North Coast Regional Plan 2036*, as shown in Figure 6.

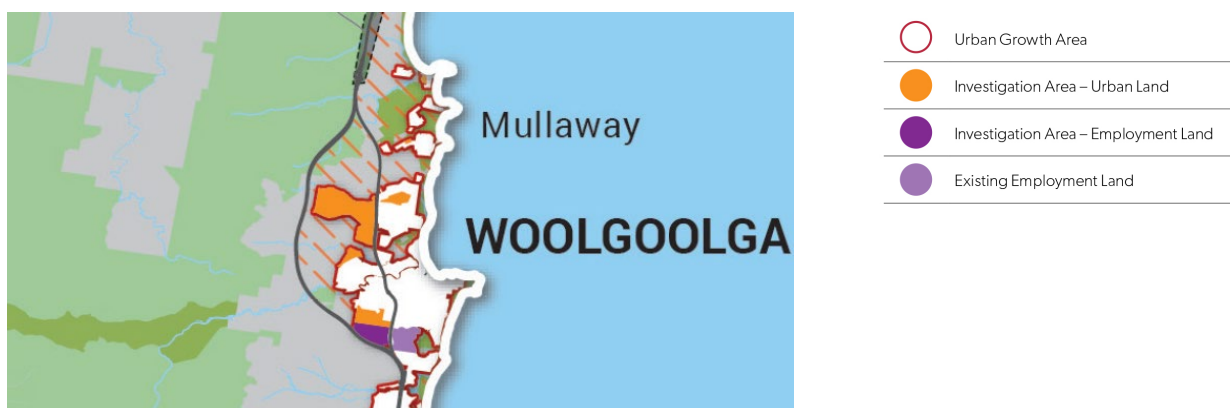


Figure 6: Context within the North Coast Regional Plan 2036

The following outlines how the Planning Proposal complies with the Goals and Directions contained in the *North Coast Regional Plan 2036*:

Goal 1: The most stunning environment in NSW

Direction 1: Deliver environmentally sustainable growth

The subject land is within the *North Coast Regional Plan 2036* urban growth area boundary. These areas have been identified to achieve a balance between urban expansion and protecting coastal and other environmental assets.

The proposed key sites clause will allow master planning of the overall Woolgoolga North West growth area and will allow Council to deliver environmentally sustainable growth.

The subject land is surrounded by residential development and is close to urban services including schools and a shopping centre. The land is not located near any significant farmland or sensitive ecosystems.

Direction 2: Enhance biodiversity, coastal and aquatic habitats, and water catchments

A Biodiversity Impact Assessment (BIA) is included with this Planning Proposal (Appendix F). The BIA notes that the site contains small areas of low and moderate conservation value, although it is largely dominated by highly disturbed and cleared lands that do not present any ecological conservation value. No threatened species, ecological communities, mapped regional corridors or key habitat linkages exist on the site. Secondary and tertiary koala habitat is present on the subject land. The secondary and tertiary koala habitat that exists on the site has moderate

conservation value and will need further environmental assessment at the development application stage.

An indicative development footprint used within the BIA showed that future residential development could be appropriately located on the site. The application of environmental zones was initially considered as part of this Planning Proposal. However, based on a review of Local Planning Direction 2.1 Environment Protection Zones, Northern Councils E Zone Review Final Recommendations Report and LEP Practice Note PN09-002 (Environment Protection Zones), the BIA determined that there is no justification to apply Environmental Conservation Zones across any areas of the site as part of this Planning Proposal.

The Strahler stream classification system has identified first and second order streams on the subject land, however these identified streams have no defined bed or bank visible in the field and have limited biodiversity value. Future development design in accordance with Water Sensitive Urban Design requirements shall ensure no long-term hydrological impacts downstream to Poundyard Creek and Woolgoolga Lake.

Direction 3: Manage natural hazards and climate change

A *conceptual subdivision masterplan* (Appendix A) for low density housing development has been prepared to assist in estimating an overall lot yield and internal road layout (including perimeter roads to improve bushfire hazard management).

Perimeter roads as shown in the concept master plan and the management actions described in the *Bushfire Risk Assessment report* (Appendix C) will be an important part of bushfire hazard protection. The bushfire assessment and concept masterplan have been prepared to accord with the NSW Rural Fire Service's draft *Planning Bush Fire Protection 2018*.

Direction 4: Promote renewable energy opportunities

Although the subject land generally faces south, good solar access opportunities and effective lot orientation can still be achieved and ensure consistency with this direction.

Goal 2: A thriving, interconnected economy

Direction 5: Strengthen communities of interest and cross-regional relationships

The proposed residential area will have good access to local employment opportunities as well as the Pacific Highway for broader regional opportunities.

Direction 6: Develop successful centres of employment

The additional residential area will support the existing Woolgoolga business and industrial areas and will help strengthen the Coffs Harbour LGA as a centre of employment.

Direction 7: Coordinate the growth of regional cities

The proposed rezoning supports the growth and redevelopment of Coffs Harbour (a designated regional city), and is consistent with the *North Coast Regional Plan 2036* and Council's *Local Growth Management Strategy 2008*.

Direction 8: Promote the growth of tourism

The proposed residential area will indirectly provide for tourism by providing land for housing, which may cater for tourism workers.

Direction 9: Strengthen regionally significant transport corridors

The proposed residential area is in close proximity to Solitary Islands Way, which is a major connector road to the Pacific Highway.

Direction 10: Facilitate air, rail and public transport infrastructure

The proposed residential area is accessible to air and rail transport nodes in Coffs Harbour, via the Pacific Highway. Local bus services are available nearby (Solitary Islands Way) and will be able to service the proposed residential area.

Direction 11: Protect and enhance productive agricultural lands

The subject land does not contain highly productive agricultural lands and is not identified as Regionally Significant Farmland. Agricultural land exists, immediately to the north of the subject land. Accordingly, a *Land Use Conflict Risk Assessment* (LUCRA, refer to Appendix D) has been undertaken as part of this planning proposal. The LUCRA recommends a 30m vegetated buffer be established on the northern part of the subject land to reduce the impact of chemical spray drift and to act as a visual barrier between competing land uses.

The rural land to the immediate north of the site is also identified in Council's LGMS as '*possible future urban investigation*' land. As outlined earlier, it is noted that the key sites clause contained within this Planning Proposal includes reference to the establishment of appropriate buffer requirements within subsequent Development Control Plan provisions.

Direction 12: Grow agribusiness across the region

The subject land does not contain highly productive agricultural lands and is not identified as Regionally Significant Farmland. Although agricultural land exists immediately to the north of the subject land, it is also identified in Council's LGMS as '*possible future urban investigation*' land.

Direction 13: Sustainably manage natural resources

The proposed rezoning will not adversely affect any nearby natural resources.

Goal 3: Vibrant and engaged communities

Direction 14: Provide great places to live and work

The proposed key sites clause and map will allow master planning of the overall Woolgoolga North West growth area and will outline how low density residential development will interact with surrounding land. *Coffs Harbour Development Control Plan 2015* will include a masterplan and specific controls to guide new development to assist the Woolgoolga North West growth area to integrate into surrounding urban areas, including its relationship with nearby road networks and open space.

Direction 15: Develop healthy, safe, socially engaged and well-connected communities

There are opportunities for links between the subject land and the Woolgoolga Sporting Fields and with the Woolgoolga State High School and the existing network of cycleways and paths on the eastern side of Solitary Islands Way.

The proposed master planning exercise provides an opportunity to ensure that these communities are well-connected with their surroundings. Existing DCP objectives and controls aim to ensure that subdivision proposals provide appropriate connectivity for servicing vehicular, walking and cycling networks. Subdivision infrastructure including cycleways, footpaths and street lighting will ensure that future residential areas are both healthy and safe via crime prevention through environmental design outcomes.

Direction 16: Collaborate and partner with Aboriginal communities

The applicant's consultants stated that they undertook a consultation process with the Aboriginal community in accordance with the (former) OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) (ACHCRP) and prepared an Aboriginal Cultural Heritage Assessment Report (Appendix E).

Direction 17: Increase the economic self-determination of Aboriginal communities

The Planning Proposal will not have outcomes that are contrary to this direction.

Direction 18: Respect and protect the North Coast's Aboriginal heritage

The results of the Archaeological Assessment are summarised as follows:

- *Two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) were observed on the access trail immediately south of the Bark Hut Road entrance to the Project Area. These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed. In any case, this Planning Proposal does not affect the locations of these two artefacts as they are not located on the subject land.*
- *Having consideration for the landscape context of the Project Area and the history of disturbance it is considered unlikely that the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the site, none are known within the Project Area. No Mythological or ceremonial sites are known to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland.*

An onsite AHIP consultation meeting was held on 18th January 2018 with the applicant's cultural heritage consultant and members of the local Aboriginal community and the Coffs Harbour and District Local Aboriginal Land Council. According to the report (Appendix E), those present agreed that the rezoning would be acceptable.

It is also appropriate that a Gateway Determination should require further consultation with local Aboriginal stakeholders and the NSW Department of Premier and Cabinet.

Direction 19: Protect historic heritage

No historic heritage is identified within the Planning Proposal area.

Direction 20: Maintain the region's distinctive built character

Existing Coffs Harbour DCP 2015 controls will assist in preserving the distinctive North Coast built character.

Direction 21: Coordinate local infrastructure delivery

Local infrastructure will be coordinated via Council's Development Servicing Plans.

Goal 4: Great housing choice and lifestyle options

Direction 22: Deliver greater housing supply

The proposed rezoning will result in an estimated 180 additional low density residential allotments within the subject land.

Direction 23: Increase housing diversity and choice

The land is proposed to be rezoned R2 Low Density Residential which provides for a range of residential accommodation land uses.

Direction 24: Deliver well-planned rural residential housing areas

Existing and future Large Lot (ie rural) Residential precincts are identified by Council's LGMS. This Planning Proposal does not propose Large Lot Residential zoned land.

Direction 25: Deliver more opportunities for affordable housing

The minimum lot size for the proposed development is one lot/dwelling per 400 m² which is the standard allotment size for the majority of low density residential housing in the Coffs Harbour LGA. The release of the subject land for low density residential housing purposes will provide additional affordable housing choice for the Woolgoolga locality.

5. Is the Planning Proposal consistent with the local council's Community Strategic Plan, or other local strategic plan?

MyCoffs Community Strategic Plan

Coffs Harbour City Council's Community Strategic Plan (MyCoffs) is based on four key themes, being: Community Wellbeing, Community Prosperity, and a Place for Community, and Sustainable Community Leadership.

This Planning Proposal is consistent with the following relevant Objectives from the MyCoffs Plan:

An active, safe and healthy community	A2.1: We support our community to lead healthy active lives
A thriving and sustainable local economy	B1.2 We attract people to work, live and visit in the Coffs Harbour local government area
Liveable neighbourhoods with a defined identity	C1.1 - We create livable spaces that are beautiful and appealing. C1.2 We undertake development that is environmentally, socially and economically responsible
A natural environment sustained for the future	C2.1: We protect the diversity of our natural environment. C2.2: We use resources responsibly to support a safe and stable climate.
Our leaders give us confidence in the future	D1.2 We undertake effective engagement and are informed
We have effective use of public resources	D2.1 - We effectively manage the planning and provision of regional public services and infrastructure. D2.2 We collaborate to achieve the best possible future for all the Coffs Harbour area

Local Growth Management Strategy – Urban Lands Component 2008

Council’s Local Growth Management Strategy (LGMS) – Urban Lands Component was finalised in 2008. The LGMS sets out a future for the growth and development of the LGA until 2031. The goal of the LGMS – Urban Lands Component is to foster healthy urban communities, which contribute to delivering the Vision for the City. The Vision is described as: The Healthy City, the Smart City and the Cultural City for our future.

The LGMS projects a population of 99,000 people by 2031 with 94,000 accommodated in existing zoned areas and the balance of 6000 people expected to be accommodated in Greenfield sites. The LGMS states that “Projected population growth indicates that, at existing rates of consumption, additional land will be required for residential purposes by the period 2016-2021 in proximity to the Coffs Harbour Township [City].”

The LGMS – Urban Lands Component is presented in five parts. Part 3 of the Strategy contains the overall Strategy, and provides details on development areas and recommended priority releases for each area. The Strategy concentrates growth in the City’s Central Business District (CBD) and key centres. It offers a hierarchy of Coffs Harbour as Coastal City; Woolgoolga, Moonee and Sawtell/Toormina/Boambee as Coastal Towns; and other settlements generally as Coastal and Hinterland Villages.

Detailed strategies are outlined for each urban area along with recommendations for future Place Management Plans for each of these areas. Part 3 also contains a supply and demand supply analysis based on population projections, and a servicing analysis.

Part 5 of the LGMS – Urban Lands Component refers to a series of maps, which include detailed strategies for each urban area within the LGA. These identify future development areas, expected

limits to growth and key strategic actions for each area. In addition, each Map includes a series (A, B and C), which provide for each growth area:

- expected lot yields;
- development areas; and
- constraints.

Map 4 and 4A of the *LGMS – Urban Lands Component* incorporates the localities of Arrawarra/Mullaway/Safety Beach/Woolgoolga and includes the subject land which is notated ‘Possible Urban Investigation Area’.

Map 4B provides details on proposed agreed growth areas and shows the subject land as having the potential to provide for 140 dwellings after 2031.

Map 4C deals with constraints, and shows the land as being generally unconstrained.

When applying the underlying growth principles of the LGMS, the proposed rezoning will achieve the following:

- deliver housing diversity and choice;
- provide walkable neighbourhoods by ensuring good connectivity between the development and West Woolgoolga Sporting Fields; and
- enhance the economic and social functions of existing local centres.

It is also acknowledged that the subject land is not highly constrained, can be efficiently serviced and has access to existing established areas of Safety Beach, Arrawarra/Mullaway, Woolgoolga High School and the Pacific Highway bypass.

Local Growth Management Strategy – Strategic Approach

Council’s peer review of this Planning Proposal reveals that it is consistent with the strategic approach taken by the revised draft Local Growth Management Strategy currently being prepared by Council, particularly:

- The subject land is identified within the Woolgoolga North West Growth Area in the draft Local Growth Management Strategy as a high priority 1-4 year land release program.
- Residential demand for the entire growth area indicates that there is capacity for an additional 1030 total dwelling yield.
- The draft Local Growth Management Strategy also identifies that greenfield developments should carefully consider environmental constraints, water sensitive design and walkability.

6. Is the Planning Proposal consistent with applicable State Environmental Planning Policies?

The State Environmental Planning Policies (SEPPs) applicable to the Planning Proposal are discussed in Table 1.

Table 1: Consistency with applicable SEPPs


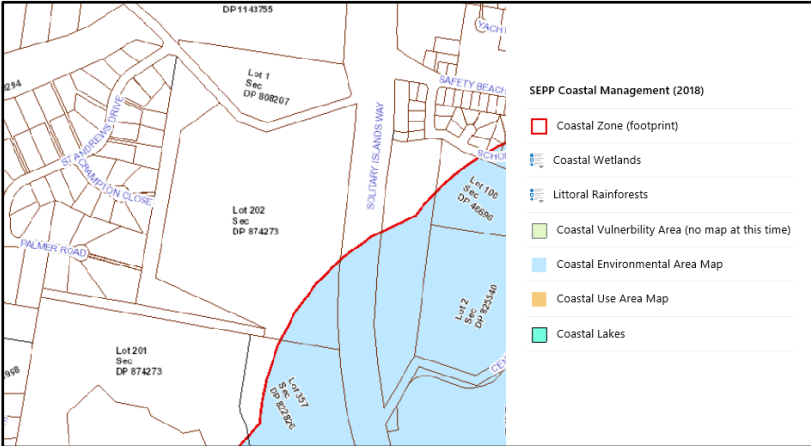
State Environmental Planning Policy	Comments	Consistency
SEPP No 1 – Development Standards	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 21 – Caravan Parks	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 33 – Hazardous and Offensive Development	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 36 – Manufactured Home Estates	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 44 – Koala Habitat Protection	<p>This SEPP encourages the conservation and management of natural vegetation areas that provide habitat for koalas to ensure that permanent free-living populations will be maintained over their present range.</p> <p>Comment: Council has an adopted <i>Koala Plan of Management 1999</i> (KPoM) which includes local provisions that apply to identified koala habitat. The KPoM identifies both secondary and tertiary koala habitat within the subject land - see Figure 7.</p> 	Consistent.

Figure 7: Koala Plan of Management Mapping

	<p>1.37 ha of Tertiary Koala Habitat and 0.1 ha of Secondary Koala Habitat have been mapped within the site (refer to Figure 8). These areas are considered to have moderate conservation value and any future development within these areas must address the provisions of the Coffs Harbour City Koala Plan of Management 1999. Future development would also need to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). A copy of the <i>Biodiversity Impact Assessment (BIA)</i> prepared by ERM is provided as an appendix to this Planning Proposal (see Appendix F).</p> <p>To ameliorate the impacts of development on koala habitat, a number of mitigative measures are recommended in the BIA. One such measure being that development be designed with due regard to the presence of potential (secondary and tertiary) koala habitat and to ensure minimal net loss of potential habitat through on site habitat management and/or habitat offsetting measures, in consultation with NSW Department of Planning, Industry and Environment.</p>	
SEPP No 50 – Canal Estate Development	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 55 – Remediation of Land	<p>A review of previous land uses of the site suggests that contamination of the site is unlikely. Past uses include low intensity stock grazing and the land is not mapped as former banana cultivation land. Searches of the land contamination register, record of notices and contaminated sites notified to Environmental Protection Authority have not identified the subject land. Contamination potential is considered minimal and manageable with appropriate remediation procedures available.</p> <p>A preliminary site contamination investigation is included with this Planning Proposal (see Appendix I) which found that there were no exceedances of adopted assessment criteria and it is considered that there is a low potential for soil contamination to be present within the subject land.</p>	Consistent.
SEPP No 64 – Advertising and Signage	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP No 65 – Design Quality of Residential Flat Development	Residential flat buildings are prohibited in the R2 zone under Coffs Harbour Local Environmental Plan 2013.	Consistent.
SEPP No 70 – Affordable	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent

Housing (Revised Schemes)		
SEPP (Coastal Management) 2018	<p>The aim of this Policy is 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 <i>Coastal Management Act 2016</i>, including the management objectives for each coastal management area by establishing a framework for land use planning to guide decision-making in the coastal zone.</p> <p>As shown in Figure 8 below, the south eastern corner of the site is located within the <i>coastal environment area</i>.</p>  <p>Figure 8: SEPP (Coastal Management) 2018</p> <p>Comment: The south-eastern corner of the subject land is affected by the provisions of the ‘<i>coastal environment area</i>’ component of SEPP (Coastal Management) 2018. This SEPP states as follows:</p> <ol style="list-style-type: none"> 1) <i>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:</i> <ol style="list-style-type: none"> (a) <i>the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,</i> (b) <i>coastal environmental values and natural coastal processes,</i> (c) <i>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,</i> (d) <i>marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,</i> (e) <i>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,</i> 	Consistent.

	<p>(f) <i>Aboriginal cultural heritage, practices and places,</i> (g) <i>the use of the surf zone.</i></p> <p>2) <i>Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:</i></p> <p>(a) <i>the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or</i> (b) <i>if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or</i> (c) <i>if that impact cannot be minimised—the development will be managed to mitigate that impact.</i></p> <p>Woolgoolga Lake is listed as a sensitive coastal lake identified in Schedule 1 of the SEPP. The conceptual subdivision masterplan for the site (Appendix A) shows a detention basin for on-site stormwater management is proposed on the south eastern corner of the subject land to ensure minimal impacts on this sensitive coastal lake. Council's DCP controls and Water Sensitive Urban Design Guidelines will ensure that future Development Application/s for subdivision incorporate water sensitive urban design into their design. This will help ensure that water quality levels are maintained and/or improved in waterways draining into Woolgoolga Lake.</p>	
SEPP (Affordable Rental Housing) 2009	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Building Sustainability Index: BASIX) 2004	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent.
SEPP (Concurrences) 2018	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Educational Establishments and Child Care Facilities) 2017	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Exempt and Complying Development Codes) 2008	No additional exempt or complying uses have been included in this Planning Proposal.	Consistent.

SEPP (Housing for Seniors or People with a Disability) 2004	Seniors housing is permitted with consent in the R2 Low Density Residential Zone under Coffs Harbour Local Environmental Plan 2013.	Consistent.
SEPP (Infrastructure) 2007	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Mining, Petroleum Production and Extractive Industries) 2007	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Miscellaneous Consent Provisions) 2007	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Primary Production and Rural Development) 2019	<p>The aims of this Policy are:</p> <ul style="list-style-type: none"> (a) to facilitate the orderly economic use and development of lands for primary production, (b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources, (c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations, (d) to simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts, (e) to encourage sustainable agriculture, including sustainable aquaculture, (f) to require consideration of the effects of all proposed development in the State on oyster aquaculture, (g) to identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors. <p>Comment: The Planning Proposal is consistent with the aims of the SEPP in that:</p> <ul style="list-style-type: none"> • The lands affected by the Planning Proposal are excluded from Regionally Significant farmland considerations and are recognised as a future residential growth area by the <i>North Coast Regional Plan 2036</i>. 	Consistent.

	<ul style="list-style-type: none"> • The site has not been used for productive agricultural uses for a significant amount of time and therefore, the impact on the overall availability of rural lands for this purpose will be negligible. • The land is small in area and is inappropriately located for sustainable agriculture, given its proximity to adjacent residential land and its recognition as a possible future urban investigation area by Council's LGMS 2008 and as a future residential growth area by the <i>North Coast Regional Plan 2036</i>. • Ecologically sensitive native vegetation will be managed by incorporating appropriate mitigative measures into the proposed development as per the recommendations of the biological impact assessment prepared for the subject land. • The Planning Proposal is consistent with the North Coast Regional Plan 2036. 	
SEPP (State and Regional Development) 2011	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (State Significant Precincts) 2005	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.	Consistent
SEPP (Vegetation in Non-Rural Areas) 2017	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP. Coffs Harbour DCP 2015 contains requirements that address the removal of significant vegetation within the Coffs Harbour LGA.	Consistent

7. Is the Planning Proposal consistent with applicable Ministerial Directions (s9.1 directions)?

Consistency with applicable s9.1 Local Planning Directions is outlined in Table 2.

Table 2: Consistency with s9.1 (2) Directions

Ministerial Direction	Comments	Consistency with direction
1. Employment and Resources		
1.1 Business and Industrial Zones	<p>The objectives of this direction are to:</p> <ul style="list-style-type: none"> (a) encourage employment growth in suitable locations, (b) protect employment land in business and industrial zones, and (c) support the viability of identified centres. <p>The Planning Proposal does not propose or affect any business or industrial zoned land.</p>	Consistent.
1.2 Rural Zones	<p>The objective of this direction is to protect the agricultural production value of rural land.</p> <p>This Planning Proposal seeks to rezone land from an existing rural zone to a residential zone. However, this inconsistency is considered to be justified for the following reasons:</p> <ul style="list-style-type: none"> • The lands affected by the Planning Proposal are excluded from Regionally Significant farmland considerations and are recognised as a future residential growth area by the North Coast Regional Plan 2036. • The site has not been used for productive agricultural uses for a significant amount of time and therefore, the impact on the overall availability of rural lands for this purpose will be negligible. • The land is small in area and is inappropriately located for sustainable agriculture, given its proximity to adjacent residential land and its recognition as an urban investigation area by Council's LGMS 2008 and as a future residential growth area by the North Coast Regional Plan 2036. 	Justifiably inconsistent for reasons listed.
1.5 Rural Lands	<p>This direction applies as the Planning Proposal includes changes in existing rural zone boundaries and minimum lot sizes of rural zoned land.</p> <p>Land which is currently zoned RU2 Rural Landscape is proposed to be amended to Zone R2 Low Density Residential.</p>	Justifiably inconsistent for reasons listed.

Ministerial Direction	Comments	Consistency with direction
	The land is identified in the <i>North Coast Regional Plan 2036</i> and <i>Council's Local Growth Management Strategy 2008</i> as within the urban growth area boundary and as an urban investigation area respectively.	
2 Environment and Heritage		
2.1 Environment Protection Zones	<p><i>The objective of this direction is to protect and conserve environmentally sensitive areas.</i></p> <p>A Biodiversity Impact Assessment (refer to Appendix F) has been prepared for the subject land and draws the following conclusions:</p> <ul style="list-style-type: none"> • The site contains primarily cleared land of low to moderate ecological value. • The site does not contain significant diversity or areas of mapped high conservation values. • No threatened species or ecological communities have been recorded within the subject land and it does not form part of any mapped regional corridors or key habitat linkages. • The site is not mapped within an environment protection zone or land otherwise identified for environmental protection purposes in CH LEP 2013. • 1.37 ha of Tertiary Koala Habitat and 0.1 ha of Secondary Koala Habitat have been mapped within the site. These areas are considered to have moderate conservation value and any future development within these areas must address the provisions of the Comprehensive Coffs Harbour City Koala Plan of Management 1999 as well as SEPP 4. Future development would also need to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). • No Commonwealth or NSW threatened ecological communities are likely to occur within the project area and given that the site is mainly cleared and has low vegetation values, it is unlikely to support a diversity of threatened fauna and flora species. <p>Given that there is no high value conservation classified land affecting the subject land, it is considered appropriate to zone the entire site for residential purposes and not apply an environmental conservation zone on any part of the land. This is consistent with the Council's current approach of not applying environmental conservation zones over secondary and tertiary koala habitat, the LEP Practice Note PN09-002 (Environment Protection Zones) issued by NSW Department</p>	Consistent

Ministerial Direction	Comments	Consistency with direction
	of Planning, Industry and Environment and the Northern Councils E Zone Review Final Recommendations Report.	
2.2 Coastal Management	<p><i>The objective of this direction is to protect and manage coastal areas of NSW.</i></p> <p>The south eastern corner of the subject land is affected by the <i>Coastal Environment Area</i> which is one of four coastal management areas as defined under the <i>SEPP (Coastal Management) 2018</i>. The <i>Coastal Environment Area</i> identifies the environmental features of the coastal zone, such as state waters, estuaries, coastal lakes and coastal lagoons.</p> <p>Overall, the Planning Proposal is consistent with the aims and objectives of the <i>Coastal Management Act 2016</i>. It will not affect public access to the beaches and coastal foreshore areas or generate the need to provide new access; it will not result in adverse impacts upon the environmental assets of the coast; and will not increase future coastal risks to the Woolgoolga Lake Catchment. The Planning Proposal will not alter the relevance or effect the <i>Coastal Design Guidelines 2003</i>.</p> <p>At the development application stage, mitigative measures will be incorporated into the stormwater drainage design to ensure all runoff will have a nil or beneficial impact downstream. There is sufficient area within the subject land to accommodate this outcome.</p>	Consistent
2.3 Heritage Conservation	<p><i>The objective of this direction is to conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.</i></p> <p>The applicant's consultants stated that they undertook a consultation process with the Aboriginal community in accordance with the (former) <i>OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010) (ACHCRP)</i> and prepared an <i>Aboriginal Cultural Heritage Assessment Report (Appendix E)</i>.</p> <p>The results of the <i>Archaeological Assessment</i> are summarised as follows:</p> <ul style="list-style-type: none"> • <i>Two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) were observed on the access trail immediately south of the Bark Hut Road entrance to the Project Area. These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an</i> 	Consistent

Ministerial Direction	Comments	Consistency with direction
	<p>area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed. In any case, this Planning Proposal does not affect the locations of these two artefacts as they are not located on the subject land.</p> <ul style="list-style-type: none"> • Having consideration for the landscape context of the Project Area and the history of disturbance it is considered unlikely that the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the site, none are known within the Project Area. No Mythological or ceremonial sites are known to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland. <p>An onsite AHIP consultation meeting was held on 18th January 2018 with the applicant's cultural heritage consultant and members of the local Aboriginal community and the Coffs Harbour and District Local Aboriginal Land Council. According to the report (Appendix E), those present agreed that the rezoning would be acceptable.</p> <p>It is also considered appropriate that a Gateway Determination should require further consultation with local Aboriginal stakeholders and the NSW Department of Premier and Cabinet.</p>	
2.4 Recreation Vehicle Areas	<p><i>The objective of this direction is to protect sensitive land or land with significant conservation values from adverse impacts from recreation vehicles.</i></p> <p>This planning proposal does not enable land to be developed for the purpose of a recreation vehicle area.</p>	Consistent
3. Housing, Infrastructure and Urban Development		
3.1 Residential Zones	<p><i>The objectives of this direction are:</i></p> <ul style="list-style-type: none"> <i>(a) to encourage a variety and choice of housing types to provide for existing and future housing needs,</i> <i>(b) to make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and</i> 	Consistent

Ministerial Direction	Comments	Consistency with direction
	<p>(c) to minimise the impact of residential development on the environment and resource lands.</p> <p>The Planning Proposal provides for an additional 16.4 hectares of R2 Zone Low Density Residential land under <i>Coffs Harbour LEP 2013</i>. The provision of additional Low Density Residential land will broaden lifestyle choices in a suitable location.</p> <p>The proposed minimum lot size is 400m² thereby ensuring an opportunity to provide more choices for a wide range of housing types and socio-economic demographics. This Planning Proposal will increase the supply of residential land within a greenfield area. The proposal relates to land that adjoins an existing large lot residential area and land zoned for public recreational purposes. As a result, the planning proposal provides the potential benefits associated with the efficient use of existing infrastructure and the co-location of sporting fields within a low density residential neighbourhood.</p> <p>The residential land is located such that the full range of existing urban services can be extended and augmented to service the area. A preliminary Engineering Appraisal prepared by deGroot and Benson, Consulting Engineers (Appendix G) indicates that a low density residential subdivision of the land can be adequately serviced.</p> <p>The proposal will increase the supply of residential land adjoining other residential land, as well as land earmarked for public recreation.</p> <p>The conceptual subdivision master plan (Appendix A) illustrates how a low density residential subdivision could be located within the site when considering the site's constraints and opportunities.</p> <p>Appropriate planning controls are also contained within <i>Coffs Harbour DCP 2015</i> to ensure that development within R2 Low Density Residential zoned land is of good design.</p>	
3.2 Caravan Parks and Manufactured Home Estates	<p><i>The objectives of this direction are:</i></p> <p>(a) to provide for a variety of housing types, and</p> <p>(b) to provide opportunities for caravan parks and manufactured home estates.</p> <p>This Planning Proposal is consistent with this direction. Caravan parks are permitted with consent in the R2 Low Density Residential zone under <i>Coffs Harbour LEP 2013</i>. There are no existing caravan parks located on the subject lands.</p>	Consistent

Ministerial Direction	Comments	Consistency with direction
3.3 Home Occupations	<p><i>The objective of this direction is to encourage the carrying out of low-impact small businesses in dwelling houses.</i></p> <p>Home occupations are permitted without consent in both the R2 and E3 zone under <i>Coffs Harbour LEP 2013</i>. This Planning Proposal does not seek to alter those LEP provisions.</p>	Consistent
3.4 Integrating Land Use and Transport	<p><i>The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives:</i></p> <ul style="list-style-type: none"> <i>(a) improving access to housing, jobs and services by walking, cycling and public transport, and</i> <i>(b) increasing the choice of available transport and reducing dependence on cars, and</i> <i>(c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and</i> <i>(d) supporting the efficient and viable operation of public transport services, and</i> <i>(e) providing for the efficient movement of freight.</i> <p>This Planning Proposal is consistent with the objectives of this direction. The introduction of a key sites clause will provide an opportunity for Council to strategically examine the area and prepare appropriate DCP provisions to provide for an efficient transport network in the area. Increasing residential development within an area served by an existing public road network will support the local school bus service and may lead to additional transport services in the area. Passive forms of transport will be improved through the provision of links and pathways to recreational areas, the Woolgoolga High School and the future West Woolgoolga Sports Complex situated immediately to the south of the subject land.</p>	Consistent
3.5 Development Near Regulated Airports and Defence Airfields	<p><i>The objectives of this direction are:</i></p> <ul style="list-style-type: none"> <i>(a) to ensure the effective and safe operation of regulated airports and defence airfields;</i> <i>(b) to ensure that their operation is not compromised by development that constitutes an obstruction, hazard or potential hazard to aircraft flying in the vicinity; and</i> 	Consistent

Ministerial Direction	Comments	Consistency with direction
	<p><i>(c) to ensure development, if situated on noise sensitive land, incorporates appropriate mitigation measures so that the development is not adversely affected by aircraft noise.</i></p> <p>This planning proposal does not affect land within the vicinity of a regulated airport or defence airfield.</p>	
3.6 Shooting Ranges	<p><i>The objectives are:</i></p> <p><i>(a) to maintain appropriate levels of public safety and amenity when rezoning land adjacent to an existing shooting range,</i></p> <p><i>(b) to reduce land use conflict arising between existing shooting ranges and rezoning of adjacent land,</i></p> <p><i>(c) to identify issues that must be addressed when giving consideration to rezoning land adjacent to an existing shooting range.</i></p> <p>This planning proposal does not affect, create, alter or remove a zone or a provision relating to land adjacent to and/ or adjoining an existing shooting range.</p>	Consistent
4. Hazard and Risk		
4.1 Acid Sulfate Soils	<p><i>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.</i></p> <p>The Acid Sulfate Soil (ASS) Planning Maps indicate that the bulk of the subject land is classified as Class 5 Acid Sulfate Soils with a small portion in the south eastern corner being classified as Class 4.</p> <p>Future building envelopes are not expected to disturb potential Class 4 or 5 ASS. However, at the development application stage, any potential excavations, including earthworks associated with civil works would need to satisfy the ASS provisions of Coffs Harbour LEP 2013 (cl 7.1).</p> <p>For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be “of minor significance”.</p> <p>An approval for a variation to this s117 Direction is considered to be reasonable under the circumstances.</p>	Justifiably inconsistent for reasons listed.
4.3 Flood Prone Land	<p><i>The objectives of this direction are:</i></p> <p><i>(a) to ensure that development of flood prone land is consistent with the NSW Government’s Flood Prone Land</i></p>	Justifiably inconsistent for reasons listed.

Ministerial Direction	Comments	Consistency with direction
	<p><i>Policy and the principles of the Floodplain Development Manual 2005, and</i></p> <p><i>(b) to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.</i></p> <p>All lands proposed to be zoned R2 Low Density Residential are not located within the mapped 1:100 year ARI flood extent. A small portion of land identified as being within the flood planning level is located on the south-eastern boundary of the site that may have minor impacts from the 1 in 500 Year ARI and PMF events only. However, given that no residential development is proposed in this location as indicated within the concept subdivision masterplan (Appendix B), there would be no adverse impact by any inundation. Any future residential development would have conditions attached to control the developed volumetric stormwater discharge flow and water quality with regard to that from the undeveloped properties.</p> <p>Further, the planning proposal:</p> <ul style="list-style-type: none"> • will not permit development in floodway areas • will not change the zone of any flood affected land • will not generate additional spending on flood mitigation measures, infrastructure or services; and • is not proposing to include additional development without consent. <p>In light of the above, an approval for a variation to this direction is considered to be reasonable under the circumstances.</p>	
4.4 Planning for Bushfire Protection	<p><i>The objectives of this direction are:</i></p> <p><i>(a) 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</i></p> <p><i>(b) to encourage sound management of bush fire prone areas.</i></p> <p>Preliminary consultation was undertaken with the local office of the NSW Rural Fire Service to discuss the conceptual subdivision masterplan and it's compliance with the current and proposed bushfire legislation ie <i>Planning for Bushfire Protection (PfBP) 2006</i> and draft <i>PfBP 2018</i>.</p> <p>Further consultation with the NSW Rural Fire Service will be necessary pending the issuing of a Gateway Determination.</p>	Referral to NSW Rural Fire Service is required prior to confirmation of consistency with this particular Direction.

Ministerial Direction	Comments	Consistency with direction
	<p>Upon the potential making of the subject Planning Proposal, all future development applications for subdivision will need to comply with the 'specifications and requirements' of draft <i>Planning for Bush Fire Protection 2018</i> and associated documents.</p> <p>Future development applications for subdivision and/or special fire protection purposes involving bushfire prone land in the Planning Proposal area will be referred to the Rural Fire Service as required under s100B of the <i>Rural Fires Act 1997</i>. The existing LEP provisions allow bushfire hazard reduction work authorised by the <i>Rural Fires Act 1997</i> to be carried out on any land without development consent.</p> <p>A <i>Bushfire Risk Assessment</i> (refer to Appendix C) is included with the Planning Proposal to assess the suitability of the site with the intended low density residential development. The report recommends the provision of appropriate APZs around the perimeter of the site to provide protection in the event of a bushfire attack from adjoining lands.</p>	
5. Regional Planning		
5.1 Implementation of Regional Strategies	<p><i>The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional strategies.</i></p> <p>No Regional Strategy applies to the Coffs Harbour Local Government Area.</p>	Consistent
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	<p><i>The objectives for managing commercial and retail development along the Pacific Highway are:</i></p> <ul style="list-style-type: none"> <i>(a) to protect the Pacific Highway's function, that is to operate as the North Coast's primary inter- and intra-regional road traffic route;</i> <i>(b) to prevent inappropriate development fronting the highway;</i> <i>(c) to protect public expenditure invested in the Pacific Highway;</i> <i>(d) to protect and improve highway safety and highway efficiency;</i> <i>(e) to provide for the food, vehicle service and rest needs of travelers on the highway; and</i> <i>(f) to reinforce the role of retail and commercial development in town centres, where they can best serve the populations of the towns.</i> <p>This proposal will not affect commercial and retail land along the Pacific Highway, North Coast.</p>	Consistent

Ministerial Direction	Comments	Consistency with direction
5.10 Implementation of Regional Plans	<p><i>The objective of this direction is to give legal effect to the vision, land use strategy, goals, directions and actions contained in Regional Plans.</i></p> <p>The North Coast Regional Plan 2036 (NCRP) applies to the Coffs Harbour LGA. The NCRP includes actions on environmental, economic and social (community) opportunities, as well as maintaining character and housing.</p> <p>Specific responses to relevant strategic directions and the accompanying actions contained within the NCRP are provided in Part 3, Section A (3) and Section B (4) above. It is considered that the Planning Proposal will result in development that supports the intent of the above actions and is therefore considered to be consistent with the NCRP.</p>	Consistent
6. Local Plan Making		
6.1 Approval and Referral Requirements	<p><i>The objective of this direction is to ensure that LEP provisions encourage the efficient and appropriate assessment of development.</i></p> <p>The Planning Proposal does not include provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority.</p> <p>It does not identify development as designated development.</p>	Consistent
6.2 Reserving Land for Public Purposes	<p><i>The objectives of this direction are:</i></p> <p><i>(a) to facilitate the provision of public services and facilities by reserving land for public purposes, and</i></p> <p><i>(b) to facilitate the removal of reservations of land for public purposes where the land is no longer required for acquisition.</i></p> <p>The Planning Proposal does not create, alter or reduce land reserved for a public purpose.</p>	Consistent
6.3 Site Specific Provisions	<p><i>The objective of this direction is to discourage unnecessarily restrictive site specific planning controls.</i></p> <p>The Planning Proposal includes a key site clause and associated map, Land Zone Map and Lot Size Map to amend Coffs Harbour LEP 2013. Given that the Planning Proposal intends to rezone the subject land to an existing zone that already applies in an existing environmental planning instrument without imposing any development standards or requirements in addition to those already contained in the zone, the Planning Proposal is considered to be consistent with this Direction.</p>	Consistent

Section C – Environmental, social and economic impact

8. 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?

A Biodiversity Impact Assessment (refer to Appendix F) has assessed the subject land as being largely dominated by highly disturbed and cleared lands that do not present any ecological conservation value. Although, the site does contain small areas of low and moderate conservation value. In summary, the Biodiversity Impact Assessment found that:

- No threatened species or ecological communities were observed within the subject land and it does not form part of any mapped regional corridors or key habitat linkages.
- 1.37 ha of Tertiary Koala Habitat and 0.1 ha of Secondary Koala Habitat are mapped within the site. These areas are considered to have moderate conservation value and any future development within these areas must address the provisions of the Coffs Harbour City Council Koala Plan of Management and SEPP44.
- The 1st Order streams within the lot have no defined bed or bank visible in the field and do not constitute a waterway based on the definitions in Guidelines for riparian corridors on waterfront land. These areas have no conservation value.
- The 2nd Order Stream located on the south-eastern portion of the Subject land does not constitute high conservation value and it does not exhibit the features of a defined channel with bed and banks. This area has limited biodiversity habitat value and does not form part of any vegetated riparian corridor.
- The small inundated ‘wetland’ area mapped within the south-eastern corner of the site is likely to be the result of water pooling following the installation of a concrete culvert offsite. Although highly disturbed and not naturally occurring, the area of inundation provides habitat opportunities for amphibians. Opportunities may exist to increase the quality of the on-site aquatic and riparian habitats through detailed design and management of surface runoff and water quality parameters, including the use of appropriately designed storm water retention and treatment options to be located within this area as indicated on the concept plan. Council’s Water Sensitive Urban Design Guideline will be relevant to any subsequent Development Application lodged over the site.
- Future development will also be required to incorporate kangaroo management measures in accordance with Council’s Kangaroo Management Plan for the Coffs Harbour Northern Beaches.

Based on the results of the field investigation and identification of low to moderate conservation values across the site, there are no significant biodiversity constraints to the proposed rezoning of the site and it is considered that future residential development on the site can be appropriately designed.

Based on a review of the Section 9.1 Ministerial Directions (2.1 Environment Protection Zones); Northern Councils E Zone Review Final Recommendations Report; and LEP Practice Note PN09-002 (Environment Protection Zones) there is no reason to apply Environmental Conservation Zones across any areas of the site as part of this planning proposal.

9. Are there any other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?

The following is a summary of other likely environmental constraints associated with the Planning Proposal:

Flood Prone Land

All lands proposed to be zoned R2 Low Density Residential areas are located outside the mapped 1:100 year ARI flood extent. A small portion of land identified as being within the flood planning level is located on the south eastern boundary of the site (see Figure 9). However, given that no residential development is likely in this location, there would be no likely adverse impact by any inundation.

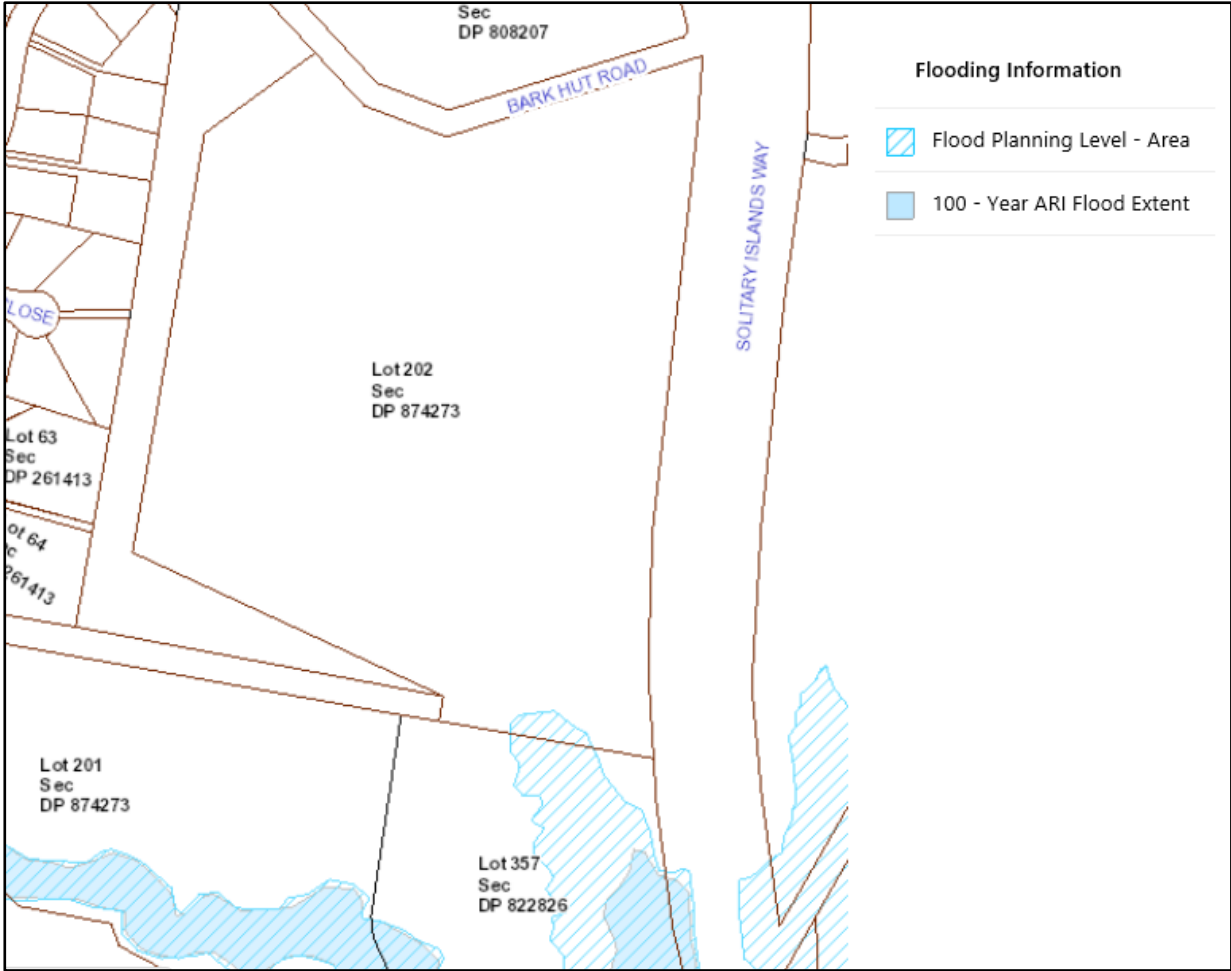


Figure 9: Flood Prone Land

Bushfire Risk

A Bushfire Risk Assessment (refer to Appendix C) has been prepared to assess the suitability of the site for low density residential development. The report recommends the provision of appropriate APZs around the perimeter of the site to provide protection in the event of a bushfire attack from adjoining lands. NSW Rural Fire Service are yet to provide comment on this Planning Proposal.

Site Contamination

A review of previous land uses of the site indicates that contamination of the site is unlikely. The land is not mapped as former banana cultivation land and past known land uses comprise low intensity stock grazing. Searches of the land contamination register, record of notices and contaminated sites notified to Environmental Protection Authority have not identified the subject land. Contamination risks are considered minimal and manageable with recognised remediation procedures available.

A preliminary site contamination investigation is included with this Planning Proposal (see Appendix I) which found that there were no exceedances of adopted assessment criteria and the report considered that there is a low potential for soil contamination to be present within the subject land.

Acid Sulfate Soils

Council's mapping system indicates that most of the subject land is Class 5 Acid Sulfate Soils. This is the lowest risk classification and therefore it is highly unlikely that development of the property into residential lots will disturb acid sulfate soils.

A very small portion of the south western corner of the subject land falls within Class 4 Acid Sulfate Soils. This area is suitable for stormwater management for any proposed residential development. The Acid Sulfate Soil Manual states that within a Class 4 area, Acid Sulfate Soils must be considered where:

- Works extend beyond 2m below the natural ground surface.
- Works may lower the water table beyond 2m below the natural ground surface

The construction of stormwater treatment measures is unlikely to disturb soils or the groundwater table to such a depth and therefore, the impacts are considered to be minimal.

Indigenous Heritage

Two artefacts were observed on the access trail immediately south of the Bark Hut Road entrance to the wider allotment (Lot 202 DP 874273). These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. There is very little topsoil material in the upper slope and the artefacts were identified on the compacted surface of the trail. These artefacts are located within land proposed to be rezoned E3 Environmental Management and are unlikely to be disturbed. However, this Planning Proposal does not affect the locations of these two artefacts as they are not located on the subject land.

The consultant report (refer to Appendix E) considers that it is unlikely that the balance of the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the Project Area none, none are known with the Project Area. No Mythological or ceremonial sites are known to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland.

The consultant report recommends that cultural heritage induction and the application of an Aboriginal Find Procedure is the appropriate level of management for work in the vicinity of the two isolated finds in the northern precinct.

Given the above, it is also considered appropriate that a Gateway Determination should require consultation with local Aboriginal stakeholders and the NSW Department of Premier and Cabinet.

European Heritage

The subject land does not contain any items listed as Heritage Items in Schedule 5 of Coffs Harbour Local Environmental Plan 2013 or on the State Heritage Register. There are no European Heritage issues that would prevent the rezoning of this site.

Visual Amenity

There are a mix of visual characteristics present within the subject land ranging from small pockets of retained vegetation to cleared paddocks. The subject land has significant capability to absorb visual change and provide an interface between existing land use types and proposed development. The subject land adjoins an existing large lot residential development to the west, the proposed West Woolgoolga Sports Complex to the south, rural land use activities to the north and the coastal village of Safety Beach to the north west.

10. How has the Planning Proposal adequately addressed any social and economic effects?

Social and economic effects arising from the Planning Proposal will be positive in terms of the provision of land for new housing close to recreation land, the Woolgoolga State High School and urban facilities in Woolgoolga.

Social Considerations

The subject land is a 'greenfield' development site of a similar character to other growth areas within the Coffs Harbour LGA. The social implications of rezoning the subject land to provide for residential development are envisaged to be positive. The interface between the site and surrounding existing residential development is suitably buffered by RE1 Public Recreation zoned land. Passive connections between the subject land and the RE1 zoned land will occur over time as the nearby sporting fields and pedestrian/cycleway connections are built. The likely population of the subject land once developed (180 lots x 2.3 people) is estimated to be 414 persons. There are adequate services available in the Woolgoolga area to cater for a gradual growth of population.

Eventual housing resulting from the rezoning is likely to have a positive impact on the Woolgoolga community in terms of the provision of affordable housing, strengthening of existing community, commercial and retail services. Similarly, the development of the Northern Beaches Multi-Purpose Centre and West Woolgoolga Sports Complex that are located in between the two planning proposal areas will complement the growth of the Woolgoolga North West urban investigation area and provide important community facilities.

Economic Issues

A detailed Residential Land Demand Analysis was prepared to inform this Planning Proposal. The full report is included as Appendix B and the findings are summarised below:

- *There are numerous factors driving the demand for new residential development and the demand for detached housing lots within the Woolgoolga area including:*
 - *Low interest rates and the availability of finance,*
 - *Improved employment prospects and labour markets within the Coffs Harbour region,*
 - *Affordable housing options relative to other major markets along Australia's east coast; and*
 - *A fundamentally solid rental market which is attractive for residential property investment.*
- *Residents of the Study Area (an area from Red Rock to Emerald each and west to Upper Corindi) community have a propensity of demand for affordable detached housing for families, but also a choice in residential product catering to retirees, older persons and other more compact households.*
- *Based on population growth alone, the Woolgoolga Study Area is projected to require an additional 2,600 dwellings between 2017 and 2036 or more than 130 new dwellings per annum over this period. A significant share of this dwelling demand will continue to be directed to detached dwellings and therefore demand for residential lots.*
- *The residential market in Coffs Harbour and the Study Area is demonstrating a supply-led market including signs of decreasing affordability and more limited choice in available residential product. It is important to ensure the timely delivery of residential land to maintain confidence in the residential market and in the ongoing delivery of affordable residential lifestyles for the Coffs Harbour*

community. A 7 to 8 year lead time is critical in ensuring sufficient residential land supply is available in maintaining affordability and confidence in the local residential market.

- Underlying demand drivers are indicative of increasing population growth and demand for residential lifestyles in Coffs Harbour and the Study Area, bringing forward population projections and dwelling demand within the Study Area.
- It is estimated that there is only three years of supply available to the market within the Study Area, including land that is currently not being developed and subject to landowner intentions and commercial viabilities, indicative of a pressing need for release of land to maintain affordability and confidence in the market.

The Residential Land Demand Analysis suggests that rezoning of the subject land for residential purposes will assist in meeting current demand for additional low density residential land stock in the Woolgoolga locality.

Section D – State and Commonwealth interests

11. Is there adequate public infrastructure for the Planning Proposal?

Yes. Adjacent residential development is serviced by reticulated water supply and sewerage. Following the preparation of a masterplan for the area and resolution of service provision responsibilities, reticulated services can be extended to service future development. Electricity and telecommunications infrastructure are available in the locality and capacity is considered adequate for future development. This Planning Proposal will not in itself generate the need for public infrastructure beyond that which already exists.

The *Traffic Impact Assessment* (refer to Appendix H) shows that the subject land is strategically located to provide adequate transport connections with respect to Council's Guidelines and Australian Standards and will not result in any significant adverse traffic impacts that would preclude its further development. A new intersection located on or near the common property boundary of the subject land and the West Woolgoolga Sports Complex may provide the opportunity to incorporate pedestrian refuge facilities on Solitary Islands Way to service both the sporting complex and the proposed residential development.

Council intends to undertake a broader traffic assessment and traffic modelling exercise as part of the master planning of the Woolgoolga North West urban investigation area to provide an optimal arrangement for traffic movement in the area. A broader traffic assessment will consider:

- the developing West Woolgoolga area to the south of the subject land;
- the desire for east-to-west pedestrian / bicycle connectivity across Solitary Islands Way (SIW) to connect Woolgoolga High School and the existing cycleway (on the east side of SIW) to the proposed West Woolgoolga Playing fields and the future Woolgoolga North West growth area on the west side
- the need for multiple intersection upgrades and new intersections along SIW in association with current growth and future growth areas and the need to access the proposed West Woolgoolga Playing fields.

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

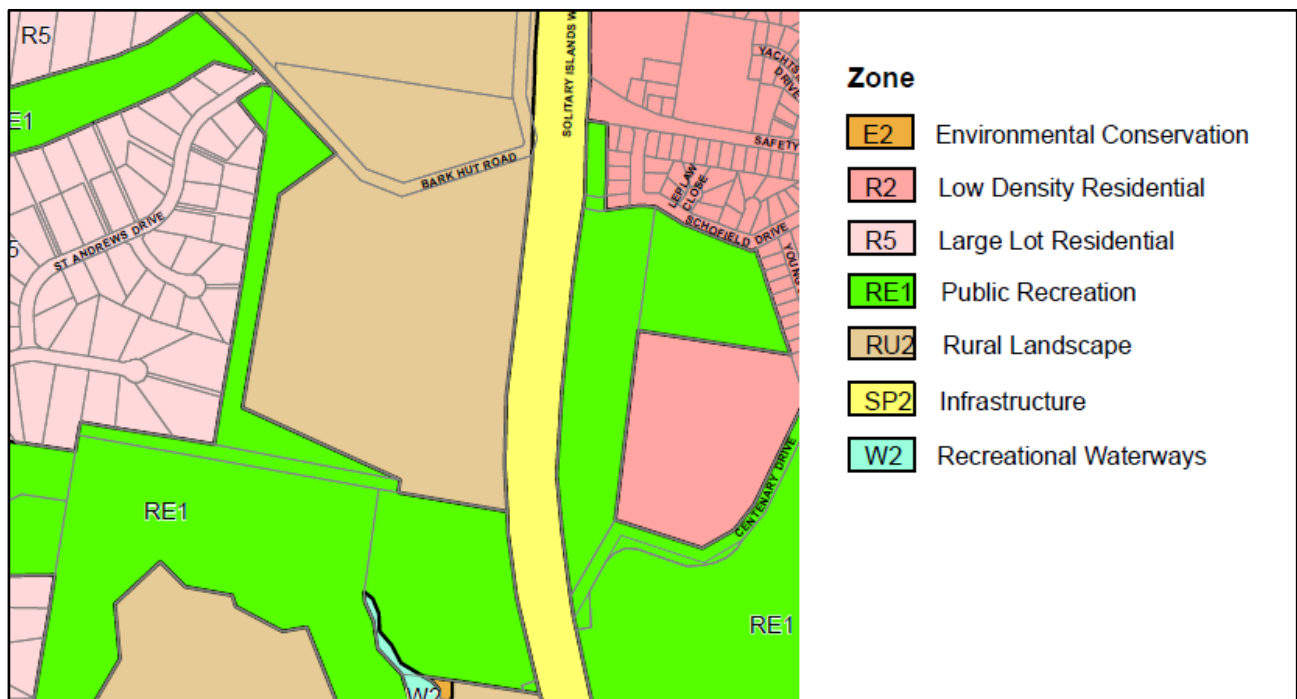
The views of public authorities will be determined following consultation with any State and Commonwealth agencies that are identified in a Gateway Determination issued by NSW Department of Planning, Industry and Environment.

PART 4 – MAPPING

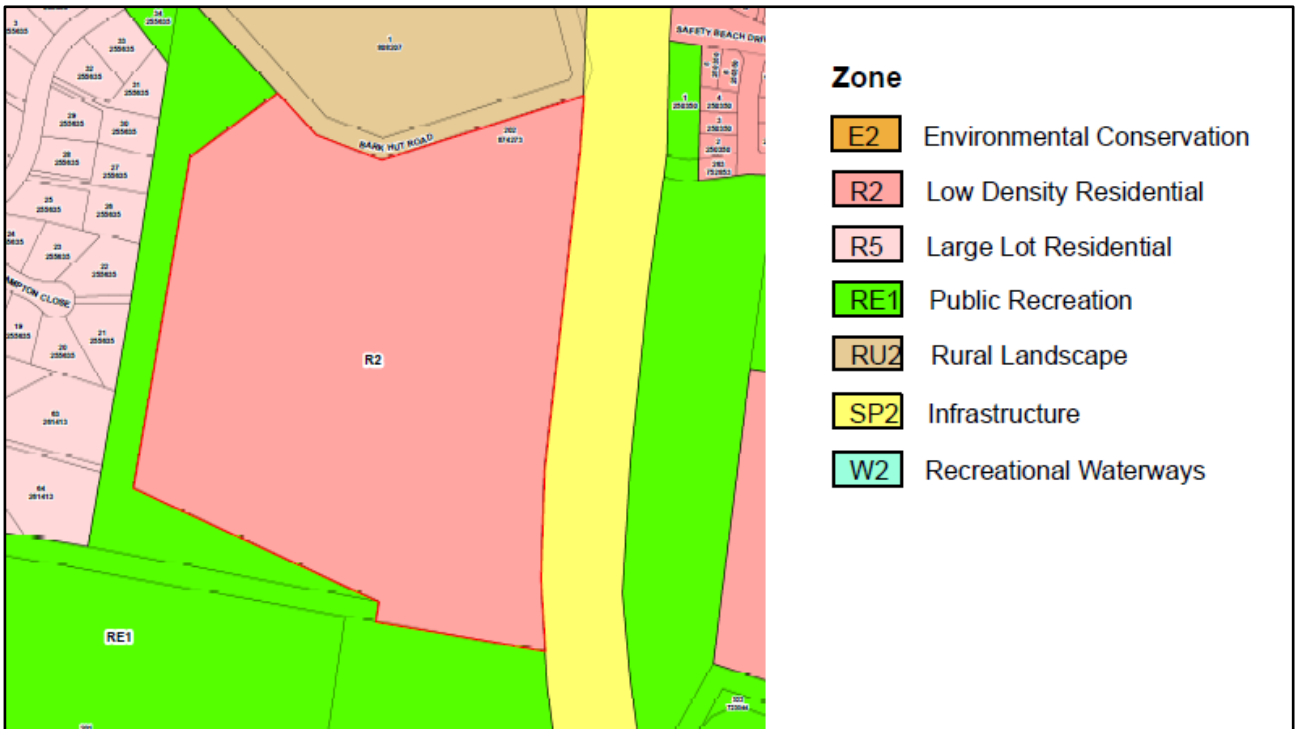
The following amendments are proposed to Coffs Harbour LEP 2013 maps:

- Amend the Coffs Harbour Land Zoning Map (Sheet LZN_005F) over Part Lot 202 DP 874273, Newmans Road, Woolgoolga to change land currently zoned RU2 Rural Landscape to Zone R2 Low Density Residential.
- Amend the Coffs Harbour Minimum Lot Size Map (Sheet LSZ_005F) over Part Lot 202 DP 874273, Newmans Road, Woolgoolga to change land currently subject to minimum lot size provision AB – 40ha to F – 400 sqm.
- Introduce a new Coffs Harbour Key Sites Map (KYS_005F).

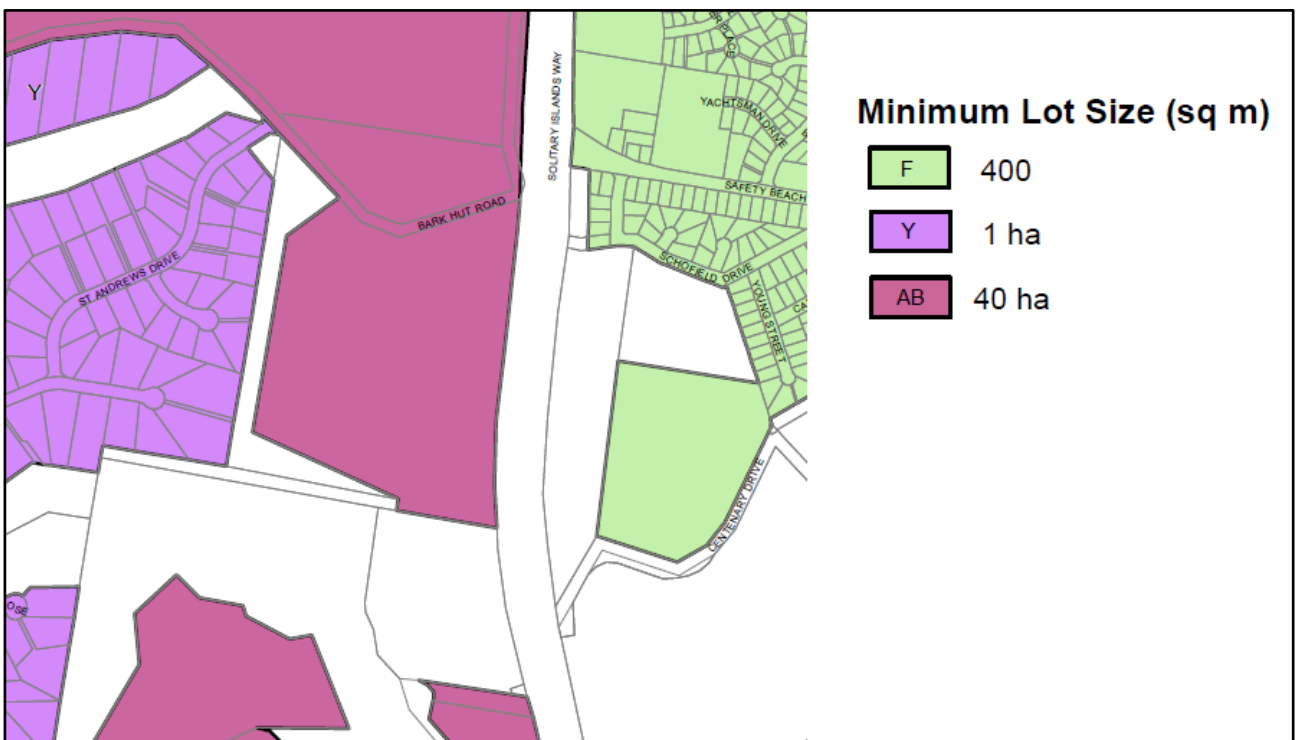
Existing mapping and proposed LEP mapping amendments are shown below:



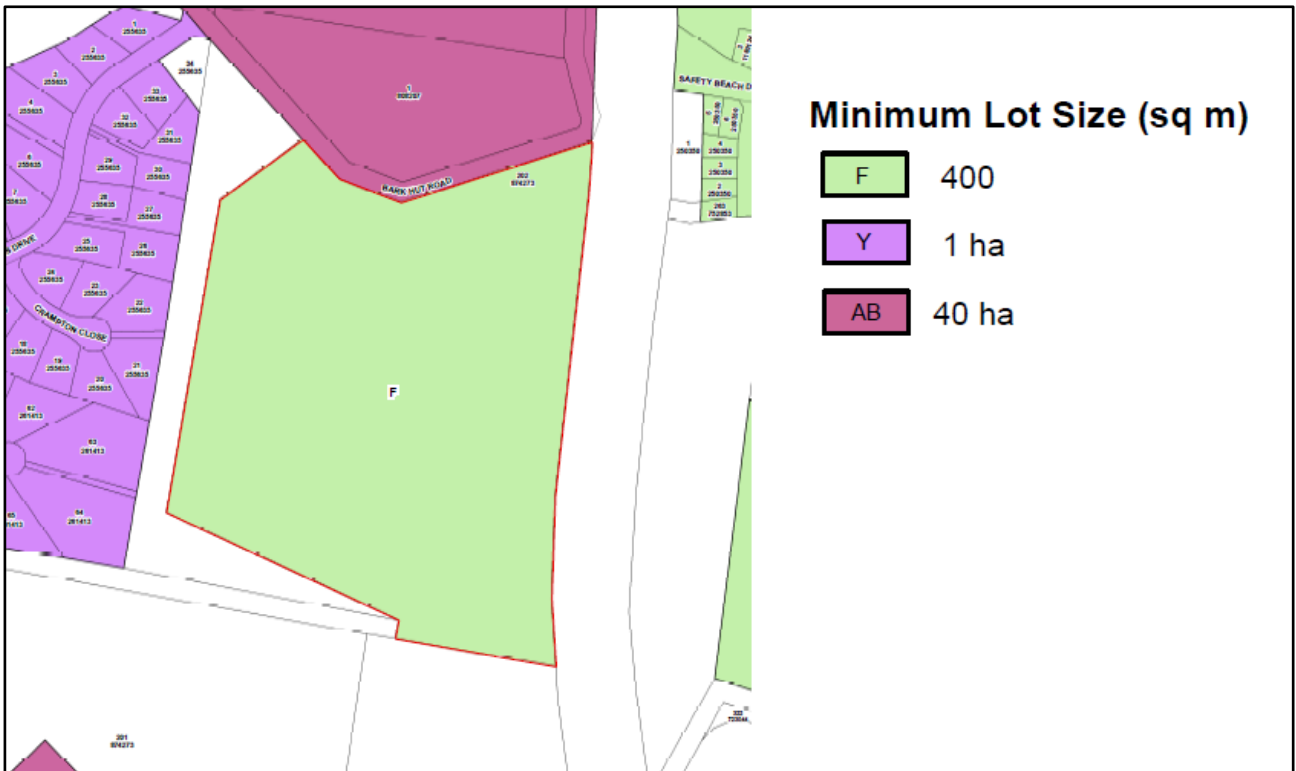
Existing LEP 2013 Zones



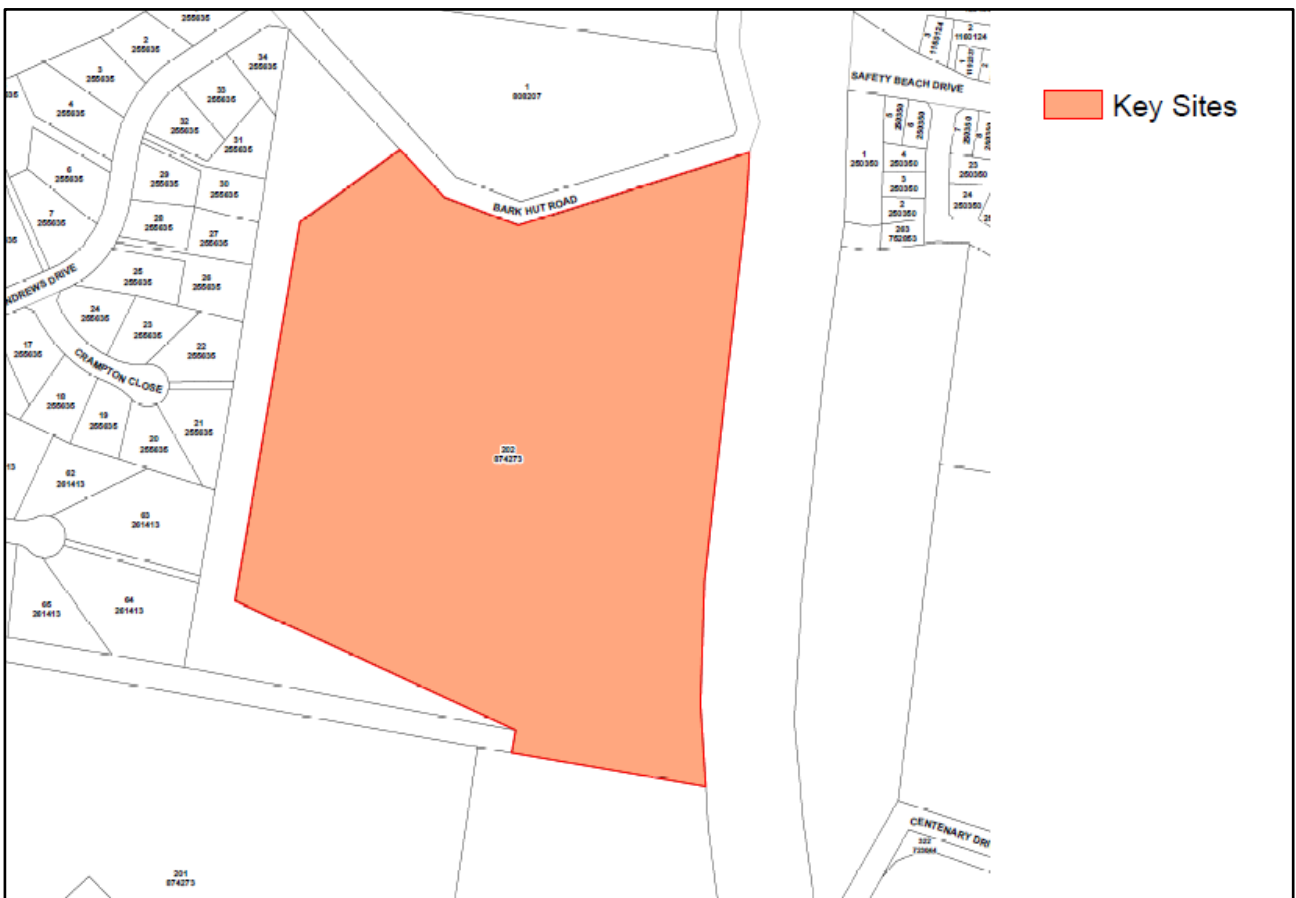
Proposed LEP 2013 Zones



Existing LEP 2013 Minimum Lot Sizes



Proposed LEP 2013 Minimum Lot Sizes



Proposed Key Sites Map

PART 5 – COMMUNITY CONSULTATION

Should the NSW Department of Planning, Industry and Environment endorse exhibition of this Planning Proposal and issue a Gateway Determination, the community, government agencies and other stakeholders will have an opportunity to make submissions to this Planning Proposal.

If endorsed to do so, the Planning Proposal will be exhibited in accordance with the Gateway Determination and relevant provisions of Section 3.34(2) of the *Environmental Planning and Assessment (EP&A) Act 1979*.

PART 6 – INDICATIVE TIMETABLE

The indicative timeframe for this Planning Proposal is outlined in table 3 below.

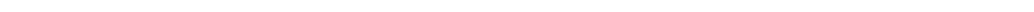
Table 3: Indicative timetable

Task	Estimated timeframe
Resolution by CHCC to proceed	September 2019
Gateway determination	October 2019
Finalisation of additional information as requested by Council and Gateway determination	October 2019
Public exhibition of Planning Proposal for not less than 28 days	November - December 2019
Agency consultation	November - December 2019
Review submissions	December 2019 - January 2020
Report to Council	February 2020
Submission to Planning Minister	March 2020
Finalisation	April - May 2020

APPENDICES

- APPENDIX A** – Conceptual Subdivision Master Plan
- APPENDIX B** – Residential Land Demand Analysis
- APPENDIX C** – Bushfire Risk Assessment
- APPENDIX D** – Land Use Conflict Risk Assessment
- APPENDIX E** - Aboriginal Cultural Heritage Assessment Report
- APPENDIX F** – Biodiversity Impact Assessment
- APPENDIX G** – Engineering Appraisal
- APPENDIX H** – Traffic Impact Assessment
- APPENDIX I** – Preliminary Land Contamination Assessment

Appendix A ~ Conceptual Masterplan



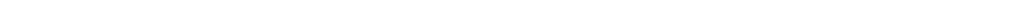


LOT LAYOUT DETAILS

AVERAGE LOT SIZE	550m ²
AVERAGE LOT DEPTH	30m
WIDTH OF INTERNAL COLLECTOR ROAD RESERVE	20m
WIDTH OF SECONDARY ROAD RESERVES	15m

NOTE
 THIS MASTER PLAN HAS BEEN PRODUCED IN ACCORDANCE WITH CURRENT PREVAILING MARKET CONDITIONS. THE LANDOWNER RESERVES THE RIGHT TO AMEND THE LOT LAYOUT IN ACCORDANCE WITH MARKET CONDITIONS AT THE TIME OF LODGING ANY FUTURE DEVELOPMENT APPLICATION.

Appendix B~ Residential Land Demand Analysis





Subject site looking south from Bark Hut Rd

Residential Land Demand Analysis: Bark Hut Road, Woolgoolga



Urban Economics
Level 10, 87 Wickham Tce
Spring Hill QLD 4000
(ph) 07 3839 1400
mail@urbaneconomics.com.au

Prepared on behalf of:

Vadejil Pty Ltd

Prepared by:

Kerrienne Meulman
Managing Director

Joshua Binkley
Consultant

January 2018 Update

16069

Warranty

This report has been based upon the most up to date readily available information at this point in time, as documented in this report. Urban Economics has applied due professional care and diligence in accordance with generally accepted standards of professional practice in undertaking the analysis contained in this report from these information sources. Urban Economics shall not be liable for damages arising from any errors or omissions which may be contained within these information sources.

As this report involves future market projections which can be affected by a number of unforeseen variables, they represent our best possible estimates at this point in time and no warranty is given that this particular set of projections will in fact eventuate.

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EXECUTIVE SUMMARY

- A masterplan has been prepared for the establishment of a 293-lot residential development on Bark Hut Road, Woolgoolga. The location has been investigated for residential development since the mid-1990's and it is now considered suitable to progress development at the site. Lots are estimated to be on average 600m², and to potentially include a range of lot sizes accommodating choice in dwelling types and promoting affordability.
- There are numerous factors driving the demand for new residential development and the demand for detached housing lots within the Woolgoolga area including:
 - Low interest rates and the availability of finance,
 - Improved employment prospects and labour markets within the Coffs Harbour region,
 - Affordable housing options relative to other major markets along Australia's east coast; and
 - A fundamentally solid rental market which is attractive for residential property investment.
- Residents of the Study Area community have a propensity of demand for affordable detached housing for families, but also a choice in residential product catering to retirees, older persons and other more compact households.
- Based on population growth alone, the Woolgoolga Study Area is projected to require an additional 2,600 dwellings between 2017 and 2036 or more than 130 new dwellings per annum over this period. A significant share of this dwelling demand will continue to be directed to detached dwellings and therefore demand for residential lots.
- The residential market in Coffs Harbour and the Study Area is demonstrating a supply-led market including signs of decreasing affordability and more limited choice in available residential product. It is important to ensure the timely delivery of residential land to maintain confidence in the residential market and in the ongoing delivery of affordable residential lifestyles for the Coffs Harbour community. A 7 to 8 year lead time is critical in ensuring sufficient residential land supply is available in maintaining affordability and confidence in the local residential market.
- Underlying demand drivers are indicative of increasing population growth and demand for residential lifestyles in Coffs Harbour and the Study Area, bringing forward population projections and dwelling demand within the Study Area.
- It is estimated that there is only 3years of supply available to the market within the Study Area, including land that is currently not being developed and subject to owner intents and commercial viabilities, indicative of a pressing need for release of land to maintain affordability and confidence in the market.

1.0 INTRODUCTION

1.1 BACKGROUND

A masterplan has been prepared for the establishment of a 293-lot residential development on Bark Hut Road, Woolgoolga. The location has been investigated for residential development since the mid-1990's and it is now considered suitable to progress development at the site.

Coffs Harbour City Council's Our Living City Settlement Strategy has identified the two land parcels within the possible Future Urban Investigation area, and has stated that it requires "an extremely compelling case to justify Council amending the priority" of the demand for residential land within the Woolgoolga area.

This Residential Land Demand Analysis has been undertaken by Urban Economics on behalf of Vadejil Pty Ltd, to comprehensively address the concerns and issues raised by Council regarding this development examining demand for residential land relative to existing and intended supply.

Urban Economics is a specialist economic and market research consultancy, with considerable experience in examining need and demand for the residential sector including masterplanned residential communities, worker's villages, rural residential and rural living developments, apartments, retirement and aged care, student accommodation and affordable housing.

1.2 STUDY OBJECTIVES AND METHODOLOGY

The key objective of this Analysis is to examine the need and demand for residential land in Woolgoolga and the relative position of the subject development within this supply and demand framework. A secondary objective will consider the proposed timing of the development as this relates to Council's strategy.

In meeting these objectives, Urban Economics has undertaken the following tasks:

- Inspected the subject properties and reviewed the masterplan for the proposed development;
- Identified existing estates currently selling within the Woolgoolga area, including an assessment of take-up rates, target markets and future supply;
- Reviewed historic aerial photography to critique take-up of residential land in Woolgoolga;
- Developed a Study Area for the proposed development and subject sites;
- Analysed historic population growth within Woolgoolga and the Coffs Harbour region;
- Conducted a series of interviews with local estate agents to explore key target markets for vacant land, key release areas, demand requirements of buyers and expectations etc;
- Prepared estimates of existing population and dwellings within the Woolgoolga area;

- Reviewed projections of the growth of the population of Woolgoolga;
- Analysed vacant residential land sales activity and median sales prices for vacant residential land within Woolgoolga;
- Reviewed the relevant planning and economic strategy framework for Coffs Harbour and the Woolgoolga local area;
- Critiqued other trends influencing the residential property market in Woolgoolga including infrastructure, employment, economic development and demographic trends;
- Analysed the supply-demand interplay within Woolgoolga and implications for the release of additional residential land;
- Analysed qualitative demand issues that may influence the demand for the subject development; and
- Critiqued economic and social benefits of the proposed residential estate.

2.0 THE PROPOSED DEVELOPMENT

2.1 PLANNING FRAMEWORK AND BACKGROUND

The planning framework for residential development within Coffs Harbour is guided by numerous documents and strategies. The following summarises the key planning and strategic documents relevant to the subject development in Woolgoolga and residential land supply.

Mid North Coast Regional Strategy 2009

The **Mid North Coast Regional Strategy 2009** outlines the development regulations and guidelines for the mid North Coast regional area to best accommodate the projected housing needs from 2006-31. The plan places restrictions on growth in areas where environmental and/or cultural importance is high. It also encompasses guidelines to provide sufficient employment opportunities for new jobs expected to hit the region in this time frame. The Strategy uses a population projected increase of around 91,000 with a reasonable amount deriving from Coffs Harbour, Port Macquarie, and Great Lakes/Taree. The Strategy also attempts to accommodate for the ageing population. It predicts that the area will need almost 60,000 new dwellings (Coffs Coast making up around 19,000 of these) to accommodate population growth, the ageing population, declining occupancy rates, and tourism demands. To achieve this, the Strategy suggests an increase in the proportion of multiunit dwellings by 20%.

The overarching goal of the Strategy is to *“maintain and enhance the opportunity for the communities of the Region to experience a healthy, prosperous and sustainable lifestyle.”*

Draft North Coast Regional Plan

The **Draft North Coast Regional Plan** develops a strategy for the Mid and Far North Coast for the next 20 years to provide *“a sustainable future for the region as it grows that protects the environment, builds a prosperous community and offers attractive lifestyle choices for residents.”* The primary focus is on Port Macquarie, Coffs Harbour and Tweed Heads regions. This Plan outlines guidelines for accommodating the ageing population and improving the affordability of the area. This Plan projects a population increase of just under 100,000, with 67% of growth stemming from the three regions above. 90% of the population growth is expected to be derived from people over 65 years of age.

This is a significant weighting of the Region’s population with considerable implications for housing and lifestyle delivery, as well as the mix of services and facilities available to the community.

The Regional Plan outlines 5 goals to achieve the above measures:

- 1) Protecting the natural environment and cultural heritage

- 2) Developing and maintaining an enjoyable area to work and live through growth opportunities
- 3) Meeting the housing needs of the changing population
- 4) Maintaining a well-performing economy with infrastructure and services
- 5) Updating freight patterns and transport connectivity

Coffs Harbour Local Environment Plan 2013 (LEP)

The **Coffs Harbour LEP 2013** provides “*local environmental planning provisions for land in Coffs Harbour in accordance with the relevant standard environmental planning instrument under Section 33A*” of the Environmental Planning and Assessment Act. The LEP hopes to encourage sustainable economic growth and development in the Coffs Harbour region. Other relevant aims include:

- development of a liveable urban sector that offers a combination of residential dwellings to meet the diverse needs of the population
- sustainable conservation and management of the region’s natural environment and culture
- protection of especially valuable scenic and recreational areas
- ecologically sustainable development and limited exposure to natural hazards

Coffs Harbour Development Control Plan 2015 (DCP)

The **Coffs Harbour DCP 2015** complements the LEP 2013 detailed above, as such to “*give effect to the aims of the Coffs Harbour LEP 2013, to facilitate development that is permissible under the Coffs Harbour LEP 2013 and achieve the objectives of land use zones under the Coffs Harbour LEP 2013.*” The DCP outlines 4 main objectives to achieve this goal:

- 1) Environmental Sustainability
 - Protection of high conservation value land and environmental heritage
 - Implementation of water-sensitive designs and minimisation of waterway impacts
 - Adherence to environmental characteristics of land
- 2) Social Sustainability
 - Meeting of needs of the population, including housing, leisure, and community facilities
 - Improving public transport, cycling paths, and walkways to minimise car dependence
- 3) Civic Leadership
 - Transparent, consistent, and accountable development proposals
- 4) Economic Sustainability
 - Contribution to economic growth and local employment opportunities
 - Sufficient support for public utilities and facilities so as to not burden the existing community

Coffs Harbour City Revised Land Capacity Assessment 2004

The **Coffs Harbour City Revised Land Capacity Assessment** estimates Coffs Harbour LGA's total population capacity and land availability for existing and future lands as of December 2004. As of 2004, the region was expected to need to accommodate for 32,000 new residents by 2030. Most of those were considered to be accommodated by subdivided vacant lots or unsubdivided land, but at least 6,000 of those require new urban zones. The entire LGA is predicted to increase by nearly 34,000, and in Woolgoolga, population is expected to increase by 3,550, while dwellings are expected to increase by 1,574 by 2031 (with an occupancy rate of 2.3). However, the Assessment notes that Woolgoolga Sewage Treatment Plant is capped to service 18,000 people unless augmented. Most of Woolgoolga's needs are to be met with vacant lots, unsubdivided land, and potential residential land and infill development. Possible future urban investigation amounts to 475 people and 190 dwellings.

Local Growth Management Strategy (LGMS) Review Stage 1 - Land Capacity Assessment Audit

The **LGMS Review Stage 1** of 2014 provides data on land capacity and supply of land *"to aid in the making of good planning decisions into the future for large lot residential, residential, business, industrial and tourist purposes"* as part of a review of the 2007 LGMS. According to the LGMS Review based on real estate responses, there is an adequate 5-year supply of land available for all of these categories (with the exception of residential land which did not have a clear agreement) in the northern part of the LGA, which centres on Woolgoolga. In the entire LGA, the audit indicates that there is significant land stock to accommodate future residential dwellings, especially where there is undeveloped land in Woolgoolga, West Coffs, North Boambee Valley, and South Coffs Harbour. R2 low density residential land can accommodate 2,970 more dwellings, while R3 medium density and R4 high density residential land can accommodate 899 more dwellings.

Our Living City Settlement Strategy

The **OLC Settlement Strategy** outlines guidelines for future urban rezoning in the LGA until 2031. This Strategy bases its plan off an expected population projection of 99,000 by 2031. The goal is to *"provide a blueprint for a smart city with accessible and reliable transport, a strong regional economy, a vibrant community and a healthy natural environment for us all."* The OLC Settlement Strategy has three objectives:

- 1) The Healthy City: Environmental Sustainability
 - Conservation of natural resources
 - Enhancement of natural values and accountability for environmental constraints
 - Efficient resource use and minimisation of negative externalities
- 2) The Smart City: Economic Sustainability
 - Augmentation of growth and development
 - Advancing employment and educational opportunities
 - Management of the population size to sufficiently sustain and advance services

3) The Cultural City: Social Sustainability

- Improvement of liveability and identity of communities
- Providing of fair access to resources for all residents
- Improvement of lifestyle through health and well-being

To achieve these goals, the OLC Settlement Strategy has specific strategies for each region. For Woolgoolga, these include but are not limited to: development as a Coast Town, determination of appropriate zonings for the environment, advance the commercial aspect of the town, develop employment opportunities and industrial land needs, initiate a Special Investigation Area to the south west, and investigate potential expansion to the north west.

The **Residential Strategy: Draft Issues & Options Discussion Paper for Community Engagement** outlines the important residential issues in Coffs Harbour to be addressed before Stage 2. The Coffs Harbour City Council highlighted five key issues:

- 1) A growing and changing community
 - Ageing population
- 2) Evolving housing and accommodation needs
 - Lower occupancy rates
 - Importance of tourism
 - Woolgoolga has a high proportion of households experiencing rental stress at 41%

“housing affordability is a significant issue within Coffs Harbour and appropriate planning responses are required to ensure that the community can meet household commitments.”

- 3) Better definition of the character of residential zones
 - Encouragement of infill residential development
- 4) A review of built form controls and how they should be administered
 - Should contribute to natural, cultural, visual and built character values
- 5) Consideration of special ‘character’ precincts
 - Woolgoolga needs an easily identifiable centre, improved service range, and various dwelling types.

To address these concerns, the Report outlines potential options that necessitate further investigation and reiterates claims from previous reports that the Region has sufficiently zoned residential land to accommodate growth to meet community needs. This is despite Coffs Harbour not having a current and adopted Residential Strategy which adequately measures the community’s needs. Urban Economics considers that much of the land within *deferred* areas such as Moonee Beach which have not progressed for more than 15years, do not contribute to the residential land needs of Coffs Harbour and are unlikely to contribute in the short to medium term given the deferred status of these localities.

2.2 THE SUBJECT SITE

The subject sites comprise two distinct land parcels described as Lot 202 on DP874273 and is approximately 25.64ha. The parcels have different access points and road frontages with the southern parcel accessed from Newmans Road and the northern parcel having frontages to Bark Hut Road and Solitary Islands Way as illustrated in FIGURE 2.1.

The site is proximate to Woolgoolga High School which included more than 840 enrolments through 2016 and straddles the proposed Woolgoolga sports precinct. The subject development is convenient to a range of services and facilities including the Woolgoolga activity centre and a modern Woolworths supermarket; all of which are within 2km of the subject site.

FIGURE 2.1: Subject Site









Source: Nearmap showing May 5th 2016

2.3 THE MASTERPLAN

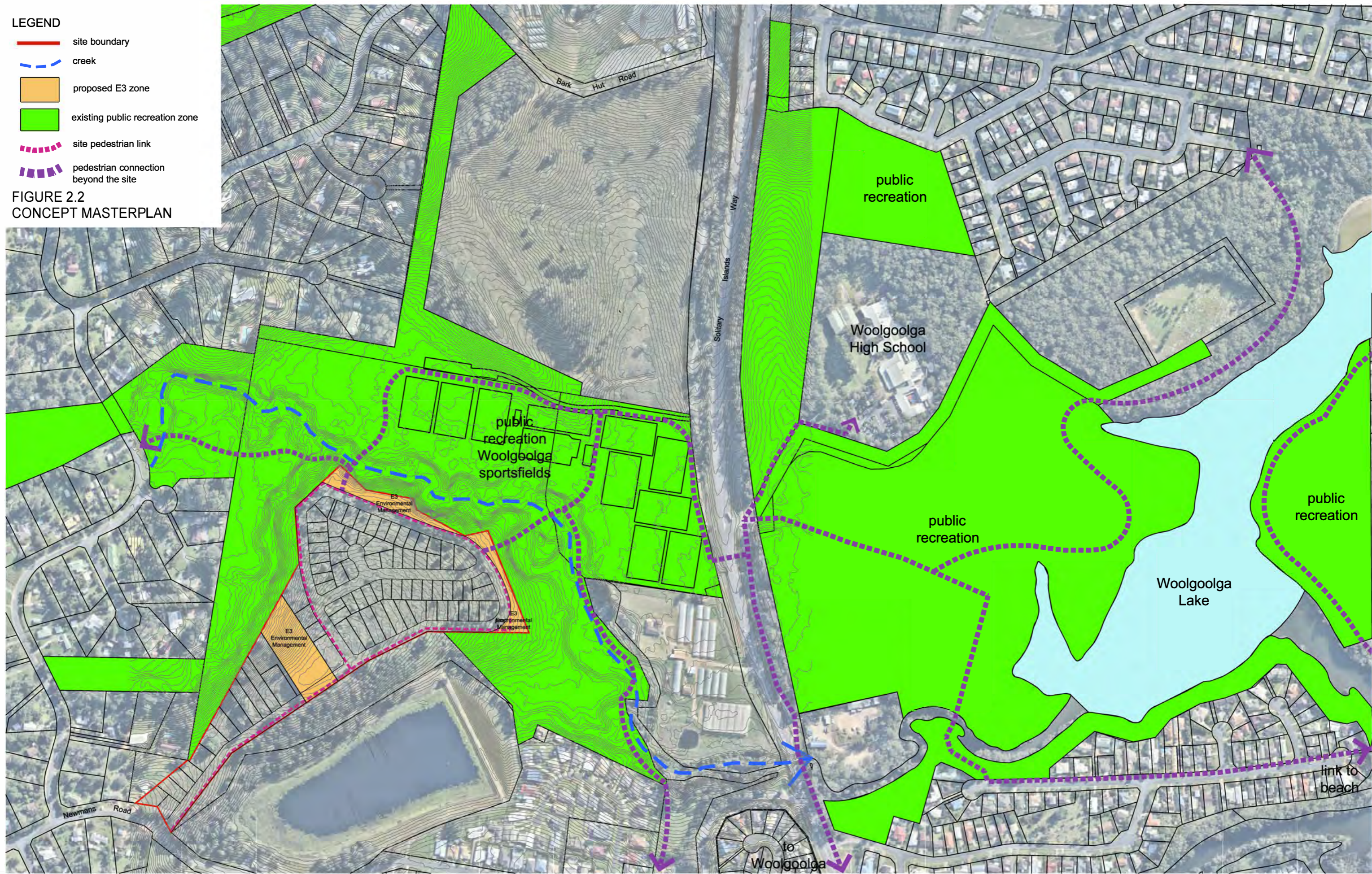
It is proposed to ultimately develop 82 residential lots within the masterplan area. Lots are estimated to be on average 600m², and to potentially include a range of lot sizes accommodating choice in dwelling types and promoting affordability.

The masterplan is conceptual at this stage, but provides an indication of intentions for the site. Other considerations for the masterplan have also included an integrated aged care and retirement facility, such as has established at The Lakes community within the North Boambee Valley. Illustrated in FIGURE 2.2, the Draft Masterplan highlights the proposed development's proximity to Woolgoolga High School and the future West Woolgoolga Sports Complex and fields.

LEGEND

-  site boundary
-  creek
-  proposed E3 zone
-  existing public recreation zone
-  site pedestrian link
-  pedestrian connection beyond the site

**FIGURE 2.2
CONCEPT MASTERPLAN**



Use figured dimensions in preference to scales. Please notify the Landscape Architect before proceeding if any anomaly is found between this drawing and conditions on site. This drawing must not be relied upon for any purpose other than that for which it was prepared or by any person or corporation other than the referred client.

AMENDMENTS			
Issue	Date	Details	Initial
A	22.2.18	Client review	JA
B	21.8.18	layout updated	JA
C	11.9.18	planning proposal	JA

PROJECT Bark Hut Road, Woolgoolga PLANNING PROPOSAL
CLIENT Keiley Hunter Urban Planner

DRAWING Planning Proposal Open Space Masterplan
DRAWING NO. 1730-07

DRAWN JA	ISSUE C
DATE September 2018	



Scale 1:5000 @ A3
metres 0 25 50 75 100 125

Jackie Amos Landscape Architect
0427 667748
jamosla@bigpond.net.au



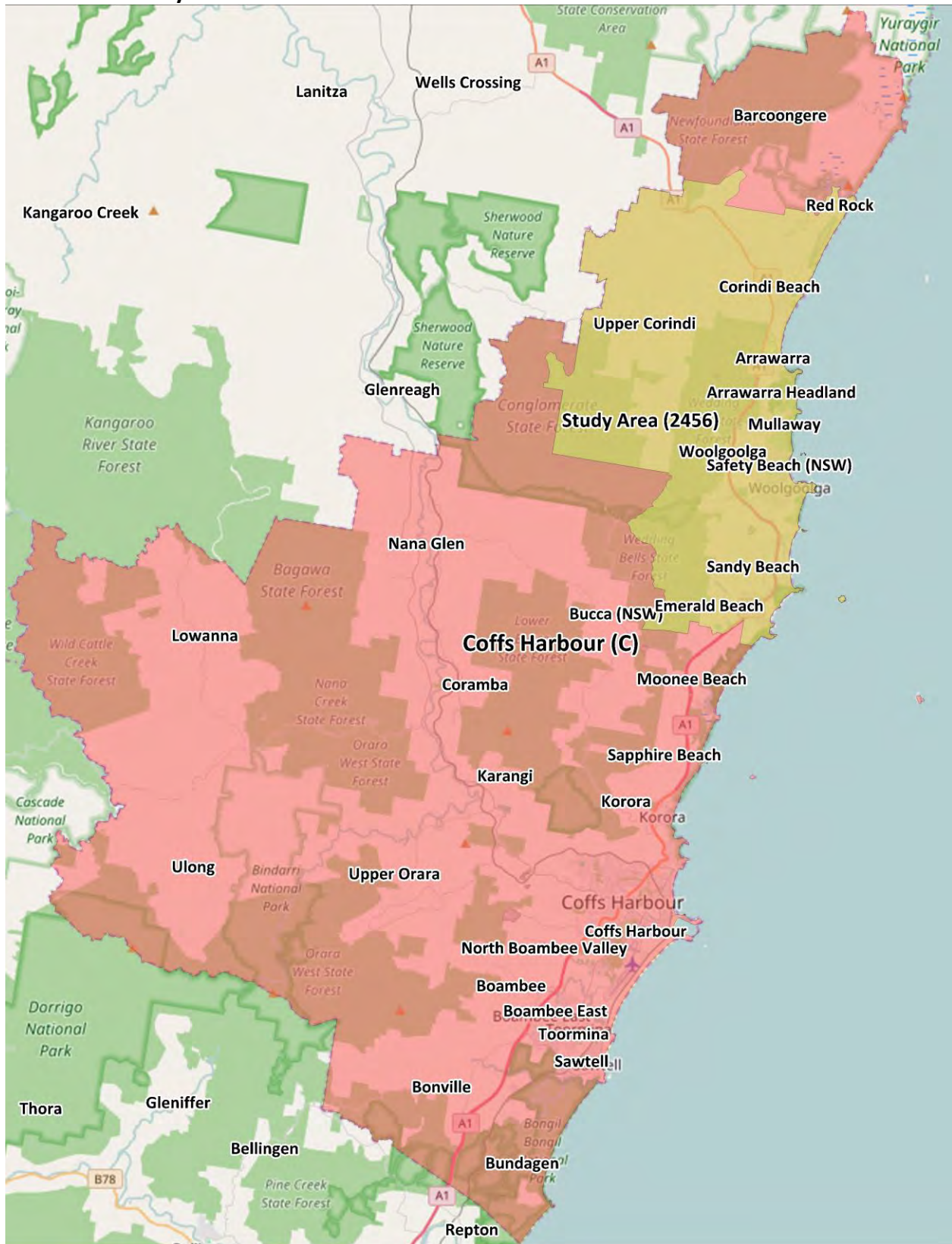
3.0 RESIDENTIAL SUPPLY ANALYSIS

3.1 STUDY AREAS

Urban Economics has defined study areas for the analysis of residential land supply, to allow for statistical comparison between markets and localities. FIGURE 3.1 illustrates the Woolgoolga Study Area which is defined by the 2456 postal area and includes the localities (state suburbs) of Arrawarra, Arrawarra Headland, Corindi Beach, Emerald Beach, Mullaway, Red Rock, Safety Beach, Sandy Beach, Upper Corindi and Woolgoolga; within the context of the Coffs Harbour local government area (LGA).

The Woolgoolga Study Area has also been defined utilising Census statistical geographies and includes parts of both the Korora - Emerald Beach and Woolgoolga – Arrawarra statistical areas (SA2).

FIGURE 3.1: Study Area



3.2 COFFS HARBOUR RESIDENTIAL MARKET

The Draft Coffs Harbour Residential Strategy identifies the historic role of the housing market of the region in *“the attraction of families and retirees from metropolitan areas further south in NSW such as Sydney. This has resulted in the steady residential expansion of coastal localities along the Mid North coastline to cater for population increases derived from the expansion of existing communities and migration in-flows.”*

At the time of the 2011 Census, Coffs Harbour included approximately 29,000 dwellings (26,000 occupied) of which around 76% were detached dwellings, 11% were semi-detached dwellings (row, terrace etc.) and 10% were flats units or apartments. Since this time, there have been more than 2,300 additional dwellings approved in the region and 2016 Census data indicates some 30,000 dwellings (27,000 occupied) at the time.

TABLE 3.1: Building Approvals – Coffs Harbour LGA

	New houses	New other residential building	Total dwellings
2011-12	195	53	273
2012-13	208	44	257
2013-14	227	51	282
2014-15	292	81	381
2015-16	268	178	452
2016-17	332	131	468
2017-18*	129	62	192

Source: ABS

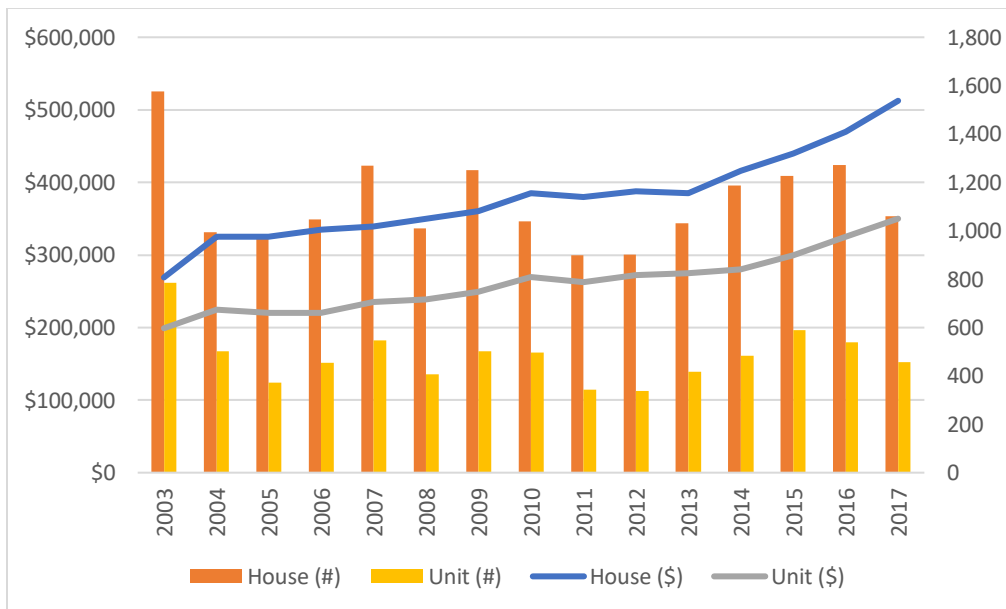
*FY to November 2017

Similarly, the NSW Valuer General noted 23,148 lots within residential zones of Coffs Harbour as at July 1st 2017. The Valuer General’s 2015 report notes that *“Historically low interest rates have resulted in continued improvement in demand for properties throughout this sector (residential) of the market with local real estate agents reporting that selling periods have shortened and buyer demand has remained steady and strong throughout the past 12 -18 months. Single residential land values have increased across all established residential areas within the LGA, with most localities recording increases in the 3% to 6% range. No area reflected a drop in value levels which also **reflects a lack of supply** to the steadily growing demand which in turn drives up prices.”* The July 2017 Report further states *“Residential land showed a strong increase with increased demand for all classes of residential land in the coastal region (Coffs Harbour),”* and indicates a 10.3% increase in residential land values from 2016 to 2017.

Herron Todd White’s Month in Review for October 2016 indicated that residential property within Coffs Harbour is rising/approaching the peak of the market. The key housing market is indicated to be within the sub-\$500,000 range, mostly sought by first home buyers and establishing families, or investors capitalising on the transient nature of the region which inherently includes a strong rental market. HTW’s October 2017 report further indicates that housing within Coffs Harbour has decreased in affordability and “fringe beachside localities such as Corindi Beach to the north, being popular with commuters from both Coffs Harbour and Grafton, and Nambucca Heads to the south where property prices are considerably more affordable in the \$300,000 to \$400,000 price range.”

FIGURE 3.2 illustrates the growth within the house and unit markets of Coffs Harbour between to December 2017. Most notably, median house prices have increased more than 47% or approximately \$243,000 since 2003.

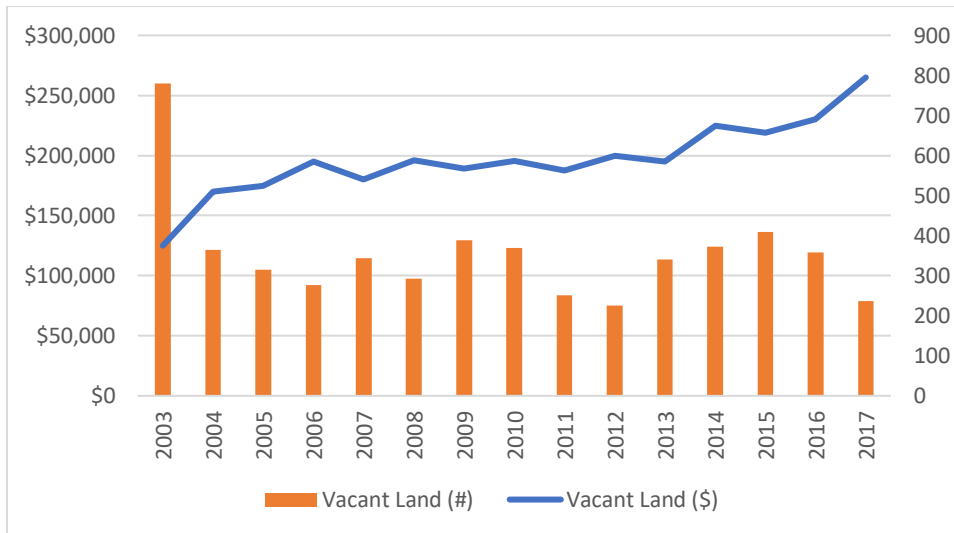
FIGURE 3.2: House and Unit Sales – Coffs Harbour



Source: Pricerfinder

Coffs Harbour has also recognised price growth within the market for vacant land, which as noted by the Valuer General, is a result of limited new supply within the region over this period. FIGURE 3.3 illustrates this dynamic whereby the volume of vacant land sales has declined and the median price has increased.

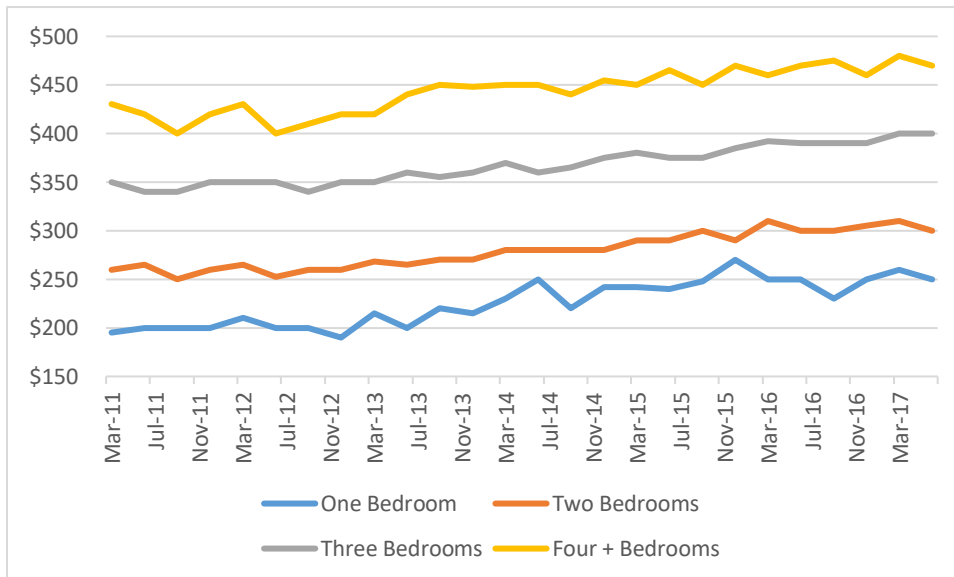
FIGURE 3.3: Vacant Land Sales – Coffs Harbour



Source: Pricerfinder

Quarterly data provided by the Department of Family and Community Services outlines that the median rental price across the Coffs Harbour LGA has steadily increased, suggesting some supply constraints in the availability of rental accommodation. FIGURE 3.4 highlights this growth with a 4-bedroom house reporting a median rental price of \$470 for the June Quarter 2016.

FIGURE 3.4: Median Rents – Coffs Harbour



Source: Department of Family and Community Services

3.2 RESIDENTIAL ESTATES

There are numerous residential developments underway and proposed throughout Coffs Harbour. The following summarises known residential development projects for detached housing throughout the region.

Urban Economics undertook inspections of the various estates in October 2016 and gathered sales data from the respective agencies to determine the availability of lots within these developments at the time.

Elements@Coffs is a masterplanned estate in Boambee East which has been proposed to include some 221 lots over 13 stages. The release of stage 1 which comprises 30 lots has sold 29. Stage 1a has sold 3 of its 15 lots. Stage 2a has sold 4 of 11 lots. Stage 9 has sold 2 of its 15 lots. The median sale price has been approximately \$195,000 (\$250/m²) for sold lots between December 2013 and June 2017; less than 1 lot per month over this period. Based on sale plans for the estate, approximately 40 lots have been sold within the development. Whilst the price may be considered within the affordable range, the masterplanned area is quite undulating, which would add to the ultimate cost of building; and likely part of the reason for the subdued uptake of lots.

Aspect@The Summit is a land release within **The Summit** development which is situated on the ridge above The Big Banana. Aspect included 29 lots between 465m² and 1,001m², all of which have already been sold. Available lots had a large price range of between \$220,000 and \$410,000; reflective of the achievable views and cost of development for sloped land.

Woopi Beach Estate is located at the corner of Hearnese Lake Rd and Solitary Islands Way in Woolgoolga which will ultimately include some 90 lots averaging around 700m² each. Currently undertaking presales for second release, 42 of the initial 90 lots have been sold or are under contract for between \$218,000 and \$235,000, with a further 60-lots becoming available in a potential future release.

North Sapphire Beach is a large masterplanned estate established by the Walker Group which sold out between early 2011 and October 2017. The final 'Sugar Mill' release in the development is currently sold out with lot sales priced between \$250,000 and \$285,000 for lots of between 447m² and 685m².

Sapphire Beachfront is a premium beachside release of lots within a community titles scheme. Of the 40 lots released all have been sold, with vacant lots achieving up \$825,000 or \$1,475/m².

Woolgoolga Heights is an approved 50 lot development (Stage 1) located at the intersecting Haviland and Backhouse streets in Woolgoolga. Advertised from \$185,000 for lots sized between 600 and 700m², the relevant sales agency has advised that development is not progressing at Woolgoolga Heights at this stage. Woolgoolga Heights forms part of a 30.4ha, 'proposed agreed growth area' within the Our Living City Settlement Strategy and is illustrated in FIGURE 3.5 below.

This area was intended to support some 300 dwellings from 2016 of which none have progressed at this stage.



Stalled development at Woolgoolga Heights

North Sandy Beach estate includes some 82 lots of which all have been sold. Initial lots were sold individually for \$155,000-\$190,000 and as 'affordable' house and land packages within the sub-\$500,000 bracket. The short sales period of just 15 months for this development (February 2015 to May 2016) is indicative of the demand for affordable family dwellings and investor demand in this price range.



Detached housing construction at North Sandy Beach

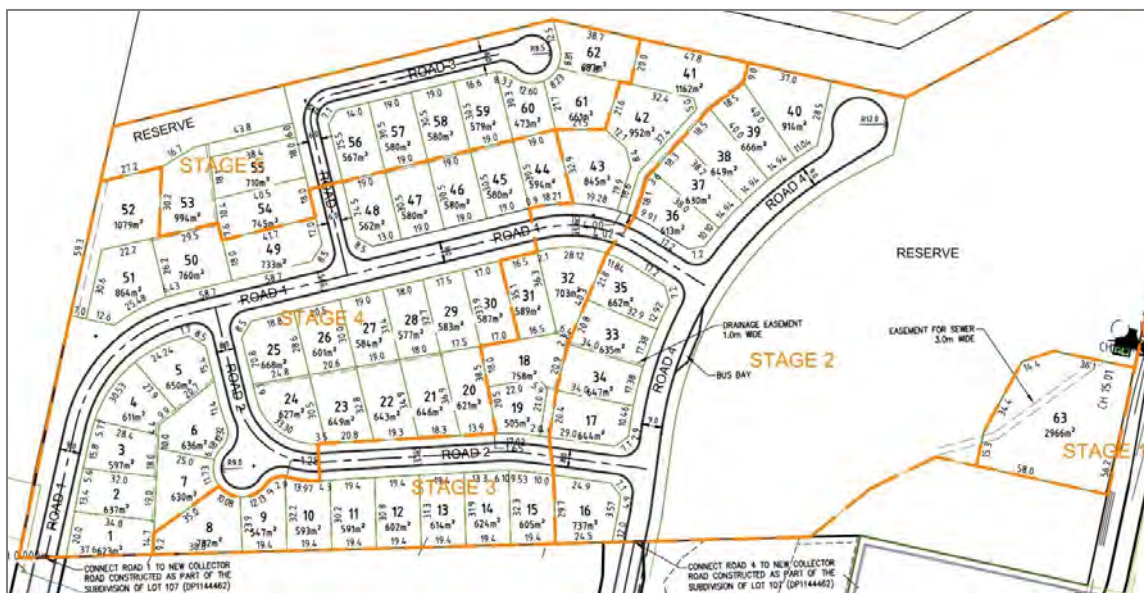
Seacrest at Sandy Beach adjoins North Sandy Beach estate and is masterplanned to include 166 residential lots. Stages 1 and 2 (43 lots) are completed and sold whilst 123 lots within stages 3 to 5 are predominantly presold with civil works continuing.

Nautica Fairways Estate at Safety Beach has evolved since initial lots were released in 2003. The development has more recently accelerated sales with the current release of 9 lots in Stage 9 having already sold 3. Available lots are currently advertised for \$260,000 and \$310,000 for areas of between 639m² and 852m².

Emerald Beach Estate is a 112-lot subdivision is located at the entrance to the Emerald Beach residential area. Stages 1 and 2 within the project have sold out (60 lots) and Stage 3 (16 lots) has just 6 remaining according to the December 2017 sales plan.

3.3 PROPOSED AND APPROVED DEVELOPMENTS

- Immediately north of the subject site a parcel described as Lot 2 on DP1143755 has been mooted to include a residential subdivision. The Our Living City Settlement Strategy (FIGURE 3.5) identifies that this parcel could support approximately 540 dwellings after 2031. Sequentially, development at this site would logically follow development at the subject site based on geographic position and location with respect to services and facilities.
- A 14.2ha growth area has been designated within the Woolgoolga Diggers Golf Course (FIGURE 3.5). This site was proposed to support 120 dwellings from 2016, however no plans or development have progressed to date.
- 13 Hearn Lake Rd, Woolgoolga is proposed to include some 63 lots from 547m² in area. The development would sequentially follow on from the current development of Woopi Beach Estate and has been included as such within this Analysis.



Proposed 13 Hearn Lake Rd subdivision

Other residential ‘proposed agreed growth areas’ within the Study Area have been identified from the Our Living City Settlement Strategy, none of which have commenced to an application or development phase including:

- 15.8hectares over 12 large lots at Corindi Beach

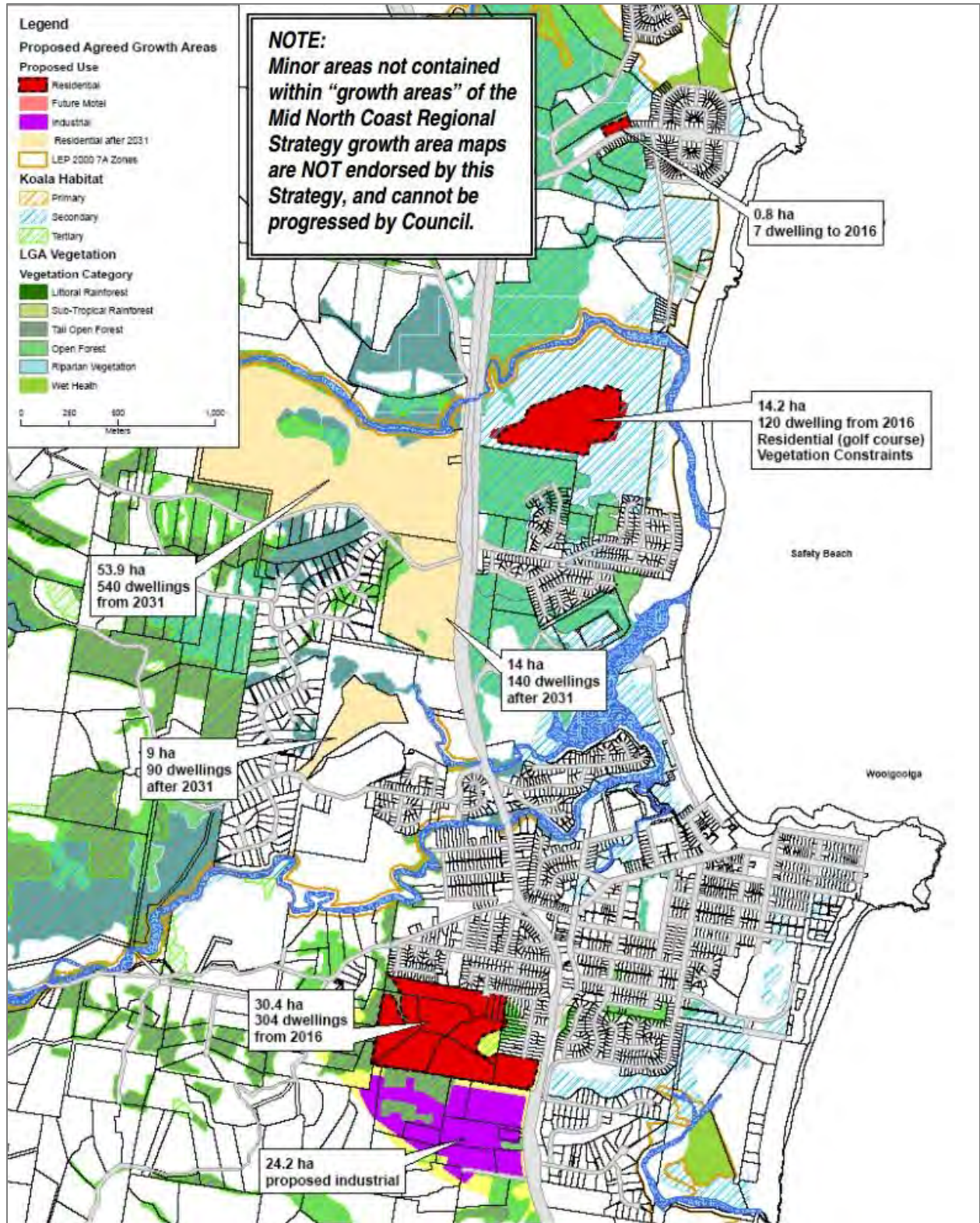
- 5 hectares at 97 Pacific St, Corindi Beach
- 2.5 hectares at Arrawarra Headland
- 0.8 hectares at Mullaway.

In total, some 68.8 hectares of land with the noted potential of approximately 665 dwellings has yet to have had plans progressed for development, which is not conducive to the steady and orderly release of residential land in the area.

The trend for residential development plans not advancing in the Region is evident within the numerous former 'Part 3A applications' which are now listed as Major Project Assessments by the Department of Planning and Environment including:

- **Glades Estate** at Moonee Beach which was initially proposed in mid-2006 to include approximately 522 lots and has undergone numerous iterations and modifications since;
- A 165-lot subdivision at Lyons Rd, North Bonville which commenced in 2008;
- The **Moonee Waters** project was initiated in 2005 to include 300 lots adjoining the North Sapphire Beach Estate, on a site with environmental constraints;
- **Sandy Beach North** (noted as an undeveloped and zoned urban area) has been proposed since early 2006 to include 280 residential lots on a 50-hectare site bound by Hearnese Lake, the Pacific Highway and the coast.
- A development parcel of approximately 25ha and known as '**Pacific Bay Estate**' has recently been sold. The site was mooted as being able to support residential development of 110 to 130 residential lots since 2006.

FIGURE 3.5: Proposed Agreed Growth Areas

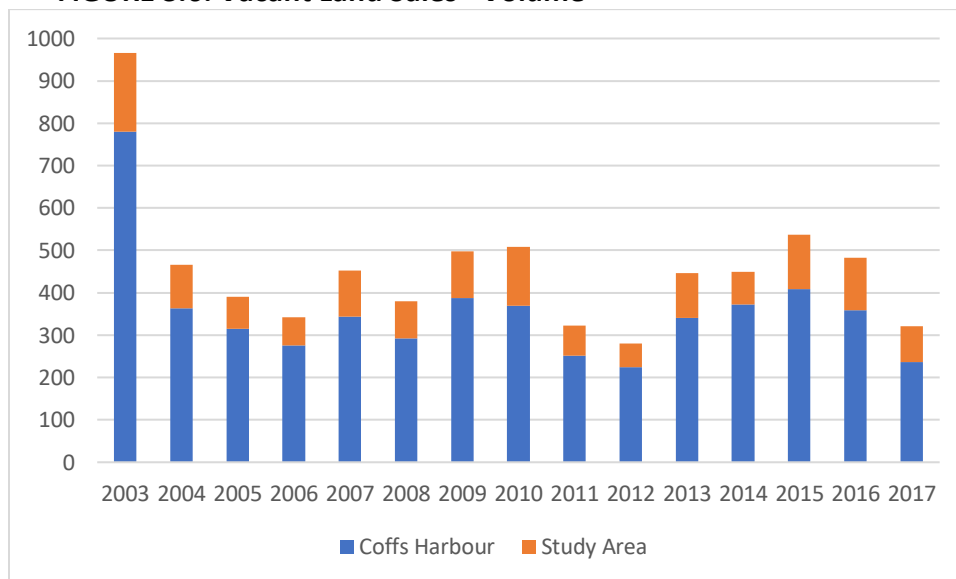


Source: Our Living City Settlement Strategy – Map 4B

3.4 THE WOOLGOOLGA STUDY AREA

The market within the Study Area has consistently represented approximately 20% of the volume of house sales and 5% of unit sales within the broader Coffs Harbour area. These products have also for the most part, had commensurate median sales prices over this time. Vacant land sales however have diverged, with the majority of new estates establishing within the Study Area as opposed to the balance of the greater Coffs Harbour region as illustrated within FIGURE 3.6, representing 35% of all sales through 2016 and 2017.

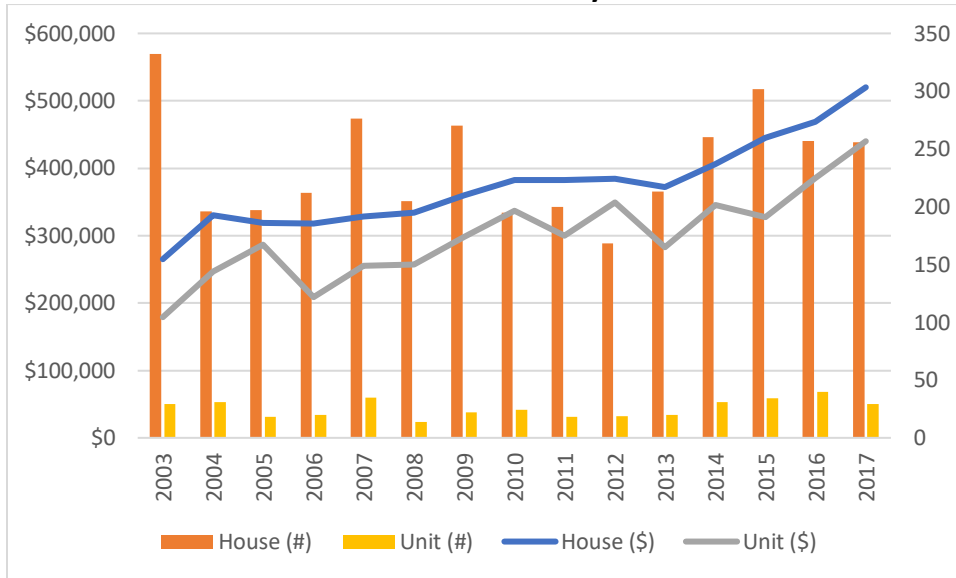
FIGURE 3.6: Vacant Land Sales - Volume



Source: Pricerfinder

Detached house sales represent the majority of transactions within the Study Area. For the year to December 2017, the median sales price within the Woolgoolga Study Area was \$520,000 and whilst representative of a substantially more affordable market than Greater Sydney, Brisbane and the Gold Coast and even the Regional markets of Port Macquarie and Newcastle; has demonstrated significant price growth since 2013, impacting upon the area's relative affordability.

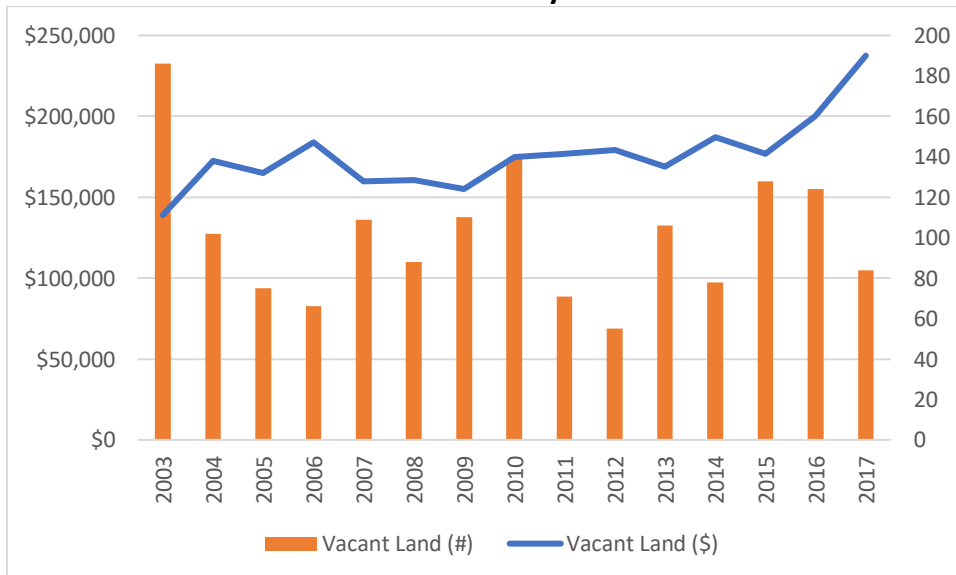
FIGURE 3.7: House and Unit Sales – Study Area



Source: Pricefinder

Vacant land sales within FIGURE 3.8 illustrate the vagaries of the land supply market and indicators of a supply-led market within the Study Area over the last 15 years, with median land prices moderating during periods of increased supply. The median residential lot price within the Study Area has increased markedly between 2015 and 2018, indicative of a supply constrained market.

FIGURE 3.8: Vacant Land Sales – Study Area



Source: Pricefinder

3.5 VACANT LAND SUPPLY

In summary, Urban Economics considers the Woolgoolga Study Area to have the following supply implications regarding the provision of lots for detached residential housing development.

- There is evidence of a supply-led and in some instances supply-constrained land supply market within the Study Area with a number of estates reporting pre-scales of lots prior to certification and works.
- 80 lots available within active residential estates within the Study Area (Woopi Beach and Nautica Fairways).
- 350 lots approved within the Study Area (Woolgoolga Heights, Hearnese Lake Rd, Emerald Beach Estate and Seacrest at Sandy Beach).
- 1,155 potential lots within identified growth areas of the Our Living City Strategy (excluding the subject site and proposed/approved developments).
- 400 potential lots within existing residential zoned englobo areas including Sandy Beach North.
- Numerous proposed, stalled and low potential projects throughout the Coffs Harbour region which will have limited opportunity to contribute to land supply and housing affordability in the short to medium term.



Woopi Beach Estate lot plan, Woolgoolga

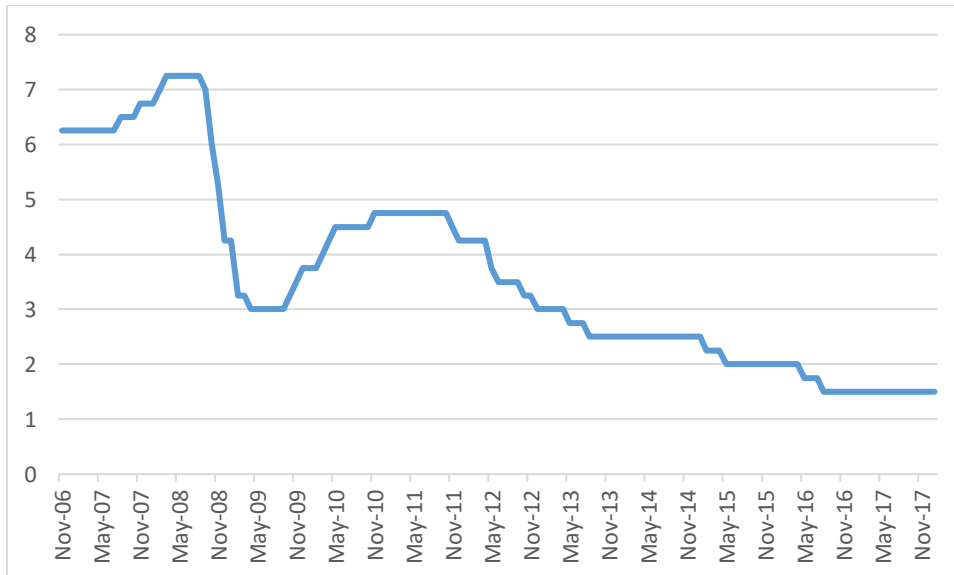
4.0 DEMAND ANALYSIS

4.1 DEMAND DRIVERS

Economic conditions in Australia have in more recent times been defined by the existence of a “two speed economy” - the resources and energy sector, which has experienced strong levels of activity, fuelled by demand particularly from China and India, and the remainder of the economy, which is much more susceptible to fluctuating international conditions, particularly from Europe and the US, which impact on business and consumer confidence. Slowing of the resources and energy sector has seen the strengthening of property and health care sectors in supporting economic growth.

The tenuous conditions have been reflected in the Reserve Bank’s policy approach to adopt a sustained record low interest rate in seeking to stimulate activity and confidence in the Australian economy post the GFC and as the resources and energy sector plateaus. The sustained low interest rates have created substantial competition amongst financial institutions and lenders, offering investors and borrowers access to more affordable lending rates, whilst the flow-on effects for the residential property market are being realised.

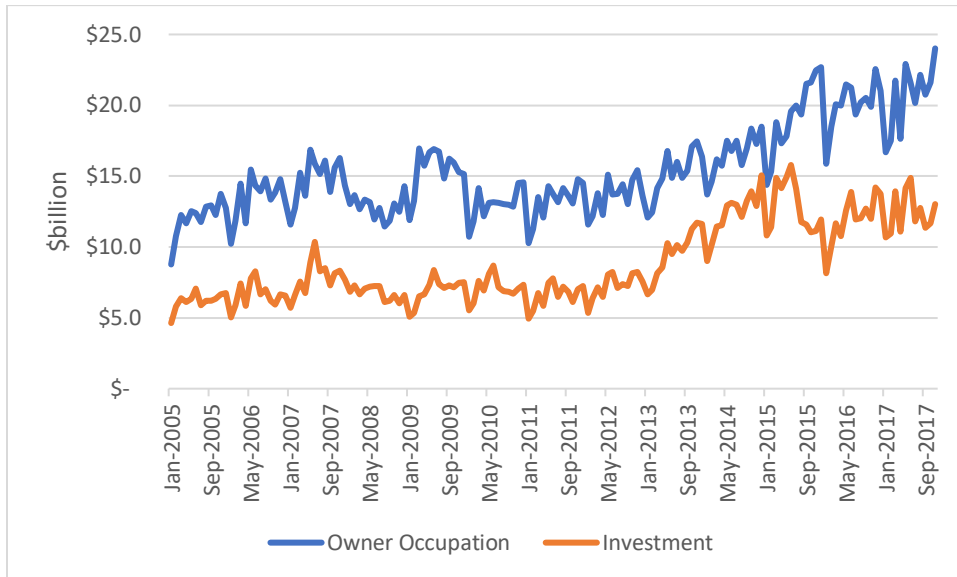
FIGURE 4.1: Cash Interest Rate Australia



Source: Reserve Bank of Australia

It is interesting to note that the value of housing finance commitments continued to rise to record highs for investors in 2014/15 and owner occupation at the end of 2015. Tighter lending conditions imposed by banks has moderated lending activity somewhat; particularly from investors however there has remained significant activity from owner occupiers which accounted for \$25billion of residential loans in November 2017, as illustrated in FIGURE 4.2.

FIGURE 4.2: Residential Finance Commitments Australia

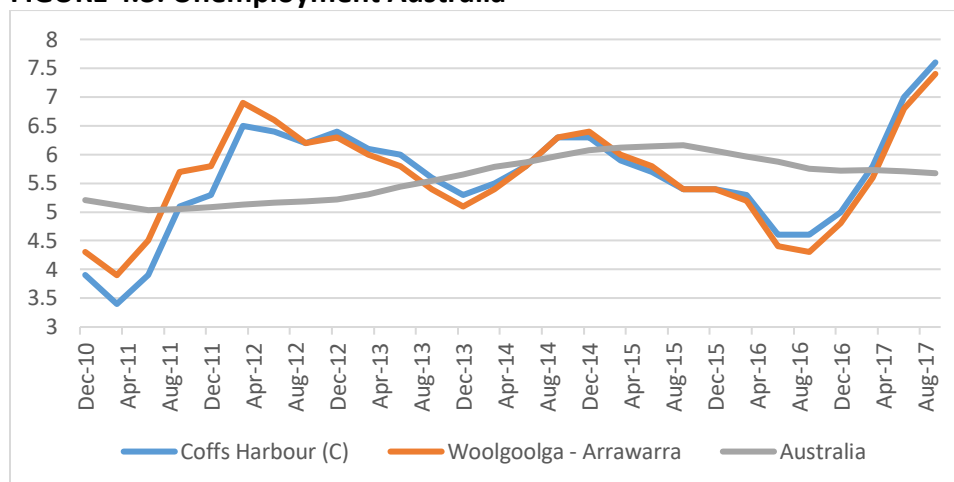


Source: ABS

Another measure of Australia’s economic performance and indicators for consumer confidence is Gross Domestic Product (GDP). Australia was the only advanced economy to not record negative GDP growth following the GFC, largely attributed to the buoyancy of the resources sector at the time. In a post-resources boom, areas such as new housing and construction will play an increasingly significant part in maintaining a positive economic output, and have been much relied upon by various state and federal treasuries in budget formulation. This is particularly important in the Coffs Harbour region whereby the construction industry accounts for some 15% of employment.

FIGURE 4.3 illustrates the unemployment rates of Coffs Harbour and the Woolgoolga-Arrowarra SA2 to the Australian average; highlighting the declining employment rate in the region.

FIGURE 4.3: Unemployment Australia

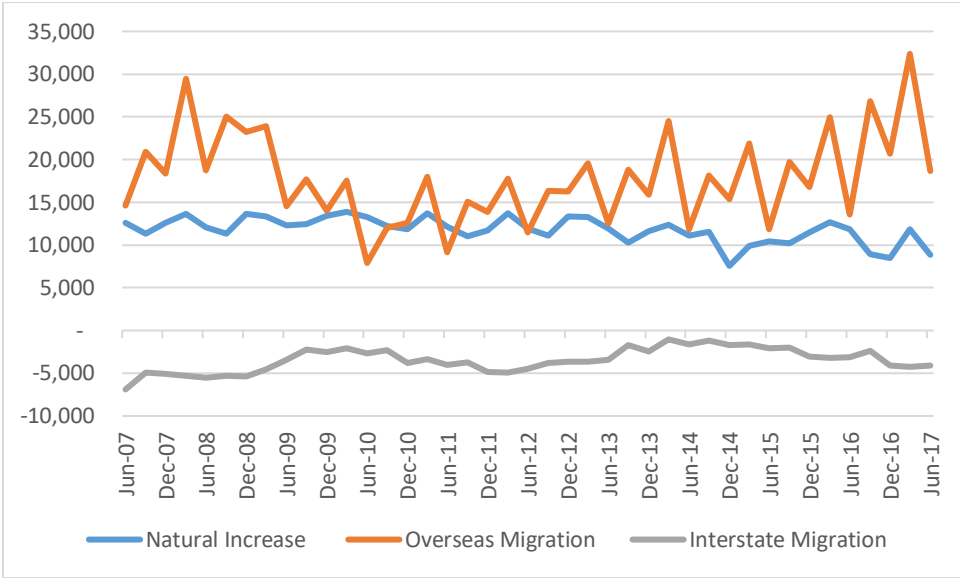


Source: Department of Employment

Critically, with national and state economic conditions being fundamentally solid, the indicator of consumer confidence has remained in positive territory, although subdued, and is reflective of confidence being buoyed by a level of job security expectations, low interest rates and rebounding commodity prices, yet weighed down by fears about the potential rising costs of living and international events. The Westpac-Melbourne Institute’s Consumer Sentiment Index remained positive for the at 105.1 as at January 2018.

Typically, NSW and Sydney has the largest net loss of population through interstate and intrastate migration respectively. Commensurately, NSW and Sydney also have the highest levels of overseas migration contributing to population growth. More recently however, net migration outflows from NSW have reduced as illustrated in FIGURE 4.4, coincident with the stronger performing economy in New South Wales and lower unemployment rates.

FIGURE 4.4: Components of Population Change – NSW



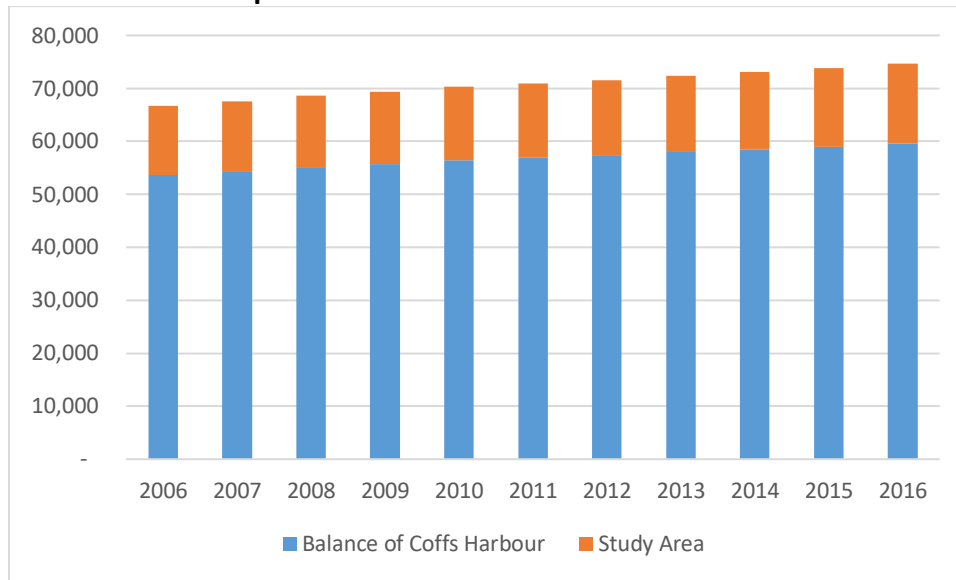
Source: ABS

Urban Economics notes that the increasing price disparity between housing in Australia’s eastern capital cities of Sydney, Brisbane and Melbourne compared to other regional centres such as Coffs Harbour, is creating conditions that may again see an influx of interstate and intrastate movers into regional areas with solid job prospects, and further demand for housing, particularly if coupled with increasing employment opportunities and affordable family and investment dwellings.

4.2 POPULATION AND HOUSEHOLD GROWTH

Between 2006 and 2016, the population of Coffs Harbour increased from an estimated 66,657 in 2006 to 74,641 persons in 2016; or by almost 8,000 persons at approximately 1.1% per annum over this period. FIGURE 4.5 breaks down population growth within the region between 2006 and 2016, demonstrating the increasing proportion of this growth within the Woolgoolga Study Area which increased by around 2,050 persons or 1.5% per annum over the decade.

FIGURE 4.5: Population Growth 2006-2016



Source: ABS

Population projections prepared by the NSW Department of Planning estimate that population growth will continue within Coffs Harbour to include some 92,650 persons by 2036 or around 16,800 additional persons between 2016 and 2036.

Coffs Harbour City Council has had population projections prepared by Forecast.id. for small areas in the Region. These projections highlight the anticipated acceleration of growth within the northern localities of Coffs Harbour, particularly Woolgoolga which is forecast to include some 3,450 additional residents between 2018 and 2036. The following TABLE 4.6 summarises Urban Economics’s population projections for the Woolgoolga Study Area guided by data from the ABS, NSW Department of Planning & Environment and Coffs Harbour City Council (Forecast.id. & Our Living City Settlement Strategy/Land Capacity Assessment).

Approximately one third of population and household growth within the Coffs Harbour region is projected to be accommodated within the Study Area. This position is commensurate with the Our Living City Settlement Strategy, whereby the ‘Northern Beaches’ (including Woolgoolga) is projected to support some 35% of new dwellings within the Region over the life of the Strategy.

Urban Economics’s projections for population growth within the defined Woolgoolga Study Area have applied an accelerating growth between 2016 and 2026. This position has been based on some assumptions which have guided the projections including:

- The development profile of the Study Area continues to include detached and relatively affordable, family type dwellings which will support and attract larger households and family groups; reflected in slightly increasing household sizes.

- Current takeup rates of other estates within the Study Area such as Woopi Beach Estate North Sandy Beach and Emerald Beach Estate suggest that there is an existing and emerging demand for residential land and dwellings in the area which is affordable. The proposed development and subject site would similarly provide a residential product to meet this demand and has been assumed to commence by 2021.
- The Our Living City Settlement Strategy estimated that growth within the Northern Beaches locality would be strongest between 2006 and 2011 (2.5% p.a.) and tapering off towards 2031. Urban Economics's projections have adopted this growth profile, however have shifted forward the timeline to allow for changes since the Strategy was published.

Population estimates by age have also been derived for the Study Area utilising projections provided by the Department of Planning and Environment. Whilst almost 50% of the growth is noted to comprise persons aged over 65, this is significantly lower than the estimated 90% of growth that the Draft North Coast Regional Plan projects will be from persons aged 65+ across the Region. Similarly, the age profile suggests the need and potential for a diversity of housing types within the Study Area toward 2036; including detached family dwellings, retirement living and aged care facilities. Diversity of residential living options and dwellings forms contributes to promoting affordable lifestyles.

TABLE 4.6: Study Area Population and Household Projections

	2011 (Act)	INCREASE P.A.	2016 (Act)	INCREASE P.A.	2017 (Est)	INCREASE P.A.	2021 (Proj)	INCREASE P.A.	2026 (Proj)	INCREASE P.A.	2031 (Proj)	INCREASE P.A.	2036 (Proj)
Population	14,023	1.4%	15,039	2.1%	15,360	1.8%	16,520	1.7%	17,980	1.5%	19,370	1.2%	20,540
Dwellings	5,842	40	6,042	100	6,142	150	6,742	150	7,492	150	8,242	100	8,742
PPH	2.40		2.49		2.50		2.45		2.40		2.35		2.35

Source: ABS, QGSO, Coffs Harbour City Council, NSW Department of Planning and Urban Economics' estimates

TABLE 4.7: Study Area Population Projections by Age

Age	2011	2016	2021	2026	2031	2036
0-4	823	847	921	993	1,039	1,078
5-9	843	914	990	1,087	1,158	1,187
10-14	1,036	1,035	1,165	1,290	1,387	1,450
15-19	949	912	938	1,064	1,157	1,221
20-24	597	605	590	601	657	681
25-29	663	737	775	783	797	842
30-34	686	811	916	968	982	988
35-39	801	788	952	1,080	1,119	1,116
40-44	890	865	900	1,088	1,205	1,213
45-49	930	893	917	965	1,142	1,238
50-54	1,136	1,094	1,125	1,195	1,234	1,418
55-59	1,173	1,232	1,262	1,333	1,391	1,424
60-64	1,001	1,096	1,226	1,278	1,328	1,366
65-69	761	964	1,107	1,267	1,304	1,339
70-74	596	724	957	1,130	1,272	1,295
75-79	503	567	725	973	1,123	1,258
80-84	354	357	432	584	793	908
85+	634	702	801	952	1,149	1,424
TOTAL	14,023	14,770	16,290	18,170	19,740	20,920

4.3 DEMOGRAPHIC PROFILE

The results of the 2016 ABS Population and Household Census (the most recent Census results available) have been utilised to examine the demographic and socio-economic characteristics of the resident population of the Study Area community, compared to the Coffs Harbour LGA, and NSW and are summarised in TABLE 4.8.

TABLE 4.8: Demographic Profile

Demographic	Study Area	Coffs Harbour	NSW
Age Profile (%)			
<i>0-14yrs</i>	18.4	18.2	18.5
<i>15-29yrs</i>	15.6	16.2	19.6
<i>30-59yrs</i>	37.3	37.2	40.0
<i>60+yrs</i>	28.7	28.4	21.9
Labour Force (%)			
<i>Unemployment Rate</i>	7.6	7.3	6.3
<i>Workforce Participation Rate</i>	53.0	53.6	55.5
Occupation Profile (%)			
<i>Managers/Administrators</i>	14.1	11.9	13.5
<i>Professionals</i>	17.0	18.8	23.6
<i>Technicians & Trade Workers</i>	13.9	13.5	12.7
<i>Community & Personal Service Workers</i>	11.5	12.4	10.4
<i>Clerks, Administrative & Sales Workers</i>	11.6	13.0	13.8
<i>Sales Workers</i>	8.1	10.8	9.2
<i>Machine Operators & Drivers</i>	5.5	5.4	6.1
<i>Labourers</i>	16.6	12.5	8.8
<i>Inadequately Described/Not Stated</i>	1.8	1.7	1.8
Home Ownership (%)			
<i>Owned Outright</i>	41.5	36.3	32.2
<i>Mortgage</i>	29.5	28.7	32.3
<i>Rent</i>	24.7	30.8	31.8
<i>Other/Not Stated</i>	4.3	4.2	3.8
Structure of Dwellings (%)			
<i>Separate House</i>	85.6	74.3	66.4
<i>Semi-detached/Row/Terrace/Townhouse</i>	7.3	12.3	12.2
<i>Flat/Unit</i>	1.7	10.1	19.9
<i>Other/Not Stated</i>	5.4	3.3	1.4
Number of Vehicles Per Dwelling (%)			
<i>0</i>	4.1	6.1	9.2
<i>1</i>	35.9	37.7	36.3
<i>2</i>	37.8	36.3	34.1
<i>3</i>	10.9	10.6	10.9
<i>4+</i>	6.5	5.2	5.8

<i>Not Stated</i>	4.8	4.1	3.7
Average Annual Household Income (\$2016)	72,690	73,290	96,410
Relationship in Household (%)			
Husband or wife in a registered marriage	38.8	37.0	38.5
Partner in de facto marriage	8.8	8.3	6.9
Lone parent	5.0	5.6	4.5
Child under 15	18.7	18.7	18.9
Dependent student (Aged 15-24 years)	3.9	4.1	5.2
Non-dependent child	5.7	5.8	6.8
Other related individual	2.1	2.0	2.6
Unrelated individual living in family household	1.4	1.3	1.4
Group household member	2.9	3.4	3.8
Lone person	9.5	11.0	9.0
Visitor (from within Australia)	3.0	3.0	2.2

Source: 2016 ABS Census

- Both the Study Area and Coffs Harbour communities had distinctly higher proportions of retirees and older persons compared to NSW. At the time of the Census, approximately 28.7% of Study Area residents were aged over 60 compared to 21.9% in NSW.
- Whilst having a high proportion of older persons, the Study Area also included an average level of school aged children, commensurate with the number of schools in the area including Woolgoolga High School, Woolgoolga PS, Sandy Beach PS, Mullaway PS and St. Francis Xavier Primary; which together had 1,984 enrolments through 2016.
- At the time of the 2016 Census, the Study Area had a heightened unemployment rate (7.6%) and lower levels of workforce participation (53%), typical of areas with higher levels of retired persons.
- Dwellings within the Study Area in 2016 were predominantly detached houses (85.6%) with limited flats, units and apartments (1.7%), demonstrative of the area's popularity for families seeking larger dwellings. Similarly, more than 40% of dwellings within the Study Area were owned outright in 2016 which is characteristic of the higher incidence of families in the later stages of the lifecycle including retirees.
- Average household incomes within the Study Area (\$72,690) and Coffs Harbour region (\$73,290) were significantly lower than the NSW average. This is linked to the heightened proportion of retired persons in these areas and a blue collar workforce with higher levels of labourers, trade workers, clerks and sales workers at the time. Despite this, 2013-14 data from the ATO outlines average individual salaries and wages of \$42,000 within the Study Area at the time.

4.4 RETIREMENT LIVING AND AGED CARE DEMAND

Whilst not included as part of the concept masterplan for the subject site, the potential for retirement living and residential aged care has been investigated for the Study Area and proposed development, particularly given the age profile of the community and issues raised within the Draft Residential Strategy.

The proponent has considered ‘The Lakes’ development at North Boambee Valley, which integrates an Opal aged care facility and The Lakes Village retirement living as an example of a potential outcome for the subject site at Woolgoolga.

Typically, some 6% of Australian’s over the age of 65 years live within purpose built retirement accommodation such as independent living units (ILU). At an average of 1.5 persons per dwelling this suggests a ***demand for some 115 retirement dwellings within the Study Area in 2016 increasing to 155 dwellings by 2026.***

This makes no allowance for over 65’s in coastal areas such as Coffs Harbour to live in purpose-built retirement accommodation. For instance, Urban Economics’s analysis in Bundaberg estimates that some 16% of those aged 65+ live in retirement accommodation.

Development of residential aged care within Australia is guided by a government planning ratio of 80 places per 1,000 persons aged 70+. Based on this ratio, residents of the Study Area would have a demand for some ***150 residential aged care places in 2016 and 200 places by 2026.***

The Study Area currently includes the Woolgoolga and District Retirement Village which has 66 residential aged beds and 30 ILUs. Gateway Lifestyle also operate ‘The Pines’ and ‘Lorikeet Park’ manufactured home parks for over 50’s which have 264 approved home sites of which approximately 50% are occupied. There is a need to ensure choice in the timely provision of age and sector appropriate housing in the Study Area and Coffs Harbour.



Opal Aged Care facility, The Lakes

4.5 IMPLICATIONS

There are numerous factors driving the demand for new residential development and the demand for detached housing lots within the Woolgoolga area including:

- Low interest rates and the availability of finance,
- Improved employment prospects and labour markets within the Coffs Harbour region,
- Affordable housing options relative to other major markets along Australia's east coast; and
- A fundamentally solid rental market which is attractive for residential property investment.

Residents of the Study Area community have a propensity for demand for affordable detached housing for families, but also a choice in residential product catering to retirees, older persons and other more compact households.

Based on population growth alone, the Study Area is projected to require an additional 2,600 dwellings between 2017 and 2036 or more than 130 new dwellings per annum over this period. A significant share of this dwelling demand will continue to be directed to detached dwellings and therefore demand for residential lots.

5.0 DEMAND AND SUPPLY CRITIQUE

5.1 SEQUENTIAL SITE ANALYSIS

This section seeks to summarise the case for the subject site to establish as an important residential land release area within the Woolgoolga area, prior to the existing planning timeframe of 2031. It is Urban Economics's view that the subject site represents the most sequentially logical englobo land parcel within the region which could accommodate residential development from an economic perspective. The following supports this view:

- Approximately 38.3ha of land slated to support 353 residential lots from 2016 within the Our Living City Settlement Strategy as 'growth areas' have yet to commence any advanced planning or had any plans progressed which would see them contribute to supply within Woolgoolga in the short to medium term. A further 30.4ha and 300+ dwellings have stalled in development within the Woolgoolga Heights estate.
- The subject site is proximate to Woolgoolga High School, the only secondary education facility between Orara High School to the south and facilities within Grafton some 55km driving to the north.
- A substantial amount of land area within the Coffs Harbour region is quite undulating and sloped. Construction costs for dwellings on sloped land is considerably higher than flat sites. Whilst the subject site has some undulation; the proposed development has the potential to provide 'easy to build' lots; contributing to the ultimate affordability of housing in the locality.
- Other significant proposed projects such as Sandy Beach North have considerable environmental constraints, similarly limiting their potential contribution to residential land supply within the Woolgoolga Study Area. The subject site is largely cleared and set back from waterways and the coast, limiting its environmental constraints and subsequent potential for delivering the proposed development.
- The proposed development would contribute to, and support the construction of, the West Woolgoolga Sports Facility which will be an important piece of community infrastructure once completed.
- The subject site is within 2km of the Woolgoolga activity centre and just 1km from the Woolgoolga Woolworths shops, consolidating households within the catchment areas for these centres and contributing to the vibrancy and vitality of these centres as well as ensuring the development of residential activity within proximity of convenience and weekly shopping and services.



Woolworths Woolgoolga

- The subject site would deliver a masterplanned development offering certainty in ongoing supply of residential land within Woolgoolga proximate to services and community facilities in maximising an affordable lifestyle for residents.

5.2 IMPLICATIONS FOR LAND SUPPLY & THE PROPOSED DEVELOPMENT

- Residential development inherently has a level of ‘supply-led’ demand. That is, without the delivery of the appropriate housing product and residential land, demand from population growth cannot be accommodated or eventuate. Woolgoolga is planned to include a significant share of the population growth within Coffs Harbour, but the area is currently hamstrung as a result of uncertainty in the delivery of appropriate residential development.
- Some smaller and existing residential developments such as the Nautical Fairways estate have not benefited from the sales momentum that is achieved through the creation of a large, staged and masterplanned community. The proposed development would contribute almost 300 lots and potentially integrate aged care and retirement facilities proximate to numerous community facilities; creating a development which is attractive for purchasers and capitalising on the ‘Delfin Effect’ which acknowledges the success of masterplanned communities by the former Delfin Group (now Lend Lease).
- The actual release and development of most ‘*proposed agreed growth area*’ land within the Settlement Strategy has little potential of actually keeping pace with the planned release ‘*from 2016*’. The subject site is more ‘shovel ready’ and proximate to the Woolgoolga activity centre and facilities; which is sequentially superior to much of the land release areas than the planned post-2031 development timeframe.

- The Woolgoolga locality is experiencing a decrease in affordability, a feature which in the past has made it an attractive place to establish a home. Urban Economics’s investigations have revealed that there are no longer any lots available within the Woolgoolga Study Area within the sub-\$200,000 price bracket with the minimum lot now marketed from \$220,000 in existing developments. The proposed development would contribute to reducing the increasing growth rate of residential land in Woolgoolga and continue to promote the area for affordable living for families and retirees alike.
- Generally, future land planning should allocate at least seven years of residential supply in creating a balanced market which is developed in a timely manner and is not impacted by inflationary price pressures. Confidence in future land supply and delivery is critical to maintaining housing affordability. Existing lots, approved developments and zoned/high potential residential land represents an estimated 310 lots or approximately 3years supply within the Study Area, allowing for a mix of attached and alternative dwelling forms.
- Between 3 to 5 years is typically required for the delivery of lots to market from residential concept through application to marketing, necessitating continuity in residential land supply.
- This land supply analysis assumes that all approved, zoned and high potential residential land is developed and within a timely period. This is subject to several local and market vagaries including the intentions and capacities of land owners, commercial developability and viability of various land parcels and development options and the mix of product delivered to the market. In reality, this 3 years supply may in effect be considerably reduced, however, for the purposes of this consultancy we have applied the “ultimate” development scenario in examining the potential demand for the proposed residential development.
- Based on demand and the projected take up of land, the proposed development would represent approximately 3 years supply of detached residential housing lots from 2021. TABLE 5.1 outlines the land supply critique within the Woolgoolga Study Area, identifying the potential for the development to proceed in the short to medium term (prior to 2021).
- Whilst the potential and proposed supply suggests a supply of around 3 years, residential lots which are actually available to the market for purchase within Study Area developments represent only 2 to 3 months supply; limiting choice and affordability, which is evidenced by the sharply escalating price for lots within the area.

TABLE 5.1: Supply Potential Critique

Name	Status	Land Area	Total Lots	Lots Sold	Lots Available	Potential	High Potential Supply
Woopi Beach Estate	Stage 2 sales	9.5ha	150	42	108	High	108
Woolgoolga Heights	Pre-sales	4.92ha	50	0	0	Low	-
North Sandy Beach	Complete	8.4ha	82	82	0	-	-
Seacrest at Sandy Beach	Stage 1 & 2 complete	18.8ha	166	166	0	High	-
Nautica Fairways Estate	Stage 11 sales	18.5ha	209	201	8	High	25
Emerald Beach Estate	Stage 3	11.5ha	76	70	6	High	6
Balance of zoned englobo land	Zoned Urban - Residential	15ha	150	0	0	High	150
Proposed Growth Areas from 2016							
2 Arrawarra Rd, Mullaway	Approved	3.1ha	22	0	0	High	22
220 Arrawarra Rd, Arrarwarra	?	2.1ha	21	0	0	Low	-
Woolgoolga Golf Course	?	14.2ha	120	0	0	Low	-
Red Rock Rd, Corindi	?	15.8ha	158	0	0	Low	-
97 Pacific St, Corindi	?	5ha	50	0	0	Low	-
201-203 Arrawarra Rd, Arrarwarra	?	0.4ha	4	0	0	Low	-
Sandy Beach North	Proposed	49.6ha	280	0	0	Low	-
Proposed Growth Areas from 2031							
Subject Site - Bark Hut Rd, Woolgoolga	Proposed	25.7ha	293	0	0	High	293
Lot 2 on DP1143755, Pacific Highway Woolgoolga	Proposed	53.9ha	540	0	0	Low	-

6.0 CONCLUSION

The residential market in Coffs Harbour and the Study Area is demonstrating a supply-led market including signs of decreasing affordability and more limited choice in available residential product. It is important to ensure the timely delivery of residential land to maintain confidence in the residential market and in the ongoing delivery of affordable residential lifestyles for the Coffs Harbour community. A 7 to 8 year lead time is critical in ensuring sufficient residential land supply is available in maintaining affordability and confidence in the local residential market.

Underlying demand drivers are indicative of increasing population growth and demand for residential lifestyles in Coffs Harbour and the Study Area, bringing forward population projections and dwelling demand within the Study Area.

It is estimated that there is only 3 years of supply available to the market within the Study Area, including land that is currently not being developed and subject to owner intents and commercial viabilities.

Whilst the timeframe for approval and development of the subject site may not see the creation and release of lots until 2019, the existing supply of residential land and high potential proposed developments in Woolgoolga, dictates that the subject site would be able to contribute to land supply and housing affordability within Coffs Harbour and Woolgoolga significantly prior to the existing post-2031 planning horizon.

More particularly there is compelling demand to bring forward the supply of well located, residential land that will deliver affordable lifestyles for the Woolgoolga Study Area and wider Coffs Harbour community.

The subject site is a sequentially superior residential development site within the Woolgoolga area, and best positioned to accommodate demand within the locality, compared with other planned growth areas, whilst offering prospective residents proximity and accessibility to services and maximising the commercial viability of the catchments for the nearby retail and commercial centres.

Significantly, the location of the subject property, its capacity to be developed as a masterplanned community and its topography, contribute to the commercial viability of the subject property to deliver affordable lifestyles for the Woolgoolga community, relative to other less well located and developable designated sites within the Study Area.

Appendix C ~ Bushfire Risk Assessment



Bushfire Risk Assessment

Solitary Islands Way, Woolgoolga

Part Lot 202 DP874273



March 2019



Resource Design & Management Pty Ltd

361 Harbour Drive
PO Box 4430

COFFS HARBOUR JETTY NSW 2450
www.resdesman.com.au

02 6651 2688

Bushfire Risk Assessment

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Limitations Statement

The sole purpose of this report and the associated services performed by Resource Design and Management Pty Ltd is to provide a Bushfire Risk Assessment at the subject site.

Resource Design and Management Pty Ltd derived the data in this report primarily from a number of sources which included site inspections, correspondence regarding the proposal, examination of records in the public domain, interviews with individuals with information about the site or the project, and field explorations conducted on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further examination / exploration of the site and subsequent data analyses, together with a re-evaluation of the findings, observations and conclusions expressed in this report.

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1. Introduction

This report has been prepared by Resource Design & Management Pty Ltd (RDM) for the purpose of undertaking a Bushfire Risk Assessment for the proposed rezoning of the subject land for residential purposes. The subject land being part Lot 202 in DP 874273, Bark Hut Road, Woolgoolga.

This report has been prepared to address Direction 4.4 (Planning for Bushfire Protection) of Section 9.1 (2) [previously S.117 (2)] of the *Environmental Planning and Assessment Act, 1979*, and the requirements of draft *Planning for Bushfire Protection, 2018* (PfBP 2018). Whilst *Planning for Bushfire Protection, 2006* (PfBP 2006) is still current, it is appropriate to consider PfBP 2018 in the context of its imminent release.

Draft PfBP 2018 used for this assessment is a pre-release version issued in August 2018.

1.1 Background

The subject site is located in the Coffs Harbour Local Government Area and is approximately 1.5 kilometres north of the coastal village of Woolgoolga. The site is situated on the western side of Solitary Islands Way, opposite Woolgoolga High School as shown in **Figure 1** below.

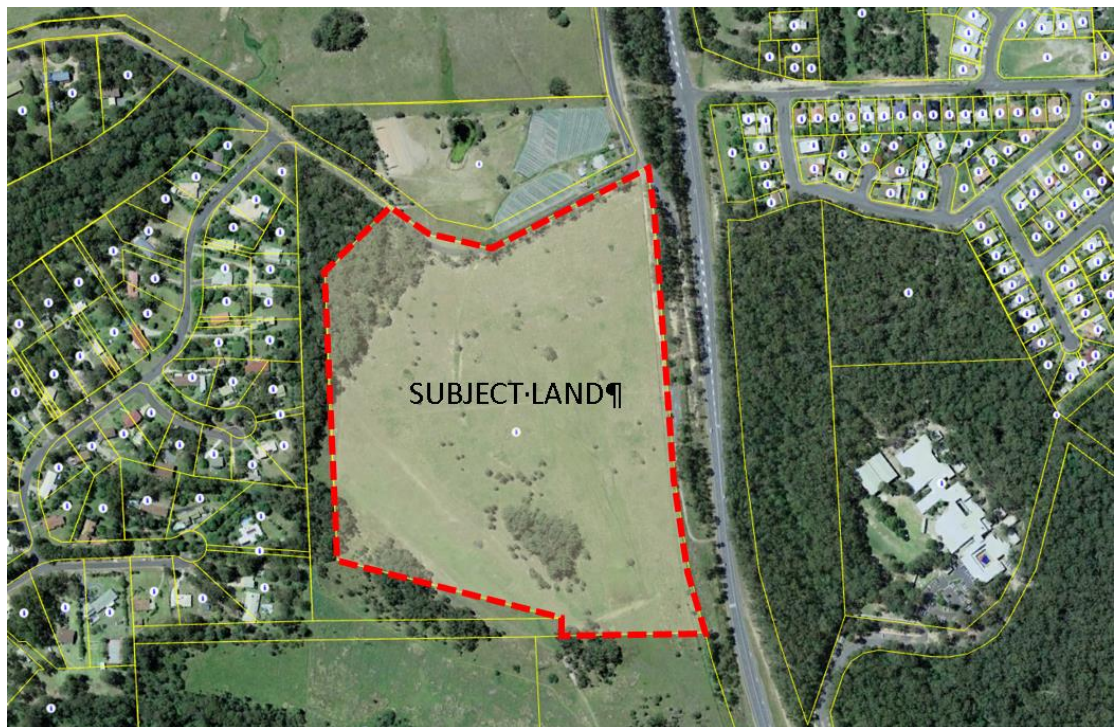


Figure 1: Locality

Source: NSW Globe/Google Earth

The site is currently zoned RU2 Rural Landscape under the provisions of the Coffs Harbour Local Environmental Plan 2013 (CHLEP 2013) and consists primarily of open pasture/grassland with a few areas of forest and isolated clumps of forest. Based on the Biodiversity Impact Assessment undertaken by ERM for the site none of the forest contained within the site holds any significant environmental value in terms of habitat.

This report has been prepared to assess the bushfire risk associated with the rezoning of the land to a R2 Low Density Residential zone under the provisions of LEP 2013.

1.2 Proposed Rezoning/Development

The land has previously been identified in the *Coffs Harbour Local Growth Management Strategy 2008 – Urban Lands Component* as a potential future urban investigation land subject to the outcome of detailed investigations and studies, being the Planning Proposal.

The Biodiversity Impact Assessment undertaken by ERM has not identified any areas of environmental significance on the site. It is understood given this fact, that the whole of the site is being considered for low and possibly density residential purposes and the forest areas within the site are unlikely to remain or will be highly modified so as not to present a bushfire hazard.

The site is bordered to the south and west by land zoned RE1 Public Recreation under LEP 2013. The land to the south has been earmarked by Coffs Harbour City Council as a future sporting complex containing numerous sporting fields, children’s playground, amenities buildings, carparking and access roads. Council’s intention to proceed with the development of the land for this purpose has been demonstrated by the recent undertaking of preliminary earthworks and the recent announcement by the State government to allocate funds to construct the community hall on the site. It is considered that the rezoning and development of the subject site for residential purposes will be a key impetus for progressing the sports complex.

1.3 Purpose of Bushfire Assessment Report

The strategic planning phase of development is an important step in creating liveable communities. It is an effective way to provide bushfire protection in new development areas. The objective of the strategic planning phase is to assess the suitability of the site for the intended purpose. Hence, the purpose of this report is to address the Local Planning Directions under Sec.117 (2) of the *Environmental Planning and Assessment Act, 1979* as set out in Section 4.4 Planning for Bushfire Protection as provided below:

1.3.1 Objectives

- 1) The objectives of this direction are:
 - a) 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
 - b) to encourage sound management of bush fire prone areas.

1.3.2 Where this direction applies

- 2) This direction applies to all local government areas in which the responsible Council is required to prepare a bush fire prone land map under section 146 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

1.3.3 When this direction applies

- 3) This direction applies when a relevant planning authority prepares a planning proposal that will affect or is in proximity to land mapped as bushfire prone land.

1.3.4 What a relevant planning authority must do if this direction applies

- 4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 56 of the Act, and prior to understanding community in satisfaction of section 57 of the Act, and take into account any comments so made,
- 5) A planning proposal must:
 - a) have regard to Planning for Bushfire Protection 2006, introduce controls that avoid placing inappropriate developments in hazardous areas, and
 - b) ensure that bushfire hazard reduction is not prohibited within the APZ.
- 6) A planning proposal must, where development is proposed comply with the following provisions, as appropriate:
 - a) provide an Asset Protection Zone (APZ) incorporating at a minimum:
 - i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and
 - ii) an Outer Protection Area Managed for hazard reduction and located on the bushland side of the perimeter road,

- b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with,
- c) contain provisions for two-way access road which links to perimeter roads and/or to fire trail networks,
- d) contain provisions for adequate water supply for firefighting purposes,
- e) minimise the perimeter of the area of land interfacing the hazard which may be developed,
- f) introduce controls on the placement of combustible materials in the Inner Protection Act.

1.3.5 Consistency

- 7) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the non-compliance, the NSW Rural Fire Service does not object to the progression of the planning proposal.

2. Bushfire Assessment Matters

The following matters have been considered in assessing the bushfire protection measures necessary in determining the suitability of the site for future residential development.

2.1 Site Location and Description

The subject site is located in the Coffs Harbour Local Government Area and is approximately 1.5 kilometres north of the coastal village of Woolgoolga. The site is situated on the western side of Solitary Islands Way, opposite Woolgoolga High School as shown in **Figure 1** above. The Coffs Harbour LGA is considered to be less prone to bushfire attack and has been rated with a Fire Danger Index (FDI) of 80.

The site is bounded along its southern side by the future West Woolgoolga Sports Complex. The western boundary adjoins a narrow strip of forested public reserve approximately 30 metres wide adjacent to a large lot residential estate known as the “Country Club Estate”. To the north, the site is bounded by Bark Hut Road with an active horticultural use on the opposite side of Bark Hut Road.

2.2 Bush Fire Prone Land Mapping

The subject site is identified as being bushfire prone in Coffs Harbour City Council’s online Bush Fire Prone Land Mapping (BFPLM). The site is impacted predominantly by bushfire hazards beyond the boundaries of the property. However, an area of Category 1 vegetation is located at the north west corner of the property and vegetation clusters located towards the southern boundary are identified as Category 2.

Category 1 vegetation is considered to be the highest risk for bush fire. This vegetation has the highest combustibility and likelihood of forming fully developed fires including heavy ember production.

Category 2 vegetation is considered to be a lower bush fire risk. This vegetation has lower combustibility and /or limited potential fire size due to the vegetation area shape and size, land geography and management practices.

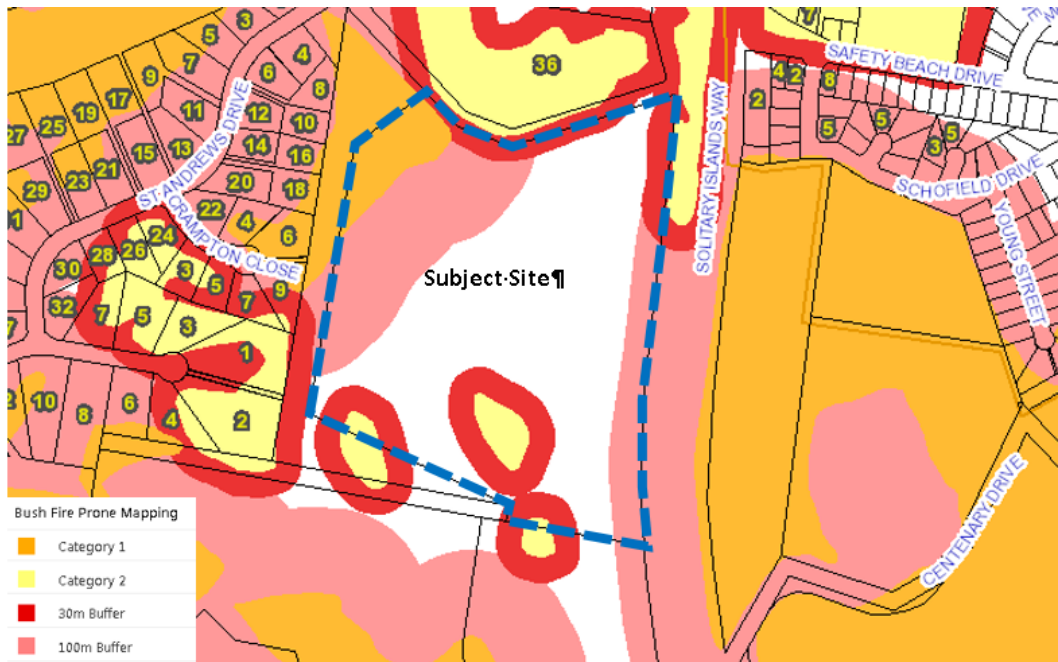


Figure 2: Bushfire Prone Land Mapping

Source: Coffs Harbour City Council

Beyond the site boundaries the major area of Category 1 vegetation exists in the northwest corner and to the east on the opposite side of Solitary Islands Way. The eastern area surrounds the Woolgoolga High School and is bordered to the north by the Safety Beach residential area.



Photo 1: From southern boundary looking north



Photo 2: From south eastern boundary, looking north west across the site



Photo 3: Adjacent to Solitary Islands Way, looking north west



Photo 4: Adjacent to Solitary Islands Way, looking due west



Photo 5: Adjacent to Solitary Islands Way, looking south west



Photo 6: Eastern boundary adjacent to Solitary Islands Way



Photo 7: From eastern boundary looking south



Photo 8: From eastern boundary looking west



Photo 9: From north western boundary looking east



Photo 10: Bark Hut Road, from north western boundary looking east



Photo 11: From north eastern boundary looking south



Photo 12: Track along western boundary

2.3 Vegetation classification

The vegetation on site and in the adjoining areas comprises of predominantly either grasslands or dry and wet sclerophyll forests. For the purpose of bushfire planning for this site the surrounding vegetation can be classified as “forest” and “grasslands” in accordance with *“Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT”* (Keith, 2004). The surrounding vegetation types are shown in **Figure 3** below.



Figure 3: Surrounding Vegetation Types
 Source: Google Earth

2.4 Slope and topography

The slope and topography for the site and surrounding areas has been determined using Coffs Harbour City Council’s online mapping showing two (2) metre contour intervals as shown below in **Figure 4**.

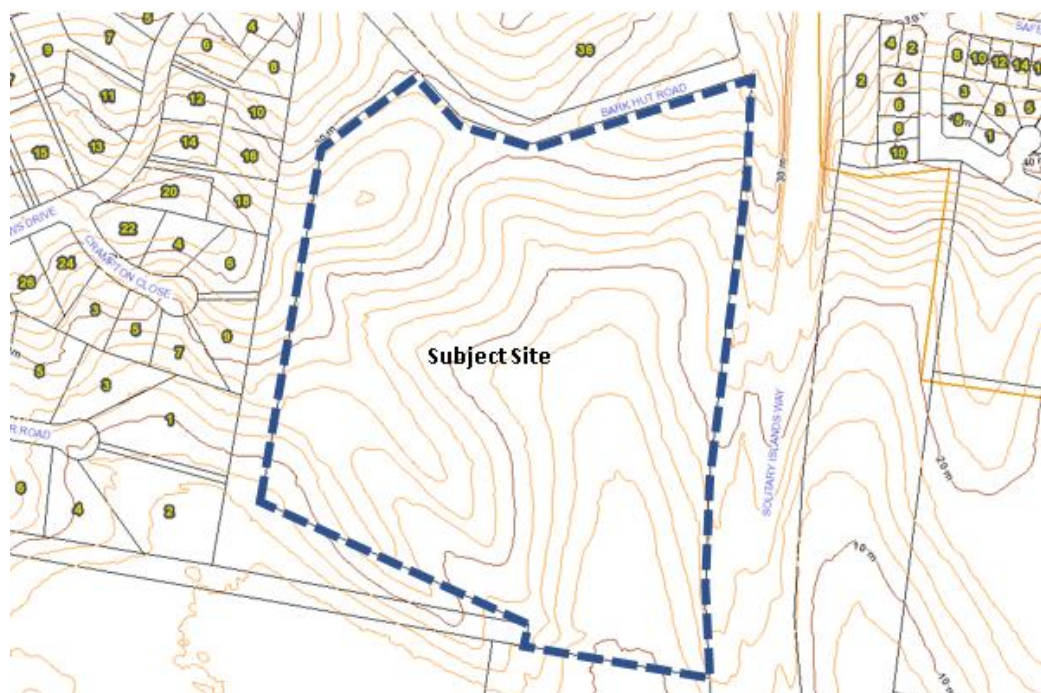


Figure 4: Topography
 Source: Coffs Harbour City Council

The slope under the bushfire hazard has a direct relationship to the spread of fire, its intensity and ultimately its ultimate level of radiant heat flux. The effective slope of the ground under the hazard has been determined from the edge of the hazard to a distance of 100 metres beyond. **Figure 5** below indicates the effective slope analysis undertaken for the subject site.

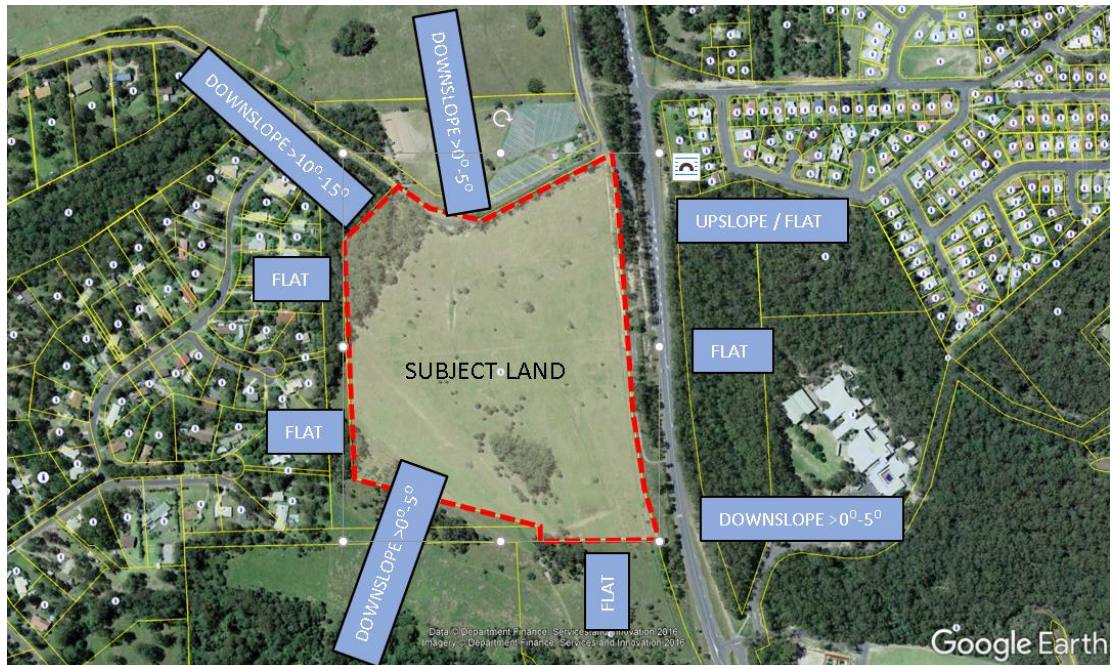


Figure 5: Effective Slope Analysis

Source: Google Earth

2.5 Significant Environmental Features

The Biodiversity Impact Assessment undertaken by ERM for the site does not identify any significant environmental features on the site.

2.6 Details of threatened species known to exist

Council's mapping indicates the site contains some areas of secondary and tertiary koala habitat. However, the Biodiversity Impact Assessment prepared by ERM suggests the identified vegetation does not form part of any habitat linkages and the area is not known to be utilised by koalas.

2.7 Detail and location of any aboriginal relic or place

The *Aboriginal Cultural Heritage Assessment Report* identifies two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) on the access trail immediately south of the Bark Hut Road entrance to the Project Area. These consisted of

stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed.

3. Bushfire Risk Assessment

The following section addresses the various bushfire risks associated with the vegetation on the site and adjoining lands post-development. In other words, the purpose of the planning proposal is to determine the suitability of the site for future residential development.

As mentioned previously the Biodiversity Impact Assessment undertaken by ERM did not consider any of the existing vegetation on site to be environmentally significant in terms of habitat. Accordingly, the post-development scenario for the assessment of bushfire risk assumes all vegetation on site will either be removed or modified so as not to present a hazard. The assessment also acknowledges that the adjoining land to the south is planned to be developed as a sportsground in conjunction with the development of the site.

3.1 Asset Protection Zones

The Asset Protection Zone (APZ) is the buffer zone between the bushfire hazard and adjacent buildings. The APZ is a managed area comprising of both an inner and outer protection area. The area is managed progressively to minimise fuel loads and reduce radiant heat levels, flame, smoke and ember attack. The appropriate APZ widths are determined using **Table 1** of PfBP 2018 which are determined based on the Fire Danger Index (FDI), vegetation type, slope and development type as shown below.

Table 1: Asset Protection Zones					
Keith Vegetation Format	Effective Slope				
	Up Slopes and Flat	>0"-5"	>5"-10"	>10"-15"	>15"-20"
Rainforest	9	12	15	20	25
Forest (Shrubby and Grassy) including Coastal Swamp Forest. Pine Plantation and Sub-Alpine Woodland	20	25	31	39	48
Woodland (Grassy and Woody)	11	13	17	21	27
Forested Wetland	8	10	13	17	22
Tall Health	15	16	18	21	23
Short Health	10	11	13	14	16
Arid-Shrublands (Acacia and chenopod)	7	8	9	10	11
Freshwater Wetlands	6	7	8	9	10
Alpine Complex	7	8	8	10	11
Grassland	10	11	12	14	16

The APZ can include roads or properties managed appropriately to be consistent with the standards set out in Appendix 4 of the PfBP 2018 and the NSW Rural Fire Service document “Standards for Asset Protection Zones”.

The APZ for forest vegetation consist of two areas:

- **Inner Protection Area (IPA)** which is the area closest to the buildings, incorporating the defendable space and for managing heat intensities at the building face.
- **Outer Protection Area (OPA)** which is for reducing the potential flame length by slowing down the rate of spread, filtering embers and suppressing crown fires.

For the purpose of this assessment each area representing a potential bushfire hazard is looked at individually. The combined results are shown in **Figure 7** which follows.

3.1.1 Northern Site Boundary

The subject site is bordered on the north by Bark Hut Road which is a two-way bitumen sealed public road. On the opposite side to the site the property is used for intensive horticultural uses. The land is well managed and offers minimal potential of supporting a bushfire. Accordingly, the land is deemed to be managed land as defined in PfBP 2018. Such land does not require provision of any APZ. In addition, the land is separated from the subject site by Bark Hut Road further minimising any future potential for bushfire attack from this area.

3.1.2 Eastern Site Boundary

The eastern boundary of the site is bordered by Solitary Islands Way which is three (3) lanes wide for its entire frontage. Beyond Solitary Island Way is an area of bushland potentially representing the highest risk of bush fire attack with respect to the subject site. The bushland is extensive and contained within the area is the Woolgoolga High School and playing fields.

The bushland is classified as “forest” as shown in **Figure 3**. The slope under the vegetation is generally flat for the middle part of and upslope at the northern end. The southern end is slightly downslope at between 0° – 5°.

Using **Table 1** the minimum distances for APZ’s for residential development in a FDI 80 area are set out below.

Keith Vegetation Formation	Upslope and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
Forest (Shrubby and Grassy) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	20	25	31	39	48

From the above a minimum APZ distance of 20 metres should be provided from the eastern forested area. The major vegetation is separated from the subject site by approximately 65 metres of potential APZ containing Solitary Island Way and a disconnected and degraded vegetated verge area. The disconnected and degraded verge vegetation is considered to form the outer protection area of the APZ. However, taking a conservative approach, we recommend an APZ distance of 15 metres should apply at the eastern boundary of the subject site.

3.1.3 Southern Site Boundary

The southern site boundary adjoins an area earmarked by Coffs Harbour City Council for development as a future sports complex. A copy of the preliminary masterplan is provided below. Council has already demonstrated its intentions to proceed having recently undertaken preliminary earthworks on the site.

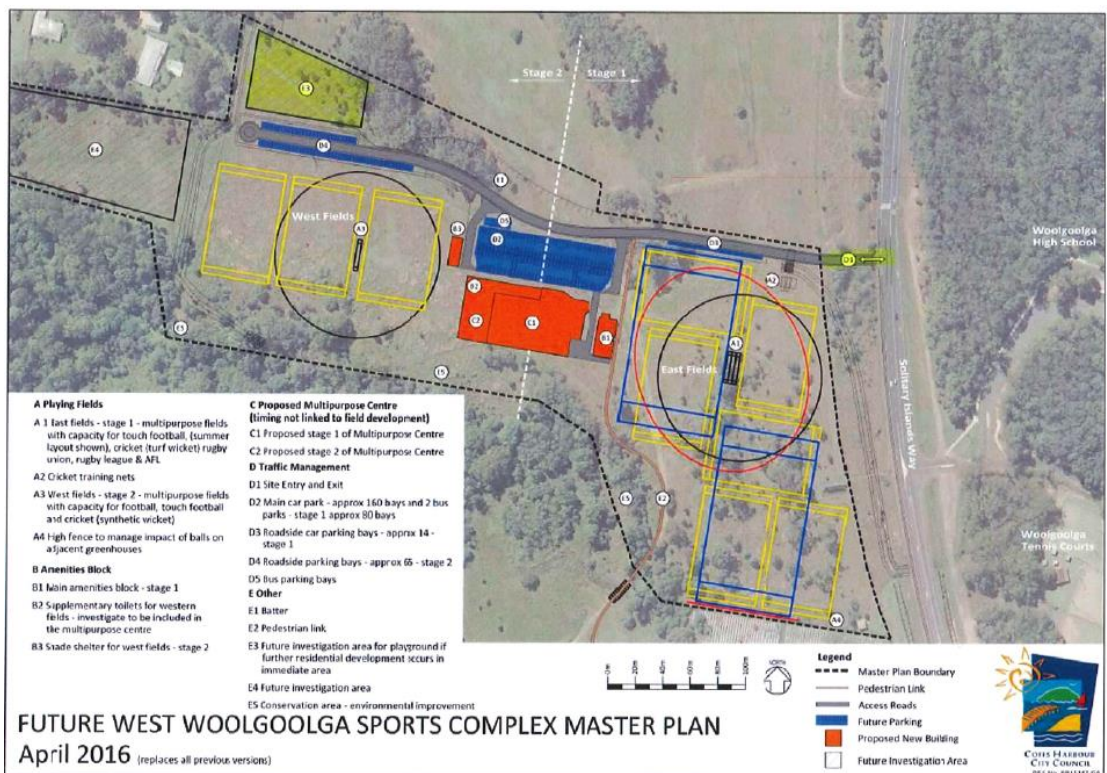


Figure 6: Woolgoolga Sports Complex Master Plan

Source: CHCC

Given the future development of the area is earmarked for a Sports Complex, the site does not represent a future potential bushfire risk. The area is generally flat and has been stabilised with grass since the preliminary earthworks were undertaken. Accordingly, the land is deemed to be managed land as defined in PfBP 2018. Such land does not require provision of any APZ, however in the short term prior to its development the area is best treated as grassland.

At the western end of the southern site boundary, the effective slope is downslope at between 0° – 5°. from the subject site. Given the vegetation is predominantly grassland with some individual forest trees and the short fire run it has been treated as grassland

Using **Table 1** the minimum distances for APZ's for residential development in a FDI 80 area are set out below.

Table 3: Southern Site Boundary					
Keith Vegetation Formation	Upslope and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
Grassland	10	11	12	14	16

From the above a minimum APZ distance of 10 metres should be provided from the southern boundary area. Presuming road access to Solitary Islands Way is shared between the subject site and the future Sports Complex it is most likely that a perimeter road will be provided along the southern boundary. Should this occur then the required APZ for grasslands will be accommodated within the road reserve.

3.1.4 Western Site Boundary

The western site boundary adjoins a public reserve approximately 30 metres wide. Beyond the public reserve is the “Country Club Estate” which is a large lot residential estate extending the full length of the western site boundary. Whilst the public reserve is predominantly forested the adjoining estate is generally well managed land with some larger trees and minimal understorey.

Apart from the northern end which will be discussed below, the effective slope is generally flat or upslope from the subject site. Given the narrowness of this area and its associated slope, it does not represent a significant risk to future residential development of the site. The vegetation can be downgraded in accordance with Clause A1.11.1 of PfbP 2018. In this case the vegetation can be downgraded to rainforest.

Using **Table 1** the minimum distances for APZ's for residential development in an FDI 80 area are set out below.

Table 4: Western Side Boundary A					
Keith Vegetation Formation	Upslope and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
Rainforest	9	12	15	20	25

From the above a minimum APZ distance of 9 metres should be provided from the western boundary. Presuming that a perimeter road will be provided along the western

boundary then the required APZ for rainforest will be accommodated within the road reserve.

With respect to the northern end of the public reserve, it provides for a higher potential bushfire risk due to its widening and effective slope. The area which is triangular in shape is heavily vegetated and is downslope 10°-15° from the site.

Using **Table 1** the minimum distances for APZ's for residential development in an FDI 80 area are set out below.

Table 5: Western Site Boundary B					
Keith Vegetation Formation	Upslope and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
Forest (Shrubby and Grassy) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	20	25	31	39	48

From the above a minimum APZ distance of 39 metres should be provided at the north-western corner of the site.

3.2 Recommended Asset Protection Zones

On the basis of the previous discussions, it is recommended that the APZ distances shown in **Figure 7** below are sufficient for bushfire protection purposes in accordance with draft *'Planning for Bushfire Protection, 2018'* with respect to low density residential purposes.

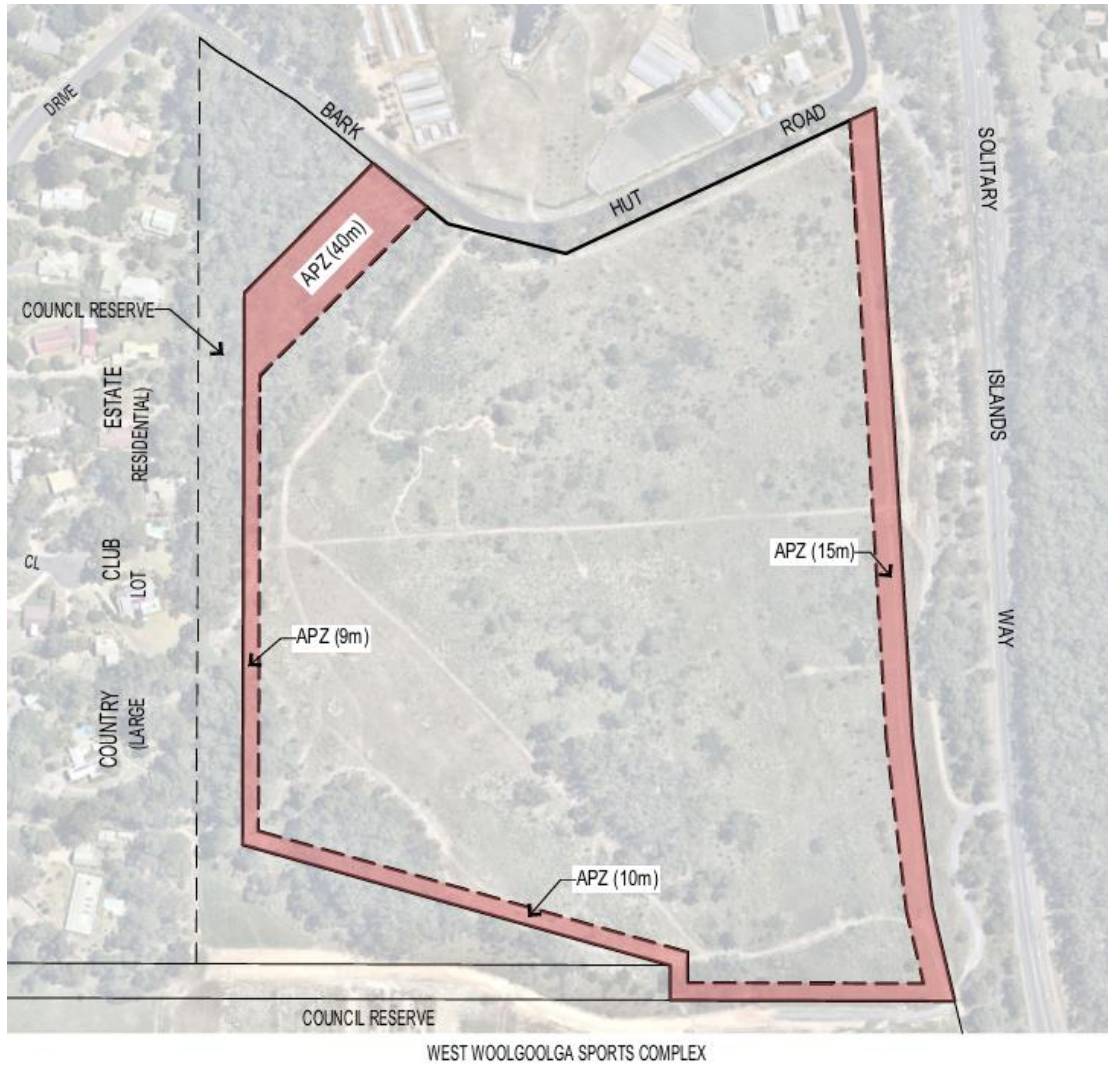


Figure 7: Asset Protection Zones

Source: RDM

4. Assessment Recommendations

Having regard to the discussion provided herein, it is Resource Design and Management's opinion that the potential bushfire risk impacting the subject site does not represent a significant impediment to the future development of the land for residential purposes. The bushfire assessment provided in this report has been prepared in accordance with Section 117 (2) Direction 4.4 – '*Planning for Bush Fire Protection*', *Planning for Bushfire Protection 2006* and draft *Planning for Bush Fire Protection 2018*.

The report recommends the provision of appropriate APZ's around the perimeter of the site to provide protection in the event of a bushfire attack from the adjoining lands. The recommended APZ distances are based on a number of assumptions as listed below:

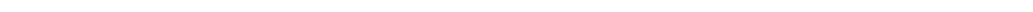
- The existing site vegetation is either wholly removed or at least modified to no longer represent a bushfire hazard.
- The disconnected and degraded road verge vegetation on the eastern boundary is maintained as an outer protection area.
- The adjoining property to the south is developed as a future West Woolgoolga Sports Complex generally in accordance with the associated master plan.
- The site is predominantly serviced by a series of perimeter roads and a secondary access is provided to Bark Hut Road for emergency access only.

A number of strategies have been provided in the form of planning controls to ensure that the risk from bushfire can be minimised and future rezoning or development approval processes can be streamlined. These include:

- Ensuring adequate setback from bushfire prone vegetation (APZs);
- Ensuring adequate access and egress from the subject site through a well-designed road system;
- Considering the adequacy of water supply and the delivery of other services (gas and electricity);
- Providing for effective and ongoing management of APZs; and
- Considering construction standards (AS3959) implications for future developments depending on ultimate development type.

Should the above development scenarios not eventuate, the APZ distances and location will need to be re-evaluated at the development application stage. This further assessment will require a more comprehensive review of the road and lot layout and subsequent planning controls to ensure they are well designed in terms of bushfire protection outcomes.

Appendix D ~ Land Use Conflict Risk Assessment



Land Use Conflict Risk Assessment

Planning Proposal Residential Rezoning for land
located at Lot 202 in DP 874273 (northern portion
only) – Woolgoolga



**HEALTH SCIENCE ENVIRONMENTAL EDUCATION
ENVIRONMENTAL AUDITOR**

Land Use Conflict Risk Assessment

Planning Proposal Residential Rezoning for land
located at Lot 202 in DP 874273 (northern portion
only) – Woolgoolga

Prepared for: Resource Design Management

Date: 29 March 2019

Job No. 55/2018

Version: REVISED FINAL

Tim Fitzroy & Associates

ABN: 94120188829

ACN: 120188829

environmental

Tim Fitzroy

**Environmental Health Scientist
Environmental Educator
Environmental Auditor**

**61 Pine Avenue
East Ballina NSW 2478
T | 02 6686 5183
M | 0448 483 837
tim@timfitzroy.com.au
www.timfitzroy.com.au**

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1. Introduction

Tim Fitzroy & Associates (TFA) has been engaged by Resource Design Management to undertake a Land Use Conflict Risk Assessment (LUCRA) to accompany a *Planning Proposal* to Coffs Harbour City Council for land located at Lot 202 DP 874273 (northern portion only) Bark Hut Road Woolgoolga to permit a residential rezoning (see Locality Plan **Illustration 1.1**).

The whole of lot 202 is 25.64 hectares with the northern portion being 16.41ha and the southern portion (not part of the subject Planning Proposal) has an area of 9.229ha. The existing configuration is provided in **Illustration 1.2**.

The key constraint regarding the proposed rezoning is the blueberry farm to the immediate north.

The subject site is zoned as follows under the Coffs Harbour LEP 2013:

- RU2 Rural Landscape.

The *Living and Working in Rural Areas Handbook* (Department of Primary Industries et.al 2007) denotes a number of recommended buffer distances to residential development. The relevant buffer distances to a future residential land release is

- **200 metres to greenhouse and controlled environment horticulture.**

It should be noted Councils Development Control Plan (DCP) 2015 refers to the *Living and Working in Rural Areas Handbook* (DPI 2007).

LUCRA's were initially conceived in the *Living and Working in Rural Areas Handbook* (Department of Primary Industries et.al 2007) by the Centre for Coastal Agricultural Landscapes in partnership with the Northern Rivers Catchment Management Authority as a tool to better manage potential land use conflicts between residential development and rural activities and environmental attributes/assets on the NSW North Coast.

The actual width of any buffer should in practice be dependent on the most limiting factor involved (i.e. the factor that will require the widest buffer). In theory, this would lead to all other factors being adequately addressed.

The *Planning Proposal* should be designed to minimise instances of incompatibility such that normal farming practice are not inhibited and natural ecosystems and attributes are enhanced where possible. Where such instances do arise, measures to ameliorate potential conflicts should be devised wherever possible.

Conflict between residential development and agricultural land uses is likely to occur where residential land uses directly abut, or are sufficiently close to, farmland such that they are likely to be affected by agricultural activities. Such conflict can arise from the use of agricultural chemicals noise, dust and odour generating activities. Adverse impacts of residential development on farmland include sediment and stormwater run-off.

When considering potential land use conflict between residential and agricultural activities it is important to recognise that all agricultural activities:

- should incorporate reasonable and practicable measures to protect the environment in accordance with the Protection of the Environment Operations Act (POEO) and associated industry specific guidelines; and
- are legally conducted as required by other legislation covering workplace health and safety, and the use and handling of agricultural chemicals.

Nevertheless, certain activities practised by even the most careful and responsible farmer may result in a nuisance to adjacent residential areas through, for example, unavoidable odour drift and noise impacts. Typical conflicts between agricultural activities and residential development as provided in **Table 1.1** below:

Table 1.1 Typical Conflicts between Agricultural Activities and adjoining residential areas

Noise	<ul style="list-style-type: none"> • Farming equipment, pumps, spray machines, transport. • Ancillary equipment associated with on-farm processing.
Odour	<ul style="list-style-type: none"> • Fertilisers and chemicals.
Health concerns	<ul style="list-style-type: none"> • Chemicals. • Spray drift.
Water	<ul style="list-style-type: none"> • Access. • Pumping. • Quantity. • Runoff, sedimentation
Smoke and ash	<ul style="list-style-type: none"> • Burning of pasture, stubble or 'rubbish'.

The Living and Working in Rural Areas Handbook (NSW DPI et. al 2007), in particular Chapter 6 Development Control, provides guidance in the assessment and mitigation of potential land use conflict matters and has been used as a resource for this Land Use Conflict Risk Assessment (LUCRA). This LUCRA has been prepared to assist Council in assessing potential land use conflicts between the proposed development at the subject site and the neighbouring blueberry farm to the north.

Illustration 1.1

Site Locality



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1.1 Scope of Works

This assessment has been undertaken to determine the potential land use conflicts between the future owners/occupiers of residential dwellings at Lot 202 in DP 874273 (northern portion only) – Woolgoolga and

- the blueberry farming activities at adjoining property to the:
 - north (Lot 1 DP808207).

This Land Use Conflict Risk Assessment (LUCRA) is to accompany a *Planning Proposal* to Coffs Harbour City Council for land located at Lot 202 DP 874273 (northern portion only) Bark Hut Road Woolgoolga to permit a residential rezoning.

The whole of lot 202 is 25.64hectares with the northern portion being 16.41ha and the southern portion (not part of the subject Planning Proposal) has an area of 9.229ha. The existing configuration is provided in **Illustration 1.2**.

The tasks involved in undertaking this assessment were to:

Step 1: Gather information

- Determine the nature of the land use change and development proposed.
- Assess the nature of the precinct where the land use change and development is proposed.
- Appraise the topography, climate and natural features of the site and broader locality
- Conduct a site inspection
- Describe and record the main activities of the surrounding agricultural land use and their regularity, including periodic and seasonal activities that have the potential to be a source of complaint or conflict

Step 2: Evaluate the risk level of each activity

- Record each activity on the risk assessment matrix, and identify the level of risk of a land use conflict arising from the activity.

Step 3: Identify the management strategies and responses that could help lower the risk of the issue resulting in a dispute and conflict

- Identify management strategies for each activity
- Prioritise Strategies
- Provide Performance targets for each activity

Step 4: Record the results of the LUCRA

- Summarise the key issues, their risk level, and the recommended management strategies

SIGNATURES, SEALS AND STATEMENTS of Intention to dedicate public roads or to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

REFERENCE TO CORNERS			
COR.	BEARING	DISTANCE	FROM
A	35° 21' 45"	0.51	R.M.G.I.PIPE FD. D.P. 242839
B	50° 34' 40"	0.61	R.M.G.I.PIPE FD. D.P. 227586
C	230° 34' 40"	1.222	R.M.G.I.PIPE FD. D.P. 227586
D	189° 12' 35"	0.5	R.M.G.I.PIPE FD. D.P. 602323
E	9° 12' 35"	0.5	R.M.G.I.PIPE FD. D.P. 602323
F	9° 12' 35"	1	R.M.G.I.PIPE FD. D.P. 261413
G	189° 12' 35"	4.34	D.H. & WING FD. D.P. 255635
H	53° 49' 55"	1.325	R.M.G.I.PIPE
I	5° 38' 55"	1	R.M.G.I.PIPE FD. D.P. 259757
J	124° 30' 10"	11.71	S.S.M. N° 48785 FD.
K	185° 38' 55"	1	R.M.G.I.PIPE FD. D.P. 259757
L	280° 23' 25"	0.51	R.M.G.I.PIPE
M	63° 56'	0.695	R.M.G.I.PIPE
	268° 20' 20"	10.175	1 OAK

SURVEY PRACTICE REGULATIONS 1990 CLAUSE 32(2)				
MARK	I.S.G. CO-ORDINATES		ZONE	ACC.
	EASTING	NORTHING		
S.S.M. 62126	317 730.118	1667 948.422	5612	2
P.M. 72007	317 847.318	1667 911.238	5612	2
S.S.M. 48785	317 933.603	1669 158.807	5612	2

SOURCE S.O.I.M.S DATE: 2.4.1993
COMBINED SCALE FACTOR 0.99994

DP 874273

Registered: 21.1.1998
 C.A. N° 134/97 OF 27-11-1997
 Title System: TORRENS
 Purpose: SUBDIVISION
 Ref. Map: WOOLGOOLGA Sh. A
 Last Plan: DP 242839*
 DP 259757*

PLAN OF SUBDIVISION OF LOT 20 IN D.P. 800222

Lengths are in metres. Reduction Ratio 1:4000

LGA COFFS HARBOUR
 Locality: WOOLGOOLGA
 Parish: WOOLGOOLGA
 County: FITZROY

This is sheet 1 of my plan in sheets.

GREGORY J. NEWNHAM
 NEWNHAM KARL & PARTNERS
 of 5 MURDOCK ST. COFFS HARBOUR

a surveyor registered under the Surveyors Act 1929, hereby certify that the survey represented in this plan is accurate, has been made in accordance with the Survey Practice Regulation 1990 and was completed on 10th OCTOBER 1997

Signature: *[Signature]*
 Surveyor registered under the Surveyors Act 1929

Plans used in preparation of survey/compilation.

D.P. 800222	D.P. 602323
D.P. 519650	D.P. 255635
D.P. 242839	D.P. 261413
D.P. 227586	D.P. 830936
F.3846 1810	F.4188 1810

PANEL FOR USE ONLY for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

IT IS INTENDED TO DEDICATE LOT 201 TO THE PUBLIC AS PUBLIC RESERVE.

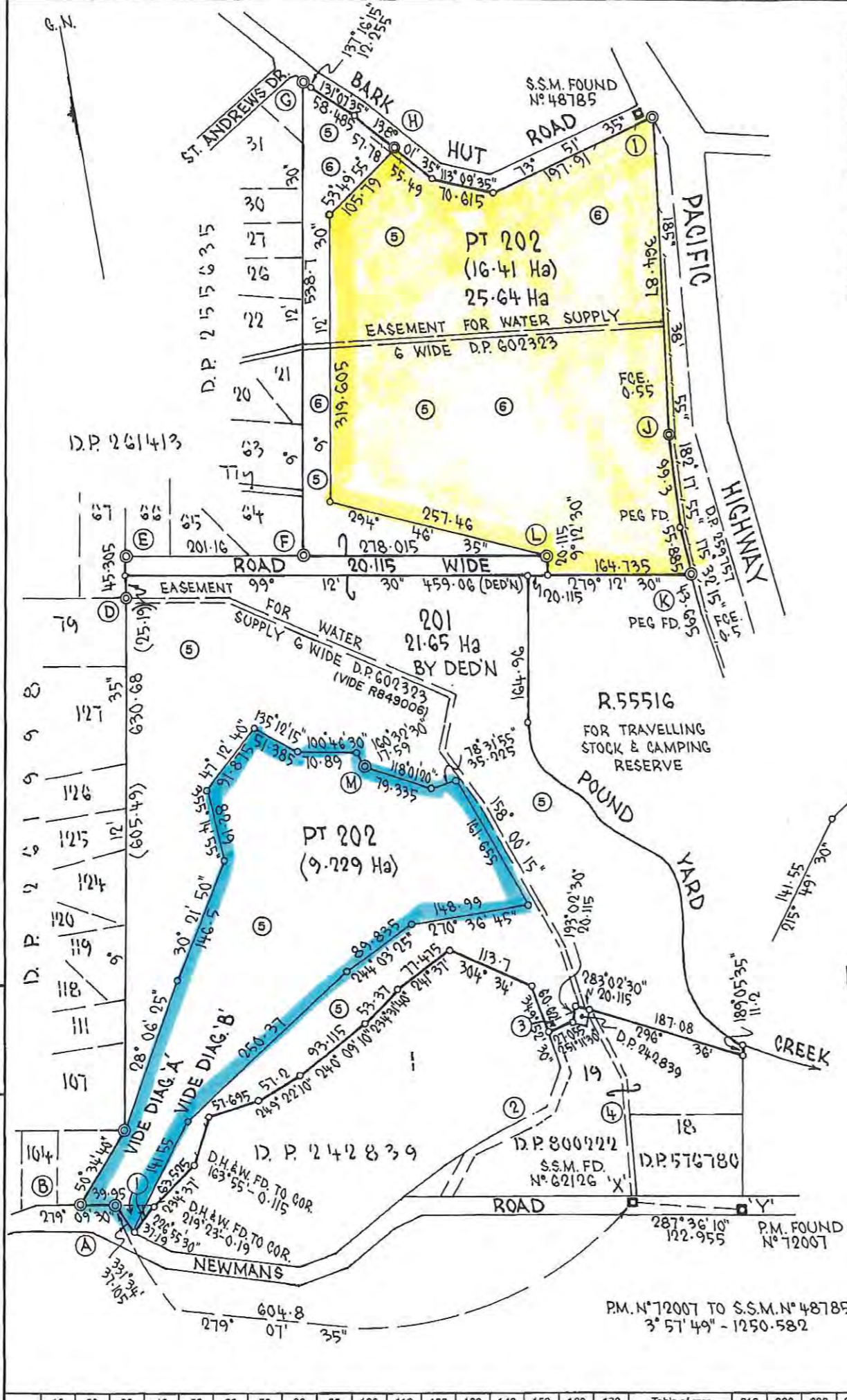


DIAGRAM 'B'

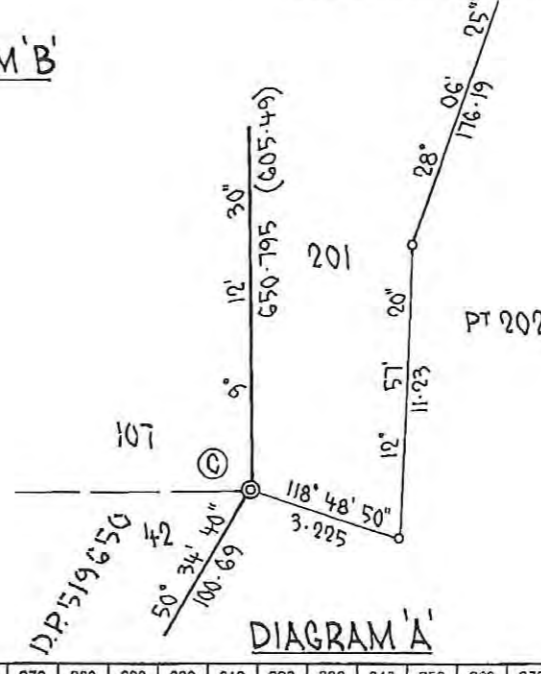


DIAGRAM 'A'

Crown Lands Office Approval

PLAN APPROVED: _____
 Authorised Officer

Land District: _____
 Paper No.: _____
 Field Book: _____ pages

Council'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 Part 3 Division 2 of the Water Board Act 1907, or Part 5 Division 1 of the Hunter Water Board (Corporation) Act 1981

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. 134/97
 Date 27/11/97
 Signature: *[Signature]*
 General Manager/Authorised Person

Council File No. _____

*This part of the 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 Water Board and the Hunter Water Corporation Ltd.

† Delete if inapplicable

10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
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WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

SURVEYOR'S REFERENCE: 1888 2874 NKP.

reg: P686314 / Doc: DP 874273 P / Rev: 23-Jan-1998 / sts: OK OK / Pgs: ALL / Prit: 31-May-2018 08:32 / seq: 1 of 1

DP 874273

2. Gather Information

2.1 Nature of the land use change and development proposed

The subject site is currently vacant. The site includes eucalyptus trees to a height of 25m spaced at between 2 and 5m apart along the northern boundary with Bark Hut Road and along the eastern boundary with Solitary Islands Way. The majority of the site appears to be have been previously cleared. Patches of regrowth are present across the site interspersed with exotic grasses and weeds.

The western and southern western boundary is heavily wooded with native vegetation whilst there is an island of native vegetation in the central southern section of the site. The site slopes from the northern boundary in a southerly direction at between 5 and 20% for approximately 150m whereupon the grade dissipates.

At a distance of 45m south of the northern boundary there is no direct line of site to the blue berry farm.

This Land Use Conflict Risk Assessment (LUCRA) is to accompany a *Planning Proposal* to Coffs City Council for land located at Lot 202 DP 874273 (northern portion only) Bark Hut Road Woolgoolga to permit a residential rezoning.

2.2 Nature of the precinct where the land use change and development is proposed

2.2.1 Topography and Soils

The site is located on the southern side of an east west trending ridge surrounded by undulating terrain. The site ranges from approximately RL 30m to RL 10m

The soils within the subject site consist of duplex soil comprising light to medium clay.

Runoff from the site drains in a south easterly direction via two gullies under the Solitary Islands Way to Woolgoolga Lake.

The subject site is zoned as follows under the Coffs Harbour LEP 2013:

- RU2 Rural Landscape, and

The subject site is vacant. Surrounding land uses include a blueberry farm to the north, the Solitary Islands Way to the immediate east, native vegetation and residential development further to the west and east (See **Illustration 2.1**).

2.3 Meteorology

Due to its latitude and proximity to the coast, Woolgoolga has a coastal sub-tropical climate. As a result, daily temperatures are in the warm to very warm range during summer months (18 - 26°C) and are milder during winter months (8 - 19°C).

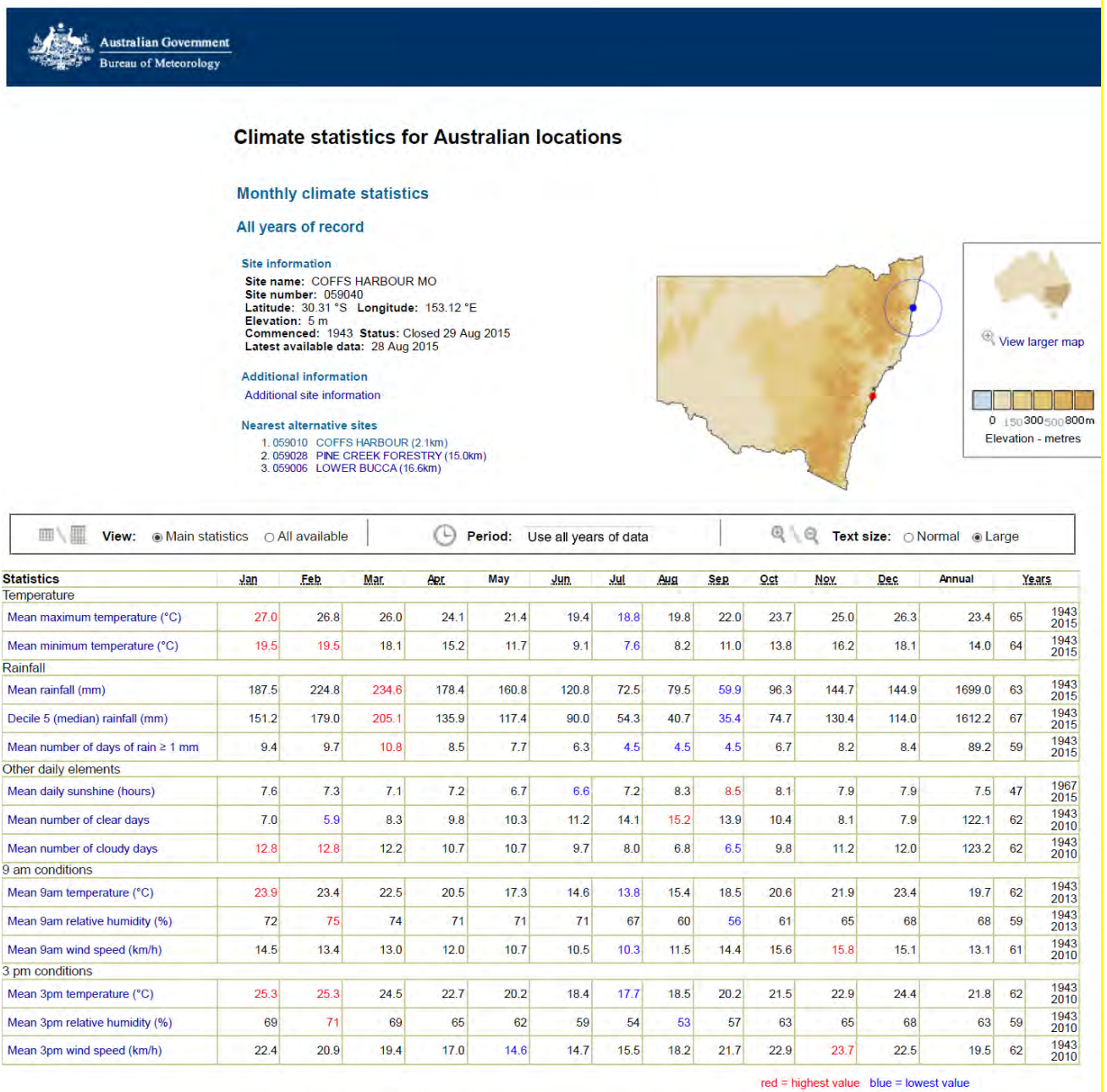
Rainfall is mainly distributed throughout November to May with 1,121 mm (72%) of the mean annual rainfall of 1563 mm falling during this period. The highest monthly rainfall occurs in February/March while the months July-October are much drier, generally receiving less than 100 mm each.

Evaporation levels between September and January often exceed rainfall levels. However, as evaporation rates are low during the winter months, rainfall exceeds evaporation on an annual basis

The climate and meteorology for the locality has been summarised in **Table 2.1** based on monthly climate statistics for the Coffs Harbour Airport Automatic Weather Station (AWS) with respect to 9am and 3pm statistics.

The Coffs Harbour MO AWS is situated at an elevation of 5 m, approximately 25km south of the site. The site opened in 1943 and closed on 29 August 2015. The records include the period 1943 to 2015 (see **Table 2.1** overleaf).

Table 2.1 Monthly Climate Statistics –Coffs Harbour MO (1943 – 2010)



Product IDCJCM0028 Prepared at Thu 22 Nov 2018 03:08:03 AM EST

Wind Regime

The wind regime for the site is based on annual wind roses for Coffs Harbour Meteorological Observations Automatic Weather Station (MO AWS).

Annual wind roses for the times of 9am and 3pm are shown in **Plate 2.1**. The wind roses are based on records from 1943 to 2015. The annual wind roses indicate that light to moderate winds are generally experienced from all directions. The wind roses also indicate the following:

- winds in the mornings are typically light to moderate to heavy winds from the south west, with lighter winds from the south, north and west;

- winds in the afternoon are typically more moderate winds from the north-east, south, south east and east; and
- Calm conditions are experienced 15% of the time at 9am in the morning and only 3% of the time at 3pm in the afternoons.

Based on the Coffs Harbour Weather Station* results over 67 years the wind frequency from the blue berry farm towards future sensitive receptors at the subject site is:

- At 9am less than 22%; and
- At 3pm less than 38%;

if three quadrants are added together (e.g. north east + north-west + north)

*The Coffs Harbour Weather Station results whilst not necessarily reflective as the exact wind patterns at the subject site have nevertheless been used to provide a guide as to the long-term wind regime patterns in the locality.

Rose of Wind direction versus Wind speed in km/h (01 Feb 1943 to 24 Aug 2015)

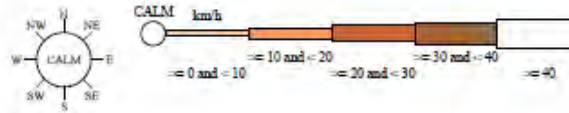
Custom times selected, refer to attached note for details

COFFS HARBOUR MO

Site No: 059040 • Opened Jan 1943 • Closed Aug 2015 • Latitude: -30.3107° • Longitude: 153.1187° • Elevation 5m

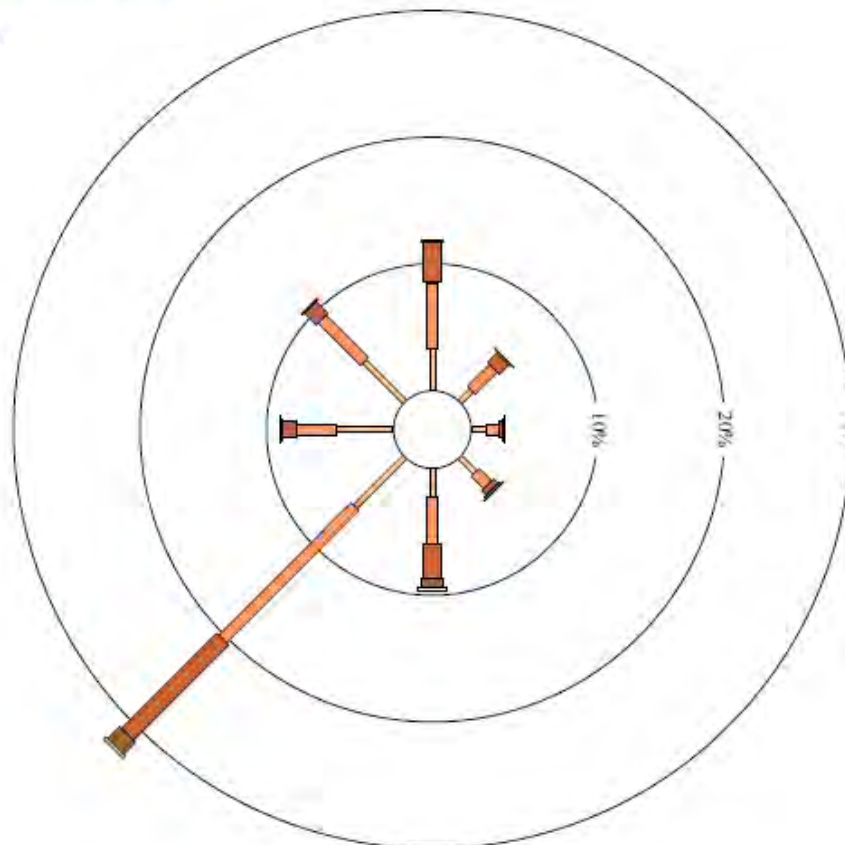
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



9 am
24228 Total Observations

Calm 15%



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Prepared by the Bureau of Meteorology.
Contact us by phone on (03) 9669 4082, by fax on (03) 9669 4515, or by email on climatedata@bom.gov.au
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Rose of Wind direction versus Wind speed in km/h (01 Feb 1943 to 24 Aug 2015)

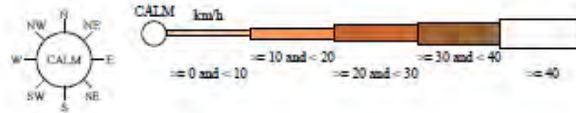
Custom times selected, refer to attached note for details

COFFS HARBOUR MO

Site No: 059040 • Opened Jan 1943 • Closed Aug 2015 • Latitude: -30.3107° • Longitude: 153.1187° • Elevation 5m

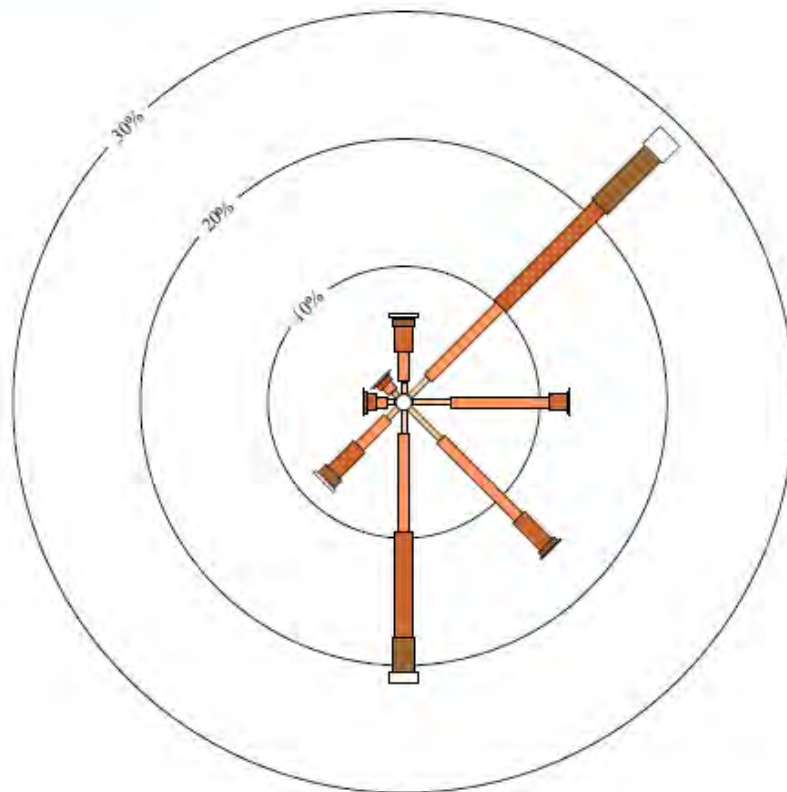
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



3 pm
24262 Total Observations

Calm 3%



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Prepared by the Bureau of Meteorology.
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Plate 2.1 Annual Wind Roses (9am and 3pm) for Coffs Harbour MO

Source: Bureau of Meteorology

Illustration 2.1

Subject Site and Surrounding Landuses



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2.4 Site Inspection

A site assessment was undertaken on the 9 November 2018 by Tim Fitzroy. On the day of the site assessment the weather was clear. The subject site is currently vacant. The site includes eucalyptus trees to a height of 25m spaced at between 2 and 5m apart along the northern boundary with Bark Hut Road and along the eastern boundary with Solitary Islands Way. The majority of the site appears to have been previously cleared. Patches of regrowth are present across the site interspersed with exotic grasses and weeds.

The western and southern western boundary is heavily wooded with native vegetation whilst there is an island of native vegetation in the central southern section of the site. The site slopes from the northern boundary in a southerly direction at between 5 and 20% for approximately 150m whereupon the grade dissipates.

There were no observable impacts from the adjoining blue berry operation to the north at No 36 Bark Hut Road. Photographs of the site subject and surrounds were taken (see **Appendix B**).

2.5 Blueberry Farm 36 Bark Hut Road Woolgoolga

The closest point of the Blueberry Farm, (Lot 1 DP808207, No 36 Bark Hut Road) is located approximately 12m north of the subject site. A single row of Lillypillys trees to a height of 2 to 2.5m have been planted as a vegetated screen on the southern boundary of the Blueberry farm adjacent to Bark Hut Road. Blueberries are grown in tunnels under netting, principally positioned on the immediate southern and south western boundary.

Bark Hut Road runs in an east west direction along a natural ridge which forms a boundary between the subject site and the blue berry farm to the north. The subject site slopes in a southerly direction away from the boundary while the blueberry farm site slopes in a northerly direction.

Blueberries are a native fruit of North America. The species comes under the genus *Vaccinium* which includes around 450 evergreen and deciduous shrubs. Three varieties of blueberry species have been identified; Highbush, Lowbush (wild) and Rabbiteye. Highbush varieties can be broken down into either Southern Highbush or Northern Highbush. Lowbush blueberries are not generally found in Australia.

Numerous cultivars have been bred from these varieties such as Misty (Southern Highbush), Denise (Northern Highbush) and Powder Blue (Rabbiteye). These cultivars all have different characteristics, growing requirements and seasonal timing.

Blueberries were first introduced into Australia in the early 1970s. By 1978 it was recognised that the warmer climate Southern Highbush and Rabbiteye varieties (originally grown in the southern states of America) would grow on the NSW North Coast and produce high value, early season fruit. These varieties are harvested from June to February.

Blueberries belong to the Azalea family and require similar growing conditions. The spineless shrubs can be either evergreen or deciduous, vary from 1 to 3 metres in

height and are long lived (up to 30 years for certain varieties).

The development of blueberry bushes is a continuous process that includes using parent plants to provide material to cultivate new plants. To begin this process branches are taken from established bushes and cut into five centimetre stalks called cuttings. The cuttings are struck into trays and placed in fog houses.

Once cuttings have sufficient roots, they are transferred into pots. Potted plants are grown out in full sun and require daily watering and fertilizing once a week. After five months, they are ready to be planted in the field. From planting, it takes approximately 15 months the bush to begin producing fruit.

The fruit has a waxy bloom and is borne in bunches on the end of branches. Blueberries ripen from early summer to autumn depending on the location and variety. The majority of Australian blueberries are hand-picked. Workers select ripe berries, picking a bush up to six times throughout a season. This is because the individual berries on a bush ripen at different stages. A mature bush can yield between 4-7kg depending on the variety.

Blueberry production is capital intensive with high development and labour costs. In northern NSW there are 3,700 plants per hectare in mounded rows 3m apart. Plants are 0.8m apart within the row. Each mature four-year-old or greater plant produces an average of 4kg of fruit per season. Some growers will obtain yields above this figure but many plants produce less depending on the season.

Blueberries will typically require irrigation for a successful commercial crop. Water use can vary widely depending on growing methods, soil types, and weather conditions. Water should be applied in an efficient manner to minimise waste. Irrigation systems and infrastructure should be well maintained.

Chemical use is governed by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and in NSW the Environmental Protection Authority (EPA). Growers must only use approved chemicals with approved methodologies. All users of chemicals must maintain the appropriate records (i.e. Material Safety Data Sheet (MSDS)) and ensure staff have appropriate training and accreditation.

Blueberries cultivation is subject to biosecurity pests (e.g. fruit fly), diseases (e.g. Blueberry Rust) and regional biosecurity risks. Systems need to be adopted to prevent on-farm entry of biosecurity risks through supply of crop and other land use inputs (e.g. nursery stock). Suitable monitoring systems should be established to identify if biosecurity risks are present and (if present) determine the level of severity.

2.6 Potential Land Use Conflicts

The following key items have been identified as potential land use conflicts as a result of the proposed development.

2.6.1 Agricultural Chemical Spray Drift

The off-target movement of agricultural chemicals can be a cause for concern to residents in proximity to farming areas. These concerns are largely based on fears of exposure to agricultural chemicals but also due to detection of odours associated with the chemical.

Whilst no contact was made with the owners of the Blueberry Farm at 36 Bark Hut Road it is more likely that not that the farms will use agricultural sprays to help manage insects and fungi. In addition, fertilisers will be applied to assist the growth of trees.

On blue berry plantations insecticides and fungicides are commonly applied using an Air Blast Sprayer while herbicides are normally applied with a boom spray and wand. As per the Protection of the Environment Operation Regulation 2010 spraying is restricted to calm conditions to ensure that spray drift is restricted to the target trees.

No aerial agricultural spraying is known to occur in the area.

From a planning perspective, it is not considered practical to base buffer area dimensions on individual chemicals or formulations. Based on the available research on chemical spray drift, the planning guidelines for setback to residential development have adopted a minimum width of 200 m where open ground conditions apply; and a minimum width of 30 m where a vegetated buffer element can be satisfactorily implemented and maintained.

It should be noted that the recommended vegetated buffer (which includes multiple rows of trees) will not capture 100% of the chemical spray drift, but may reduce spray drift to less than 1% at a sensitive receptor when managed in terms of porosity, litter build up and noxious weed control to ensure effectiveness.

Very fine or fine droplets pose the highest risk of spray drift; it is the single most important factor controlling drift potential. The selection of applicators and nozzles that give the correct droplet size range is important. The higher droplets are released, the greater potential for drift.

Blueberry plants are usually fertilised via an irrigation system with liquid nutrients in a process known as fertigation. Fertigation is compulsory in northern NSW as weed matting does not allow for broadcast application of fertiliser, and high rainfall creates a significant likelihood of leaching large single fertiliser applications. (Prime Fact 1509, NSW DPI November 2016). Therefore, small, frequent fertiliser applications through the drip system are recommended.

In northern NSW, the lowest rainfall and the greatest evaporation usually occur from August to December. Therefore, peak water demand for blueberries usually occurs in this period. September to October is generally recognised as the driest period and unfortunately this is often the only time effective irrigation is considered. However, floral initiation for the following season's crop occurs in February and March and inadequate irrigation at this critical time will result in wilting and dieback of tender shoots, and will lead to poor fruit set.

Blueberries, as a general rule, require 25–40 mm per week during their growing season. The demand for water is greatest from the time of fruit expansion until harvest.

Weather influences the pests and diseases that will affect berry orchards. By observing the weather, growers can predict the occurrence and severity of pest and disease outbreaks and only spray when a threat exists.

Growers are moving away from the 'sledgehammer' approach of using broad-spectrum pesticides due to environmental and occupational health problems. Over the last 5–10

years, growers have opted for a more IPDM (integrated pest and disease management) approach. Biological control plays an important role in IPDM success. Biological control agents are natural enemies of orchard pests. They include insect predators and parasites, predatory mites, isomates and bacterial pesticides.

Most pests and diseases of blueberries appear during specific growth stages of the crop. This guide lists the most common pests and diseases that growers should be on the lookout for over a typical growing season.

A variety of insecticides, herbicides, fungicides and fertilisers are used each year on commercial Blueberry plantations in Northern NSW. In addition, the average frequency and method of application for chemicals utilised on blueberry plantations is provided.

Table 2.3 lists all chemicals registered for use on Australian blueberries. This does not mean that the subject adjacent blueberry growers are using all of these chemicals or regularly. Chemical application forms only a minor part of an overall management strategy and should be used sparingly.

No information on rates (quantity of product in the spray mix) is provided. This information appears on the product label.

Guide to chemical groups

The letter in brackets which appears after a chemical name (e.g. copper hydroxide (M1)) refers to its mode of action (MOA) chemical group.

Resistance management

A fundamental aspect of any integrated pest disease management (IPDM) strategy is the pesticide or pesticides that are used. The primary consideration is to rotate chemicals so that the pest, disease or weed is not continually exposed to the same MOA group. To do this successfully, growers need to be able to identify chemical groups.

Colour coding of pesticides

Trade names (in brackets) are only included where only one product is registered for that common name (NSW DPI, 2018). Coloured dots before the chemical common name denote that chemical's compatibility with IPM.

① indicates that – when used with care – a chemical will have very little impact on beneficials and is recommended in an IPDM program.

② indicates that this pesticide can be used with caution in an IPDM program, but the beneficials present and the chemical's likely impact should be assessed before application.

③ indicates that this chemical is likely to have a long-lasting, negative off-target effect (including on beneficial arthropods) and it should only be used in an emergency where no alternative exists.

(Source: Berry Plant Protection Guide 2017-2018 DPI 2017)

Pest and disease management

Not all pesticides registered for a particular condition are necessarily mentioned. Each group of chemicals is intended to show those compounds recommended for that situation.

Table 2.3 Blueberries – chemical options for pests and diseases

Reason	Treatment	Fungicide group	WHP days	Remarks
Anthracnose	Captan PER13958 OR	M4 9,12 7,11	1	Botrytis control sprays will also control Anthracnose.
	Cyprodinil + Fludioxonil (Switch) PER13630 OR Boscalid + Pyroclostrobin (Pristine) PER82986 OR		7 (Aust. only)	If rain is forecast and fruit is present apply additional sprays. Captan is preferable close to harvest due to its short WHP.
	Copper PER14132 Qld only (under direction of permit holder)		3	Do not spray more than two consecutive sprays from the same chemical group.
Aphids	Pirimicarb OR Horticultural mineral oil OR Dimethoate	1A 1B	2 1 1	Do not spray mineral oils if leaf temperatures are 26 °C or greater. Do not exceed a maximum number of 7 applications per crop per season with a minimum 21-day interval between application. Apply in the afternoon when bees have finished foraging.
Blueberry rust	Chlorothalonil PER14309 OR	M5 3 M3 7,11 M9	28 3 7 3 21	Apply at the first sign of rust to leaves, flowers or fruit, beginning in December.
	Propiconazole (Tilt)			Use preventatively when conditions favour the disease.
	PER14740 OR Mancozeb PER13958 OR			If sending fruit with ICA31, apply Pristine or Propiconazole or Dithane every 14 days from fruit set to harvest.
	Boscalid + Pyroclostrobin (Pristine) PER82986 OR Dithianon PER82601			Additional sprays might be required to retain leaves where the disease is a problem. Make a maximum of three (3) applications per season, with minimum 21-day retreatment interval.
Botrytis flower blight Grey mould	Chlorothalonil PER14309 OR Pyrimethanil (Scala) PER13958 OR Captan PER13958 OR Switch PER13630 OR Iprodione OR	M5 9 M4 9,12 B M	28 1 1 7 1 1	Apply at early bloom or before flowers open. Additional sprays might be necessary if conditions favour the disease. Scala at full strength will burn flowers and needs to be used before the early pink bud stage.

	Sulphur dioxide pads PER13955			Do not spray more than two consecutive sprays from the same chemical group. Ippon Aquaflo 500 is registered for use in all states. Apply every 10–14 days from flowering in rotation with products from other chemical groups. Sulphur pads are used in packed trays to reduce the incidence of Botrytis.
Budworms (Heliothis, Helicoverpa)	Spinetoram OR Methomyl PER14134 (Methomyl is registered on label for blueberries in NSW and WA but a permit is required for QLD) OR Helicoverpa NPV OR Chloranthraniliprole PER84178	G5 A1 NA 28	1 5 3	Not required when used as directed; Comments: Thorough coverage is required as product needs to be ingested to be effective. Has a short residual activity and re-treatment may be required at 2-3 day intervals. DO NOT apply more than three (3) applications per crop, with a minimum re-treatment interval of 7 days between sprays
Downy mildew	Mancozeb PER13958 OR Chlorothalonil PER14309	3 M5	7 28	Repeat every 14 days.
Elephant weevil borer	Bifenthrin PER14448 OR Indoxacarb PER13289	3A 22A	1 1	Spray one week after pruning early SH varieties if weevil is observed on tops of plants. A follow up spray 7–10 days later for later emerging beetles is required.
Light brown apple moth (LBAM)	Spinetoram OR Methoxyfenozide (Prodigy) OR Indoxacarb PER13289 OR <i>Bacillus thuringiensis</i> OR Chloranthraniliprole PER84178	G5 G18 22A 11 28	1 7 1 Nil 3	Isomate mating disruption lures are used in the orchard at 500/ha to confuse LBAM males. Delta traps can be used to monitor numbers. The insect is present when young leaves show folding and webbing is observed around terminal clusters. Do not apply Indoxacarb if bees are foraging. DO NOT apply more than three (3) applications per crop, with a minimum re-treatment interval of 7 days between sprays

Reason	Treatment	Fungicide group	WHP days	Remarks
Monolepta beetle (red shouldered leaf beetle)	Methomyl PER14134 (Methomyl is registered on label for blueberries in NSW and WA but a permit is required for QLD) OR Pyrethrin PER80070	A1 3A	5 Not required when used as directed	Apply to plants when swarm is present. Hatching occurs from grassed rows in spring to autumn after rains. Early detection is essential as swarms can strip leaves, fruit and buds and numbers increase quickly. Ensure adequate spray coverage and penetration to obtain effective control of the pest. Minimum re-treatment interval of 1-2 days.
Painted apple moth larvae	Yates Nature's Way Caterpillar Killer <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> is the only control registered in Australia			Apply when chewing damage is first observed. Controls caterpillars on herbs, fruits, vines and ornamentals.
Phytophthora root rot	Phosphonic acid (Agrifos, Phospot) PER13958 OR Metalaxyl (Ridomil) PER13958	33 4	Not required when used as directed 48	Usually caused by poor drainage from the previous season. Plants will show stress signs when fruit flowers and leaves are demanding moisture after a wet year. Metalaxyl should be used when planting and mixed well in the planting hole. Phosphonate can also be used as a root dip when planting.
Plague thrips	Methomyl (Methomyl is registered on label for blueberries in NSW and WA but a permit is PER14134 required for QLD)	A1	5	Spray during flowering if thrips detected in flowers. Tap 10 flowers on to white paper. If more than four thrips are detected per 10 flowers, treat plants with registered products.
Queensland fruit fly (QFF)	1. Trapping OR 2. Baiting OR Dimethoate PER84247 OR Maldison PER12940 OR Trichlorfon (Trichlorfon is registered on label for blueberries in NSW but a permit PER12486 is required for all other states) OR Spinetoram PER12927 OR Abamectin PER14423	1B 1B 1B 5G 6	1 3 2 1 7	1. Hang male lures in the orchard (16/ha) to detect fly presence. Fruit stings can start in August. 2. Start a baiting program both inside the orchard and on perimeter trees before numbers spike in traps. Repeat weekly using yeast autolysate PER13785 or acetoxyphe-nyl-butanone (cue-lure) with either maldison, fipronil or spinosad as a contact insecticide. Dimethoate is under permit and can be used for QFF control as a cover spray from flowering to harvest. Apply a maximum of three applications /season. Apply a

				<p>maximum of three cover sprays/season.</p> <p>Can be used as a cover spray with a maximum of four applications/season.</p> <p>No more than 12 applications in a season.</p> <p>A grid system of 16 Amulet® PER13785 fly lures/hectare gives good control in conjunction with monitoring traps, baiting and good crop hygiene.</p>
Scarab beetles	<p>Chlorpyrifos PER82002 OR Chloranthraniliprole</p> <p>PER81063 (NSW and TAS only) OR Clothianidin (Sumitomo Samurai) PER81063 (NSW and TAS only) OR Imidacloprid PER12534</p>	<p>1B 28</p> <p>4A 4A</p>	<p>Not required when used as directed 14</p> <p>14</p> <p>Not required when used as directed</p>	<p>Soil-borne insects that chew roots and move into mounds from the grassed inter row.</p> <p>Place pellets in bottom of planting hole and mix in well. Retreat if necessary in autumn and spring.</p>
Slugs and snails	Methiocarb			Snail and slug bait.
Western flower thrip (WFT)	Spinetoram OR	5B	1	WFT activity is more likely close to harvest than at flowering. Do not confuse WFT with other thrips.
White wax scale	<p>Diazinon OR Paraffinic oil OR</p> <p>Petroleum oil OR Spirotetramat</p>	1B 23	14 7	<p>Easy to treat early in the year around January as crawlers are small. Once the scale forms a waxy coating, it is more difficult to control.</p> <p>Do not spray petroleum spray oil (PSO) if leaf temperatures are over 26 °C.</p> <p>Make a maximum of three (3) applications per season, at a minimum 14-day retreatment interval.</p>

WHP = Withholding period

SH = Southern Highbush Blueberries – calendar Northern Highbush (late)

(Source: Berry Plant Protection Guide 2017-2018 DPI 2017)

Table 2.4 Blueberries Southern Highbush (early) – likely timing for monitoring and treatment of pests as indicated by the purple bars

	Flowering			Harvest					Post harvest			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
African black beetle												
Anthraxnose												
Aphids												
Botrytis flower blight												
Budworms (Helicoverpa previously Heliiothis)												
Caterpillars												
Common garden snail												
Corn earworm (Helicoverpa previously Heliiothis)												
Downy mildew												
Dried fruit beetles (Carpophilus)												
Elephant weevil												
Grey mould (Botrytis)												
Jassids												
Lesser Queensland fruit fly												
Light brown apple moth (LBAM)												
Loopers												
Mites												
Monolepta beetle												
Phytophthora root rot												
Plague thrips												
Painted apple moth (hairy)												
Queensland fruit fly												
Rust												
Scale (wax) insects												
Scarab beetle												
Septoria leaf spot												
Slugs												
Spider (red) mites												
Spur blight												
Thrips												
Western flower thrip												

(Source: Berry Plant Protection Guide 2017-2018 DPI 2017)

Table 2.5 Pesticides Registered/Permitted for Managing Blueberries

For managing...	Pesticide common name (trade name) ²	Comment ³
African black beetle	Ⓢ Imidacloprid (Confidor®)	contact and stomach insecticide applied through drippers
Anthracnose	🟢 Captan	protectant fungicide
	🟢 Cyprodinil + fludioxonil (Switch®)	fungicide with protectant and some curative action
	🟢 Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action
	🟢 Copper oxychloride	protectant fungicide
Aphids	🟢 Pirimicarb	stomach action
	🟢 Horticultural mineral oil	insecticide and miticide
Botrytis flower blight	🟢 Chlorothalonil	protectant fungicide
	🟢 Pyrimethanil (Scala®)	fungicide with protectant and some curative action
	🟢 Captan	protectant fungicide
	🟢 Cyprodinil + fludioxonil (Switch®)	fungicide with protectant and some curative action
	🟢 Iprodione	fungicide with protectant and some curative action
	🟢 Sulfur dioxide	
Budworms (Heliothis, Helicoverpa)	Ⓢ Spinetoram	insecticide with contact and stomach action
	🟢 Methomyl	systemic insecticide with contact and stomach action
Caterpillars	Ⓢ Methomyl	systemic insecticide with contact and stomach action
	🟢 <i>Bacillus thuringiensis</i>	biological control-stomach poison
Common garden snail	🟢 Methiocarb snail bait	molluscicide acts as a physical barrier
Corn earworm (Heliothis, Helicoverpa)	Ⓢ Spinetoram	insecticide with contact action
	Ⓢ Methomyl	systemic insecticide with contact and stomach action
Downy mildew	🟢 Chlorothalonil	protectant fungicide
	Ⓢ Mancozeb	protectant fungicide
Dried fruit beetles (Carpophilus)	🟢 Carpophilus lure and trap system	used as lure to attract insects to trap.
	Ⓢ Mancozeb	protectant fungicide
Elephant weevil	Ⓢ Indoxacarb (Avatar®)	insecticide with both contact and stomach action on larvae
	Ⓢ Bifenthrin	contact insecticide
European wasp	🟢 Permethrin (bait only)	contact insecticide for use on dusted baits
Grey mould (Botrytis)	🟢 Chlorothalonil	protectant fungicide
	🟢 Pyrimethanil (Scala®)	fungicide with protectant and some curative action
	🟢 Captan	protectant fungicide
	🟢 Cyprodinil + fludioxonil (Switch®)	fungicide with protectant and some curative action
	🟢 Iprodione	fungicide with protectant and some curative action
	🟢 Sulfur dioxide infruta pads	fungicide with vapour action
	🟢 Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action

For managing...	Pesticide common name (trade name) ²	Comment ³
Lesser Queensland fruit fly	③ Dimethoate	contact insecticide with larvicidal and ovicidal activity
	③ Maldison	contact insecticide with stomach and respiratory action
	③ Trichlorfon	insecticide and acaricide with contact and stomach action
	② Spinetoram	insecticide with contact action
	③ Abamectin	acaricide with stomach action and translaminar movement
Light brown apple moth (LBAM)	② Spinetoram	insecticide with contact action
	① Methoxyfenozide (Prodigy®)	insecticide with contact action
	② Indoxacarb (Avatar®)	insecticide with both contact and stomach action on larvae
	③ Azinphos methyl	insecticide with contact and stomach action, moderate persistence
	① <i>Bacillus thuringiensis</i>	biological control–stomach poison
Mites	② Bifenazate Acramite®	acaricide with contact and residual activity
Monolepta beetle	② Methomyl	systemic insecticide with contact and stomach action
	① Pyrethrin Pyganic®	contact insecticide
Phytophthora root rot	① Metalaxyl (Ridomil®)	protectant fungicide with slow release activity
	① Phosphonic acid	protectant fungicide
Plague thrips	③ Methomyl	systemic insecticide with contact and stomach action
Painted apple moth (hairy)	① <i>Bacillus thuringiensis</i>	biological control–stomach poison
Queensland fruit fly	③ Dimethoate	contact insecticide with larvicidal and ovicidal activity
	③ Maldison	contact insecticide with stomach and respiratory action
	③ Trichlorfon	insecticide and acaricide with contact and stomach action
	② Spinetoram	insecticide with contact action
	② Abamectin used in conjunction with protein yeast attractant	contact insecticide with stomach and respiratory action
	① Acetoxy-phenyl-butanone Amulet lures	contact insecticide impregnated into baits
	① Fipronil (Amulet cue lure®)	contact insecticide impregnated into baits and gel powder in yeast mixture
Rust	② Mancozeb	protectant fungicide
	③ Propiconazole (Tilt®)	systemic fungicide with protectant and curative action
	① Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action
	② Chlorothalonil	protectant fungicide
Scale (wax)	③ Diazinon	insecticide with contact, stomach and respiratory action
	① Horticultural mineral oil	insecticide and miticide
Scarab beetles	③ Imidacloprid	systemic insecticide applied by dripper to plant root systems
	② Chlorpyrifos	contact insecticide with stomach and respiratory action
	① Chloranthraniliprole	insecticide interrupts normal muscle contraction
Septoria leaf spot	② Chlorothalonil	protectant fungicide
Slugs	③ Copper as complex Kendon Escar-Go®	protectant molluscicide
Spider (red) mites	③ Bifenazate	acaricide with contact and residual activity
Spur blight	③ Captan	protectant fungicide
Thrips	③ Methomyl	systemic insecticide with contact and stomach action
	③ Bifenthrin	contact insecticide
Western flower thrip (WFT)	② Spinosad	insecticide with contact and stomach action

¹ Source: APVMA Pubcris.

Trade names (in brackets) are only included where only one product is registered for that common name. Coloured dots before the chemical common name denote that chemical's compatibility with IPM.

① indicates that – when used with care – a chemical will have very little impact on beneficials and is recommended in an IPM program.

② indicates that this pesticide can be used with caution in an IPM program, but the beneficials present and the chemicals likely impact should be assessed prior to application.

③ indicates that this chemical is likely to have a long-lasting, negative off-target impact (including an impact on beneficial arthropods) and it should only be used in an emergency where no alternative exists.

Table adapted from *The pesticide manual*, 14th Edition, British Crop Protection Council 2006.

(Source: Berry Plant Protection Guide 2017-2018 DPI 2017)

The greatest risk of drift potential relates to the use of the Air Blast Sprayer. It is important that all protocols are maintained to minimise drift.

2.6.2 Odour

Odour from cropping and horticulture can arise from use of chemical sprays, fertilisers (inorganic and organic), effluent disposal and composting. Such detrimental odours can impact on residential amenity and have the potential to affect public health.

Odour is often a major factor in many complaints about off-site chemical spray drift where there is sometimes no objective evidence of toxic exposure. Some agricultural chemicals contain ‘markers’ (strong odours) to allow easy identification and these markers or mixing agents are sometimes detected at a distance from the target area and cause concern even though in some circumstances extremely low levels of the active ingredients may be present.

Residents’ association of the odour with the chemical is sufficient to raise fears of exposure. In addition, perceptions of an odour’s acceptability and individual capacity to detect particular odours can vary greatly.

Factors affecting complaints from odour are influenced by the frequency, intensity, duration and offensiveness of the odour. An objectionable odour may be tolerated if it occurs infrequently at a high intensity, however a similar odour may not be tolerated at lower levels if it persists for a longer duration.

2.6.3 Noise

There are four types of noise associated with agricultural activity which may lead to land use conflict. These are the noises associated with intensive livestock facilities, aircraft activities, constant or long-term noise, (e.g. pumps or refrigeration plants), and intermittent noise from tractors and other machinery.

The most likely types of noise associated with agricultural activity which may lead to land use conflict in the locality would be noise from refrigeration and tractor operation.

Cool room motor noise varies on the size of the motor. Noise measurements undertaken by TFA for other Noise Impact Assessments indicates cool room noise levels at 1.15m offset as follows:

Location	Time Period	Description	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
1	12:15pm to 12:30pm	Western boundary, 1.15m offset from cool room compressor	66.8	90.9	68.2	64.1

The cool room compressor was operating consistently and without fault during measurements.

Tractor noise varies depends on a number of factors (listed below) however noise levels can range from 80 decibels (dB) to 92dB at source. Noise decay over distance can be predicted on the basis of noise attenuation rates of 6 dB(A) for each doubling of distance from the noise source. This attenuation rate assumes open ground conditions. The existence of natural barriers, broken topography or other features would increase attenuation and affect the resultant noise level at the receiver.

Factors affecting noise from agricultural activities include:

- type of engine (diesel or petrol; 2- or 4-stroke);
- number of cylinders;
- cooling system (air or liquid);
- load;
- timing, frequency and duration of operations;
- geographical conditions and barriers e.g. topography and inversions;
- weather conditions e.g. wind speed and direction; and
- typical industry machinery and practices.

Given the nature of adjoining land use it is unlikely that noisy activities will occur at night. Noise from general farming operations (tractor use, spraying etc), vehicle movements, pruning of trees and general farm activities is a normal part of farming.

There was no evidence of noise impacts from blueberry production onsite at Lot 1 DP808207 during our site inspection on 9 November 2018.

A number of routine blueberry farm operations generate noise. These noises are common to blueberry plantations.

The activities are summarised below:

- Mowing (all year round)

Mowing around the farm throughout the year. Mowing machinery generally includes either small tyre mowers or tractor with slasher.

- Spraying of Insecticides/fungicides (can occur several times a year during the flowering, harvest and post-harvest)

An Air Blast sprayer may be utilised to apply insecticides to trees. The initial application each year usually occurs at daytime at pre flowering stage to ensure that non-target species (i.e. bees) are not impacted.

- Spraying of Herbicides (can occur several times a year)

A hand wand (low to ground) or wand is used to apply herbicides.

- Pruning

Trees (depending on their age) are generally pruned on an occasional basis (not regularly).

- Mulching (Once a year (September))

- Cool room

- Blue berries are normally housed in cool room prior to distribution. Noise associated with cool room motors, especially during the evening at night-time can be a source of concern to sensitive receivers depending on the setback distance

- Truck and Vehicle Movements

Harvested berries will be collected for offsite distribution from June to February. TFA do not have details on the number of truck movements from the subject blue berry farm.

Estimated noise emissions from external plant will be compared with:

- Noise Policy for Industry – NSW EPA 2017
Recommends acceptable amenity noise level from industrial sources at a residential receiver are to be below 55 dB (A), 45 dB (A) and 40 dB (A) for the day, evening and night periods at the boundary of any adjacent suburban lot.

***Note:** No onsite noise monitoring has been undertaken

Estimate of Noise Decay from Cool room Condensers by Distance Attenuation only

Sound power levels reduce logarithmically with distance away from the noise source. A 6 dB (A) reduction for every doubling of distance from the source in a free field environment is an accepted method for noise attenuation through distance.

Given that the existing cool room/s are assumed to be located approximately 25 metres from the northern boundary of the subject site the resultant noise levels will be in the order of 40dB(A) at the closest point on the subject site.

The estimated noise levels from the existing cool room condensers are therefore predicted to be in compliance with the recommended noise criteria with no additional mitigation measures in place.

2.6.4 Dust

The main sources of dust from cropping include cultivation prior to planting, tractor and transport movements. Contemporary farming practices incorporate measures to minimise loss of soil, but at times it is necessary to leave land unplanted for extended periods, which can lead to the movement of dust. Local conditions, including wind strength and direction, rainfall, humidity and ambient temperatures, soil type, vegetative cover and type of onsite activity determine the extent of the nuisance.

The vegetated buffer designed to capture chemical spray drift will also be effective in reducing conflict resulting from dust.

2.6.5 Pests

Pests primarily include flies and rodents. Practices that minimise breeding on farm are necessary since pest's impact directly on community amenity and increase the risk of disease transfer. All pest control materials need to be used in strict adherence with labelling directions. They must be correctly stored away from children and domestic animals. Records of pesticide use should also be maintained.

2.6.6 Operating Times

General farm operations are usually during daylight hours. The blueberry harvest period generally runs from the end of July to the end of November however the duration is subject to changeable weather conditions.

2.6.7 Chemical Use

Volatile components of chemicals sprayed may affect neighbours if not used in accordance with manufacturer and workplace health and safety requirements. Spraying should also be avoided during adverse weather conditions that may impact on neighbours.

2.6.8 Surface Water and Sediment Runoff

The blue berry farm and proposed future residential land release are located in separate catchments. Runoff from the blue berry farm heads in a northerly direction whilst surface water flow from the subject site will eventually drain into Woolgoolga Lake. The subject site drains to the south and south east. The proposed rezoning will not result in any additional surface runoff impacting on the adjoining blueberry farm.

Given the drainage towards Woolgoolga Lake measures to protect and engage with the waterway are important to minimise sedimentation and erosion and the runoff of pollutant.

2.6.9 Traffic and Access

According to discussions with Clyde Treadwell, Resource Design and Management (RDM) (pers.com 21 November 2018) access for the future proposed residential will occur off Solitary Islands Way in conjunction with the proposed recreational sports fields to the south of the subject site. There is not envisaged to be any significant land use conflicts with respect to the traffic and access between the proposed rezoning of the subject site for residential use and the existing blue berry farm operation.

3. Land Use Conflict Risk Assessment

3.1 Introduction

In this report, a risk assessment matrix is used to rank the potential Land Use Conflicts in terms of significance. The matrix assesses the environmental/public health and amenity impacts according to the:

- Probability of occurrence; and
- Severity of impact.

The procedure of environmental/public health & amenity hazard identification and risk control are performed in three stages.

1. Environmental/public health & amenity hazard identification;
2. Risk assessment and ranking;
3. Risk control development.

Procedure:

1. Prepare LUCRA Hazard Identification and Risk Control form.
2. List all hazards associated with each activity.
3. Assess and rank the risk arising from each hazard before “controls” are applied on the LUCRA form.
4. Develop controls that minimise the probability and consequence of each risk using the five level methods. Record these controls on the form.
5. Re-rank each risk with the control in place to ensure that the risk has been reduced to an acceptable level. If the risk ranking is not deemed to be acceptable consideration should be given to whether the proposed activity should be allowed to proceed.

3.2 Risk Assessment and Risk Ranking

It is necessary to differentiate between an 'environmental hazard' and an 'environmental risk'. 'Hazard' indicates the potential for harm, while 'risk' refers to the probability of that harm occurring. For example, the presence of chemicals stored in a building is a hazard, but while the chemicals are stored appropriately, the risk is negligible. **Table 3.1** defines the hazard risks used in this report.

The Risk Ratings (severity of the risks) have been established by assessing the consequences of the risks and the likelihood of the risks occurring.

Table 3.1 Measure of Consequence

Level	Descriptor	Description	Examples/Implications
1	Severe	<ul style="list-style-type: none"> Severe and/or permanent damage to the environment Irreversible with management 	<ul style="list-style-type: none"> Damage or death to animals, fish, birds or plants Long term damage to soil or water Odours so offensive some people are evacuated or leave voluntarily Many public complaints and serious damage to Council's reputation Contravenes Protection of the Environment & Operations Act and the conditions of Council's licences and permits. Almost certain prosecution under the POEO Act
2	Major	<ul style="list-style-type: none"> Serious and/or long-term impact to the environment Long-term management implications 	<ul style="list-style-type: none"> Water, soil or air impacted badly, possibly in the long term. Limited damage to animals, fish or birds or plants Some public complaints Impacts pass quickly Contravenes the conditions of Council's licences, permits and the POEO Act Likely prosecution
3	Moderate	<ul style="list-style-type: none"> Moderate and/or medium-term impact to the environment Some ongoing management implications 	<ul style="list-style-type: none"> Water, soil or air known to be affected, probably in the short term No damage to plants or animals Public unaware and no complaints to Council May contravene the conditions of Council's Licences and the POEO Act Unlikely to result in prosecution
4	Minor	<ul style="list-style-type: none"> Minor and/or short-term impact to the environment Can be effectively managed as part of normal operations 	<ul style="list-style-type: none"> Theoretically could affect the environment or people but no impacts noticed No complaints to Council Does not affect the legal compliance status of Council

Level	Descriptor	Description	Examples/Implications
5	Negligible	<ul style="list-style-type: none"> • Very minor impact to the environment • Can be effectively managed as part of normal operations 	<ul style="list-style-type: none"> • No measurable or identifiable impact on the environment

This report utilises an enhanced measure of likelihood of risk approach¹ which provides for 5 levels of probability (A-E). The 5 levels of probability are set out below in **Table 3.2**.

Table 3.2 Probability Table

Level	Descriptor	Description
A	Almost certain	Common or repeating occurrence
B	Likely	Known to occur, or 'it has happened'
C	Possible	Could occur, or 'I've heard of it happening'
D	Unlikely	Could occur in some circumstances, but not likely to occur
E	Rare	Practically impossible

3.3 Risk Ranking Method

For each event, the appropriate 'probability' (i.e. a letter A to E) and 'consequence' (i.e. a number 1 to 5) is selected.

The consequences (environmental impacts) are combined with a 'probability' (of those outcomes) in the Risk Ranking Table (Table 3.3) to identify the risk rank of each environmental impact (e.g. a 'consequence' 3 with 'probability' D yields a risk rank 9).

The table yields a risk rank from 25 to 1 for each set of 'probabilities' and 'consequences'. A rank of 25 is the highest magnitude of risk that is a highly likely, very serious event.

A rank of 1 represents the lowest magnitude or risk, an almost impossible, very low consequence event.

Table 3.3 Risk Ranking Table

PROBABILITY	A	B	C	D	E
Consequence					
1	25	24	22	19	15
2	23	21	18	14	10
3	20	17	13	9	6
4	16	12	8	5	3
5	11	7	4	2	1

NOTE

A risk ranking of 25-11 is deemed as an unacceptable risk.

A risk ranking of 10-1 is deemed as an acceptable risk.

Thus, the objective is to endeavour to identify and define controls to lower risk to a ranking of 10 or below.

3.4 Risk Reduction Controls

The process of risk reduction is one of looking at controls that have an effect on probability such as the implementation of certain procedures; new technology or scientific controls that might lower the risk probability values.

It is also appropriate to look at controls which affect consequences e.g. staff supply with a mechanism to change impacts or better communications established. Such matters can sometimes lead to the lowering of the consequences.

Table 3.4 LUCRA Site Assessment

Site Feature	Condition/Comments	Potential Conflict
Residential Development/ Buffer Distances	<p>The closest point of the subject site is approximately</p> <ul style="list-style-type: none"> 12m to the blueberry farm on Lot 1 DP808207 to the north <p>Default Buffer distances to Residential development:</p> <ul style="list-style-type: none"> 200 metres to greenhouse and controlled environment horticulture. 	Major
Site Location: Vehicular Access	According to discussions with Clyde Treadwell (pers.com RDM, 21 November 2018), access for the future proposed residential will occur off Solitary Islands Way in conjunction with the proposed recreational sports fields to the south of the subject site. There is not envisaged to be any significant land use conflicts with respect to the traffic and access between the proposed rezoning of the subject site for residential use and the existing blue berry farm operation	Minor
Aspect	South, facing away from the Blue beery farm to the north	Low

Exposure	<p>At 9am the dominant wind is from the south west (32%), while at 3pm the dominant wind direction is mixed between north east (29%) and southerly (21%) (BOM 2018)</p> <p>The annual wind roses indicate that light to moderate winds are generally experienced from all directions. The wind roses also indicate the following:</p> <ul style="list-style-type: none"> winds in the mornings are typically light to moderate to heavy winds from the south west, with lighter winds from the south, north and west; winds in the afternoon are typically more moderate winds from the north-east, south, south east and east; and Calm conditions are experienced 15% of the time at 9am in the morning and only 3% of the time at 3pm in the afternoons. 	Low - Moderate
Run-on and Upslope Seepage Site Drainage and Water pollution	<p>Run-on or seepage on adjoining farmland will not occur as the catchments as the subject site generally slopes in a southerly direction. The adjoining farmland drains in a northerly direction.</p> <p>The catchments are separated by Bart Hart Road.</p> <p>The soils within the Project Site are generally consist of duplex soil comprising light to medium clay. The site is located on the southern side of an east west trending ridge surrounded by undulating terrain. The site ranges from approximately RL 30m to RL 10m.</p>	Negligible
Agricultural Chemical Spray Drift	<p>The off-target movement of agricultural chemicals can be a cause for concern to residents in proximity to farming areas. These concerns are largely based on fears of exposure to agricultural chemicals but also due to detection of odours associated with the chemical.</p>	Major
Odour	<p>Odour from greenhouse horticulture can arise from use of chemical sprays, fertilisers (inorganic and organic), effluent disposal and composting. Such detrimental odours can impact on residential amenity and have the potential to affect public health.</p>	Major
Noise	<p>Given the proposed setbacks, resultant noise decay by distance attenuation and the intermittent use of tractors and delivery vehicles the likelihood of noise impacts from the existing blueberry farm activities are deemed to be low to negligible.</p>	Low to negligible
Dust	<p>The main sources of dust from a blueberry farm include cultivation prior to planting, tractor and transport movements.</p> <p>Wind speed in excess of 30 km/hr from the north have the potential to generate airborne particulate matter (dust) from the adjoining farm to the north of the Project Site</p>	Low to Moderate

The areas of moderate potential conflict outlined in **Table 3.4** will be addressed through the following **Risk Reduction Controls** outlined in **Table 3.5**.

Table 3.5 Hazard Identification and Risk Control Sheet

Activity	Identified Hazard	Risk Ranking	Method of Control	Controlled Ranking
<p>Use of Agricultural/Horticultural Sprays</p>	<p>Health and Safety Spray drift from an application of agricultural chemicals has the potential to adversely affect the health and safety of persons in non-targeted areas.</p>	<p>C3 = 13 Unacceptable</p>	<p>Based on the proximity of the existing Blueberry farm to the north (Lot 1 DP808207) of the subject site (northern portion of Lot 202 DP874273) we recommend a vegetated buffer be installed to provide an effective safeguard to spray drift.</p> <p>A vegetated buffer based on the following criteria is to be installed on the Project Site along the northern boundary:</p> <ul style="list-style-type: none"> ▪ contain random plantings of a variety of tree and shrub species of differing growth habits, at spacings of 4–5 m for a minimum width of 30 m. ▪ include species with long, thin and rough foliage which facilitates the more efficient capture of spray droplets; ▪ provide a permeable barrier which allows air to pass through the buffer. A porosity of 0.5 is acceptable (approximately 50% of the screen should be air space); ▪ foliage is from the base to the crown; ▪ include species which are fast growing and hardy; and ▪ have a mature tree height at least 4m <p>Note: The Pesticides Act 1999 regulates the use of pesticides in NSW. Management practices must either eliminate spray drift or at least minimise it to a level where it will not cause adverse health impacts.</p>	<p>C4 = 8 Acceptable</p>

Odour	Chemical sprays, fertilisers (inorganic and organic), effluent disposal and composting	B4 = 12 Unacceptable	The nominated vegetated buffer designed to capture chemical spray drift will also be effective in reducing conflict resulting from odour	D4 = 5 Acceptable
Noise	Tractor operations, mowers, cool room condensers	B4 = 12 Unacceptable	The most likely types of noise associated with agricultural activity which may lead to land use conflict in the locality would be intermittent noise from cool room operation, tractors and other machinery. Given the proposed setbacks, resultant noise decay by distance attenuation and the intermittent use of tractors and delivery vehicles the likelihood of noise impacts from the existing blueberry farm activities are deemed to be low to negligible.	D4 = 5 Acceptable
Dust	Cultivation prior to planting, tractor and transport movements	B3 = 17 Unacceptable	The nominated vegetated buffer designed to capture chemical spray drift will also be effective in reducing conflict resulting from dust.	D4 = 5 Acceptable
Residential Development/ Buffer Distances	The closest point of the subject site is approximately <ul style="list-style-type: none"> ▪ 12m to the blueberry farm on Lot 1 DP808207 to the north 	B3 = 17 Unacceptable	The nominated vegetated buffer designed to capture chemical spray drift will also be effective in reducing conflict resulting from activities associated with surrounding land uses.	D4 = 5 Acceptable

4. Discussion

While a default buffer area of 200m width is recommended between *greenhouse and controlled environment horticulture* and residential development the actual width of the buffer should in practice be dependent on the most limiting factor involved (i.e. the factor that will require the widest buffer). In theory, this would lead to all other factors being adequately addressed.

The LUCRA identified that the most limiting factor is agricultural spray drift and odour.

The proposed development should be designed to minimise instances of incompatibility such that normal farming practice are not inhibited. Where such instances do arise, measures to ameliorate potential conflicts should be devised wherever possible.

When considering potential land use conflict between residential and agricultural activities it is important to recognise that all agricultural activities:

- should incorporate reasonable and practicable measures to protect the environment in accordance with the Protection of the Environment Operations Act (POEO) 2010 and associated industry specific guidelines; and
- are legally conducted as required by other legislation covering workplace health and safety, and the use and handling of agricultural chemicals.

Nevertheless, certain activities practised by even the most careful and responsible farmer may result in a nuisance to adjacent residential areas through, for example, unavoidable odour drift and noise impacts.

4.1 Vegetated Buffers

The use of vegetated buffers to separate incompatible land uses is gaining increasing interest as a means of reducing the need for physical separation and hence increasing development opportunities. Biological buffers can also contribute to increased biodiversity, shade, visual improvements, soil stability, water quality and amenity. The role of appropriately designed vegetative buffers in intercepting chemical drift and providing visual barriers is well recognised. Such benefits, however, are only derived from established and well-maintained buffers, which may take many years to realise and can prove difficult to enforce.

Biological buffers can also affect the local microclimate (either positively or negatively) through shading, taking up of water and nutrients, and altered airflow patterns. They can also impede the views and amenity of nearby residents and, if inappropriately managed, can harbour exotic weeds or pests.

Vegetated buffers have other advantages in that they:

- create habitat and corridors for wildlife;
- increase the biological diversity of an area, thus assisting in pest control;
- favourably influence the microclimate;
- are aesthetically pleasing;
- provide opportunities for recreational uses;
- contribute to the reduction of noise and dust impacts.

In order to maximise beneficial effects and effectively reduce conflict, biological buffers need to be well planned and managed. This includes effective provision for ongoing management and maintenance of the values of the vegetated barrier so that it performs its function as a buffer.

It is recommended that a landscape plan be prepared indicating the extent of the buffer, the location and spacing of proposed and existing trees and shrubs and a list of tree and shrub species to be planted. The application should also contain details concerning proposed ownership of the vegetated buffer and the means by which the buffer is to be maintained.

All plantings are to be mulched, fertilised and watered for the first twelve months after planting.

The landscape plan must indicate:

- a) proposed location for planted shrubs and trees;
- b) botanical name of shrubs and trees to be planted;
- c) mature height of trees to be planted;
- d) location of trees identified for retention in the development application plans.

As a general rule, buffer areas should be properly designed to avoid special maintenance requirements whilst achieving their maximum desired effect of separating conflicting land uses. However, it will be necessary to ensure ongoing maintenance of buffer areas, including replanting, thinning, management for fire protection, herbicide damage, noxious weeds, feral animals, litter build-up etc. so that the buffer areas continue to be effective in reducing conflict. Vegetated buffers may require ongoing attention to maintain a porosity of 0.5 with suitable lower and upper storey vegetation to ensure their effectiveness in capturing spray drift.

Vegetated buffers may serve as components of wildlife corridors and improve opportunities for conserving wildlife habitat.

To achieve effective management, clear responsibilities for maintenance should be determined before the buffer areas are implemented. Responsibilities for maintenance will be largely determined by ownership. In general, maintenance of buffer areas in private ownership will be the responsibility of the proprietor, as controlled by development conditions. The recommended mechanism is through planning conditions imposed on a development approval. These conditions attach to the land and are binding on successors in title.

The necessary controls to ensure this maintenance is carried out must be in place at the time the buffer area is created.

4.3 Noise Impacts

There are four types of noise associated with agricultural activity which may lead to land use conflict. These are the noises associated with intensive livestock facilities, aircraft activities, constant or long-term noise, (e.g. pumps or refrigeration plants), and intermittent noise from tractors and other machinery.

The most likely types of noise associated with agricultural activity which may lead to land use conflict in the locality would be noise from refrigeration and tractor operation.

Cool room motor noise varies on the size of the motor. Noise measurements undertaken by TFA for other Noise Impact Assessments indicates cool room noise levels at 1.15m offset as follows:

Location	Time Period	Description	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
1	12:15pm to 12:30pm	Western boundary, 1.15m offset from cool room compressor	66.8	90.9	68.2	64.1

The cool room compressor was operating consistently and without fault during measurements.

Tractor noise varies depends on a number of factors (listed below) however noise levels can range from 80 decibels (dB) to 92dB at source. Noise decay over distance can be predicted on the basis of noise attenuation rates of 6 dB(A) for each doubling of distance from the noise source. This attenuation rate assumes open ground conditions. The existence of natural barriers, broken topography or other features would increase attenuation and affect the resultant noise level at the receiver.

Factors affecting noise from agricultural activities include:

- type of engine (diesel or petrol; 2- or 4-stroke);
- number of cylinders;
- cooling system (air or liquid);
- load;
- timing, frequency and duration of operations;
- geographical conditions and barriers e.g. topography and inversions;
- weather conditions e.g. wind speed and direction; and
- typical industry machinery and practices.

Given the nature of adjoining land use it is unlikely that noisy activities will occur at night. Noise from general farming operations (tractor use, spraying etc), vehicle movements, pruning of trees and general farm activities is a normal part of farming.

Estimated noise emissions from external plant were compared with:

- Noise Policy for Industry – NSW EPA 2017
Recommends acceptable amenity noise level from industrial sources at a residential receiver are to be below 55 dB (A), 45 dB (A) and 40 dB (A) for the day, evening and night periods at the boundary of any adjacent suburban lot.

Estimate of Noise Decay from Cool room Condensers by Distance Attenuation only

Given that the existing cool room/s are assumed to be located approximately 25 metres from the northern boundary of the subject site the resultant noise levels will be in the order of 40dB(A) at the closest point on the subject site. As noted previously this attenuation rate assumes open ground conditions. The existence of natural barriers, broken topography or other features would increase attenuation and affect the resultant noise level at the receiver.

The estimated noise levels from the existing cool room condensers are therefore predicted to be in compliance with the recommended noise criteria with no additional mitigation measures in place.

4.4 Stormwater Management

The subject site (lot 202 DP 874273) and the adjoining Blueberry farm site (Lot 1 DP808207) are located in separate catchments which are divided along the common Boundary (Bark Hut Road).

Run-on or seepage on adjoining farmland will therefore not occur as the catchments at the subject site generally slopes in a southerly direction. The adjoining blueberry farm drains in a northerly direction.

4.5 Traffic and Access

According to discussions with Clyde Treadwell, RDM, (pers.com 21 November 2018) access for the future proposed residential will occur off Solitary Islands Way in conjunction with the proposed recreational sports fields to the south of the subject site. There is not envisaged to be any significant land use conflicts with respect to the traffic and access between the proposed rezoning of the subject site for residential use and the existing blue berry farm operation.

5 Conclusions and Recommendations

This Land Use Conflict Risk Assessment is based on:

- a review of Aerial Photography;
- discussions with Clyde Treadwell; and
- a review of surrounding landuses.

This LUCRA has concluded that the *Planning Proposal* to Coffs Harbour City Council for land located at Lot 202 DP 874273 (northern portion only) Bark Hut Road Woolgoolga to permit a residential rezoning as part of the Planning Proposal is considered suitable subject to the recommendations provided further below.

Recommendations for Vegetated Buffers

Based on the proximity of the existing blueberry farm to the north of the proposed residential rezoning we recommend a vegetated buffer be installed to provide an effective safeguard to spray drift.

1. A **vegetated buffer** based on the following criteria is to be installed on the Project Site along the northern boundary
 - contain random plantings of a variety of tree and shrub species of differing growth habits, at spacings of 4–5 m for a minimum width of 30 m.
 - include species with long, thin and rough foliage which facilitates the more efficient capture of spray droplets;
 - provide a permeable barrier which allows air to pass through the buffer. A porosity of 0.5 is acceptable (approximately 50% of the screen should be air space);
 - foliage is from the base to the crown;
 - include species which are fast growing and hardy; and
 - have a mature tree height at least 4m.

Note: The Pesticides Act 1999 regulates the use of pesticides in NSW. Management practices must either eliminate spray drift or at least minimise it to a level where it will not cause adverse health impacts.

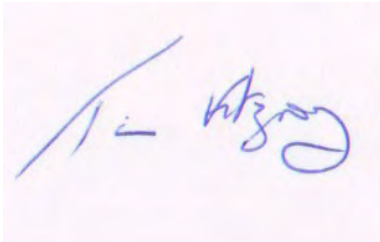
Other Considerations that have Informed this Assessment

A number of factors have led to this conclusion including:

- No aerial agricultural spraying is known to occur in the area.

- Given the proposed setbacks, resultant noise decay by distance attenuation and the intermittent use of tractors and delivery vehicles the likelihood of noise impacts from the existing blueberry farm activities are deemed to be low to negligible.

This report has been prepared by Tim Fitzroy of *Tim Fitzroy & Associates*.



Tim Fitzroy
Environmental Health Scientist
Environmental Auditor

References

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Primary Industries Institute, Wollongbar, September 2015 NSW Blueberry establishment and production costs, Prime fact 133, fourth edition^[1]

Department of Primary Industries 2017 Berry Plant Protection Guide 2017-2018

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A Concept Masterplan



LOT LAYOUT DETAILS

AVERAGE LOT SIZE	550m ²
AVERAGE LOT DEPTH	30m
WIDTH OF INTERNAL COLLECTOR ROAD RESERVE	20m
WIDTH OF SECONDARY ROAD RESERVES	15m

NOTE

THIS MASTER PLAN HAS BEEN PRODUCED IN ACCORDANCE WITH CURRENT PREVAILING MARKET CONDITIONS. THE LANDOWNER RESERVES THE RIGHT TO AMEND THE LOT LAYOUT IN ACCORDANCE WITH MARKET CONDITIONS AT THE TIME OF LODGING ANY FUTURE DEVELOPMENT APPLICATION.

B Photographs



Photo A Subject Site Looking South



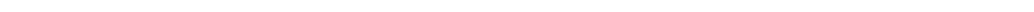
Photo B Blue Berry Farm looking East



Photo C Blueberry Farm Looking North west



Photo D Subject Site Looking East



ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

BARK HUT ROAD REZONING



WOOLGOOLGA, NSW

PREPARED FOR VADEJIL PTY LTD



Report Reference:

Hill, T, P. Fowler and T. Robins 2018 *Bark Hut Road Woolgoolga: Aboriginal Cultural Heritage Assessment (February 2018)*. Everick Heritage Consultants Pty Ltd. Unpublished report prepared for Vadejil Pty Ltd.

EVERICK HERITAGE CONSULTANTS PTY LTD

Brisbane – Tweed Heads – Coffs Harbour – Alice Springs

ABN: 78 102 206 682

Head Office: 47 Arthur Terrace

PO Box 146

RED HILL, QLD 4059

T: (07) 3368 2660

F: (07)3368 2440

E: info@everick.com.au

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EXECUTIVE SUMMARY

This report provides the results of an Aboriginal Cultural Heritage Assessment for the proposed rezoning of land at Bark Hut Road, Woolgoolga NSW (the 'Project'). The lands subject to assessment include Lot 202 DP874273 and are approximately 25.55 hectares in area (Figure 1: the 'Project Area'). The planning proposal is to rezone the land from RU1 Primary Production to R 2 Low density residential. The intent of the archaeological investigation is to identify Aboriginal and historical archaeological or cultural heritage constraints for the Project, and if found, establish ways in which any impacts could be mitigated or avoided. Everick Heritage Consultants (the 'Consultant') was commissioned by Keiley Hunter on behalf of Vadejil Pty Ltd (the 'Proponent') to undertake this assessment. It is understood that this assessment will be used in support of a Development Application to the Coffs Harbour City Council ('CHCC').

The brief for this Project was to undertake an Aboriginal and European heritage assessment of suitable standard to accompany the Development Application to the CHCC. In accordance with the relevant administrative and legislative standards for New South Wales (see Section 2 below), the methods employed in this assessment included:

- a) a search of relevant heritage registers;
- b) a site inspection undertaken by Senior Archaeologist Tim Hill on 1 March 2016;
- c) a review of the archaeological and cultural heritage assessments pertinent to the potential heritage values associated with the Project Area;
- d) review historical aerial photographs of the Project Area; and
- e) assessment of the potential for the Project Area to contain significant Aboriginal heritage and the impact on the Project may have on said heritage, consistent with the OEH *Due Diligence Code for the Protection of Aboriginal Objects in NSW* (2010).

As a result of the desktop study, field inspections, Aboriginal community consultation and archaeological investigation of the Project Area, the following was found.

- Two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) were observed on the access trail immediately south of the Bark Hut Road entrance to the Project Area (As a result of the desktop study, field inspections, Aboriginal community consultation and archaeological investigation of the Project Area, the following was found.
- Two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) were observed on the access trail immediately south of the Bark Hut Road entrance to the Project Area (**Error! Not**



a valid bookmark self-reference.). These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed.

- Having consideration for the landscape context of the Project Area and the history of disturbance it is considered unlikely that the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the Project Area none are known within the Project Area. No Mythological or ceremonial sites are known to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland.
- There is very little topsoil material in the upper slope and the artefacts were identified on the compacted surface of the trail. It is considered unlikely that the surrounding soils would contain Aboriginal objects. However, having consideration for the Due Diligence Code of Practice requirements the entire ridge crest is considered to be a Potential Archaeological Deposit (PAD). This includes a small ridge crest in the north-east corner of the Project Area.
- A second PAD was identified in the southern portion of the Project Area comprising a knoll to the west of the water storage dam however no Aboriginal objects were identified on the knoll. However, the presence of topsoil on the knoll provides an indication that there is the potential for an Aboriginal stone artefact scatter to occur on the knoll.
- Table 5). These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed.
- Having consideration for the landscape context of the Project Area and the history of disturbance it is considered unlikely that the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the Project Area none are known within the Project Area. No Mythological or ceremonial sites are known



to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland.

- There is very little topsoil material in the upper slope and the artefacts were identified on the compacted surface of the trail. It is considered unlikely that the surrounding soils would contain Aboriginal objects. However, having consideration for the Due Diligence Code of Practice requirements the entire ridge crest is considered to a Potential Archaeological Deposit (PAD). This includes a small ridge crest in the north-east corner of the Project Area.
- A second PAD was identified in the southern portion of the Project Area comprising a knoll to the west of the water storage dam however no Aboriginal objects were identified on the knoll. However, the presence of topsoil on the knoll provides an indication that there is the potential for an Aboriginal stone artefact scatter to occur on the knoll.

On the basis of the results and discussed above, the following management recommendations are provided:

Recommendation 1: Cultural Heritage Induction

It is recommended that a cultural heritage induction is provided by representatives of the RAPs for all senior civil works staff involved in the initial removal of topsoil from the ridge crests identified by the ACHAR. This induction should provide;

- an overview of the nature and extent of archaeological materials within the Project Area;
- the broader cultural context of the site and its significance to Aboriginal people;
- an outline of relevant legislation; and
- an outline of the AHIP salvage procedure and an outline of an appropriate Finds Procedure.

Recommendation 2: Application for an Aboriginal Heritage Impact Permit (AHIP)

It is recommended that prior to commencement of works (issue of Construction Certificate) that the proponent apply for an Aboriginal Heritage Impact Permit (AHIP) for salvage of known Aboriginal Objects from within the Project Area (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504). This AHIP should be subject to the following conditions relating to the salvage program:

- Cultural heritage induction for all ground clearance contractors.
- Collection of surface artefacts by Raps and temporary storage at CHDLALC.
- Monitoring of topsoil removal and collection of artefacts from the ridge crest and temporary storage at CHDLALC.



- The monitoring should be in an area 20m below the access track and along the apex of the ridge to the upper/ mid slope. All the way down to Creek.
- Permanent burial of artefacts within a reserve or garden area nearby.
- The monitoring should also include the ridge area in the north-east of the Lot.

Recommendation 3: Southern PAD

It is noted that the site inspection did not identify any Aboriginal objects within the southern PAD area, defined by the knoll to the west of the water storage dam. Having consideration for the potential of this PAD to contain Aboriginal sites of high or moderate conservation value it is recommended that the minimum management response for this PAD is a cultural heritage induction and the application of an Aboriginal Find Procedure.

If it is suspected that Aboriginal material has been uncovered as a result of development activities within the Project Area:

- a) work in the surrounding area is to stop immediately;
- b) a temporary fence is to be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site;
- c) an appropriately qualified archaeological consultant is to be engaged to identify the material; and
- d) if the material is found to be of Aboriginal origin, the Aboriginal community is to be consulted in a manner as outlined in the *ACHCRP Guidelines* (2010).

Should the material be identified as an Aboriginal object and the proposed works cannot be amended to avoid the Aboriginal site an Aboriginal Heritage Impact Permit (AHIP) would be required prior to recommencement of works in the vicinity of the site. Consultation with stakeholders from the Aboriginal community would be required as a part of the AHIP application process.

It is recommended that these requirements are formalised within a Cultural Heritage Management Plan agreed to by Registered Aboriginal Parties prior to issue for the Development Application for subdivision to allow an opportunity for RAPs to better consider the full impacts of proposed works.

Recommendation 4: Aboriginal Human Remains

Although it is unlikely that Human Remains will be located at any stage during earthworks within the Project Area, should this event arise it is recommended that all works must halt in the immediate area to prevent any further impacts to the remains. The Site should be cordoned off and the remains themselves should be left untouched.



The nearest police station (Coffs Harbour), the Coffs Harbour Local Aboriginal Land Council and the OEH Regional Office (Coffs Harbour) are all to be notified as soon as possible. If the remains are found to be of Aboriginal origin and the police do not wish to investigate the Site for criminal activities, the Aboriginal community and the OEH should be consulted as to how the remains should be dealt with. Work may only resume after agreement is reached between all notified parties, provided it is in accordance with all parties' statutory obligations.

It is also recommended that in all dealings with Aboriginal human remains, the Proponent should use respectful language, bearing in mind that they are the remains of Aboriginal people rather than scientific specimens.

Recommendation 5: Conservation Principles

It is recommended that all effort must be taken to avoid any impacts on Aboriginal Cultural Heritage values at all stages during the development works. If impacts are unavoidable, mitigation measures should be negotiated between the Proponent, OEH and the Aboriginal community.



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DEFINITIONS

The following definitions apply to the terms used in this report:

Aboriginal Object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the [Aboriginal](#) habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes [Aboriginal remains](#).

Aboriginal Place means any place declared to be an Aboriginal place (under s.84 of the NPW Act) by the Minister administering the NPW Act, by order published in the NSW Government Gazette, because the Minister is of the opinion that the place is or was of special significance with respect to Aboriginal culture. It may or may not contain Aboriginal Objects.

ACHCRP Guidelines means the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010).

AHIP means Aboriginal Heritage Impact Permit

Code of Practice means the OEH *Code of Practice for Archaeological Conduct in New South Wales* (2010).

Consultant means qualified archaeological staff and/or contractors of Everick Heritage Consultants Pty Ltd.

Development Area means those lands within the Project Area subject to the Proposed Works.

Due Diligence Code means the OEH *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010).

LALC means Local Aboriginal Land Council

LEP means the Local Environment Plan

NPW Act means the *National Parks and Wildlife Act 1974* (NSW).

NPW Regulations means the *National Parks and Wildlife Regulations 2009* (NSW).

OEH means the New South Wales Office of Environment and Heritage.

Project means the proposed future development of the Project Area for a low density residential subdivision.

Project Area means the land subject to this assessment being Lot 202 DP 874273, located at Bark Hut Road Woolgoolga NSW.

Proposed Works means all activities associated with proposed future ground disturbance within the Development Area, including activities undertaken by subsequent landholders.

Proponent means Vadejil Pty Ltd, and all associated employees and contractors and subcontractors of the same.



1. INTRODUCTION

1.1 Purpose of the Cultural Heritage Assessment

This report provides the results of an Aboriginal Cultural Heritage Assessment for the proposed rezoning of land at Bark Hut Road, Woolgoolga NSW (the 'Project'). The lands subject to assessment include Lot 202 DP874273 and are approximately 25.55 hectares in area (Figure 1). The planning proposal is to rezone the land from RU1 Primary Production to R2 Low density residential.

The intent of the archaeological investigation is to identify Aboriginal and historical archaeological or cultural heritage constraints for the Project, and if found, establish ways in which any impacts could be mitigated or avoided.

1.2 Proponent, Project Brief & Methodology

Everick Heritage Consultants (the 'Consultant') was commissioned by Keiley Hunter on behalf of Vadejil Pty Ltd (the 'Proponent') to undertake this assessment. It is understood that this assessment will be used in support of a Development Application to the Coffs Harbour City Council ('CHCC').

The brief for this Project was to undertake an Aboriginal and European heritage assessment of suitable standard to accompany the Development Application. In accordance with the relevant administrative and legislative standards for New South Wales (see Section 2 below), the methods employed in this assessment included:

- a) a search of relevant heritage registers;
- b) a site inspection undertaken by Senior Archaeologist Tim Hill on 01 March 2016;
- c) a review of the archaeological and cultural heritage assessments pertinent to the potential heritage values associated with the Project Area; and
- d) assessment of the potential for the Project Area to contain significant Aboriginal heritage and the impact on the Project may have on said heritage, consistent with the OEH *Due Diligence Code for the Protection of Aboriginal Objects in NSW* (2010).



The methods used for this assessment are in compliance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010* and all relevant legislation as described in Section 2 of this Report.

1.3 Description of Proposal

The current proposal is to rezone the Project Area from RU2 (Rural Landscape) to R2 (Low Density Residential) for the purpose of developing the land into a residential subdivision. The average lot size will be approximately 600m². The overall development will be centred around the Woolgoolga sports field development (Figure 2 and Figure 3). The Proposed Works also include connection of all utilities and construction of roads, paths and landscaping.

1.4 Report Authorship

The desktop study was undertaken by Senior Archaeologist Tim Hill, assisted by Archaeologist Pauline Fowler. The field inspection was conducted by Senior Archaeologist Tim Hill. This report was written by Tim Hill and Everick Director Tim Robins.

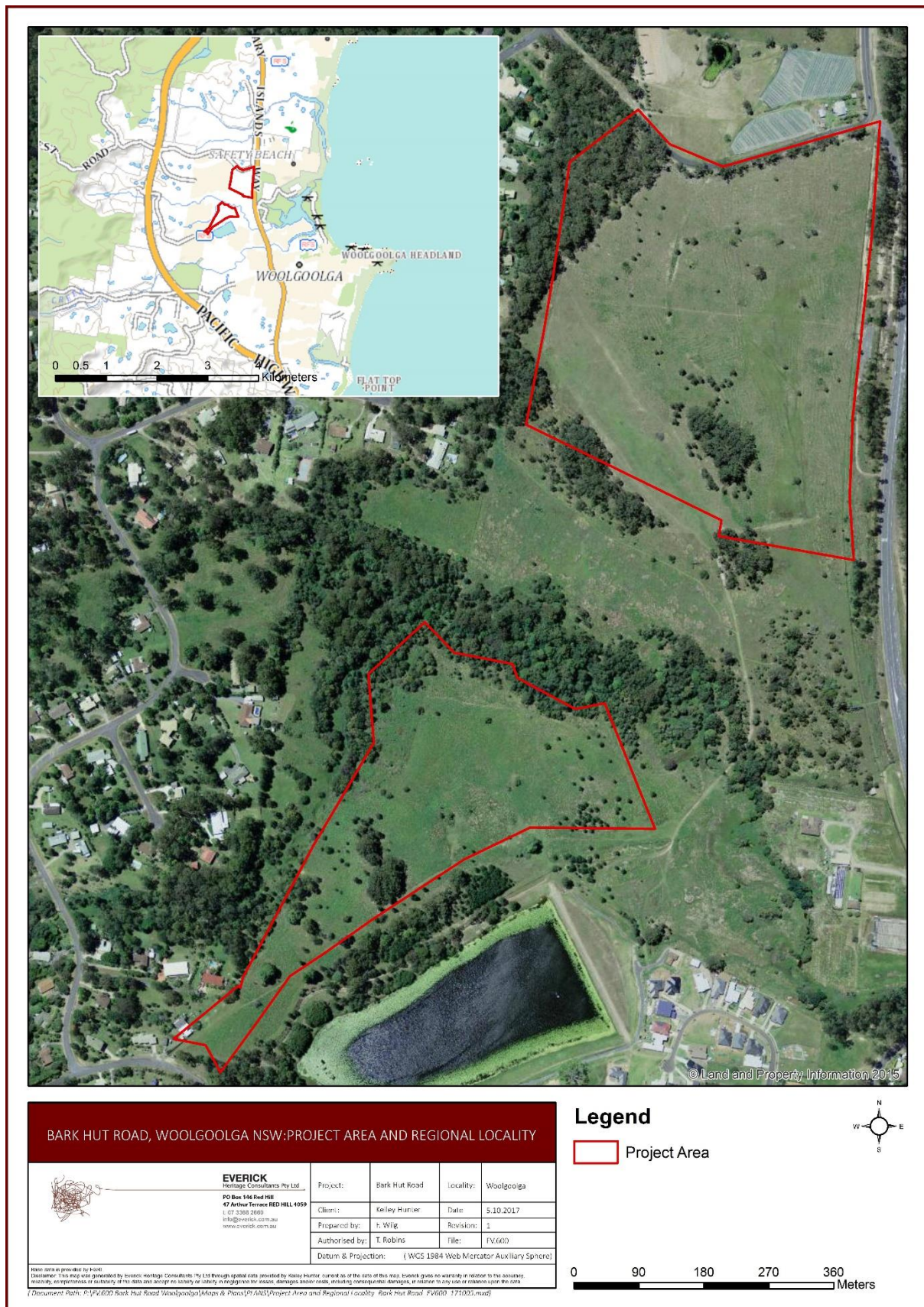


Figure 1: Regional Locality of the Project Area.





Figure 2: Proposed Lot Layout (Northern section)

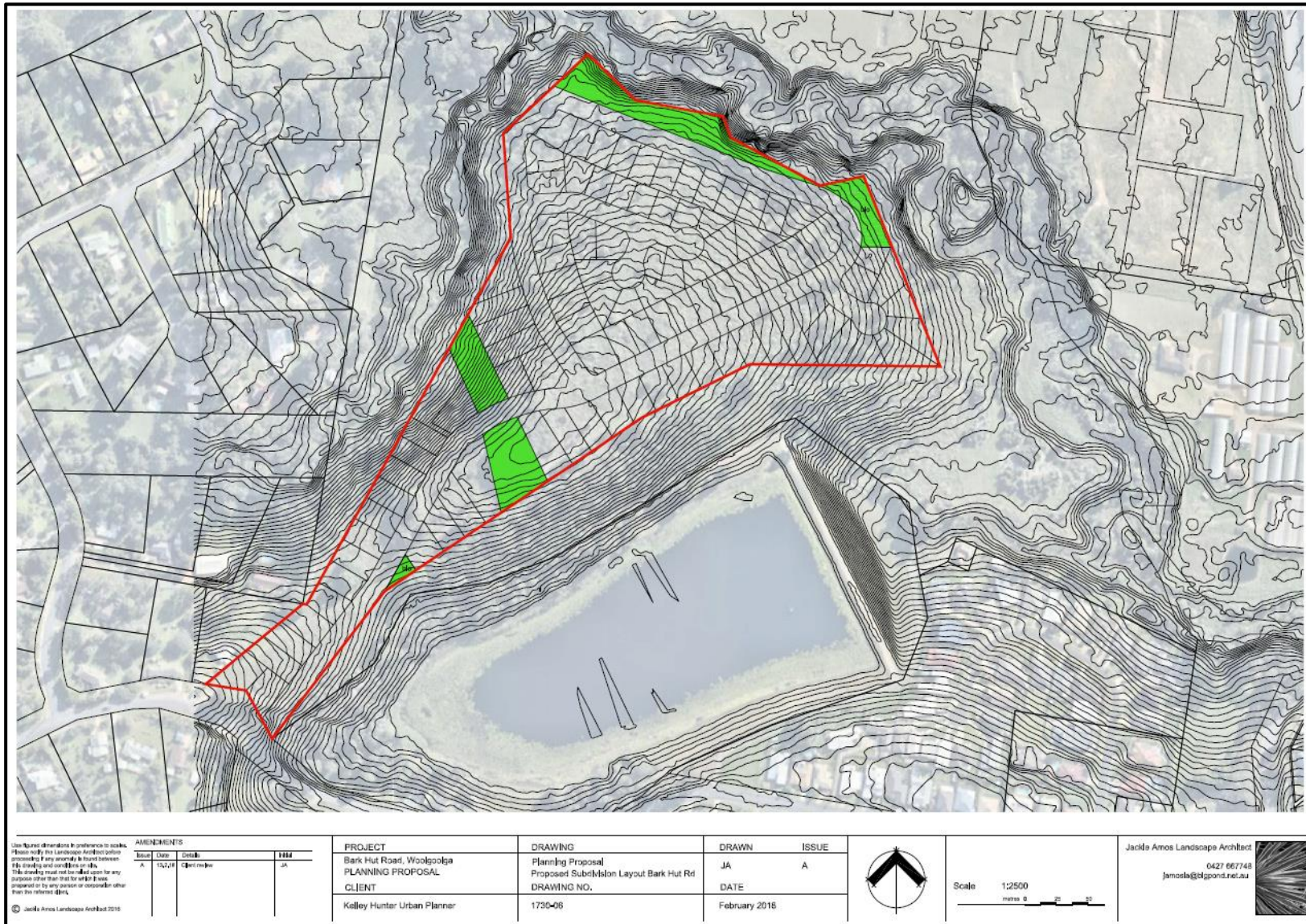


Figure 3: Proposed Lot Layout (Southern Section).



2. LEGISLATIVE AND PLANNING CONTEXT

The following legislation provides the context for cultural heritage in NSW: the *National Parks and Wildlife Act 1974* (NSW) ('NPW Act'), the *Environmental Planning and Assessment Act 1979* (NSW) ('EP&A Act') and the *Heritage Act 1977* (NSW). The Commonwealth also has a role in the protection of nationally significant cultural heritage through the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth), *The Protection of Movable Cultural Heritage Act 1986* (Cth) and the *Historic Shipwrecks Act 1976* (Cth).

For the purposes of this assessment it is the state and local legislation that is relevant. The consent authorities will be the CHCC and, where a referral agency is required to be reported to, the OEHL. Approval from the OEHL will be required should the Project propose to impact on identified Aboriginal Objects. The information below lists the legislative and policy framework within which this assessment is set.

2.1 The *National Parks and Wildlife Act 1974* (NSW) and the *National Parks and Wildlife Regulations 2009* (NSW)

The NPW Act is the primary legislation concerning the identification and protection of Aboriginal cultural heritage. It provides for the management of both Aboriginal Objects and Aboriginal Places. Under the NPW Act, an Aboriginal Object is any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area, regardless of whether the evidence of habitation occurred before or after non-Aboriginal settlement of the land. This means that every Aboriginal Object, regardless of its size or seeming isolation from other Objects, is protected under the Act.

An Aboriginal Place is an area of particular significance to Aboriginal people which has been *declared* an Aboriginal Place by the Minister. The drafting of this legislation reflects the traditional focus on Objects, rather than on areas of significance such as story places and ceremonial grounds. However, a gradual shift in cultural heritage management practices is occurring towards recognising the value of identifying the significance of areas to Indigenous peoples beyond their physical attributes.

With the introduction of the *NPW Amendment Act 2010* (NSW) the former offence provisions under Section 86 of 'disturbing', 'moving', 'removing' or 'taking possession' of Aboriginal Objects or Places have been replaced by the new offence of 'harming or desecrating'. The definition of 'harm' is 'destroying, defacing or damaging an Object'. Importantly in the context of the management recommendations in this assessment, harm to an Object that is 'trivial or negligible' will not constitute an offence.



The new amendments also significantly strengthen the penalty provisions. The issue of intent to harm Aboriginal cultural heritage has been formally addresses by separating it from inadvertent harm. The penalty for individuals who inadvertently harm Aboriginal Objects is up to \$55,000, while for corporations it is \$220,000. Also introduced is the concept of '*circumstances of aggravation*' which allows for harsher penalties (up to \$110,000) for individuals who inadvertently harm Aboriginal heritage in the course of undertaking a commercial activity or have a record for committing similar offences. For those who knowingly harm Aboriginal cultural heritage, the penalty will rise substantially. The maximum penalty is set at \$275,000 or one year imprisonment for individuals, while for corporations it will rise to \$1,100,000.

Where a land user has or is likely to undertake activities that will harm Aboriginal Objects, the Director General (OEH) has a range of enforcement powers, including stop work orders, interim protection orders and remediation orders.

The NPW Act also includes a range of defence provisions for unintentionally harming Aboriginal Objects:

- a) Undertaking activities that are prescribed as 'Low Impact'.
- b) Acting in accordance with the new Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010) ('Due Diligence Code');
- c) Using a consulting archaeologist who correctly applies the OEH Code of Practice for Archaeological Conduct in New South Wales (2010); and
- d) Acting in accordance with an Aboriginal Heritage Impact Permit (AHIP).

2.1.1 '*Low Impact Activities*'

The NPW Regulations allow for a range of low impact activities to be undertaken without the need to consult the OEH or a consulting archaeologist. Generally, those who undertake activities of this nature will not be committing an offence, even if they inadvertently harm Aboriginal objects. These activities include:

- a) maintenance such as on existing roads and tracks, or on existing utilities such as underground power cables and sewage lines;
- b) farming and land Management for land previously disturbed, activities such as cropping, grazing, bores, fencing and erosion control;
- c) removal of dead or dying vegetation (only if there is minimal ground disturbance);
- d) environmental rehabilitation such as weed removal, bush regeneration;
- e) development in accordance with a Development Certificate issued under the EPA Act 1979 (provided the land is previously disturbed);



- f) downhole logging, sampling and coring using hand held equipment; and
- g) geochemical surveying, seismic surveying, costeaming or drilling.*

*This defence is only available where the land has been disturbed by previous activity. Disturbance is defined as a clear and observable change to the land's surface, including but not limited to land disturbed by the following: soil ploughing; urban development; rural infrastructure (such as dams and fences); roads, trails and walking tracks, pipelines, transmission lines; and storm water drainage and other similar infrastructure.

2.2 Due Diligence Code of Practice for the Protection of Aboriginal Objects

The Due Diligence Code has been applied in Section 10 of this assessment. It operates by posing a series of questions for land users before they commence development. These questions are based around assessing previous ground disturbance. An activity will generally be unlikely to harm Aboriginal Objects where it:

- a) will cause no additional ground disturbance;
- b) is in a developed area; or
- c) is in a significantly disturbed area.

Where these criteria are not fulfilled, further assessment for Aboriginal cultural heritage will typically be required prior to commencing the activity.

2.3 The ACHCRP (2010)

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) ('ACHCRP') provide an acceptable framework for conducting Aboriginal community consultation in preparation for impacts to Aboriginal cultural heritage. Proponents are required to follow them where a Project is likely to impact on cultural heritage and where required by Council.

It is recommended by the OEH that all cultural heritage assessments involve this level of consultation, although it is not strictly a requirement unless it meets the above criteria. The ACHCRP Guidelines typically take a minimum of 90 days to complete. However, in complicated Projects this period may need to be extended by several months. The Guidelines require public notice of the assessment, preparation of a proposed methodology, undertaking site meetings and excavations where required, the production of a draft report, which is distributed to the registered Aboriginal groups and the production of a final report.



Given the low archaeological potential of the current Project Area, it has been concluded that following the ACHCRP Guidelines is not warranted for this assessment.

2.4 The Coffs Harbour Local Environmental Plan 2013

The Coffs Harbour LEP 2013 provides statutory protection for items already listed as being of heritage significance (Schedule 5), items that fall under the ambit of the *Heritage Act 1977* (NSW) and Aboriginal Objects under the *National Parks and Wildlife Act 1974* (NSW). It aims to ensure best practice components of the heritage decision making process are followed.

For listed heritage items, or a building, work, relic or tree and heritage conservation areas, the following action can only be carried out with the consent of the Coffs Harbour City Council (CHCC):

- a) demolishing or moving a heritage item or a building, work, relic or tree within a heritage conservation area;
- b) altering a heritage item or a building, work, relic, tree or place within a heritage conservation area, including (in the case of a building) making changes to the detail, fabric, finish or appearance of its exterior;
- c) altering a heritage item that is a building by making structural changes to its interior;
- d) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed;
- e) disturbing or excavating a heritage conservation area that is a place of Aboriginal heritage significance;
- f) erecting a building on land on which a heritage item is located or that is within a heritage conservation area; and
- g) subdividing land on which a heritage item is located or that is within a heritage conservation area.

In addition, CHCC may not grant development consent without considering the effect the proposed development will have on the heritage significance of heritage item or heritage conservation area concerned.

Furthermore, in regards to Aboriginal heritage significance (Part 5.10.8) the consent authority must, before granting consent under this clause to the carrying out of development in a place of Aboriginal heritage significance:

- a) consider the effect of the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place; and



- b) notify the local Aboriginal communities (in such way as it thinks appropriate) about the application and take into consideration any response received within 28 days after the notice is sent.



3. ABORIGINAL COMMUNITY CONSULTATION

3.1 Traditional Owner Knowledge

The Aboriginal Stakeholders are the primary determinants of the significance of their cultural heritage. Members of the Aboriginal community will be consulted, and will continue to be consulted, with regard to their concerns not only about known archaeological sites in the region, but also about cultural values such as areas with historic and spiritual significance, and other values relating to flora and fauna of the area. Everick recognises that there may be Traditional Owner knowledge associated with the region that will have to be treated in a confidential manner.

3.2 The Consultation Process

Everick undertook a consultation process with the Aboriginal community in accordance with the *OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) (ACHCRP). A summary of the process undertaken is as follows:

- a) correspondence to the Office of Environment and Heritage (dated 6 October 2017);
- b) correspondence to The Registrar, *Aboriginal Land Rights Act* 1983 for a list of Aboriginal Owners (dated 6 October 2017);
- c) correspondence to NTSCORP Limited (dated 6 October 2017); and
- d) correspondence to Coffs Harbour City Council (dated 6 October 2017).

Written correspondence was forwarded on 2 November 2017 to the following individuals and organisations providing an opportunity to be involved in the assessment project:

- Garby Elders,
- Coffs Harbour and District Local Aboriginal Land Council,
- Garlambirla Guuyu-girrwa Aboriginal Corporation,
- Mudjay Elders,
- Bagawa Birra Murri Aboriginal Corporation,
- Yarrawarra Aboriginal Corporation,
- Mimi Mothers Aboriginal Corporation,



- Muurrbay Aboriginal Language and Cultural Cooperative Ltd,
- Ciaron Dunn,
- Gumbayngirr Native Title Group,
- Gumbayngirr Elders,
- Ngurrala Aboriginal Corporation,
- Uncle Thomas Kelly and Family,
- Derrick Vale Sr.,
- Natalene Mercy,
- Jagun Elders; and
- Norm Archibold.

A public advertisement was placed in the Coffs Coast Advocate on 4 November 2017 (Figure 4) with a closing date of 12 April 2016.

Aboriginal Cultural Heritage Study Registration of Interest

Everick Heritage Consultants Pty Ltd (ABN 78 102 206 682) is seeking to consult with interested Aboriginal persons in preparation for the proposed rezoning project at Bark Hut Road, Woolgoolga, NSW. The Study Area consists of Lot 202 DP874273, Woolgoolga (west of Solitary Islands Way). Consultation will be undertaken in preparation for an Aboriginal Heritage Impact Permit application.

What do you need to do?

Aboriginal persons who hold cultural knowledge of the region are invited to register their interest in writing with:

Everick Heritage Consultants
PO Box 200
COFFS HARBOUR NSW 2450
or t.hill@everick.com.au

When must registration be received?

Registration must be received by Monday 20 November 2017.

Figure 4: Copy of advertisement placed in Coffs Coast Advocate 4 November 2017

As a result of the consultation process the following list of Registered Aboriginal Parties (RAPs) was developed:

- Coffs Harbour and District Local Aboriginal Land Council; and
- Jagun Elders (via email see Appendix 3).



Everick Heritage Consultants believe that this Community Consultation process was adequate for the current project and as such has utilised this list as the basis for consultation for the current assessment.

A letter was forwarded to OEH and Coffs Harbour and District Local Aboriginal Land Council on 29 November 2017 notifying them of the outcomes of the consultation process (Appendix 4).

A consultation meeting was held with Mr Ian Brown and Ms Luana Ferguson (CHDLALC) and Uncle Tony Perkins (Jagun Elders) on 18 January 2018 to discuss the results of the initial inspection and provide advice and comment on the proposed management response for the project. An invitation to attend this meeting was provided to the Garby Elders however Uncle Milton Duroux and MR Tony Dootson were not able to attend the meeting. The notes from the meeting and email responses from RAPs are provide in Appendix D.



4. ABORIGINAL CULTURAL HERITAGE DESKTOP REVIEW

4.1 The OEH Aboriginal Heritage Information Management System (AHIMS)

Care should be taken when using the AHIMS database to reach conclusions about site prevalence or distribution. For example, a lack of sites in a given area should not be seen as evidence that the area was not occupied by Aboriginal people. It may simply be an indication that it has not been surveyed for cultural heritage, or that the surveys were undertaken in areas of poor surface visibility. Further to this, care needs to be taken when looking at the classification of sites. For example, the decision to classify a site an artefact scatter containing shell rather than a midden can be a highly subjective exercise, the threshold for which may vary between archaeologists.

An extensive search was conducted on 12 January 2017 of the OEH AHIMS for the Project Area with a 50 metre buffer (ID 261963) which returned 2 Aboriginal site listings. Site features include artefacts and an Aboriginal Resource and Gathering site (See Table 1 and Figure 5). These sites are located within a proposed reserve area associated with Poundyard Creek and the Woolgoolga Sports Field development and will not be affected by the rezoning proposal.

Table 1: AHIMS Search Results

<i>Site Number</i>	<i>Name</i>	<i>Easting</i>	<i>Northing</i>	<i>Site 'Features'</i>
22-1-0152	C1_Poundyard Creek	517710	6669940	Artefact (1)
22-1-0408	West Woolgoolga Sports Field	517856	6669964	Artefact (2)



Figure 5: AHIMS extensive search results.



4.2 Other Heritage Registers

The following heritage registers were accessed on 27 September 2017:

- **The National Heritage List** (Australian Heritage Council): Contains no Aboriginal heritage listings within or within close proximity to the Project Area.
- **Commonwealth Heritage List** (Australian Heritage Council): Contains no Aboriginal heritage listings within or within close proximity to the Project Area.
- **Register of the National Estate** (Australian Heritage Council): Contains no Aboriginal heritage listings within or within close proximity to the Project Area.
- **The State Heritage Register** (NSW Heritage Office): Contains no Aboriginal heritage listings under Section 1 (Aboriginal Places listed under the NPW Act) within or within close proximity to the Project Area;
- **The Register of the National Trust of Australia:** Contains no listings within or within close proximity to the Project Area.
- **Coffs Harbour Local Environment Plan 2013 ('LEP'):** Contains no listings within or within close proximity to the Project Area.



5. LANDSCAPE CONTEXT

5.1 Environment Locality

5.1.1 Topography

Topography can generally be described as gently slopes and ridges. Elevation of the site varies from approximately RL 9.5m AHD, to around RL 38.0 m AHD. Surface slope is relatively moderate, typically around 10%, with isolated areas getting as steep as 25% and as flat as 1%. The northern portion of the site is situated on the southern side of a ridge, and consequently, falls to the south-east, to a well defined gully running south to Poundyard Creek. The southern portion of the site is located on a knoll, and as such the land falls away from the top of the feature.

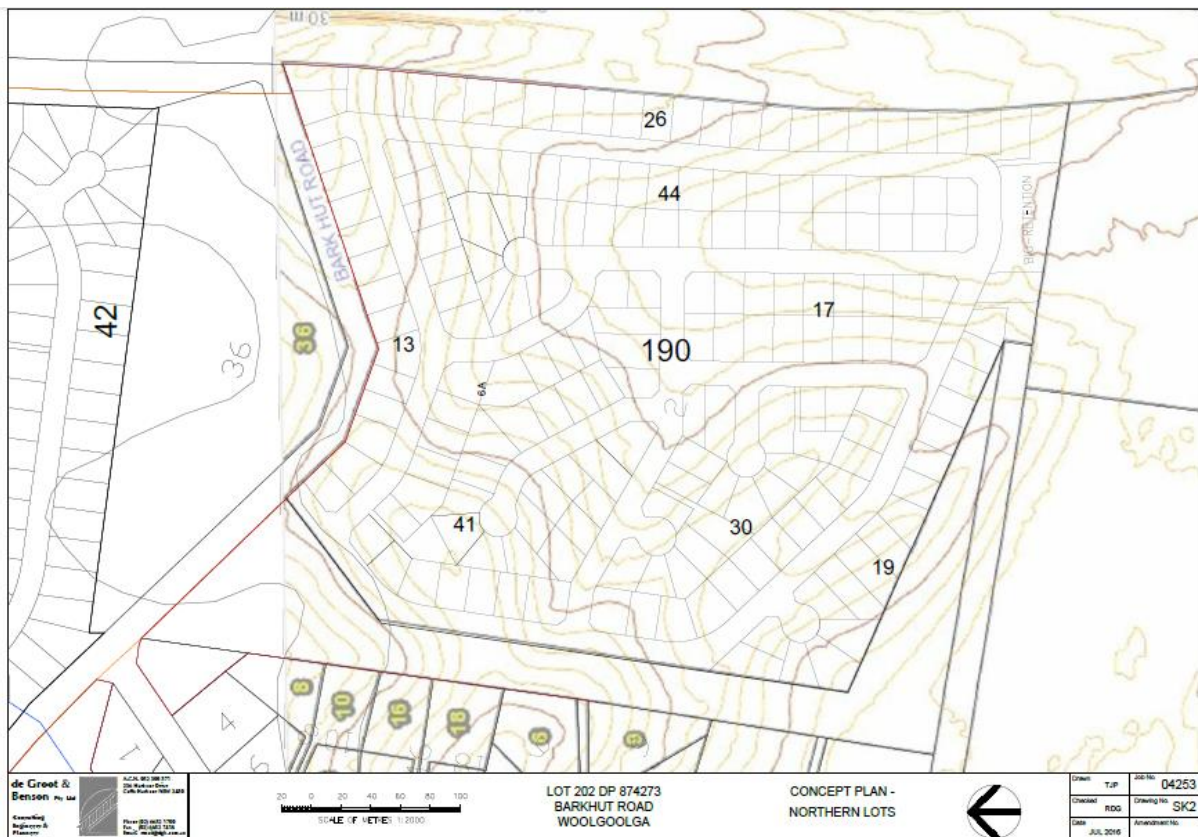


Figure 6: Lot Layout and contour map- Northern section.

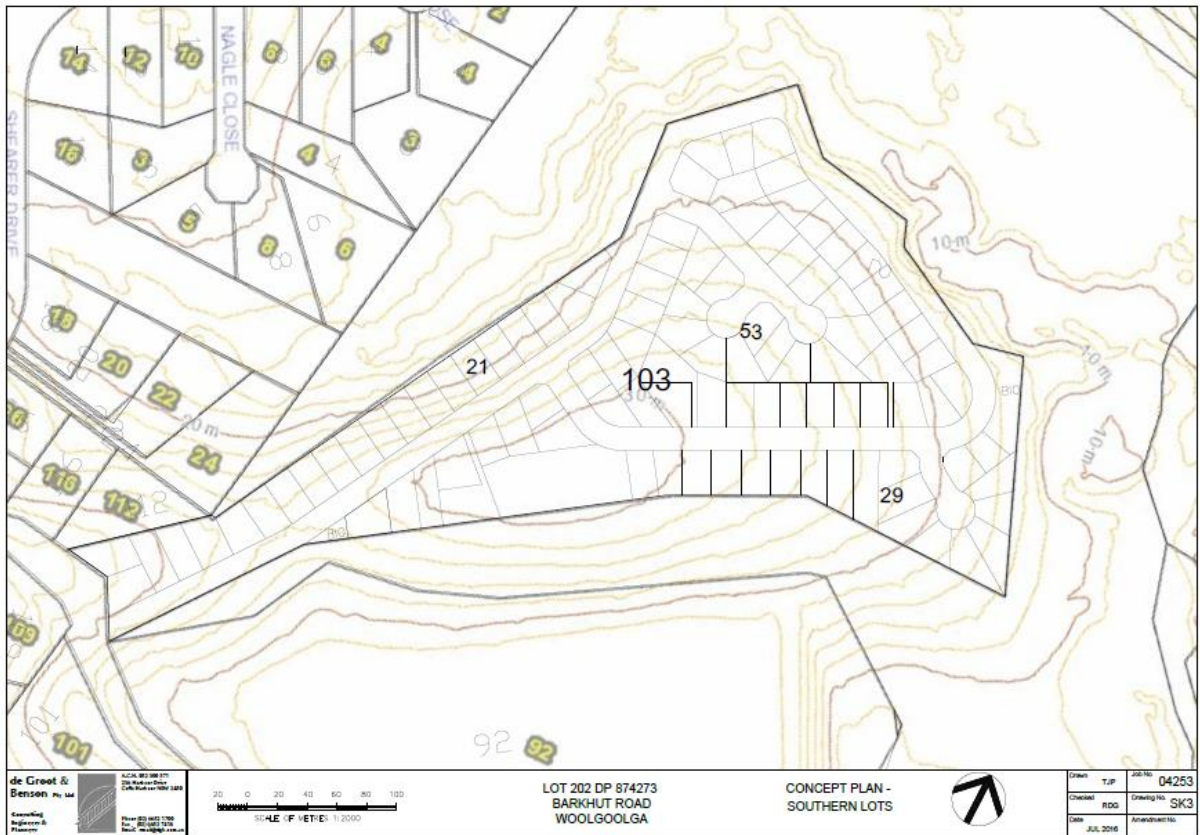


Figure 7: Lot Layout and contour map- Southern section.



6. ARCHAEOLOGICAL SYNTHESIS AND PREDICTIONS

6.1 European History of the Coffs Harbour Area.

The first historical documents relating to the Woolgoolga area are the naming of the 'Solitary Islands' by James Cook in May 1770, with additionally mapping by Matthew Flinders in 1779. However, despite the early records from 1791 of the convicts William and Mary Bryan and their two children running away to the area, it was not until 1847 that the next record of the settlement exists, with Captain John Korff taking shelter at the southern Headland of the area that is now 'Coffs Harbour' (Thomas 2013). European settlement of the Coffs Harbour/ Woolgoolga area was relatively late compared to areas along the Bellinger and Clarence Rivers. This was largely due to the absence of a large river system:

There was at least some cedar getting at Coffs Creek by Walter Harvie and George Tucker in 1865, with the camp set up by Harvie and Tucker being one of the earliest known semi-permanent settlements in the Coffs Harbour area. Timber getters often employed the services of Aboriginal bushmen who had the knowledge and skills to rapidly identify Cedar trees (Thomas 2013:2).

The township of 'Woogoolga' was first gazetted in 1888, (subsequently changed to Woolgoolga in 1966) following initial settlement in the 1870's. Three major phases of settlement can be defined within the Coffs Harbour area which have had cumulative impacts around Woolgoolga:

Forestry and forest related industries: This phase of settlement includes the very early extraction of cedar and later more broad extraction of remaining eucalypt species. This later process of clearing has historic linkages to the settlement of the area post World War 1 and the clearing of land by returned soldiers for early agriculture and horticulture. It is reasonable to assume that the Project Area was initially cleared for its timber resources.

Horticulture and agriculture: Farming has played an important role in the study area and has had the most significant impact on the physical landscape. Large areas of land have been cleared and regrowth managed for grazing and horticulture. Significant early crops include bananas, sugar cane and pineapples. Some agricultural diversification has taken place, and contemporary land use includes the cultivation of Blueberries and nuts (Macadamias particularly) and the establishment of aquaculture. A number of market gardens have operated within the area and are consistent with the historical process of dividing agricultural land into smaller lots as the district population increased. This type of land use has had the most significant historical effect on the Project Area.

Residential development: This process of urbanisation has increased significantly since the 1980's. This process is most noticeable with the development of residential areas around small coastal settlements such as Sandy



Beach and Safety Beach. This urbanisation has mostly been contained within areas already cleared as a result of forestry and horticulture, and has significantly changed water courses and drainage. No evidence of residential development was observed on the Project Area.

6.2 Aboriginal History

The study area is located within the Gumbayngirr Nation/Language Area which is broadly known to include the lands north of Nambucca Heads, south of the Clarence River and west up to the Great Dividing Range (Thomas 2013:1). The name Woolgoolga is understood to be derived from the word Wee- gullga or Weilgulga for a native plum or lilly pilly which was known to occur abundantly between the beach and lake (http://www.gnb.nsw.gov.au/place_naming/placename_search/extract?id=SXlpIMKmMn). This reference supports the use of the area for exploitation of closed and rainforest resources.

Given the problematic nature of pre-European Aboriginal population estimates, the latter and more 'general' observations of Mathews (1898) for the broader Northern NSW coastline are more relevant:

In the well-watered coastal districts of New South Wales, where fish and game are abundant, their hunting grounds would be comparatively small (Mathews 1898:66).

Radcliffe Brown (in Lane 1970:V.8) concludes for the coastal areas that population densities would be in the order of 'one person to every three square miles'. Estimates of tribal groups in the order of 200 individuals are relatively common amongst ethno-historic and anthropological literature (i.e. see Lane (1970) for the Nambucca River district immediately south). An additional element to this discussion of population density is the differentiation between the coastal and the escarpment areas where it is generally accepted had lower and much more mobile Aboriginal populations. For the larger River systems (Nambucca, Clarence and Macleay) the concept of more intensive use of the coast as compared to the up-river and escarpment is generally accepted (i.e. McBryde 1974, Godwin 1990).

However, a unique aspect of the Coffs Harbour/ Woolgoolga area is the close proximity of the Great Dividing Range to the Coastline and the absence of a major river system. No other 'district' on the North Coast has such a narrow coastal zone, or such a short distance between the very different environments of coast and elevated/cold forests, and so many small creek or estuary systems which run directly into the Pacific Ocean. There is however great potential for pathways and routes between the coast and escarpment/hinterland however, these are not necessarily represented archaeologically through the discard of Aboriginal Objects or noted in early ethno-historical accounts.



Due largely to the absence of a large river system the Coffs Harbour district was settled by Europeans later than areas of the Clarence River to the north or Bellingen/ Kalang and Nambucca Rivers to the South. As such any observations from the relatively late settlement of the Woolgoolga area would also be biased as Gumbayngirr people generally would have had some 25 years of contact with European settlers by the time detailed records of Aboriginal life in the area were produced. It is expected that most of the local populations would have moved northward to Grafton around the time of settlement of Woolgoolga.

The relatively limited amount of ethno historical information available for Coffs Harbour has been collated for the Coffs Harbour by-pass project which is focussed on the edge of the Coffs Harbour escarpment and therefore an analogous environment to the Study Area (Connell Wagner 2004). The study suggests that a mode of occupation focussed around 'base camps' which provided a degree of protection from the elements surrounded by a series of smaller 'resource-specific' sites in between. The study places populations (in terms of size of group per camp) at 50 with groups as large as 200 recorded at Sawtell/ Bonville Creek. The study (Connell Wagner 2004:6) also makes specific reference to the sub-coastal area- indicating that permanent occupation of these areas was rare- with use being typically during travel to another location.

Historic camps in the Coffs Harbour area tended to be on Public land and nearby to small townships where there was access to water either naturally occurring or at a public tap. The main camping areas identified by Goulding (2001:64,65) are at Corindi Lake, inland from Arrawarra, Nana Glen (junction of Orara River and Bucca Bucca Creek), Happy Valley in Coffs Harbour, Coffs Creek/Fitzroy Oval, Wongala Estate and Yellow Rock. Generally speaking the historical experiences of Aboriginal people has been one of exclusion up until the 1960's (i.e Calley 1956:201). The nature of historic Aboriginal camps and economy within the historic period is such that it is unlikely these types of 'sites' will be present in the historic record of the study area.

6.3 Archaeological and Cultural Heritage Assessments

6.3.1 *Hearnes Lake.*

Hearnes Lake is a small creek and estuary system located immediately south of Woolgoolga Creek and provides a useful analogy for the Project Area. An archaeological assessment of the Hearnes Lake Caravan Park was undertaken in 1983 (Lilley 1983). No sites were recorded during the survey in the caravan park however, an isolated artefact and midden scatter was recorded immediately north of Hearnes Lake Road. The middens were described as 'dinner time camps' and contained Triton Spp. which are associated with rocky coastlines.

Dallas (2008) undertook an archaeological assessment for a proposed residential development to the south of Hearnes Lake which identified a number of sites directly associated to Hearnes Lake and Double Crossing Creek. Site types included artefact scatters and isolated artefacts. These artefacts were typically derived from locally



available cobbles or pebbles and included several manuports. The sites were located on the alluvial plain in close proximity to estuarine and swamp environments

An archaeological survey was undertaken for the Development Control Plan for Hearnese Lake residential area immediately south of the Woolgoolga industrial area (Collins 2004). This study identified a number of Aboriginal sites and PADs including site HL-1 (22-1-0234) which is described as an Artefact Scatter consisting of flakes and cores produced from locally available Greywackes as well as introduced Cherts and indurated Mudstones. A total of 13 stone artefacts were recorded (Collins 2004:20). The DCP survey also identified 19 stone artefacts within Lot 21 DP 714858 (#22-1-0359-Hearnese RD Lot 21 Ridge Site) which is immediately adjacent to the coastline/ Hearnese Lake entrance.

Two archaeological assessments were undertaken for the 'Woopi Beach Estate' residential development which comprised the area of the Hearnese Lake 1 site (Hill et al 2015a, 2015b). These studies confirmed the extent of the Hearnese Lake 1 site as being the ridge crest as originally mapped by Collins (2004). Artefacts identified at Hearnese Lake 1 included a large number of small flakes produced from mudstones and siltstones; quartz and silcrete however the assemblage predominately comprised simple greywacke flakes, cores and flake pieces. A double edge ground greywacke axe and an isolate flake to the east of the study area (Hearnese Lake 5) were also identified by this study (Hill 2015a). A major finding of the study was the presence of artefacts in areas which had been cleared and grazed and the absence of artefacts in areas which had been excavated.

6.3.2 *Coffs Harbour- Urunga Forestry Management Areas (Davies and Stewart Zerba 1995).*

The Coffs Harbour- Urunga Forestry Management study provides the most comprehensive regional assessment of the archaeological values and potential of the Coffs Coast hinterland. Whilst it is acknowledged that the sub-coastal zone which comprises the Project Area is not included within the Davies study some of its findings have practical application as the study was structured around 'landsystems' (Davies and Stewart Zerba 2005). Overall the sampling strategy employed by the study was biased towards the location of open campsites, stone artefact scatters and isolated finds. However the study found a strong correlation between archaeological sites; the degree of slope and the sandiness of soils and concluded that the majority of archaeological sites occurred on the crests of spurs in areas which would have been dry sclerophyll or open forest. Regionally the majority of archaeological sites in the study area were associated with the dissected escarpment and ranges with relatively few sites found on near coastal low hills and rises. However, the study found that whilst 'site density' was greater in the escarpment area the number of artefacts per site was much lower when compared to coastal and sub-coastal sites. This finding supports a model of greater mobility through the escarpment and a relative absence of permanent camps when compared resource rich marine and estuarine areas of the coastline.



6.3.3 *Sapphire to Woolgoolga Pacific Highway Upgrade (Collins 2007)*

The upgrade of the Pacific Highway between Sapphire and Woolgoolga resulted in the construction of a new highway bypass less than 1km west of the Project Area. The archaeological assessment for this major project was undertaken by Collins (2007) and identified a total of 7 archaeological sites and 8 PADs. Three of these sites (S2W-5, S2W-6 and S2W-7) are in close proximity to the Project Area (refer section 5.1 above) and are located on a single south facing ridge-crest which forms part of the Woolgoolga Creek catchment area. Two PADs (PAD 2 and 3) were also recorded during this study.

Two of the sites (S2W 5 and S2W-6) were recorded as isolated artefacts whilst the S2W-7 site was recorded as a much larger stone artefact scatter with at least 200 artefacts. The artefact assemblage in S2W-7 is diverse and includes (as examples) simple greywacke flakes, retouched mudstone flakes; chert flakes, chert cores and a grindstone. As such it is reasonable to conclude that the ridge crest was used as a campsite and knapping area. The average density of S2W-7 was estimated to be 2.2 artefact per m² (Collins 2007:40-44).

6.3.4 *Woolgoolga Modular Housing Estate (Hill et al 2016)*

Everick Heritage Consultants undertook an Aboriginal Cultural Heritage Assessment of the Woolgoolga Modular Housing Estate ('MHE') located on McIntosh Crescent, to the south of Newmans Road, Woolgoolga. This survey resulted in the identification of 2 artefacts on a small tributary to Woolgoolga Creek and a redeposited hammer stone in a pile of introduced fill. The study concluded that the area was not utilised as a main campsite or stone tool production area. The study proposed that the main campsites, and therefore areas of high archaeological potential, are located along the Woolgoolga Estuary closer to the coast and on the surrounding ridge crests to the north of the Project Area. Consultation with Coffs Harbour and District Local Aboriginal Land Council indicated that the study area may have been a 'pathway' between Woogoolga Creek Estuary and the Coast Range, including 'Marys Waterhole' or have functioned as a peripheral area to the Woolgoolga fighting ground located to the east (near the Fire station).

6.4 Potential Site Types: Aboriginal Archaeological Sites in the Coffs Harbour Region

The most comprehensive 'regional' model for the area is provided by Godwin (1990) in a major review of the earlier archaeological research of Isabelle McBryde. Godwin's model specifically investigates patterns of movement between the coastal, sub-coastal and tablelands (escarpment) areas. However the applicability of this model to the Coffs Harbour area is problematic as the tablelands/escarpment intrude so far into the coastal zone.



For the purposes of understanding the archaeological record the study area is considered to fall into the 'coastal' area.

Amongst coastal groups proper there was no movement from the coast back into the sub-coastal river valleys and foothills. These people were semi-sedentary and lived close to the coast the whole year round. Movement associated with the subsistence round involved travelling only short distances away from the littoral. There were instances of long distance travel associated with ceremonial gatherings. However, such movement was generally parallel to the coast (i.e. north-south along the coast rather than east-west from coast to hinterland) (Godwin 1990:122,123).

Collins (2007:27-28) study of the Sapphire to Woolgoolga Highway upgrade proposed a model of archaeological sensitivity based on landform. This study identifies three broad land systems- being Coastal Alluvial Plains; Coastal Ramp and Escarpment Foothills. The Project Area is considered to fall within the Coastal Alluvial Plain of which the study (Collins 2007) proposes;

...those with highest archaeological sensitivity are well-drained swamp and estuary banks, and the level to low - gradient crests of low rises and spurs.

Elements of lowest archaeological sensitivity are valley flats, plains and open depressions. Irrespective of their landscape context, areas developed for residential uses or otherwise intensively disturbed (e.g. road and services easements) will also have low archaeological sensitivity. (Collins 2007:27)

For the purposes of this model the Project Area is considered to be a valley flat or plain on the grounds that the adjacent creek is not estuarine and there is no noticeable gradient typical of crests of spurs which occur further to the west and north.

Based on the review of previous archaeological and cultural heritage assessments in Woolgoolga and the broader region it is reasonable to propose that specific environment contexts including lowland hills, estuarine creek banks and coastal dunes are more likely to contain evidence of Aboriginal occupation. The review of previous studies indicates that archaeological sites are rarely found on alluvial flats not associated to estuarine environments. However, the following site types and potential types have been identified in the above contexts.

6.4.1 Isolated Artefacts

These sites consist of single stone artefacts, which may have been randomly discarded or lost. They can occur in almost any environmental context exploited by Aboriginal people. They are commonly stone axes, single cores, hammer stones, pebbles, flakes and grinding stones and/or grooves. Their presence may indicate that more



extensive scatters of stone artefacts exist or existed nearby, perhaps obscured by vegetation or dispersed by mechanical means.

There is a low potential for isolated artefacts to be located within the Project Area. Should these occur they are likely related to peripheral use of larger campsites along ridge crests to the west and the Woolgoolga Creek estuary to the south.

6.4.2 Open Campsites/Artefact Scatters

Open campsites/artefact scatters generally consist of scatters of stone artefacts and possibly bone and hearth features. Their exposure to the elements means that evidence of food resources used on the site (with the exception of shellfish) is usually lacking. An open campsite containing a large component of shell refuse may be described as a midden. They invariably consist of low or high density scatters of primary and secondary flakes in addition to the types of artefacts found as isolated finds. Open campsites may also contain burials when located on sand strata. Few open campsites are found on kraznozem and podzolic soils, possibly due to the destructive impacts of land clearing and the heavy vegetation cover. Detection is usually unlikely unless a high degrees of surface visibility is present.

There is a low potential for artefacts scatters to be located within the Project Area. It is likely that larger open campsites will be located on ridgecrests to the west of the Project Area and to the east along the Woolgoolga Creek estuary.

6.4.3 Quarry Sites

A stone quarry may occur where a source of opaline silica exists or other siliceous types of stone occur (e.g. chert, chalcedony and silcrete). The area can be identified by a number of different types of stone tools in various stages of production as well as refuse flakes.

Given that lack of visible suitable bedded rock outcrops or known sources of siliceous material, it is reasonable to expect that no quarry sites will be located within the Project Area.

6.4.4 Scarred Trees

Scarred trees result from the removal of bark for use as covering, shields, containers or canoes. No doubt, as an outcome of widespread intensive land clearing and natural causes very few have survived.

As the Project Area has been completely cleared of trees, it is reasonable to assume that no scarred trees will be located. Scarred trees may exist within the riparian zone however would not be affected by the rezoning proposal.



6.4.5 *Burials*

Human burials are typically individual or small group internments which can be found in sandy soil substrates, such as creek lines or within small rock crevices. Most of the known burials have been located by accidental means through mechanical disturbance or natural erosion.

Given that the underlying soil is not sandy, there is a low potential to locate burials within the Project Area.

6.4.6 *Ceremonial Sites*

Ceremonial grounds are typically places identified by Aboriginal groups as places of importance which were visited by groups to mark or commemorate rites or other occasions. One such example is Bora grounds; earthen mounds crafted in a circular formation which were used for the purposes of ceremonial practices.

No ceremonial sites are known to occur on within the Project Area.

6.4.7 *Mythological Sites*

These sites are natural features, which derive their significance from an association with stories of the creation and mythological heroes.

No mythological sites are known to occur within the Project Area.



7. FIELD SURVEY: ABORIGINAL CULTURAL HERITAGE

7.1 Survey Team

A pedestrian survey for cultural heritage of the Project Area was undertaken by Everick Senior Archaeologist Tim Hill and CHDLALC Senior Aboriginal Sites Officer Ian Brown on 20 September 2017.

7.2 Assessment Methods

The field methods aimed to inspect exposed ground surfaces as conditions would allow, to record any archaeological material found and undertake a preliminary assessment of its significance. The potential of the Development Area to contain sub-surface deposits (PADs) was also assessed through observation of soil profiles along Woolgoolga Creek and in any disturbed areas.

Photographs were taken as a record of general features and to document past disturbance. Notes were made of the degree of disturbance and the archaeological potential. A Garmin GPS (GDA 94 datum) was used to record the extent of survey coverage. Mapping and plans used in this assessment were provided by Connectability Pty Ltd and represent the level of information provided to the consultant.

In addition to assessing the cultural heritage potential of the Project Area, the survey aimed to confirm the interpretation of the nature and degree of ground disturbance observed in historical aerial photographs (**Error! Reference source not found.** and **Error! Reference source not found.**) and satellite imagery (Figure 2).

For ease of ground coverage and for purposes of description the Project Area is treated as a single unit due to the uniformity of conditions. There are no mature trees within the Development Area and as such these were not directly targeted by the survey.

7.3 Constraints to Site Detection

An assessment of the constraints to site detection is made to assist in formulating a view as to the effectiveness of the field inspection to find Aboriginal sites and cultural heritage materials. It also assists in the forming of a view of the likelihood of concealed sites (PADs), keeping in mind a site specific knowledge of the disturbance impacts that European land uses and natural processes may have had on the 'survivability' of Aboriginal sites in a Development Area.



The constraints to site detection are almost always most influenced by post European settlement land uses and seldom by natural erosion processes. The area of surface exposure and the degree of surface visibility within exposed surfaces are usually the product of 'recent' land uses e.g. land clearing, ploughing, road construction, natural erosion and accelerated (manmade) erosion (McDonald et .al. 1990:92).

In this case the major 'manmade' constraints to Aboriginal site survivability and detection are due to the clearing of original forest and the subsequent impacts of grazing which through, what is called taphonomic processes, can have the effect of accelerating movement of artefacts such as stone downward through soft soils. Detection of Aboriginal archaeological sites in the Project Area is severely limited by the presence of improved pastures. Vegetation has been cleared in the past. Some evidence of mass movement and erosion of soils was noted throughout the Project Area in the form of a large swale which has likely been constructed from material excavated from the Sports Field. Based on the observations taken during the survey it reasonable to conclude that it is unlikely that any soils in the upper 300mm contain original surfaces (Figure 8, Figure 9 and Figure 10 **Error! Reference source not found.**).

Table 2: Summary of Environment and Ground Disturbance for Survey Unit.

<i>Survey Unit</i>	<i>Environmental Description</i>	<i>Ground Disturbance Summary</i>
Ridge crests	Open pastured grassland with some sparse native and introduced (pine) trees. Vehicle tracks occur along the spine of most ridge crests.	Land clearing.
Slopes	Open pastured grassland with some sparse native and introduced (pine) trees.	Land clearing.

7.4 Survey Coverage

To achieve as thorough and effective an archaeological assessment as possible a pedestrian ground survey of a sample of the Project Area was undertaken. The following summarises the broad conditions for the survey of each identified unit within the Project Area:

- a) Ridge crests. Cleared open grassland with some regrowth of native trees and introduced pines. The understory was typically dense comprising bladey grass and weeds.
- b) Slopes. Cleared grassland with large patches of regrowth forest including native trees and introduced pines. The understory was typically dense comprising bladey grass and weeds.

Table 3 and Table 4 present information on the extent to which survey data provides sufficient evidence for an evaluation of the distribution of archaeological materials across the Project Area. The evaluation of survey



coverage provides a measure of the potential for the survey to identify archaeological evidence. The calculations in Table 4 and Table 3 do not provide an exact percentages, but reasonable estimates.

Table 3: Survey Coverage.

Survey Unit	Landform	Survey Area (m ²)	Visibility (%)	Exposure (%)	Effective Coverage Area (m ²)	Effective Coverage (%)	Sites Found
PAD 1 (North ridge)	Ridgecrest	200	20	30	12	6	2
PAD 2 (Middle Ridge)	Ridgecrest	375	20	30	22.5	6	0
PAD 3 (South Ridge)	Ridgecrest	150	5	5	.375	0.25	0

Table 4: Landform summary- sampled areas

Landform	Landform Area (m ²)	Area Effectively surveyed (m ²)	% of Landform effectively surveyed	Number of sites	Number of artefacts
PAD 1 (North ridge)	4119	12	0.29	2	2
PAD 2 (Middle Ridge)	5028	22.5	0.44	0	0
PAD 3 (South Ridge)	9742	.375	0.0038	0	0

The following should be considered when reviewing the effectiveness of the survey and the survey results:

- a) The target total survey area for pedestrian transects was 5% of the Project Area which was not achieved by the survey primarily due to the significant amount of improved pasture and weeds over the Project Area at the time of the survey.
- b) The overall low predicted likelihood of identifying sites within the Project Area.
- c) The potential that stone artefacts have moved downward through the soil profile as a result of clearing, trampling and topsoil disturbance.



Figure 8: Typical surface exposure along trail on ridge crest with regrowth trees on slope.



Figure 9: Trail along ridge with cleared crest and slopes.



Figure 10: Typical exposure on trail from western portion of Project Area.



8. RESULTS

8.1 Results

As a result of the desktop study, field inspections, Aboriginal community consultation and archaeological investigation of the Project Area, the following was found.

- Two artefacts (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504) were observed on the access trail immediately south of the Bark Hut Road entrance to the Project Area (**Error! Not a valid bookmark self-reference.**). These consisted of stone flakes derived from Greywacke and Rhyolite, which are common in the Woolgoolga area. Given the location of the artefacts on an area of upper slope, it is likely that the artefacts are a secondary deposit from the main campsite, which is identified in the Council Reserve to the immediate west of the access road. This area will not be part of the rezoning application and as such this ridge crest was not surveyed.
- Having consideration for the landscape context of the Project Area and the history of disturbance it is considered unlikely that the Project Area will contain Aboriginal sites of high or moderate conservation value. The Project Area is unlikely to contain burials or middens and does not contain scarred or modified trees. Whilst some historic campsites are known in the general vicinity the Project Area none are known within the Project Area. No Mythological or ceremonial sites are known to occur within the Project Area, however it is noted that the ridge-crest may have been utilised as a pathway between the coast and hinterland.
- There is very little topsoil material in the upper slope and the artefacts were identified on the compacted surface of the trail. It is considered unlikely that the surrounding soils would contain Aboriginal objects. However, having consideration for the Due Diligence Code of Practice requirements the entire ridge crest is considered to a Potential Archaeological Deposit (PAD). This includes a small ridge crest in the north-east corner of the Project Area.
- A second PAD was identified in the southern portion of the Project Area comprising a knoll to the west of the water storage dam however no Aboriginal objects were identified on the knoll. However, the presence of topsoil on the knoll provides an indication that there is the potential for an Aboriginal stone artefact scatter to occur on the knoll.



Table 5: Summary of survey results

<i>Site Name</i>	<i>Feature</i>	<i>Easting (GDA94)</i>	<i>Northing (GDA 94)</i>	<i>Survey Unit</i>	<i>Landform</i>
<i>Bark Hut Road IF 01 (#22-1-0503)</i>	Stone artefact	517672	6670314	2	Upper Slope.
<i>Bark Hut Road IF 02 (#22-1-0504)</i>	Stone artefact	517742	6670394	2	Upper Slope.

No items or relics of European heritage were identified during the assessment.



Figure 11: Bark Hut Road Isolated Find locations



Figure 12: Site and PAD locations northern section.



Figure 13: PAD location southern section.



Figure 14: Location of Bark Hut Road Isolated Find 01 on access trail.



Figure 15: Detail of Bark Hut Road Isolated Find 1.



Figure 16: Location of Bark Hut Road Isolated Find 02 on access trail.



Figure 17: Detail Bark Hut Road Isolated Find 2 core.



8.2 Significance Assessment

The artefacts identified by the study are determined to have low scientific value. The basis for this assessment is primarily the low degree of confidence that the artefacts are insitu, and that the artefacts are similar to stone artefacts from other assemblages in the Woolgoolga area. It is likely that the artefacts have been moved down slope from the adjacent ridge crest.

Based consultation with Aboriginal Sites Officers present during the assessment the Bark Hut Road sites are considered to be of social or cultural significance.

The aesthetic significance of the sites is considered to be low given the extent of surrounding land clearing.

8.3 Impact Assessment

The following table is provided to summarise the impacts that might arise from the Project (Table 6).

Table 6: Bark Hut Road impact assessment summary.

<i>Site Name</i>	<i>Type of Harm</i>	<i>Degree of Harm</i>	<i>Consequence of Harm</i>
Bark Hut Road IF 01	Direct	Total	Total loss of value
Bark Hut Road IF 02	Direct	Total	Total loss of value

8.4 Management and Mitigation Measures

The following management and mitigation options have been considered for the Bark Hut Road IF 01 and Bark Hut Road IF 02 sites:

- a) complete avoidance;
- b) harm with salvage and repatriation on-site; and
- c) harm without salvage.

It is concluded that 'harm with salvage and repatriation onsite' is the most appropriate management response for Bark Hut Road IF 01 and Bark Hut Road IF 02 sites.

The options for the salvage any Aboriginal objects which may occur within the Project Area include;

- retrieval of artefacts via a mechanical sieving program and reburial within the Project Area;



- relocation of the topsoil into designated reserve/ landscape areas; and
- relocation of topsoil to an appropriate location away from the Project Area.

8.5 Ecologically Sustainable Design Principles

It is reasonable to conclude that the Development Area has a low potential to contain Aboriginal objects and that the Bark Hut Road Isolated Finds 01 and 02 are disturbed. It is likely that the main areas of occupation, and therefore potential to contain Aboriginal objects, are located on the ridge crest to the west of Bark Hut Road IF 02.

The Bark Hut Road Isolated Finds 01 and 02 sites will not significantly add to the current knowledge of coastal archaeology due to the nature of disturbance across the site and overall low artefact densities. Further the artefacts are not considered sufficiently unique to add to collections of artefacts held by the CHDLALC for future educational use or display.

The potential cumulative impact of the harm has been assessed as low on the basis that the Bark Hut Road Isolated Finds 01 and 02 sites have already disturbed.

8.6 Additional Research

It is not considered that additional archaeological research, in the form of test pit excavations, will significantly inform the management response for sites within the Project Area. This conclusion is based on the following considerations;

- the absence of large scale stone artefact scatters identified during the archaeological survey;
- the absence of known ceremonial or intangible sites in the Project Area and surrounds;
- the nature and extent of known archaeological sites in the surrounding areas; and
- The absence of deep and undisturbed topsoil deposits.

It is considered unlikely that an archaeological excavation program over the PAD areas will identify a stone artefact scatter with either high or moderate conservation value. Stone artefact scatters, should they occur, are likely to be disturbed, have low artefact densities and are unlikely to contain locally unique artefacts. As such it is reasonable to conclude that these sites, should they exist, will be of low conservation value. As with the known Isolated Finds, salvage with repatriation on site is considered to be an appropriate management response for archaeological sites on PAD areas.



9. CONCLUSIONS AND RECOMMENDATIONS

On the basis of the results and discussed above, the following management recommendations are provided:

Recommendation 1: Cultural Heritage Induction

It is recommended that a cultural heritage induction is provided by representatives of the RAPs for all senior civil works staff involved in the initial removal of topsoil from the ridge crests identified by the ACHAR. This induction should provide;

- an overview of the nature and extent of archaeological materials within the Project Area;
- the broader cultural context of the site and its significance to Aboriginal people;
- an outline of relevant legislation; and
- an outline of the AHIP salvage procedure and an outline of an appropriate Finds Procedure.

Recommendation 2: Application for an Aboriginal Heritage Impact Permit (AHIP)

It is recommended that prior to commencement of works (issue of Construction Certificate) that the proponent apply for an Aboriginal Heritage Impact Permit (AHIP) for salvage of known Aboriginal Objects from within the Project Area (Bark Hut Road IF 01 #22-1-0503 and Bark Hut Road IF 02 #22-1-0504). This AHIP should be subject to the following conditions relating to the salvage program:

- Cultural heritage induction for all ground clearance contractors.
- Collection of surface artefacts by Raps and temporary storage at CHDLALC.
- Monitoring of topsoil removal and collection of artefacts from the ridge crest and temporary storage at CHDLALC.
- The monitoring should be in an area 20m below the access track and along the apex of the ridge to the upper/ mid slope. All the way down to Creek.
- Permanent burial of artefacts within a reserve or garden area nearby.
- The monitoring should also include the ridge area in the north-east of the Lot.

Recommendation 3: Southern PAD

It is noted that the site inspection did not identify any Aboriginal objects within the southern PAD area, defined by the knoll to the west of the water storage dam. Having consideration for the potential of this PAD to contain Aboriginal sites of high or moderate conservation value it is recommended that the minimum management response for this PAD is a cultural heritage induction and the application of an Aboriginal Find Procedure.



If it is suspected that Aboriginal material has been uncovered as a result of development activities within the Project Area:

- a) work in the surrounding area is to stop immediately;
- b) a temporary fence is to be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site;
- c) an appropriately qualified archaeological consultant is to be engaged to identify the material; and
- d) if the material is found to be of Aboriginal origin, the Aboriginal community is to be consulted in a manner as outlined in the *ACHCRP Guidelines (2010)*.

Should the material be identified as an Aboriginal object and the proposed works cannot be amended to avoid the Aboriginal site an Aboriginal Heritage Impact Permit (AHIP) would be required prior to recommencement of works in the vicinity of the site. Consultation with stakeholders from the Aboriginal community would be required as a part of the AHIP application process.

It is recommended that these requirements are formalised within a Cultural Heritage Management Plan agreed to by Registered Aboriginal Parties prior to issue for the Development Application for subdivision to allow an opportunity for RAPs to better consider the full impacts of proposed works.

Recommendation 4: Aboriginal Human Remains

Although it is unlikely that Human Remains will be located at any stage during earthworks within the Project Area, should this event arise it is recommended that all works must halt in the immediate area to prevent any further impacts to the remains. The Site should be cordoned off and the remains themselves should be left untouched. The nearest police station (Coffs Harbour), the Coffs Harbour Local Aboriginal Land Council and the OEH Regional Office (Coffs Harbour) are all to be notified as soon as possible. If the remains are found to be of Aboriginal origin and the police do not wish to investigate the Site for criminal activities, the Aboriginal community and the OEH should be consulted as to how the remains should be dealt with. Work may only resume after agreement is reached between all notified parties, provided it is in accordance with all parties' statutory obligations.

It is also recommended that in all dealings with Aboriginal human remains, the Proponent should use respectful language, bearing in mind that they are the remains of Aboriginal people rather than scientific specimens.

Recommendation 5: Conservation Principles

It is recommended that all effort must be taken to avoid any impacts on Aboriginal Cultural Heritage values at all stages during the development works. If impacts are unavoidable, mitigation measures should be negotiated between the Proponent, OEH and the Aboriginal community.





10. REFERENCES

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APPENDIX A: AHIMS SEARCH RESULTS



Office of
Environment
& Heritage

AHIMS Web Services (AWS) Extensive search - Site list report

Your Ref/PO Number : Bark Hut Road
Client Service ID : 261963

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
22-1-0152	C1_Poundyard Ck	AGD	56	517710	6669940	Open site	Valid	Aboriginal Resource and Gathering : -, Artefact : 3		102143,102419
	Contact									
	Recorders									
22-1-0408	West Woolgoolga Sports Field	GDA	56	517856	6669964	Open site	Valid	Artefact : 2		
	Contact									
	Recorders									
									Permits	3613

Report generated by AHIMS Web Service on 12/01/2017 for Kelley Hunter for the following area at Lot : 202, DP:DP874273 with a Buffer of 50 meters. Additional Info : map items. Number of Aboriginal sites and Aboriginal objects found is 2
This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.



APPENDIX B: CORRESPONDENCE TO POTENTIAL ABORIGINAL STAKEHOLDERS

02 November 2017

Our Ref: EV.600

Garby Elders
Deborah Dootson
21 Knox Street
WOOLGOOLGA NSW 2456

Dear Deborah,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

We wish to advise that we have been engaged to undertake an Aboriginal Cultural Heritage Assessment for the above mentioned study area. The land subject to assessment is situated at Bark Hut Road, Woolgoolga, NSW. The assessment will be conducted for the proposed rezoning of Lot 202 DP874273, Woolgoolga, NSW, (west of Solitary Islands Way)(see enclosed plan).

We are seeking to consult with all Aboriginal persons and organisations that may have knowledge about the history of the Project Area. Consultation will be consistent with the *Office of Environmental Heritage Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010)*. If you are interested, or know of persons who may be interested, we request that you contact us by **20 November 2017** to register your interest. Please write to:

Tim Hill
Senior Archaeologist
Everick Heritage Consultants
PO Box 200
Coffs Harbour NSW 2450 /or
t.hill@everick.com.au

If you have any questions about the Project, please contact Tim Hill on 0422 309 822. If you wish to find out more about our qualifications and experience in this field, please visit our website www.everick.com.au. We look forward to hearing from you.

Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Coffs Harbour and District Local Aboriginal Land Council
Greg Douglas
PO Box 6150
COFFS HARBOUR NSW 2450

Dear Greg,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

We wish to advise that we have been engaged to undertake an Aboriginal Cultural Heritage Assessment for the above mentioned study area. The land subject to assessment is situated at Bark Hut Road, Woolgoolga, NSW. The assessment will be conducted for the proposed rezoning of Lot 202 DP874273, Woolgoolga, NSW, (west of Solitary Islands Way)(see enclosed plan).

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Garlambirla Guuyu-girrwa Aboriginal Corporation
The Chairperson
PO Box 6904
PARK BEACH NSW 2450

To the nominated Chairperson,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

We wish to advise that we have been engaged to undertake an Aboriginal Cultural Heritage Assessment for the above mentioned study area. The land subject to assessment is situated at Bark Hut Road, Woolgoolga, NSW. The assessment will be conducted for the proposed rezoning of Lot 202 DP874273, Woolgoolga, NSW, (west of Solitary Islands Way)(see enclosed plan).

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Mudjay Elders
Cultural Heritage Officer
11 Anderton Street
COFFS HARBOUR NSW 2450

To the nominated Cultural Heritage Officer,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Bagawa Birra Murri Aboriginal Corporation
Susan Hoskins
31 Soren Larson Crescent
BOAMBEE EAST NSW 2452

Dear Susan,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Gurehlgam Corporation Ltd T/A Yarrawarra
Kenn Payne
PO Box 1676
GRAFTON NSW 2460

Dear Kenn,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Mimi Mothers Aboriginal Corporation
Marcia Hillery
90 High Street
BOWRAVILLE NSW 2449

Dear Marcia,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Murrumbidgee Aboriginal Language and Cultural Co-operative Ltd
Gary Williams
14 Belwood Road
Via NAMBUCCA HEADS NSW 2448

Dear Gary,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

We wish to advise that we have been engaged to undertake an Aboriginal Cultural Heritage Assessment for the above mentioned study area. The land subject to assessment is situated at Bark Hut Road, Woolgoolga, NSW. The assessment will be conducted for the proposed rezoning of Lot 202 DP874273, Woolgoolga, NSW, (west of Solitary Islands Way)(see enclosed plan).

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Cultural Heritage Officer
Gumbaynggirr Native Title Group
14 Belwood Road
NAMBUCCA HEADS NSW 2448

To the nominated Cultural Heritage Officer,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Cultural Heritage Officer
Gumbayngirr Elders
PO Box 400
NAMBUCCA HEADS NSW2448

To the nominated Cultural Heritage Officer,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Noel Campbell
Ngurrala Aboriginal Corporation
PO Box 62
MACKSVILLE NSW 2447

Dear Noel,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

DFTV Enterprises
5 Mountbatten Close
RUTHERFORD NSW 2320

Dear Derrick,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Aaron Talbott & Natalene Mercy
6 Bando Street
GUNNEDAH NSW 2380

Dear Aaron & Natalene,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Jagun Elders
Tony Perkins
PO Box 649
WOOLGOOLGA NSW 2456

Dear Tony,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



02 November 2017

Our Ref: EV.600

Norm Archibald
17 Flobern Ave
WAUCHOPE NSW 2446

Dear Norm,

**RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT
LOT 202 DP874273, WOOLGOOLGA, NSW**

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Yours faithfully,

Tim Robins
Director/Archaeologist
Everick Heritage Consultants



APPENDIX C: REGISTRATION FROM ABORIGINAL STAKEHOLDERS

From: Culture [mailto:Culture@coffsharbourlalc.com.au]

Sent: Thursday, 9 November 2017 1:07 PM

To: Tim Hill <t.hill@everick.net.au>

Subject: Bark Hut Road Woolgoolga

Hi Tim,

To keep it official I am registering our interest in this project ok – thank you,

Yours in Unity

Michelle Flanders

Project Officer Culture & Heritage

CH&D LALC

2-3 Wongala Drive, Wongala Estate

PO Box 6150

Coffs Harbour NSW 2450

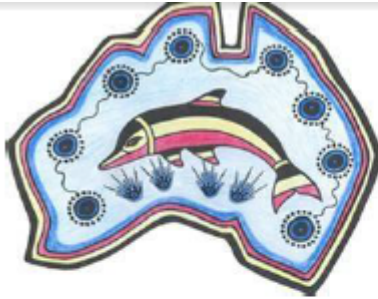
Ph: 02 6652 8740

Fax: 02 6652 5923

culture@coffsharbourlalc.com.au

PLEASE NOTE: I ONLY WORK ON THURSDAYS & FRIDAYS. If your enquiry requires urgent attention please contact the office on 02 6652 8740 for further assistance.

My office is located on Gumbaynggirr land & I pay my respect to our Elders past & present



Jagun Aged & Community Care

ABN: 73 116 306 346

Phone: 0417 806 239

PO Box 649 Woolgoolga NSW 2456

Everick Heritage Consultants Pty Ltd

P.O. Box 200

Coffs Harbour NSW 2450

Attention: Tim Hill

Jagun Aged and Community Care hereby register an Interest in Aboriginal Cultural Heritage Assessment rezoning land from RU2 (Rural landscape) to R2 (low density residential) Woolgoolga DP874273.

Jagun will be represented by Anthony Perkins Gumbaynggirr Elder/ Cultural Knowledge Holder, who has vast knowledge of the area.

Contact details for Anthony Perkins: mobile 0417 049 962, email simone@jagunagedcare.com.au and postal address PO Box 649 Woolgoolga NSW 2456.

Kind regards

Simone Perkins

Program Manager

21/10/2017



APPENDIX D: CONSULTATION NOTES 18 JANUARY 2018

From: Tim Hill [<mailto:t.hill@everick.net.au>]
Sent: Friday, 19 January 2018 4:12 PM
To: Culture; Simone Perkins; Deb Dootson
Cc: Ian Brown; tony dootson; Keiley Hunter
Subject: Bark Hut Road AHIP consultation/ site inspection

Hi Tony, Michelle and Deb (Ian and Tony)

Please see below my notes from the AHIP consultation meeting at Bark Hat Road Woolgoolga yesterday (18th January 2018). The meeting was attended by Uncle Tony Perkins (Jagun Elders), Ian Brown and Luana Ferguson (CHDLALC). Uncle Milton Duroux and Tony Dootson were apologies for the meeting.

BARK HUT ROAD ISOLATED FINDS 1 & 2

- Tim Provided a background to the proposed subdivision rezoning, indicating that the rezoning would provide for lots with a Lot size of between 500-600m². The boundaries of the area are the fenceline (to immediate west of meeting) and the Solitary Island Way and a section of and to the other side of Woopi Creek.
Noted that the initial site inspection included Ian Brown from CHDLALC and 2 flakes were recorded on the access trail (location of meeting). The flakes were rhyolite and greywacke, they were typical of flakes from the coastal area.
- Ian Indicated that there was an outcrop of Rhyolite underneath Corindi village. Discussed the qualities of rhyolite for knapping- particularly that you needed to heat the rock to get through the cortex before knapping.
- Tim Discussed the landscape context of the site and noted that the topsoil layer was very thin and disturbed. Discussed what might have been the practice of clearing- that was likely in the 1960's or 70s.
- Mika Indicated that he bought the block in 1988 and have mostly just had it slashed since then.
- Ian Indicated that there was a walking trail through Woopi Creek down to the lake at Woolgoolga- that the lake was a teaching site.
- Tony Indicated that an old lady had a camp in the 1950's up near the Country Club Estate and that Michael McDougall had a camp across Bark Hut Road in an old packing shed.
Noted that the old 'battle ground' was down on the creek where the Council depot is on the other side of the old highway. Described the last known use of this place and that the young man was buried in Woolgoolga Creek under a log.
- Tim Noted that two artefacts had previously been recorded in the area of the sportsfield proposal.
- Ina Thought that there were more than 2 artefacts.
- Tony Noted the problem that Council brought a lot of fill into the sportsfield area and he wasn't sure where it came from.

General discussion of management of the artefacts.

Ian Noted that he had problems with test pits in areas like this where there isn't a big site. Referred back to the excavations at Hearne's Lake ACHA study and noted they found a lot more during the ground works than they expected from the excavation results.

Tim Indicated that if the site was a large stone artefact scatter it would be visible on the ground and track. The absence of artefacts probably means it is only a low density stone artefact scatter or a small knapping area. Noted that it was unlikely to contain midden, scarred trees, unlikely to contain burials and there is no known mythological or historic sites. The main story is the connection through to St Mary's waterhole but that pathway isn't clearly understood to come through this block.

Ian Discussed the location of burials in the area and some traditional practices of burial.

General discussion of the ridge to the south of the site.



Tony Indicated it was likely the connection to the coast was from the north-east through to Arrawarra headland and Mullaway

Ian Noted the 'cut' along Bark Hut Road and that only some of the ridge is left intact.

Tony Indicated that women used to carry white clay along all the ridges up to the waterhole- probably up until the 1940's. The young girls went up into the mountains before they had babies.

Ian Suggested that test pits in this area probably wouldn't show up anything.

Discussion of management for the site

- Cultural heritage induction for all ground clearance contractors.
- Collection of surface artefacts by Raps and temporary storage at CHDLALC.
- Monitoring of topsoil removal and collection of artefacts and temporary storage at CHDLALC.
- Permanent burial of artefacts within a reserve or garden area nearby.
- The monitoring should be in an area 20m below the access track and along the apex of the ridge to the upper/ mid slope. All the way down to Creek.
- The monitoring should include the ridge area in the north-east of the Lot.\
- Noted that the AHIMS site #IDs should be combined from two isolated finds to 1 single site.

DISCUSSION OF SOUTHERN PAD

Tim Identified the obvious knoll- hilltop and noted that this had been identified as a PAD during the initial site inspection.

Tony Questioned is the block was cleared in the 1960's when they built the water dam- would have been 66 or 65- that was the town water supply then.

Ian indicated that the trees might be 30 or 40 years ld.

Tim Questioned if test pits would be required prior to rezoning or Development consent.

Tony Questioned if the trees would be retained or removed for the development.

Mika Indicated the ecologist report did not specify to retain the trees.

General discussion of a test pit program around the knoll. Conclusion that the program would be 1-2 days depending on if anything was located.

Ian Noted that a minimum they would need to have an induction and a 'Find Procedure' which involved stopping work.

Tim Noted that- as with the other PAD on Bark Hut Road- there was unlikely to be middens, scarred trees, burials and no known historical or mythological sites were known in the area. If there was sites they would likely be low density stone artefact scatters which have likely been disturbed when the land was cleared. Noted that there were no sites which would likely stop the development based on cultural or scientific significance.

Ian Indicated that test pit excavations should be completed prior to going to the DA- this would clear up the matter of whether an AHIP is required or not. Discussed the delays of stopping work if artefacts are found during construction works.

Tony Agreed that there are problems stopping work during construction and that he recommends getting an AHIP prior to starting the work.

Tim Suggested and a Cultural Heritage Management Plan could be a minimum requirement for the rezoning.

Noted the other sites at Hearn's Lake and McIntosh Crescent are close by and similar- both of those projects required test pit excavations.

General discussion of the proximity of the knoll to other landmarks and access routes up Woopi Creek. Noted that the estuary is a fair way downstream- but the knoll is still a good campsite.

Agreement to recommend test pit excavation prior to development consent to determine the requirement for an AHIP. Noted that the rezoning would be OK based on what is thought to be on the knoll.

Tim Hill BA (Hons.)

Senior Archaeologist



EVERICK Heritage Consultants Pty Ltd
ABN 78102206682

PO Box 200
Coffs Harbour NSW 2450

Ph: 1300 124 356
Mob: 0422 309 822
Fax: (07) 3368 2440
Email: t.hill@everick.com.au

Web: www.everick.com.au





APPENDIX E: CORRESPONDENCE FROM JAGUN ELDERS

From: Simone Perkins [mailto:simone@jagunagedcare.com.au]

Sent: Monday, 22 January 2018 8:41 PM

To: Tim Hill <t.hill@everick.net.au>

Subject: RE: Bark Hut Road AHIP consultation/ site inspection

Hi Tim

Tony has reviewed notes from AHIP Consultation meeting on 19/01/2018 and verifies are true and correct as per consultation discussions.

Simone Perkins

Jagun Aged Care

M: 0429 811 742

E: simone@jagunagedcare.com.au

Website: www.jagunagedcare.com.au

Appendix F ~ Biodiversity Impact Assessment





8:45 1/NOV/2018

Biodiversity Impact Assessment

Prepared for Resource Design &
Management

Proposed Rezoning of Part Lot 202
DP874273, Bark Hut Road, Woolgoolga
NSW

14 March 2019

Project No.: 0483513

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	Biodiversity Impact Assessment
Document subtitle	Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road, Woolgoolga NSW
Project No.	0483513
Date	14 March 2019
Version	F01
Author	Adriana Corona-Mothe
Client Name	Resource Design & Management

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	01	Adriana Corona-Mothe	Joanne Woodhouse	Paul Douglass	22/11/2018	First Draft submitted for comment by RDM
Draft	02	Adriana Corona-Mothe	Joanne Woodhouse	Paul Douglass	11/03/2019	Addressing Client's comments
Final	01	Adriana Corona-Mothe	Joanne Woodhouse	Paul Douglass	14/03/2019	Final report

Signature Page

14 March 2018

Biodiversity Impact Assessment

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW



Joanne Woodhouse
Project Manager



Paul Douglas
Partner

ERM Newcastle
Level 1 Watt Street Commercial Centre
45 Watt Street
Newcastle NSW
2300

+61 2 4903 5500

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EXECUTIVE SUMMARY

Environmental Resources Management (ERM) has been engaged by Resource Design & Management (RDM) to undertake a Biodiversity Impact Assessment (BIA) on the northern portion of Lot 202 DP 874273 located south of Bark Hut Road, Woolgoolga NSW. The BIA has been prepared to support a rezoning planning application to be submitted to Coffs Harbour City Council.

The Assessment is based on a combination of desktop review, aerial photo interpretation and a one day field survey in November 2018. The site is assessed as containing small areas of low and moderate conservation values, although is largely dominated by highly disturbed and cleared lands that do not present any ecological conservation value. In summary:

- No threatened species or ecological communities have been recorded within the subject site and it does not form part of any mapped regional corridors or key habitat linkages.
- 1.37 ha of Tertiary Koala Habitat and 0.1 ha of Secondary Koala Habitat have been mapped within the site. These areas are considered to have moderate conservation value and any future development within these areas must address the provisions of the Coffs Harbour City Council Koala Plan of Management and SEPP 44.
- The 1st Order streams have no defined bed or bank visible in the field and do not constitute a waterway based on the definitions in Guidelines for riparian corridors on waterfront land. These areas have no conservation value.
- The 2nd Order Stream located on the south-eastern portion of the Subject Site does not constitute high conservation value and it does not exhibit the features of a defined channel with bed and banks. This area has limited biodiversity habitat value and does not form part of any vegetated riparian corridor. Future development design should ensure no long term hydrological impacts downstream to Poundyard Creek and Woolgoolga Lake
- The small inundated 'wetland' area mapped within the south-eastern corner of the site is likely the result of water pooling following the installation of a concrete culvert offsite. Although highly disturbed and not naturally occurring, the area of inundation provides habitat opportunities for amphibians. Opportunities may actually exist to increase the quality of the on-site aquatic and riparian habitats through detailed design and management of surface runoff and water quality parameters, including the use of appropriately designed storm water retention and treatment options to be located within this area as indicated on the concept plan.
- Future development will also be required to incorporate kangaroo management measures in accordance with the Coffs Harbour City Council's (CHCC) Kangaroo Management Plan for the Coffs Harbour Northern Beaches.

Based on the results of the field investigation and identification of low to moderate conservation values across the site, there are no significant constraints to the proposed rezoning of the site. An indicative development footprint has been used within the BIA to show that future residential development on this site can be appropriately designed.

The consideration of conservation zones may be considered as part of any future development proposal, however based on a review of the Section 117 Directions, 2.1 Environment Protection Zones; Northern Councils E Zone Review Final Recommendations Report; and LEP Practice Note PN09-002 (Environment Protection Zones) there is no justification to apply Environmental Conservation Zones across any areas of the site as part of this planning proposal.

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Acronyms and Abbreviations

Name	Description
AoS	Assessment of Significance (under the EPBC Act)
APZ	Assets Protection Zone
BAM	Biodiversity Assessment Method
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BIA	Biodiversity Impact Assessment
BV Map	Biodiversity Values Map
FM Act	NSW Fisheries Management Act 1994
LEP	Local Environmental Plan
PCT	Plant Community Type
RFS 2018	Rural Fire Service (2018) <i>Planning for Bushfire Protection Guidelines</i>
Subject Site	The northern portion of Lot 202 DP874273 as shown in Figure 1.1
TEC	Threatened Ecological Community
ToS	Test of Significance
WM Act	NSW Water Management Act 2000
WoNS	Weeds of National Significance

1. INTRODUCTION

Environmental Resources Management (ERM) has been engaged by Resource Design & Management (RDM) to undertake a Biodiversity Impact Assessment (BIA) on the northern portion of Lot 202 DP 874273 located south of Bark Hut Road, Woolgoolga NSW (the Subject Site; refer to Figure 1.1) to support a rezoning planning application to be submitted to Coffs Harbour City Council.

1.1 Background and approach rationale

It is understood that RDM proposes to rezone the Subject Site from the existing RU2 (Rural Landscape) to an applicable residential zone (R2 Low Density Residential or R3 Medium Density Residential).

For the purpose of identifying the conservation and biodiversity values of the site and identifying potential impacts of any future residential development, an indicative footprint has been provided (refer to Figure 1.2). This enables an assessment of the suitability of the land for residential development and demonstrates that future development can accommodate suitable mitigation measures if required.

As a precautionary measure, the identification of potential impacts and discussion of suitable mitigations measures in Section 6 of this report considers impacts of completely clearing the remnant vegetation which would trigger entry into the Biodiversity Offset Scheme.

It is understood that a Bushfire Assessment Report is being concurrently prepared in accordance with the requirements of the *Planning for Bushfire Protection Guidelines* (RFS 2018). The identification of potential impacts and discussion of suitable mitigations measures in Section 6 of this report has considered that asset protection zones (APZ) of at least 20 m to the retained vegetation will be required to achieve a radiant heat flux <29kW/m². This is based on the vegetation classification of dry sclerophyll forest, upslope <5 degrees within FDI 80 (fire weather district). Consideration must also be given to minimum lot sizes to ensure appropriate APZs can be accommodated within future development applications and a perimeter road will be required between the residential development and the bush land interface.

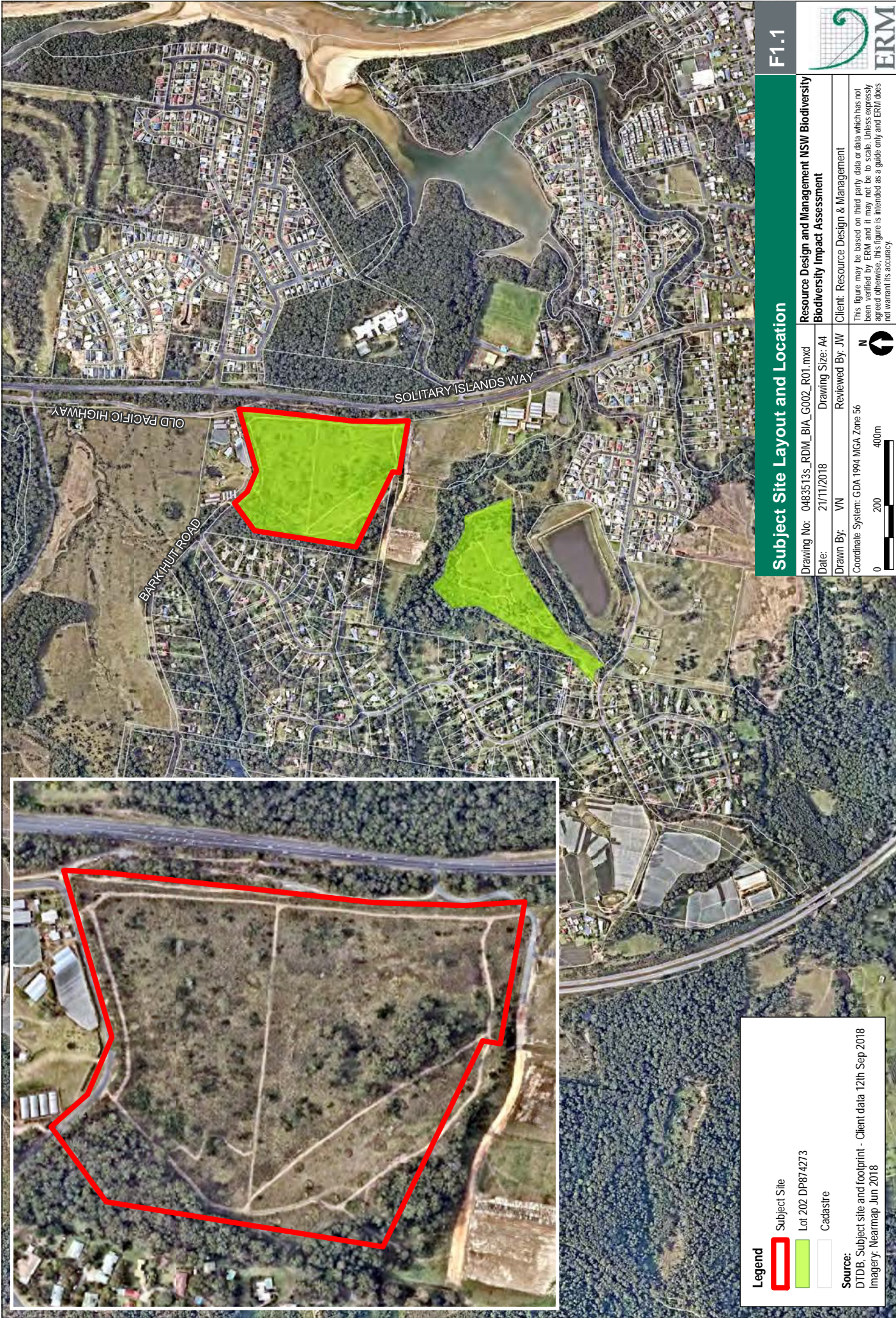
1.2 Site Description

A description of key site feature is provided below in Table 1.1.

Table 1.1 Subject Site Description

Site Feature	Description
Location	The Subject Site is located on the northern portion of Lot 202 DP 874273 located south of Bark Hut Road, Woolgoolga NSW. The Subject Site is bounded to the north by Bark Hut Road, to the west by a strip of council managed lands (woodland vegetation) and then residential development. To the south the land has been recently cleared and developed as a recreational area and sporting fields. To the east the Subject Site is bounded by disturbed vegetation and then Solitary Island Way (the former highway).
Zoning	The Subject Site is located within the Coffs Harbour Local Government Area (LGA) and is currently zoned RU2 – Rural Landscape in the Coffs Harbour Local Environmental Plan 2013 (LEP).
Topography	The Subject Site slopes down from Bark Hut Road to the south. The land elevation varies from 30m AHD to 10m AHD.
Hydrology	Two unnamed 1 st order stream and one 2 nd order stream are mapped within the Subject Site. These streams are tributaries of Poundyard Creek located 270 m to the south-east.

Site Feature	Description
Geology and Soils	The Dorrigo – Coffs Harbour 1:250 000 Geological Map Sheet SH/56-10 (Leitch et. al. 1971) indicates that soils at the Subject Site consist of Corima Beds (greywacke, slate, siliceous argillite). Acid Sulfate Soil (ASS) Risk map indicates that the southern part of the Subject Site falls into Low probability of ASS.
Connectivity	The Subject Site does not form part of any mapped local or regional habitat corridors. A review of the Coffs Harbour City Council online mapping tool shows a landscape corridor to the south of the Subject Site, however this is no longer relevant as this area has been developed as a sports and recreational area (managed by council).
Previous Landuse	The Subject Site appears to have a long history of land disturbance and most of the site has been completely cleared of native vegetation. Land use and disturbance is also evidenced by the concrete culvert located at the southern end of the 2 nd order stream and the ponding of water in the southern portion of the Subject Site (immediately north and upstream of the culvert).



F1.1



Subject Site Layout and Location

Drawing No: 0483513s_RDM_BIA_G002_R01.mxd
 Date: 21/11/2018
 Drawing Size: A4
 Drawn By: VN
 Reviewed By: JW

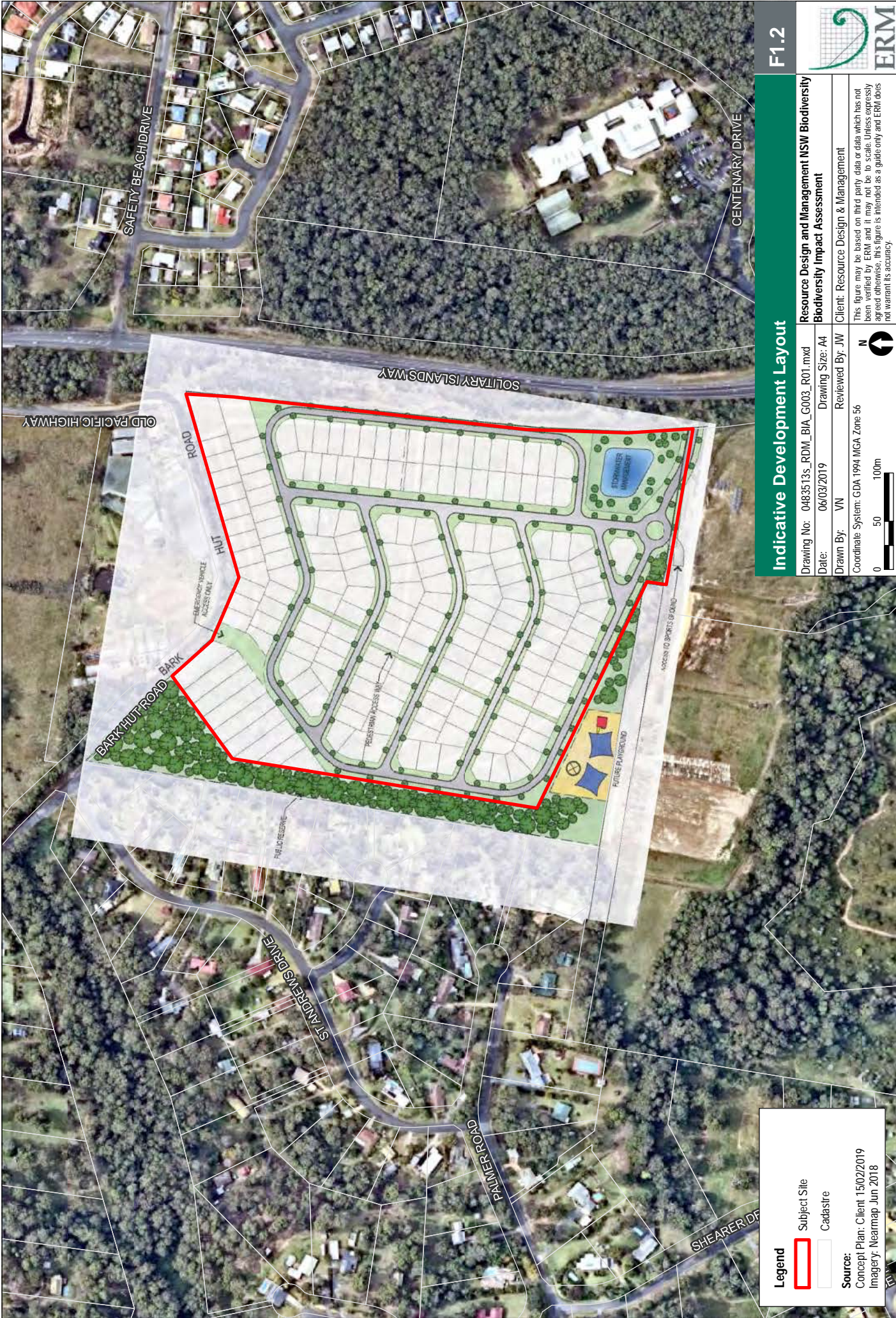
Client: Resource Design & Management
 Resource Design and Management NSW Biodiversity
 Biodiversity Impact Assessment
 Coordinate System: GDA 1994 MCA Zone 56
 0 200 400m
 N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Legend

- Subject Site
- Lot 202 DP874273
- Cadastre

Source:
 DTDB, Subject site and footprint - Client data 12th Sep 2018
 Imagery: Neamap Jun 2018



Legend

- Subject Site
- Cadastre

Source:
 Concept Plan: Client 15/02/2019
 Imagery: Nearnmap Jun 2018

Indicative Development Layout

F1.2



Drawing No: 0483513s_RDM_BIA_G003_R01.mxd
 Date: 06/03/2019
 Drawing Size: A4
 Drawn By: VN
 Reviewed By: JW

Resource Design and Management NSW Biodiversity Biodiversity Impact Assessment
 Client: Resource Design & Management

Coordinate System: GDA 1994 MCA Zone 56

0 50 100m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

2. LEGISLATION

Table 2.1 lists the legislation, planning instruments and guidelines as they are applicable to the preparation and lodgement of a Planning Proposal with regards to the identification of relevant biodiversity and long-term conservation values of the site.

Table 2.1 Applicable Legislation, Plans and Guidelines

Commonwealth Legislation		
Commonwealth <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)		
<p>The <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) requires approval of the Commonwealth Minister for Environment (formerly the Minister of Sustainability, Environment, Water, Population and Communities) for actions that may have a significant impact on Matters of National Environmental Significance (MNES). The EPBC Act is administered by the Commonwealth Department of Environment and Energy (DoEE) and lists threatened species, ecological communities and other MNES. Any proposed action that is expected to have an impact on MNES must be referred to the Minister for assessment under the EPBC Act, or assessed under the accredited process between the Commonwealth and the State of NSW.</p>		
Matters of National Environmental Significance	Application to the Subject Site	Addressed
World heritage properties	Not identified within the Subject Site	Not applicable
National heritage places	Not identified within the Subject Site	Not applicable
Ramsar wetlands of international importance	Not identified within the Subject Site. The closest Ramsar wetland is the Little Llangothlin Nature Reserve, located over 60 km west of Woolgoolga.	Not applicable
Listed threatened species and communities	Threatened species have been recorded within the locality and have potential habitat available within the Subject Site. No Threatened Ecological Communities (TEC) are present.	<i>Section 4 and Attachment A</i>
Internationally protected migratory species	Migratory species identified as potentially occurring within the Subject Site.	<i>Attachment D</i>
Commonwealth marine areas	Not identified within the Subject Site	Not applicable
The Great Barrier Reef Marine Park	Not identified within the Subject Site	Not applicable
Nuclear actions	Not applicable	Not applicable
A water resource, in relation to coal seam gas development and large coal mining development	Not applicable	Not applicable

Statutory Legislation and Guidelines

Biodiversity Conservation Act 2016 (BC Act)

The NSW *Biodiversity Conservation Act 2016* came into effect on 25 August 2017. The BC Act replaced the NSW *Threatened Species Conservation Act 1995*, the NSW *Nature Conservation Trust Act 2001* and parts of the NSW *National Parks and Wildlife Act 1974*. The BC Act establishes mechanisms for:

- The management and protection of listed threatened species of native flora and fauna (excluding fish and marine vegetation) and threatened ecological communities (TECs).
- The listing of threatened species, TECs and key threatening processes.
- The development and implementation of recovery and threat abatement plans.
- The declaration of critical habitat.
- The consideration and assessment of threatened species impacts in development assessment process.
- Biodiversity Offsets Scheme, including the Biodiversity Values Map and method to identify serious and irreversible impacts (SAII).

The BC Act establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments. Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the Biodiversity Assessment Method (BAM). A Biodiversity Values Map and Biodiversity Offsets Scheme Entry Threshold (BOSET) tool are available to identify the presence of mapped biodiversity values within land proposed for development as well as the clearing thresholds that would trigger application of the BAM.

The Biodiversity Offsets Scheme applies to all local developments, major projects or the clearing of native vegetation where the State Environmental Planning Policy (Vegetation in Non - Rural Areas) 2017 applies. Any of these will also require entry into the Biodiversity Offsets Scheme if they occur on land mapped on the Biodiversity Values Map. ERM has reviewed and can confirm that part Lot 202 DP874273, is not currently mapped on the Biodiversity Values Map (see BOSET report in *Appendix A*).

The proposed rezoning and future development of this area would not trigger the Biodiversity Offsets Scheme (based on current entry thresholds) unless the final design of the development footprint requires clearing of more than 0.5 ha of native vegetation or it is considered to have a significant impact on threatened biodiversity listed in Schedule 1 and 2 of the BC Act. Where future residential development of the Subject Site triggers the BAM, a Biodiversity Development Assessment Report (BDAR) will be required to support the development application.

In terms of the proposed rezoning, the planning proposal must take into account species likely to occur within available habitat based on existing records of threatened species and ecological communities, as well as those species likely to occur based on geographic distribution and presence of potential habitat (refer to *Appendix D*)

Water Management Act 2000

A controlled activity approval under the Water Management Act 2000 (WM Act) is required for certain types of developments and activities that are carried out in or within 40 m of a river, lake or estuary.

The WM Act provides a number of mechanisms for protection of water sources via the water management planning process. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under Section 91(2) of the WM Act. 'Controlled activities' include; the construction of buildings or carrying out of works; the removal of material or vegetation from land by excavation or any other means; the deposition of material on land by landfill or otherwise. 'Waterfront land' is defined as 'the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and 40 metres inland from either the highest bank or shore'.

Approvals for controlled activities are administered by NSW Office of Water and a set of guidelines have been developed to assist applicants who are considering carrying out a controlled activity on waterfront land. The guidelines provide information on the design and construction of a controlled activity, and other mechanisms for the protection of waterfront land and include:

- In-stream works
- Laying pipes & cables in watercourses
- Outlet structures
- Riparian corridors
- Vegetation Management Plans
- Watercourse crossings

These guidelines are available from:

https://www.industry.nsw.gov.au/data/assets/pdf_file/0003/160464/licensing_approvals_controlled_activities_riparian_corridors.pdf

The vegetation buffer criteria has been incorporated into this ecological assessment process as they are a potential restriction on future development. Of particular note to this is assessment and with specific regard to the mapped 1st and 2nd order streams, where a watercourse does not exhibit the features of a defined channel with bed and banks, the NSW Office of Water may determine that the watercourse is not waterfront land for the purposes of the WM Act

Biosecurity Act 2015

The NSW Biosecurity Act 2015 came into effect on 1 July 2017, effectively replacing the Noxious Weeds Act 1993, and 13 other Acts, with a single Act. Under the Noxious Weeds Act all landowners have a responsibility to control noxious weeds on their property. Under the Biosecurity Act the same responsibility will apply and will be known as a General Biosecurity Duty.

The General Biosecurity Duty states “Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.” The general biosecurity duty applies to all weeds listed in Schedule 3 of the Biosecurity Act (also included as Weeds of National Significance (WoNS)).

As detailed in Section 4.2.6, four WoNS have been confirmed within the Subject Site - Ground Asparagus (*Asparagus aethiopicus*), Bitou Bush (*Chrysanthemoides monilifera*), Fireweed (*Senecio madagascariensis*) and Lantana (*Lantana camara*). A strategic plan for each WoNS has been developed to define responsibilities and identify strategies and actions to control the weed species. These can be downloaded from:

<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>

SEPP No. 44 – Koala Habitat Protection

SEPP 44 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. A review of SEPP 44 is currently under consideration. The key changes proposed in the amended SEPP 44 relate to the definitions of koala habitat; list of tree species; list of councils; and development assessment process.

SEPP 44 currently applies to the Subject Site will need to be addressed within any future development proposal.

State Environmental Planning Policy (Coastal Management) 2018

The Coastal Management SEPP provides for strategic and integrated management, use and development of the coast for the social, cultural and economic wellbeing of the people of NSW. This SEPP focus on the ecological sustainable development that: protects and enhances sensitive coastal environments, habitats and natural processes; strategically manages risks from coastal hazards; maintains and enhances public access to scenic areas, beaches and foreshores; supports the objectives of NSW's marine environments and protects and enhances the unique character, cultural and built heritage of our coastal areas, including Aboriginal cultural heritage.

The SEPP applies to four coastal management areas within the application land zone. The coastal management areas are: i) Coastal Wetlands and Littoral Rainforests; ii) Coastal Vulnerability area; iii) Coastal

Environmental Area and iv) Coastal Use Area. There are defined objectives for the management of each of these management areas.

As discussed within Section 4.1, the south-eastern corner of the Subject Site is located within the Coastal Environmental Area Map (see Figure 4.1). As outlined within the Coastal Management Act 2016, the management objectives for the coastal environment area are:

- a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity,
- b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change,
- c) to maintain and improve water quality and estuary health,
- d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons,
- e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place, and
- f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.

Coffs Harbour City Council Guidelines

Coffs Harbour Local Environmental Plan (LEP) 2013

The Subject Site is located within the Coffs Harbour Local Government Area (LGA) and the relevant local planning instrument is the Coffs Harbour Local Environmental Plan (LEP) 2013.

The Subject Site is currently zoned RU2 – Rural Landscape in the Coffs Harbour LEP 2013.

A review of the Terrestrial Biodiversity, Drinking Water Catchment, Riparian Lands and Watercourses Map (Map identification number: 1800_COM_CL2_005F_020_20170915) does not identify any areas Terrestrial Biodiversity or Watercourses within the Subject Land.

The Subject Site does not form part of any mapped local or regional habitat corridors. A review of the Coffs Harbour City Council online mapping tool shows a landscape corridor to the south of the Subject Site, however this is no longer relevant as this area has been developed as a sports and recreational area (managed by council).

Kangaroo Management Plan for the Coffs Harbour Northern Beaches (KaMP)

The Kangaroo Management Plan for the Coffs Harbour Northern Beaches was developed in partnership with the National Parks and Wildlife Service (NPWS) and Wildlife Information, Rescue and Education Service Inc (WIRES), to address issues relating to populations of kangaroos living within, and in close proximity to, human population centres on the Coffs Harbour Northern Beaches.

As discussed within Section 4.1, the Subject Site is located within the Safety Beach - north-west Woolgoolga management unit. Key objectives of this management plan will need to be considered during any future residential development of the Subject Site including:

- To reduce the incidence of negative interactions between people and kangaroos;
- To raise community awareness regarding kangaroo management issues; and
- To identify management policies and protocols required to achieve more strategic approaches to kangaroo management.

Koala Plan of Management (KPoM)

The Coffs Harbour City's Koala Plan of Management (KPoM) applies for Koala (*Phascolarctos cinereus*) in the Coffs Harbour LGA. The KPoM states that the consent authority shall not grant consent to any development on lands mapped as Primary, Secondary or Tertiary Koala Habitat or on lands adjoining Primary Koala Habitat unless the development is in accordance with the KPoM.

The Subject Site contains both Secondary and Tertiary Koala Habitat under the CKPoM (Figure 4.2) and the application of the KPoM in terms of the current planning proposal and future residential development has been considered in Section 4.3.6.

Coffs Harbour LGA Flying-fox Camps – Strategic Camp Management Plan

The Flying-fox Strategic Camp Management Plan (FfSCMP) applies to management of the three species of flying-fox known to occur in the LGA, Black Flying-fox (*Pteropus alecto*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Little Red Flying-fox (*Pteropus scapulatus*). Coffs Harbour is home to three permanent flying-fox camps with the Woolgoolga Lake Camp and Barcoo Court Camp at Toormina both listed as nationally important sites for the species. There is also a camp at Coffs Creek, as well as other temporary camps that occur sporadically.

As discussed within Section 4.1, the nearest permanent Flying-fox camp is Woolgoolga Lake Flying-Fox Camp located at approximately 0.9 km to the east from the Subject Site. The Subject Site is also outside the 500m buffer to the camp.

Landscape Corridors of the Coffs Harbour LGA

Coffs Harbour City Council (CHCC) has identified landscape corridors that act as links amongst fragments of flora and fauna habitats. Landscape corridors are protected and restored to enhance the terrestrial biodiversity assets of the Coffs Harbour LGA. Landscape corridors within the Coffs Harbour LGA are available in the online mapping tool within the CHCC's website.

As discussed within Section 4.1, the Subject Site does form part of any mapped regional corridors or key habitat linkages.

3. METHODS

3.1 Desktop Review

ERM undertook an initial desktop review to confirm the key biodiversity constraints relevant to the Subject Site. The desktop assessment is based on searches of the following online resources:

- NSW Wildlife Atlas (BioNET);
- Commonwealth Department of Environment's (DoE's) Protected Matters Search Tool (PMST);
- Online search of the OEH Vegetation Information System (VIS) database;
- Online search of the OEH Threatened Biodiversity Database;
- NSW SEED mapping to identify Plant Community Types (PCT), threatened species or communities known or likely to occur; and
- Coffs Harbour City Council on-line mapping tool.

3.2 Field Surveys

ERM undertook a one-day biodiversity survey on 1st November 2018. This survey aimed to ground-truth the regional vegetation mapping (Fine-scale Vegetation Mapping of the Coffs Harbour Local Government Area, 2012. VIS_ID4189) and to confirm the extent of native vegetation and plant community types (PCTs) present in the Subject Site and their associated habitat attributes.

Random meander searches were conducted across the site and PCT's were identified based on the native species present, landform descriptions and location in the IBRA sub-region using the BioNet Vegetation Classification Database.

Two detailed floristic plots (20m by 50m) were also undertaken. Data was collected on the composition, structure and function of the vegetation as per the Biodiversity Assessment Methodology (BAM) (OEH 2017) by persons accredited under the BAM.

The biodiversity survey also included:

- Flora surveys to detect the presence of threatened flora species;
- Fauna habitat assessment to assess the extent and suitability of habitat resources for threatened fauna species in the Subject Site;
- Targeted searches for koala and koala habitat were undertaken across the subject site generally in accordance with the requirements of SEPP 44 and were aimed at confirming the presence and extent of koala habitat as per the Koala Habitat Planning Map and the KPoM; and
- Searches for indirect evidence of species including scats, tracks and regurgitation pellets (owls).

3.3 Field Survey Limitations

As with all ecological assessments, a range of limitations are likely to have influenced the results of this study. Due to the limited survey period and general logistic limitations (seasonal constraints), not all threatened species with the potential to occur in the Subject Site were targeted during the field survey. Some flora species are visible and identifiable at particular times of any year, depending on the season. Notes were taken on the overall vegetation type to assist in predicting what species of conservation significance may be present

The surveys have been undertaken to identify and map broad conservation values across the site to inform this planning application. They have not been designed to address any detailed development design. Additional survey and detailed floristic plots are likely to be required in accordance with the Biodiversity Assessment Method to support any future development proposal and a detailed impact assessment will need to be based on a final development design.

3.4 Analysis

3.4.1 GIS Mapping

The results of the field surveys have been input into the Project GIS. These datasets include ground truth vegetation zones and fauna habitat mapping across the Subject Site with the aid of satellite imagery to delineate boundaries.

3.4.2 Threatened Species Likelihood of Occurrence

To account for the limitations of the field survey, a conservative approach was undertaken in the identification of threatened species that may occur in the Subject Site through an assessment of the likelihood of occurrence of threatened biodiversity. In making this determination, the following factors were considered:

- habitat quality within and adjacent to the Subject Site as determined through review of regional vegetation mapping and the one day site survey;
- breeding habitat/resources present – assists with identification of the importance of habitat to the species;
- dispersal ability - based on known ecology - whether the species have an ability to disperse to new areas of habitat following disturbance; and
- local records in similar habitat/distance/connectivity to the site.

This allows for assessment of cryptic or seasonal species that are unlikely to be readily identified during brief site inspections and/or due to seasonal constraints. The likelihood of each species occurring was categorised as known, potential or unlikely to occur based on the definitions provided in Table 3.1.

Table 3.1 Definitions of Likelihood of Occurrence

Category	Description
Known	<ul style="list-style-type: none"> ■ the ecological community/species/matter has been recorded in the Subject Site during field surveys; or ■ database records demonstrate that the ecological community/species has been known to occur in the Subject Site within the last 10 year period.
Potential	<ul style="list-style-type: none"> ■ the ecological community/species' known distribution includes the Subject Site, and suitable habitat is present within the Subject Site, or, ■ database records demonstrate that the ecological community/species has been known to occur in the Subject Site, however has not been recorded within the last 10 years, or ■ the species is a wide ranging flying species which may 'fly-over' the Subject Site, regardless of the habitat types present and has been recorded within 10 km of the Subject Site.
Unlikely	<ul style="list-style-type: none"> ■ the ecological community/species has not been recorded within 10 km of the Subject Site and suitable habitat does not occur within the Subject Site, or ■ the Subject Site is not within the TEC/species' known distribution, or ■ sufficient field surveys have been conducted to conclude that the species is likely to be absent.

The following considerations were made in assessing habitat suitability and distribution:

Habitat quality within and adjacent to the Subject Site.

Breeding habitat/resources present – assists with identification of the importance of habitat to the species.

The species' ability to disperse to new areas of habitat following disturbance.

Local records in similar habitat/distance/connectivity to the site.

3.4.3 Risk Assessment

A risk assessment was undertaken using the definitions of Species Sensitivity and Consequence to assign a relative risk ranking for each listed ecological value (Low, Medium, High or Very High, as shown in Table 3.2). Impacts to ecological values with potential to occur that were assessed as having a Low risk was not further assessed. Impacts to ecological values with potential to occur that were assessed as having a Medium, High or Very High risk were assessed in terms of the planning proposal, taking into consideration the future residential development of the Subject Site.

Species sensitivity rankings are based on the species conservation status under the EPBC Act, FM Act and BC Act. Where the conservation status differs between listings, the conservation status with higher sensitivity is used.

Table 3.2 Risk Assessment Matrix

		Consequence			
		Negligible	Minor	Moderate	Major
Sensitivity	Ecological value not listed as threatened	Low	Low	Medium	High
	Ecological value listed as Vulnerable or Migratory	Low	Medium	Medium	High
	Ecological value listed as Endangered	Low	Medium	High	Very High
	Ecological value listed as Critically Endangered	Medium	High	Very High	Very High

Consequence Definitions

- Negligible:** No impacts or removal of ecological community. Effect on species is within the likely normal range of variation. No removal of specific breeding habitat features.
- Minor:** Indirect impacts to listed ecological community which may affect a small proportion of the ecological community. Effects a small proportion of a population and Project-related mortality of a small number of individuals may occur, but does not substantially affect other species dependent on it, or the populations of the species itself. No removal of specific breeding habitat features.
- Moderate:** Direct removal of a portion of a listed ecological community. Effects a sufficient proportion of a species population that it may bring about a substantial change in abundance and/or reduction in distribution over one or more generations, but does not threaten the long term viability of that population or any population dependent on it.
- Major:** Direct removal of a listed ecological community. Effects an entire population or species at sufficient scale to cause a substantial decline in abundance and/or change in distribution beyond with natural recruitment (reproduction, immigration from unaffected areas) may not return that population or species, or any population or species dependent upon it, to its former level within several generations, or when there is no possibility of recovery.

Species sensitivity definitions

Species sensitivities refer to listed under either the EPBC Act or BC Act. Where listings differ, the higher sensitivity is used.

4. RESULTS

4.1 Desktop Review

Table 4.1 provides a summary of the desktop review and is based on publically available online resources as described in *Section 2* and *Section 3.1*.

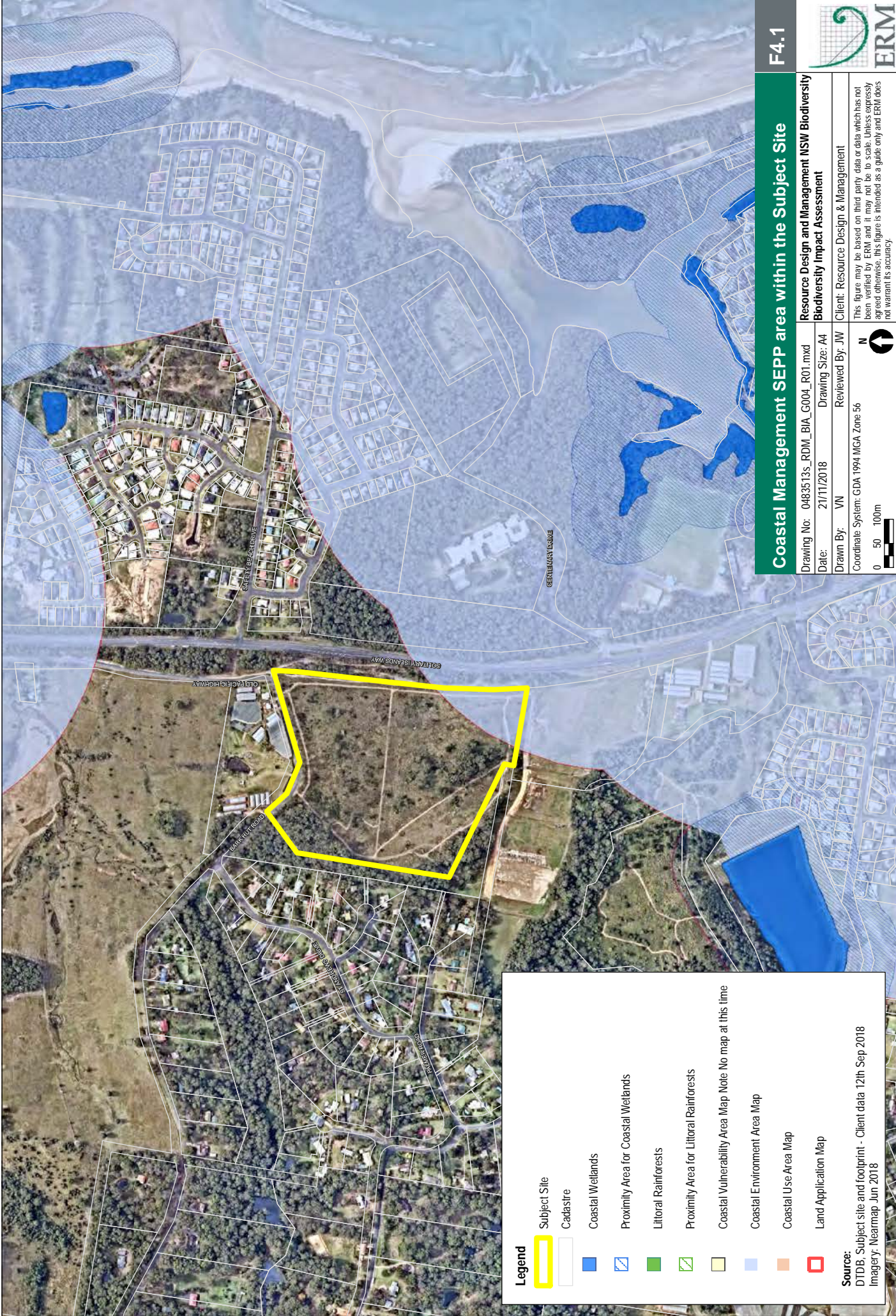
Table 4.1 Summary of Desktop Review

Database Source	Application to the Subject Site	Assessment requirements
Coastal Management SEPP		
Coastal Management SEPP	<p>An area of 1.32 ha in the south-eastern corner of the Subject Site is located within the Coastal Environmental Area Map (see Figure 4.1). As outlined within the Coastal Management Act 2016, the management objectives for the coastal environment area are:</p> <ul style="list-style-type: none"> a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity, b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change, c) to maintain and improve water quality and estuary health, d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons, e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place, and f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms. 	<p>These objectives will need to be considered within the planning proposal although they do not represent any key ecological constraints or require targeted survey.</p>
Coffs Harbour LGA policies and guidelines		
Kangaroo Management Plan for the Coffs Harbour Northern Beaches (KaMP)	<p>The Subject Site is located within Kangaroo Management Unit (KaMU) '5: Safety Beach – north-western Woolgoolga', which is identified as Level 2 priority.</p> <p>Vehicle accident is identified as a significant management issue within this KaMU. The Subject Site is located in a hot spot with numerous kangaroo incidents recorded along St Andrews Drive and Solitary Islands Way. The Subject Site is also mapped as potential Kangaroo Habitat Class 1 – Best. Key kangaroo issues for this KaMU are:</p>	<p>The proposed rezoning will require consideration of kangaroo management. Refer to Section 4.3.7.</p>

Database Source	Application to the Subject Site	Assessment requirements
	<ul style="list-style-type: none"> ■ High incidence of kangaroo attacks (particularly in the large lot residential area of north-western Woolgoolga). ■ High incidence of motor vehicle accidents involving kangaroos. The KaMU is bisected by the Solitary Islands Way (the old highway) which has been a source of many road accidents involving kangaroos over the years; this is less of an issue now that Woolgoolga has been by-passed and traffic flows are reduced although accidents within the urban areas are still prevalent. ■ Relatively high number of sick / injured kangaroos and dog attacks on kangaroos. ■ Council strategic planning and management is rated as a significant issue in this KaMU. There is the very high potential for kangaroo population increases associated with urban growth and playing fields management in Woolgoolga precincts. 	
Koala Plan of Management (KPoM)	In accordance with the Koala Habitat Planning Map (see Figure 4.2), the Subject Site contains: <ul style="list-style-type: none"> ■ Tertiary Koala Habitat Type (1.37 ha). ■ Secondary Koala Habitat Type (0.1 ha) 	The mapped presence of koala habitat guided targeted field survey and confirmation of habitat mapping. Refer to Section 4.3.6.
Coffs Harbour LGA Flying-fox Camps – Strategic Camp Management Plan	No known permanent or temporary Flying-fox camps are present with the Subject Site. The nearest permanent Flying-fox camp is Woolgoolga Lake Flying-Fox Camp located at approximately 0.9 km to the east from the Subject Site. The Subject Site is outside the 500m buffer from the Woolgoolga Lake Flying-Fox Camp.	None. Flying foxes may utilise the resources present within the Subject Site as a seasonal foraging resource only.
Landscape Corridors of the Coffs Harbour LGA	The Subject Site does form part of any mapped regional corridors or key habitat linkages.	None. Habitat connectivity is further discussed in Section 4.3.6.
NSW Threatened Biodiversity Database		
BioNet Atlas	<p>A total of 79 threatened species, including 11 threatened flora species and 68 threatened fauna species have been recorded within a 10km radius of the Subject Site (refer to Figure B1 and Table B1).</p> <p>A likelihood of occurrence was undertaken (See Table D.2 in <i>Appendix D</i>).</p> <p>Note: One flora threatened species has been recorded on the BioNet Atlas within the Subject Site - Rustray Plum (<i>Niemeyera whitei</i>). This record has not been verified, is within a previously cleared area and cannot be located despite targeted survey.</p>	<p>Most of the species assessed in Appendix D are considered to have a low potential to be impacted as a result of the proposed rezoning (and future development) of the Subject Site.</p> <p>One species, Regent Honeyeater, was identified as having medium residual risk based on their level of protection. A test of significance was prepared</p>

Database Source	Application to the Subject Site	Assessment requirements
		<p>for this species (see <i>Appendix F</i>).</p> <p>A test of significance was undertaken for the koala as a precautionary measure only given the high profile of the species in the LGA (see Table F.1 in <i>Appendix F</i>).</p> <p>No additional targeted survey or assessments of significance are required to inform this planning proposal.</p>
Commonwealth's Matters of National Environmental Significance (MNES)		
PMST	<p>The PMST identified the following Matters of National Environmental Significance (MNES) as likely to occur:</p> <ul style="list-style-type: none"> ■ Four Threatened Ecological Communities (TECs). ■ 73 Threatened Species ■ 57 Migratory species <p>A likelihood of occurrence was undertaken (See Table D.1 in <i>Appendix D</i>). Based on geographic distribution, it was concluded that no TEC are likely to occur within the Subject Site (refer to Table D.1).</p> <p>Most of the species assessed in <i>Appendix D</i> are considered to have a low (or none) potential to be impacted as a result of the proposed rezoning (and future development) of the Subject Site.</p> <p>Three species were identified as having a Medium residual risk based on their level of protection rather than on tangible impacts to habitat.</p> <p>Marine and Marine Migratory species were excluded from the analysis.</p>	<p>Most of the species assessed in <i>Appendix D</i> are considered to have a low potential to be impacted as a result of the proposed rezoning (and future development) of the Subject Site.</p> <p>One species, Regent Honeyeater, had a medium residual risk. An assessment of significance was undertaken in <i>Appendix G</i>.</p> <p>An assessment of significance was undertaken for the koala as a precautionary measure only given the high profile of the species in the LGA (see Table G.1 in <i>Appendix G</i>).</p> <p>No additional targeted survey or assessments of significance are required to inform this planning proposal.</p>
Other Biodiversity Features		
Riparian habitat	<p>A small, highly disturbed 'wetland' (approximately 0.57 ha) is located within the south eastern portion of the Subject Site. This area is visible on the aerial photo although does not contain any open water habitats and appears to be an area of inundation/pooling as a result of concrete culverts being installed offsite to the south (not naturally occurring)</p>	<p>Field survey required to confirm if this area contains any significant ecological conservation value.</p>

Database Source	Application to the Subject Site	Assessment requirements
First and Second order streams	Two first order streams are mapped (visible on the topographic map) within the north-eastern portion of the Subject Site and forming a second order stream within the southern portion of the site. These unnamed streams converge into Poundyard Creek then discharge into Woolgoolga Lake (located 600m to the east).	Field survey is required to confirm the status of these streams to confirm presence of any defined bed and bank.



Legend

- Subject Site
- Cadastre
- Coastal Wetlands
- Proximity Area for Coastal Wetlands
- Littoral Rainforests
- Proximity Area for Littoral Rainforests
- Coastal Vulnerability Area Map Note No map at this time
- Coastal Environment Area Map
- Coastal Use Area Map
- Land Application Map

Source:
 DTDB, Subject site and footprint - Client data 12th Sep 2018
 Imagery: Nearamap Jun 2018

F4.1 Coastal Management SEPP area within the Subject Site



Drawing No: 0483513s_RDM_BIA_G004_R01.mxd	Resource Design and Management NSW Biodiversity	Biodiversity Impact Assessment
Date: 21/11/2018	Drawing Size: A4	
Drawn By: VN	Reviewed By: JW	Client: Resource Design & Management

Coordinate System: GDA 1994 MCA Zone 56

0 50 100m



N



This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



Koala Habitat within the Subject Site

Drawing No: 0483513s_RDM_BIA_G005_R01.mxd	Resource Design and Management NSW Biodiversity	ERM
Date: 21/11/2018	Drawing Size: A4	Biodiversity Impact Assessment
Drawn By: VN	Reviewed By: JW	Client: Resource Design & Management
<p style="font-size: small;">Coordinate System: GDA 1994 MCA Zone 56</p> <p style="font-size: x-small;">This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>		

Legend

- Subject Site
- Cadastre
- 1st Order Streams
- 2nd Order Streams

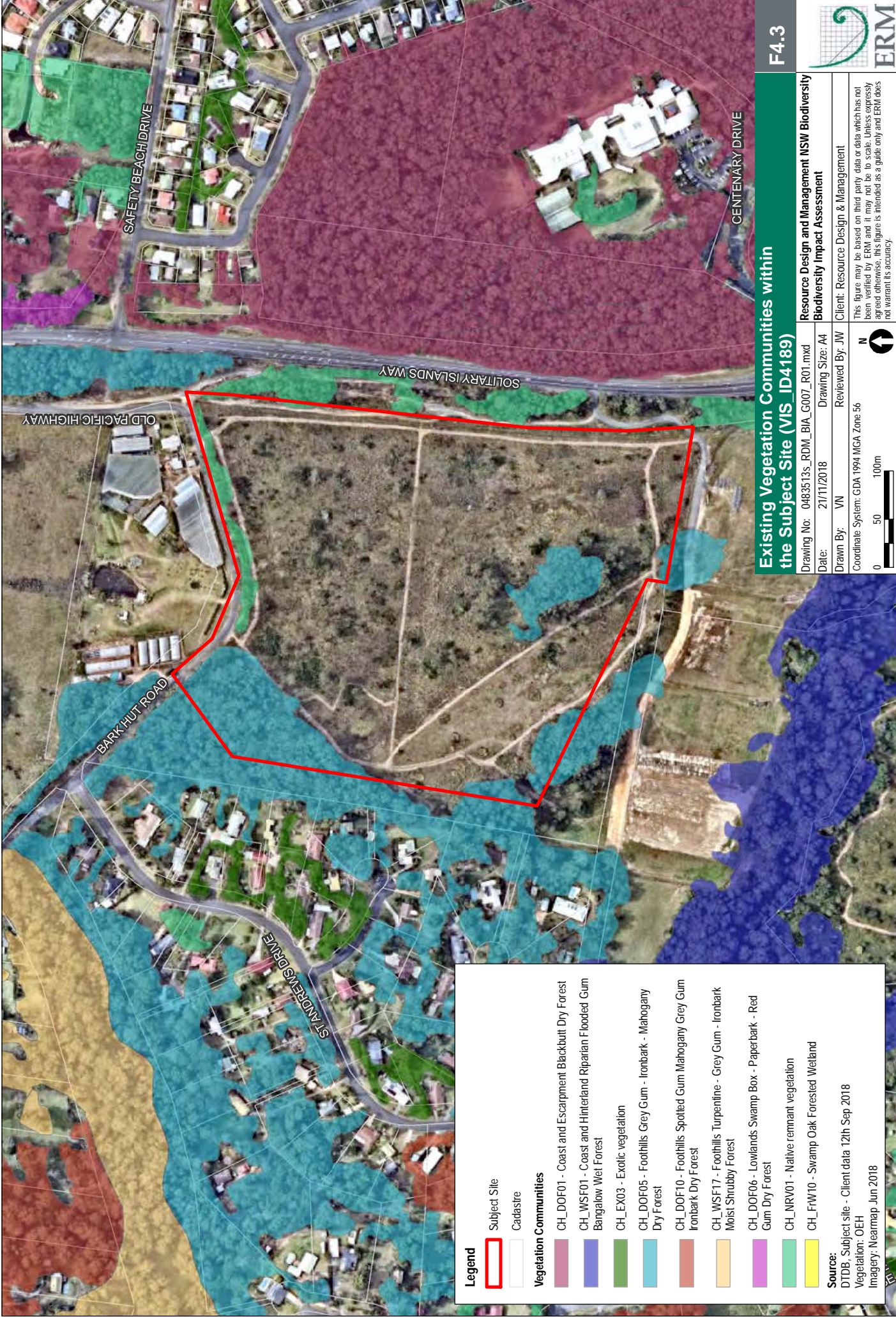
KPoll mapped Koala Habitat

- Secondary Koala Habitat Type (CHCC)
- Tertiary Koala Habitat Type (CHCC)

ERM ground truthed Koala Habitat

- Current extent of Tertiary Koala Habitat

Source:
DTDB, Subject site - Client data 12th Sep 2018
Habitat: Coffs Harbour City Council
Ground truthed habitat: ERM Nov 2018
Imagery: Nearmap Jun 2018



F4.3

ERM

Existing Vegetation Communities within the Subject Site (VIS_ID4189)

Drawing No: 0483513s_RDM_BIA_G007_R01.mxd	Resource Design and Management NSW Biodiversity Biodiversity Impact Assessment
Date: 21/11/2018	Client: Resource Design & Management
Drawn By: VN	Reviewed By: JW
Coordinate System: GDA 1994 MCA Zone 56	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 50 100m

N

- Legend**
- Subject Site
 - Cadastre
- Vegetation Communities**
- CH_DOF01 - Coast and Escarpment Blackbutt Dry Forest
 - CH_WSF01 - Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest
 - CH_EX03 - Exotic vegetation
 - CH_DOF05 - Foothills Grey Gum - Ironbark - Mahogany Dry Forest
 - CH_DOF10 - Foothills Spotted Gum Mahogany Grey Gum Ironbark Dry Forest
 - CH_WSF17 - Foothills Turpentine - Grey Gum - Ironbark Moist Shrubby Forest
 - CH_DOF06 - Lowlands Swamp Box - Paperbark - Red Gum Dry Forest
 - CH_NRV01 - Native remnant vegetation
 - CH_FFW10 - Swamp Oak Forested Wetland
- Source:**
 DTDB, Subject site - Client data 12th Sep 2018
 Vegetation: OEH
 Imagery: Nearmap Jun 2018

4.2 Ground-truthed Vegetation Communities

Field survey has confirmed a total of 89 species within 38 families within the Subject Site. The most diverse families were Poaceae (13 species), Asteraceae (11 species), Fabaceae (8 species) and Myrtaceae (8 species). The full flora list is presented in Table E.1 (*Appendix E*).

Field survey has confirmed the presence of five mapped vegetation zones, consistent with three separate Plant Community Types (refer to Figure 4.4 and Table 4.2). These include:

- Native vegetation along the western boundary of the Subject Site is consistent with the Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05) in moderate condition. This area is adjacent to similar vegetation within the council managed lands to the west and provides the greatest potential for habitat connectivity.
- Two smaller patches of remnant vegetation consistent with the Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05) in low to moderate condition are located within the centre of the site (see Figure 4.4). These isolated fragments of vegetation are surrounded by cleared land dominated by exotic species. Edge effects, weed invasion and limited connectivity reduce the conservation value of these areas.
- A narrow strip of remnant trees along Bark Hut Road (partially outside of the lot boundary) contains native trees with no to very poor groundcover. This is likely to be a remnant of Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05). This strip of vegetation is highly disturbed and provides limited habitat opportunities and is of low conservation value.
- Non-native vegetation dominates the remainder of the Subject Site. This vegetation comprises of a mix of native and exotic species which are not consistent with known native vegetation in the locality. The flora composition is consistent with historical clearing of the Subject Site.
- A disturbed area of 'wetland' (0.57 ha) is located within the south-eastern portion of the Subject Site. This area does not provide any open water habitats for wetland dependant (or migratory) avifauna and is characterised by a mixture of common native and exotic plants. It is essentially part of the mapped second order stream and the pooling of water encouraged by the construction of a concrete culvert to the south (offsite). This area of inundation is not a naturally occurring or high conservation wetland.

Table 4.2 Ground Truth Vegetation Communities and their extent within the Subject Site

Vegetation Community (VIS_ID4189)			Corresponding Plant Community Type (PCT)		Ground Truthed
Code	Name	Area (ha)	PCT No	PCT Name	Area (ha)
CH_DOF05	Foothills Grey Gum – Ironbark – Mahogany Dry Forest Moderate to Good Condition	2.01	2251	Pink Bloodwood – Thick-leaved Mahogany – Grey Ironbark – Small-fruited Grey Gum grassy open forest on exposed slopes with shallow sedimentary soils; NSW North Coast Bioregion and South Eastern Queensland Bioregion	1.20
CH_DOF05	Foothills Grey Gum – Ironbark – Mahogany Dry Forest Low to Moderate Condition (Isolated Fragments)		2251	Pink Bloodwood – Thick-leaved Mahogany – Grey Ironbark – Small-fruited Grey Gum grassy open forest on exposed slopes with shallow sedimentary soils; NSW North Coast Bioregion and South Eastern Queensland Bioregion	1.25
CH_NRV01	Strip of trees typical of the Foothills Grey Gum – Ironbark – Mahogany Dry Forest Very poor condition	0.24	NA	NA	0.24
-	Cleared Land (Non-native)	14.22	NA	NA	13.31
-	Disturbed Wetland Vegetation (mixed native and exotic)	-	NA	NA	0.57



Legend

- Subject Site
- ★ BAM Plot
- CH_DOF5: Foothills Grey Gum - Ironbank - Mahogany Dry Forest
- Remnant trees of CH_DOF5: Foothills Grey Gum - Ironbank - Mahogany Dry Forest
- Non-native dominated by Pinus eliotii
- Welland Vegetation (not surveyed)

Source:
 DTDB, Subject site - Client data 12th Sep 2018
 Vegetation: ERM ground truth Nov 2018
 Imagery: Nearmap Jun 2018

F4.4

ERM

Ground truthed Vegetation Mapping

Resource Design and Management NSW Biodiversity Biodiversity Impact Assessment

Client: Resource Design & Management

Drawing No: 0483513s_RDM_BIA_G008_R01.mxd
 Drawing Size: A4
 Date: 22/11/2018
 Drawn By: VN
 Reviewed By: JW

Coordinate System: GDA 1994 MCA Zone 56

0 50 100m

N

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

4.2.1 Foothills Grey Gum – Ironbark – Mahogany Dry Forest

Three distinct areas of Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DO05) have been mapped within the Subject Site as follows:

- A 1.20 ha area located in the north-western and south-western portion of the Subject Site. This vegetation is in moderate to good condition with intact structural layers, including canopy, shrub and ground layer.
- 1.25 ha of low to moderate condition, isolated remnants are mapped within the centre of the Subject Site and includes two separate fragmented patches (0.12ha and 1.13ha).
- A narrow strip of remnant trees with no shrub layer and a highly disturbed exotic ground layer is present along Bark Hut Road. This area is approximately 0.24 ha of which some is partially outside of the lot boundary.

The Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DO05) vegetation community corresponds to Plant Community Type (PCT) Pink Bloodwood – Thick-leaved Mahogany – Grey Ironbark – Small-fruited Grey Gum grassy open forest on exposed slopes with shallow sedimentary soils; NSW North Coast Bioregion and South Eastern Queensland Bioregion and it is not a Threatened Ecological Community (TEC).

The vegetation community is characterised by a tall canopy and low to moderate ground and shrub cover (see Photograph 4.1 and 4.2). Canopy species include Broad-leaved White Mahogany (*Eucalyptus carnea*), Tallowwood (*Eucalyptus microcorys*), Blackbutt (*Eucalyptus pilularis*), Small-fruited Grey Gum (*Eucalyptus propinqua*) and Forest Oak (*Allocasuarina torulosa*).

Native shrub cover (where present) included: White Sally Wattle (*Acacia floribunda*), *Bossiaea stephensonii*, Eastern Flame Pea (*Chorizema parviflorum*), *Goodia* sp., *Hibbertia cistoidea* and Rice Flower (*Ozothamnus diosmifolius*).

Ground cover included a mix of grasses and forbs. Grasses included: Shorthair Plumegrass (*Dichelachne micrantha*), *Echinopogon nutans*, Wiry Panic (*Entolasia stricta*), Blady Grass (*Imperata cylindrica*) and Kangaroo Grass (*Themeda triandra*). Forbs included: Slender Stackhousia (*Stackhousia viminea*), Forest Buttercup (*Ranunculus plebeius*), Slender Onion Orchid (*Microtis parviflora*) and Kidney Weed (*Dichondra repens*).

Exotic species included the following weeds of national significance (WoNS): Ground Asparagus (*Asparagus aethiopicus*), Bitou Bush (*Chrysanthemoides monilifera*), Fireweed (*Senecio madagascariensis*) and Lantana (*Lantana camara*).

Two detailed floristic plots (20m by 50m) were also undertaken within this PCT (see Figure 4.4). Data was collected on the composition, structure and function of the vegetation as per the Biodiversity Assessment Methodology (BAM) and was used to confirm the condition (and ultimately the conservation value) of the vegetation present. Plot 1 recorded a total of 41 species, including 27 natives and 14 exotic species. A slightly higher number of species were recorded in the larger remnant within the western portion of the site (Plot 2), including 37 natives and only eight exotic species.



Photograph 4-1 Foothills Grey Gum – Ironbark – Mahogany Dry Forest in the south-central portion of the Subject Site - low to moderate condition



Photograph 4-2 Foothills Grey Gum – Ironbark – Mahogany Dry Forest in the north-western portion of the Subject Site – moderate to good condition



Photograph 4-3 Remnant trees along Bark Hut Road - very poor condition

4.2.2 Non-native vegetation

A total of 13.31 ha of cleared land has been confirmed across the Subject Site. This is the dominant vegetation community and is characterised by a mixture of native and exotics (dominant) (see Photographs 4.4 to 4.6).

A total of 40 species were recorded in the areas of non-native vegetation, including 21 natives (less common) and 19 exotics (dominant and in some cases invasive). Some of the dominant species in each stratum include:

- Upper stratum: Slash Pine (*Pinus ellottii*)
- Medium stratum: Bitou Bush (*Chrysanthemoides monilifera*), Senna (*Senna pendula*), White Sally Wattle (*Acacia floribunda*), Native Currant (*Leucopogon juniperinus*) and Rice Flower (*Ozothamnus diosmifolius*).
- Lower stratum: Purpletop (*Verbena bonariensis*), Wild Tobacco Bush (*Solanum mauritianum*), Common Bracken (*Pteridium esculentum*) and Flaxleaf Fleabane (*Conyza bonariensis*).

A full list of species is presented in *Appendix E*.



Photograph 4-4 Slash Pine dominated area on the north-eastern portion of the Subject Site



Photograph 4-5 View of non-native vegetation within the Subject Site



Photograph 4-6 Bitou Bush dominated area within the Subject Site



Photograph 4-7 View of the disturbed 'wetland' vegetation (area of inundation- no open water bodies) within the south eastern corner Subject Site

4.2.3 Wetland vegetation

It is noted that a small disturbed 'wetland' (approximately 0.57 ha) is located within the south-eastern portion of the Subject Site (see Photograph 4.7). This area does not provide any significant open water habitats for wetland dependant (or migratory) avifauna species and is characterised by a mixture of common native and exotic sedges and wetland vegetation such as *Typha* and *Juncus* species. The ponding of water within this area appears to be the result of the installation of a concrete culvert downstream and it is important to note that it is not a naturally occurring or high conservation wetland habitat.

4.2.4 Threatened Communities

No threatened ecological communities (TECs) have been identified within the Subject Site.

4.2.5 Threatened Flora Species

No threatened flora species have been recorded within the Subject Site.

As noted in Table 4.1, a record from 1991 of the Rusty Plum (*Niemeyera whitei*) exists in the BioNet database. The Rusty Plum is reported to occur within previously cleared areas in north-western portion of the Subject Site (see Figure B.1 in *Appendix B*).

The Rusty Plum is a small to medium size tree that is found in gullies, warm temperate or littoral rainforests and the adjacent understory of moist eucalypt forest. The habitats available within the Subject Site are not consistent with the habitats preferred by this species and it is considered unlikely that this species would occur.

The species was not recorded during surveys by ERM in November 2018 and it has not been assessed as a potential constraint to the proposed rezoning and future development of this site.

4.2.6 Weed Species

A total of 29 exotic species were recorded within the Subject Site. Five exotic species are Weeds of National Significance (WoNS): Ground Asparagus (*Asparagus aethiopicus*), Bridal Creeper (*Asparagus asparagoides*), Bitou Bush (*Chrysanthemoides monilifera*), Fireweed (*Senecio madagascariensis*) and Lantana (*Lantana camara*).

Eight weed species are listed as part of the North Coast Regional Strategic Weed Management Plan (NCLLS 2017) as regional priority weeds (Lantana, Fireweed, Bitou Bush, Groundsel Bush (*Baccharis halimifolia*), Bridal Creeper and Ground Asparagus) or watch species (Slash Pine (*Pinus elliottii*), Small-leaved Privet (*Ligustrum sinense*)) in the North Coast.

The long term management of weeds on this land should be considered as part of the planning proposal and future development of this site. Mitigation measures are available to reduce the spread of weeds as outlined within Section 6.

4.3 Fauna and Fauna Habitat

4.3.1 Threatened Fauna Species

No threatened fauna species have been recorded within the Subject Site.

A likelihood of occurrence assessment was undertaken for threatened species identified by BioNet and PMST searches as known (or likely to occur) within the locality (see Table D.2 in *Appendix D*). Marine and marine migratory species have been excluded from the assessment based on geographic distribution and lack of marine habitats.

The assessment concluded that 45 fauna species and one flora species have the potential to occur within the Subject Site based on their geographic distribution and the habitats available. One species was identified as having a Medium residual risk based on their level of protection (i.e. critically endangered) as limited suitable habitat for it occurs within the Subject Site. Test and assessments of significance indicated no significant impacts will result on this species (see *Appendix F and G*).

None of these species assessed would be dependent on any of the resources present within the site and the proposed rezoning and future development of the site would have a low potential to significantly impact any local populations of the species assessed based on the criteria outlined in Section 3.4.2.

4.3.2 Opportunistic Fauna and Habitat Observations

The following fauna habitat observations were made during the one day field survey:

- The areas of open forest provide a range of foraging and roosting habitat for native species including woodland birds, arboreal mammals and terrestrial fauna. Nests were observed in two trees within the remnant vegetation within the Subject Site (see Photograph 4.8);
- The disturbed 'wetland' habitat (area of inundation) located on the south-eastern portion of the Subject Site provides habitat for frogs and provides a drinking resource for larger fauna. This area does not provide any significant open water habitats for wetland dependant fauna species such as wetland birds or migratory species and it not considered to be either a naturally occurring or high conservation habitat resource(see Photograph 4.9);
- The cleared lands also provide temporal habitat for small birds, reptiles and mobile fauna (e.g. Eastern Grey Kangaroo); and
- Nesting habitat is limited to those species not dependant on hollows.

Opportunistic observation of fauna utilising these habitats include:

- The Eastern Grey Kangaroo (*Macropus giganteus*) was observed within the Subject Site during surveys. Numerous Eastern Grey Kangaroos were also seen basking in the land immediately south from the Subject Site in the afternoon (refer to Photograph 4.10);
- Two bird species, Common Myna (*Acridotheres tristis*) and Noisy Miner (*Manorina melanocephala*) were seen during surveys and
- Frog calls, likely to be those of the Common Eastern Froglet (*Crinia signifera*) were heard in the south-eastern portion of the Subject Site.



Photograph 4-8 View of Nest on the upper canopy



Photograph 4-9 View of wetland and open forest habitat



Photograph 4-10 Kangaroos in land immediately south form the Subject Site

4.3.3 Riparian Habitats

As noted in Table 4.1, two 1st order and a 2nd order stream are mapped within the Subject Site (see Figure 4.2). In accordance with the NSW Office of Water's "Guidelines for riparian corridors on waterfront land", waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

The 1st order streams within the Subject Site do not have a defined bed and bank, and are not visible in the field (see Photograph 4.11). Based on field observations it is considered that the 1st order streams have no conservation value and would not pose any constraints to the proposed rezoning or future residential development.

The location of the 2nd order stream (see Photograph 4.12) can be identified in the field as a slight depression in the landform and provides a connection with the disturbed wetland habitats and the concrete culvert located on the south-eastern corner (see Photograph 4.13). This area does not constitute high conservation value and it does not exhibit the features of a defined channel with bed and banks. The Office of Water may therefore determine that the mapped 2nd order stream is also not waterfront land for the purposes of the WM Act (although this would need to be confirmed during detailed design and assessment).

This area has limited biodiversity habitat value and does not form part of any vegetated riparian corridor.



Photograph 4-11 View of the area where convergence of the two 1st order streams occur within the Subject Site (no visible bed or bank).



Photograph 4-12 View of the 2nd order stream within the Subject Site. (no defined banks, although the stream is visible in the field as a slight depression in the landform).



Photograph 4-13 View of the southern extent of the 2nd order Stream at the culvert on the south-eastern border of the Subject Site

4.3.4 Hollow Bearing Trees

Hollow bearing trees were not observed across the Subject Site.

4.3.5 Koala Habitat

No koalas, koala scats or evidence of koala scratches were observed within the Subject Site during the one day field survey. The closest record is approximately 80 m to the south from the Subject Site (dated from 2006 in the Council managed land) however this area has since been cleared and developed as a recreational sports ground.

A review of the mapping included within the CHCC KPoM has identified 1.37 ha of Tertiary Koala Habitat and 0.1ha of Secondary Koala Habitat within the Subject Site. Based on the results of the field survey, koala habitat mapping has been refined based on the extent of koala feed trees: Tallowwood (*Eucalyptus microcorys*), Blackbutt (*Eucalyptus pilularis*), Small-fruited Grey Gum (*Eucalyptus propinqua*), Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*). The updated extent of koala habitat within the Subject Site is provided in Figure 4.5.

A description of the zones and their key management actions are provided in Table 4.3 below.

Table 4.3 Koala Habitat within the Subject Site

Koala Habitat Type	Key Management Actions	Application to the Subject Site
Primary Koala Habitat		
<p>Areas of Primary Koala Habitat (see Koala Habitat Planning Map) are the most significant habitats available to koalas in the LGA and accordingly require a high level of protection. The majority of this habitat (and the highest level of koala records and activity) occurs in the south-east section of the LGA generally south of Korora and Bruxner Park, east of Karangi, south through Boambee State Forest to the southern boundary of the LGA at Pine Creek State Forest. It includes the most populated and highly developed areas of the LGA. The vegetation in this section of the LGA is fragmented, and the koala population is subject to a number of threats associated with urban expansion and other developments which remove or modify habitat and create barriers to movement.</p>	<p>With the exception of primary koala habitat occurring on lands already zoned for urban, industrial or special purposes, or as open space, primary koala habitat has been zoned 7(A) Environmental Protection - Habitat and Catchment in Coffs Harbour LEP 2000. The equivalent zone to the former 7A Environmental Protection (Habitat and Catchment) under LEP 2000 is now the E2 Environmental Conservation zone under LEP 2013. In accordance within the requirements of the KPoM, any development proposal within areas of Primary Koala Habitat must demonstrate that there should be zero net loss of Primary Koala Habitat.</p>	<p>Not applicable to the Subject Site</p>
Secondary Koala Habitat		
<p>Areas of Secondary Koala Habitat generally have lower koala activity levels than those in primary habitat, but do support many koala populations particularly away from coastal areas. They contribute to the overall habitat available to koalas and play a vital role in linking areas of Primary Koala Habitat. They are also important to dispersing and juvenile koalas, provide seasonal and drought foraging habitat, and may act as fire refuges.</p>	<p>In accordance within the requirements of the KPoM, any development proposal within areas of Secondary Koala Habitat must demonstrate that:</p> <ul style="list-style-type: none"> ■ the proposal will not result in significant barriers to koala movement; ■ boundary fencing does not prevent the free movement of koalas; ■ lighting and koala exclusion fencing is provided where appropriate on roadways adjacent to koala habitat; ■ tree species listed above under Secondary Koala Habitat are retained, where possible; ■ new local roads are designed to reduce traffic speed to 40 kph in potential koala blackspots; ■ preferred koala trees are used in landscaping where suitable; ■ threats to koalas by dogs have been minimised ie. banning of dogs or confining of dogs to koala proof yards; 	<p>The areas of Secondary Koala Habitat (as mapped in the KPoM) have been mapped as moderate conservation value. This does not pose any direct constraints to the proposed rezoning proposal however it is important to note that any future development within these areas must address the provisions of the KPoM and SEPP 44 as discussed in Section 6.</p>

Koala Habitat Type	Key Management Actions	Application to the Subject Site
	<ul style="list-style-type: none"> ■ fire protection zones, including fuel reduced zones and radiation zones, are provided generally outside of Secondary Koala Habitat. 	
Tertiary Koala Habitat		
<p>Areas mapped as Tertiary Koala Habitat occur predominantly in rural parts of the LGA, generally west of the coastal range. While koala records occur throughout this area, and some important populations occur, koala records are generally lower in these areas than those within other mapped habitat types in the LGA.</p>	<p>In accordance within the requirements of the KPoM, any development proposal within areas of Tertiary Koala Habitat must demonstrate that appropriate measures are taken to:</p> <ul style="list-style-type: none"> ■ minimise barriers to koala movement; ■ reduce the risk of koala mortality by road kill by appropriate road design, lighting and traffic speed limits; ■ minimise the removal of koala tree species; ■ provide preferred koala trees in landscaping where suitable; ■ minimise threats to koalas by dogs ie. banning of dogs or confining of dogs to koala proof yards; and ■ minimise removal or disturbance of Tertiary Koala Habitat in fire protection zones, including fuel reduced zones and radiation zones. Key management actions with areas of Tertiary Koala Habitat. 	<p>Areas mapped as moderate to good condition Tertiary Koala Habitat (based on a combination of the KPoM mapping and field survey) have been mapped as moderate conservation value. This does not pose any direct constraints to the proposed rezoning proposal however it is important to note that any future development with these areas must address the provisions of the KPoM and SEPP44 as discussed in Section 6.</p>
Habitat Linking Area		
<p>Regionally significant links include:</p> <ul style="list-style-type: none"> ■ the vegetated corridor from the Dorrigo Plateau to the coast through Pine Creek State Forest, ■ the forest along the coastal range from Boambee State Forest through Red Hill to Bruxner Park Flora Reserve, Orara East State Forest and Korora, ■ the link from Boambee State Forest through to Roberts Hill, south through North Boambee Valley to Council’s Waste Depot, across Lindsay’s Cutting, along both sides of Boambee Creek to the University site and Airport lands and south to Boambee, ■ link from Tuckers Knob State Forest across the Pacific Highway to the northwestern corner of Bongil Bongil National Park south of Lyons Road. 	<p>In accordance within the requirements of the KPoM, any development proposal within Habitat Linking Area must demonstrate that:</p> <ul style="list-style-type: none"> ■ the proposal will not reduce the effectiveness of the area in acting as a koala habitat link between areas of secondary and/or primary koala habitats; ■ the significance of the area in contributing to the functioning of amelioration measures constructed and/or proposed by the RTA or Council for roadways has been considered; and, ■ enhancement planting of preferred koala trees has been included in the proposal. 	<p>Not applicable to the Subject Site</p>

4.4 Ecological values of the Subject Site

Based on the results discussed in the previous sections, the following preliminary ecological values have been identified (see Figure 4.6):

- Moderate Ecological Values:
 - Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05) in moderate to good condition;
 - Large intact remnant of Secondary and Tertiary Koala Habitat in moderate to good condition; and
 - Wetland habitat (albiet disturbed and not naturally occurring).
- Low Ecological Values:
 - Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05) in low to moderate condition;
 - Isolated fragments of Tertiary Koala Habitat in low to moderate condition.
- No Ecological Values:
 - Cleared land; and
 - Remnant trees of the Foothills Grey Gum – Ironbark – Mahogany Dry Forest (CH_DOF05) in very poor condition along Bark Hut Road.



Legend

- Subject Site
- Cadastre
- Current extent of Tertiary Koala Habitat
- Secondary Koala Habitat Type (GHCC)
- Disturbed Wetland (concrete culvert/not naturally occurring)
- 1st Order Streams
- 2nd Order Streams
- Bird nest
- Frog calls

Source:
 Cadastre : DTDB
 Fauna habitat: ERM observation Nov 2018
 Imagery: Nearmap Jun 2018

F4.5

Fauna Habitat Observations

Drawing No: 0483513s_RDM_BIA_G009_R03.mxd	Resource Design and Management NSW Biodiversity
Date: 08/03/2019	Biodiversity Impact Assessment
Drawn By: VN / GR	Client: Resource Design & Management
Reviewed By: JW	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 50 100m

N



Legend

- Subject Land
- 1st Order Streams
- 2nd Order Streams

Ecological Values

- Moderate Conservation Value
- Low Ecological / Conservation Value
- No Ecological / Conservation Value

Source:

DTDB, Subject site - Client data 12th Sep 2018
 Vegetation: ERM ground truth Nov 2018
 Imagery: Nearmap Jun 2018

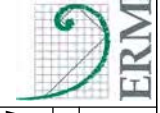
Ecological Values of the Subject Site

Drawing No: 0483513s_RDM_BIA_G010_R02.mxd
 Date: 06/03/2019
 Drawing Size: A4
 Drawn By: VN
 Reviewed By: JW

Client: Resource Design & Management
 Resource Design and Management NSW Biodiversity
 Biodiversity Impact Assessment
 Coordinate System: GDA 1994 MCA Zone 56
 0 50 100m
 N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4.6



5. IMPACT EVALUATION

No threatened species or ecological communities have been recorded within the Subject Site and the proposed rezoning will not result in any impacts to the identified biodiversity values of the site.

5.1 Koala Habitat Modification

The proposed rezoning will not result in any impacts to mapped koala habitat, however consideration of future residential development must consider potential impacts including direct habitat clearance as well as barriers to the movement of any local population, increased predation and increased vehicle strikes.

The areas mapped koala habitat have been identified as having moderate conservation value, do not form part of any identified habitat linkages and are not known to be utilised by the local population. An indicative ToS and AoS for the koala are presented in *Appendix G and F* and confirm that the proposed rezoning and conceptual subdivision would not impact on any known habitat linkages for this species.

While koalas have not been recorded on site and do not present a direct constraint to the planning proposal, future development should be designed with due consideration of the KPOM and must be able to demonstrate that appropriate measures are taken to:

- minimise barriers to koala movement;
- reduce the risk of koala mortality by road kill by appropriate road design, lighting and traffic speed limits;
- minimise the removal of koala tree species;
- provide preferred koala trees in landscaping where suitable;
- minimise threats to koalas by dogs ie. banning of dogs or confining of dogs to koala proof yards; and
- minimise removal or disturbance of koala habitat in bushfire APZ.

Where avoidance is not possible, the possibility to offset the impact on site by active management and/or enhancing retained areas of habitat offsite may be considered a viable option in consultation with OEH.

Attacks by domestic dogs and vehicle strikes are reported within the KPOM as being one of the greatest threats to the species. Consideration of fencing design, control of domestic animals, appropriate signage and reduced speed limits along perimeter roads should also be addressed within future development approvals.

5.2 Riparian Habitat Modification

The disturbed wetland habitats located on the south-eastern portion of the Subject Site have been assessed as having moderate conservation value only. This area has limited biodiversity habitat value and does not form part of any vegetated riparian corridor.

The location of the 2nd order stream can be identified in the field as a slight depression in the landform and provides a connection with the disturbed wetland habitats (area of inundation as a result of the concrete culvert) located on the south-eastern corner. This area is likely to provide a hydrologic connection downstream to Poundyard Creek and Woolgoolga Lake although in its current state, does not constitute high conservation value and it does not exhibit the features of a defined channel with bed and banks. The Office of Water may therefore determine that the mapped 2nd order stream is not waterfront land for the purposes of the WM Act (although this would need to be confirmed during future detailed design and assessment).

While not a direct constraint to the planning proposal, future development design should ensure no long term hydrological impacts are likely to occur. Opportunities may actually exist to increase the quality of the on-site aquatic and riparian habitats through detailed design and management of surface runoff and water quality parameters, including the use of appropriately designed stormwater retention and treatment options to be located within this area as indicated on the concept plan.

5.3 Direct Clearance

No significant habitat features have been recorded for any of the threatened species assessed however any clearing of native vegetation within this site would be considered to contribute to cumulative loss of potential habitat across the region.

In the event that future residential development will remove greater than 0.5ha of native vegetation (as indicated within the concept plan), it would trigger entry into the Biodiversity Offset Scheme and any loss of native vegetation would need to be offset ensuring no net loss of habitat within the region. This would be prepared based on final development design and not at this early planning stage.

5.4 Edge Effects

Edge effects are changes in habitat conditions (such as degree of humidity and exposure to light or wind) and occur at the ecotone between different types of vegetation (e.g. forest vs grassland). Edge effects are inherent or natural in nature but can have negative impacts if they alter ecological processes. Edge effects are intensified at the interface between native vegetation and cleared or build up areas as habitat modification (e.g. isolation and fragmentation) and habitat loss (e.g. vegetation clearing) events occur rapidly and prevent organisms (flora and fauna) to assimilate changes.

Removal of vegetation induces edge effects as it causes new environmental conditions to develop along the edges of cleared environments. The removal of vegetation generally promotes invasion of exotic species and/or disturbance tolerant native plants. The clearing of vegetation may in turn promote the influx of pest species such as foxes and feral cats that use edges to stalk and ambush prey. Native animals such as owls and microchiropteran bats also use edge environments for hunting.

Native vegetation at the Subject Site has already been exposed to edge effects due to historical clearing. Therefore, potential additional edge effects associated with any future residential development are expected to be minimal. The following edge effects should be considered during future development design:

- minor changes in microclimate;
- localised and downstream changes in stream hydrology;
- invasion by exotic plant and animals species; and
- increase in sedimentation.

Appropriate management and mitigation measures including weed control and erosion and sediment control are outlined in Section 6.

6. SUMMARY OF MITIGATION MEASURES AND RECOMMENDATIONS FOR THE PROPOSED REZONING AND DESIGN OF FUTURE DEVELOPMENT ON THE SUBJECT SITE

6.1 Application of Environmental Conservation Zones

Based on the results of the field investigation and identification of low to moderate conservation values only across the site, there are no significant ecological constraints to the proposed rezoning of the Subject Site. The indicative development footprint has been used to show that future residential development on this site can be appropriately designed and with additional survey and assessment in accordance with the Biodiversity Assessment Methodology, has the potential (with mitigation and offset) to ensure minimal loss of biodiversity values.

The consideration of conservation zones may be considered as part of any future development proposal, however based on a review of the Section 117 Directions, 2.1 Environment Protection Zones; and LEP Practice Note PN09-002 (Environment Protection Zones) there is no justification to apply Environmental Conservation Zones across any areas of the Subject Site as part of this planning proposal.

The Northern Councils E Zone Review Final Recommendations Report (NSW Department of Planning and Environment, 2015) does not currently apply to the Coffs Harbour LGA however it is being referred to as a guidance document by Coffs Harbour City Council. As stated on Page 6 of the Recommendations Report, E2 and E3 zones will only be applied if the primary use of the land is considered to be environmental conservation (E2) or environmental management (E3) and the land has attributes which have been verified to meet the criteria for an E2 or E3 zone. The Subject Site does not meet any of the E Zone criteria as specified in Section 3 of the Final Recommendations report (refer to Table 6.1 below) and there is no justification to apply any E Zones as part of this planning proposal.

Table 6.1 Application of Environmental Conservation Zones

Key Planning Documentation	Summary and objectives of the strategic guidelines	Application to the current planning proposal
Section 117 Directions, 2.1 Environment Protection Zones	A planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas.	The Subject Site does not contain significant diversity or areas of mapped high conservation values.
	A planning proposal that applies to land within an environment protection zone or land otherwise identified for environment protection purposes in a LEP must not reduce the environmental protection standards that apply to the land (including by modifying development standards that apply to the land).	The Subject Site is not mapped within an environment protection zone or land otherwise identified for environment protection purposes in the CHCC LEP 2013.
LEP Practice Note PN09-002 (Environment Protection Zones)	E1 - This zone is for existing national parks, nature reserves and conservation areas and new areas proposed for reservation that have been identified and agreed by the NSW Government.	E1 – not applicable E2 – E4. The land is not identified as exhibiting high ecological, scientific, cultural or aesthetic values. No threatened species or ecological communities have been

Key Planning Documentation	Summary and objectives of the strategic guidelines	Application to the current planning proposal
	<p>E2 Environmental Conservation. This zone is for areas with high ecological, scientific, cultural or aesthetic values outside national parks and nature reserves. The zone provides the highest level of protection, management and restoration for such lands whilst allowing uses compatible with those values.</p> <p>E3 Environmental Management. This zone is for land where there are special ecological, scientific, cultural or aesthetic attributes or environmental hazards/processes that require careful consideration/management and for uses compatible with these values.</p> <p>E4 Environmental Living. This zone is for land with special environmental or scenic values, and accommodates low impact residential development.</p>	<p>identified and the Subject Site does not contain significant diversity or areas of mapped high conservation values.</p> <p>The presence of koala habitat and riparian habitats will be captured within any future development application.</p>
<p>Northern Councils E Zone Review – Final Recommendations Report</p>	<p><u>E2 Zone Criteria</u> SEPP 26 Littoral Rainforests SEPP 14 Coastal Wetlands Endangered Communities (EECs) Key Threatened Species Habitat Over-cleared vegetation communities Culturally significant lands.</p>	<p>The Subject Site does not contain significant diversity or areas of mapped high conservation values. It does not include any SEPP 26 Littoral Rainforests, SEPP 14 Coastal Wetlands, Endangered Communities (EECs) or Key Threatened Species Habitat. The Subject Site is not identified as being on an over-cleared Mitchell Landscape or containing over cleared vegetation communities (Coffs Harbour City Council Online Mapping Tool).</p>
	<p><u>E3 Zone Criteria</u> Riparian and estuarine vegetation and wetlands Native vegetation on coastal foreshores. Rare, Endangered and Vulnerable Forest Ecosystems</p>	<p>The Subject Site is not located on a coastal foreshore and does not contain any Rare, Endangered and Vulnerable Forest Ecosystems.</p> <p>The riparian vegetation present is not of high conservation value and is not mapped on the Coffs Harbour City Council Online Mapping as either a major creek or river.</p>

6.2 Mitigation Measures for Riparian Habitats

The requirement for buffer zones to any retained or improved riparian habitats will be assessed in any future development application and will provide due consideration to the WM Act and the NSW Office of Water Guidelines for Riparian Corridors on Waterfront Land.

Adequate erosion and sedimentation measures must be considered in the final development footprint to prevent run off or contamination on retained aquatic habitats during construction and future residential activities. The mitigation measures should include as a minimum:

- Temporal sedimentation and erosional controls to be installed prior to commencement of the construction phase and monitored during the construction phase. Erosion and sedimentation measures to be in accordance with relevant guidelines, including:
 - Catchments and Creeks Pty Ltd (2012) *Erosion and Sediment Control – A Field Guide for Construction Site Managers* Version 4 April 2012
<https://www.austieca.com.au/documents/item/57>
 - NSW Office of Environment and Heritage (2012) *Erosion and sediment control on unsealed roads: a field guide for erosion and sediment control maintenance practices*
<http://www.environment.nsw.gov.au/resources/stormwater/120410unsealedroads.pdf>
 - NSW Government, Sydney Australia; LandCom NSW (2004) *Managing Urban Stormwater: Soils and Construction* NSW Government, Sydney Australia.
<http://www.environment.nsw.gov.au/resources/water/BlueBookVol1.pdf>
- Stockpiling of excavated materials and storage of chemicals/construction materials to occur at least 100m away from wetlands and riparian habitat.
- Adequate sedimentation and erosion design is integrated in the design of residential lots surrounding the wetland habitat to prevent sediment and erosion impacts into the wetland habitat.
- Consolidated pedestrian footpaths are included in the project design to prevent unauthorized creation of pedestrian tracks into the wetland by future residential users.
- Any future development application that will encroach or alter these riparian areas should also be supported by targeted amphibian surveys.

6.3 Mitigation Measures for Terrestrial Biodiversity and Koala Habitat

No significant habitat features have been recorded however the clearing of native vegetation within this site would be considered to contribute to cumulative loss of potential habitat across the region. The following general measures are recommended to reduce the potential for impact on the mapped biodiversity values of the Subject Site, including Secondary and Tertiary Koala Habitat, as a result of the proposed rezoning and subsequent development:

- Development should be designed with due regard to the presence of potential (secondary and tertiary) koala habitat and to ensure minimal net loss of potential habitat through on site habitat management and/or habitat offsetting measures (in consultation OEH).
- Limit clearing through delineation of designated construction areas. This will help to protect native vegetation to be retained within adjacent habitats during the construction phase;
- Manage clearance of areas of weed infestation, to allow for separate stockpiling and disposal of weed material. Vehicle hygiene protocols should also be included and will assist to control the movement of both pathogens and weeds, including management measures for WoNS and regional weeds;
- Underground services trenches and any other impact area is to be backfilled at completion of the works and revegetated using a native grass mix;

- All workers will be made aware of the presence of Tertiary Koala Habitat and the potential presence of koala or other threatened species in remnant native vegetation and the manner in which they should be treated shall they move across the work area;
- During the construction phase and within the construction site, vehicles shall be restricted to a maximum speed of 40 kph and shall operate only in daylight hours;
- Prohibition of construction personnel bringing dogs or other exotic pet species onto the site;
- Avoid the use of heavy machinery such as earth moving plant and steel tracked equipment following heavy rain near the adjacent riparian habitats, wetland habitat and remnant native vegetation to minimise the potential for soil disturbance, erosion and deposition of sediments;
- Develop pre-clearance survey protocol for fauna habitat and for clearance of noxious weeds; and
- Develop fauna clearance protocol that includes procedures to be followed should any injured fauna be encountered.

As mentioned in Table 4.1, the Subject Site is located within Kangaroo Management Unit '5: – Safety Beach – north-western Woolgoolga', where vehicle incidents and dog attacks are risks to kangaroos and future residents. Future residential development within the Subject Site will need to consider the objective of Kangaroo Management Plan and should consider:

- Consideration and retention of safe movement corridors along the Subject Site's boundaries to encourage kangaroos to move between areas of suitable habitat, and not through the centre of any future residential precinct;
- Implementation of mitigation measures to reduce potential for vehicle collisions with kangaroos, such as speed limits, presence of humps and signs indicating presence of kangaroos;
- Consideration of landscaping plans to discourage kangaroo feeding areas at residential dwellings; and
- Delineation of on-leash areas for future residents, to prevent dog attacks.

In the event that future residential development is not designed to avoid areas of remnant vegetation (as outlined within the concept plan), it would trigger entry into the Biodiversity Offset Scheme and any loss of native vegetation would be offset ensuring to net loss of habitat within the region. Based on the confirmed low to moderate conservation values across the site, this is considered a viable option to be considered during future development applications. The application of the BAM and preparation of a Biodiversity Development Impact Assessment Report will need to be supported by additional field survey and detailed floristic plots.

7. REFERENCES

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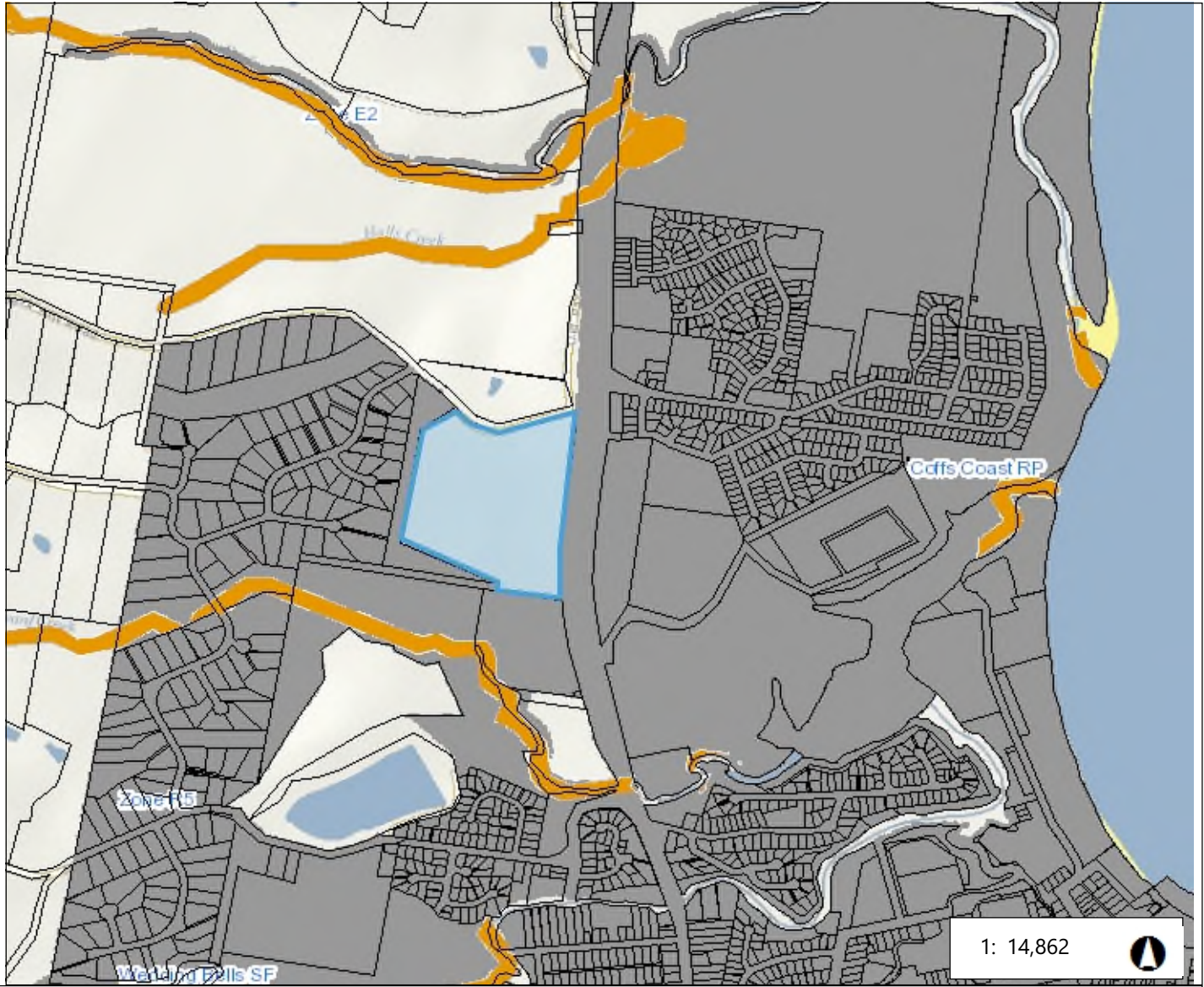
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- Phillips S. and Callaghan J. (2011) The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas *Phascolarctos cinereus*. Australian Zoologist 35(3): 774-780.

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
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APPENDIX A BOSET REPORT

Biodiversity Offset Scheme (BOS) Entry Threshold Map



0.8 0 0.38 0.8 Kilometers

GCS_GDA_1994

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

- Biodiversity Values
- Land Excluded from LLS Act

Notes

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Biodiversity Offset Scheme (BOS) Entry Threshold Report

Results Summary

Date of Calculation	05/11/2018 2:38 PM	BAM Required*
Total Digitised Area	15.87 ha	
Minimum Lot Size Method	Lot size	
Minimum Lot Size	25.81 ha	
Area Threshold	0.5 ha	
Area of native vegetation cleared	Unknown #	Unknown #
Impact on biodiversity values land map	no	no

*If BAM required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor> to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared – refer to the BOSET user guide for how to do this.

Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies with all aspects of the *Biodiversity Conservation Act 2016*.

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature _____ Date: 05/11/2018 02:38 PM

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW

APPENDIX B NSW BIONET ATLAS RESULTS

BIODIVERSITY IMPACT ASSESSMENTProposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW**Table B.1 BioNet Atlas records of Threatened Species within the Subject Site and Locality**

Family	Scientific Name	Common Name	Threatened Species Status		Number of Records	
			BC Act	EPBC Act	10km Locality	Subject Site
Amphibia						
Myobatrachidae	<i>Crinia tinnula</i>	Wallum Froglet	V		2	
Myobatrachidae	<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	47	
Reptilia						
Cheloniidae	<i>Caretta caretta</i>	Loggerhead Turtle	E	E	2	
Cheloniidae	<i>Chelonia mydas</i>	Green Turtle	V	V	7	
Cheloniidae	<i>Eretmochelys imbricata</i>	Hawksbill Turtle		V	3	
Elapidae	<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V		1	
Aves						
Anatidae	<i>Stictonetta naevosa</i>	Freckled Duck	V		1	
Phaethontidae	<i>Phaethon lepturus</i>	White-tailed Tropicbird		Mi	1	
Columbidae	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V		79	
Columbidae	<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V		20	
Columbidae	<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		6	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		Mi	2	
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		Mi	13	
Oceanitidae	<i>Oceanites oceanicus</i>	Wilson's Storm-Petrel		Mi	1	
Procellariidae	<i>Ardenna pacificus</i>	Wedge-tailed Shearwater		Mi	217	
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E		22	

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road, Woolgoolga NSW

Family	Scientific Name	Common Name	Threatened Species Status		Number of Records	
			BC Act	EPBC Act	10km Locality	Subject Site
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		Mi	11	
Ardeidae	<i>Egretta sacra</i>	Eastern Reef Egret		Mi	5	
Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	V		2	
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	Mi	17	
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		5	
Accipitridae	<i>Pandion cristatus</i>	Eastern Osprey	V		40	
Gruidae	<i>Grus rubicunda</i>	Brolga	V		1	
Burhinidae	<i>Burhinus gallinarius</i>	Bush Stone-curlew	E		1	
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		29	
Haematopodidae	<i>Haematopus longirostris</i>	Pied Oystercatcher	E		15	
Charadriidae	<i>Pluvialis fulva</i>	Pacific Golden Plover		Mi	2	
Jacaniidae	<i>Irediparra gallinacea</i>	Comb-crested Jacana	V		3	
Scolopaciidae	<i>Arenaria interpres</i>	Ruddy Turnstone		Mi	20	
Scolopaciidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, Mi	2	
Scolopaciidae	<i>Calidris tenuirostris</i>	Great Knot	V	CE, Mi	1	
Scolopaciidae	<i>Limosa lapponica</i>	Bar-tailed Godwit		Mi	4	
Scolopaciidae	<i>Limosa limosa</i>	Black-tailed Godwit	V	Mi	1	
Scolopaciidae	<i>Numenius phaeopus</i>	Whimbrel		Mi	1	
Scolopaciidae	<i>Tringa brevipes</i>	Grey-tailed Tattler		Mi	3	
Scolopaciidae	<i>Tringa incana</i>	Wandering Tattler		Mi	4	

BIODIVERSITY IMPACT ASSESSMENT

 Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
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Family	Scientific Name	Common Name	Threatened Species Status		Number of Records	
			BC Act	EPBC Act	10km Locality	Subject Site
Laridae	<i>Anous stolidus</i>	Common Noddy		Mi	1	
Laridae	<i>Gelochelidon nilotica</i>	Gull-billed Tern		Mi	1	
Laridae	<i>Hydroprogne caspia</i>	Caspian Tern		Mi	1	
Laridae	<i>Sterna hirundo</i>	Common Tern		Mi	1	
Laridae	<i>Sterna albibifrons</i>	Little Tern	E	Mi	13	
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		49	
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		5	
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	CE	3	
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		7	
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		3	
Tytonidae	<i>Tyto tenebricosa</i>	Sooty Owl	V		2	
Alcedinidae	<i>Todiramphus chloris</i>	Collared Kingfisher	V		1	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		Mi	18	
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V	V	1	
Neositidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		11	
Campephagidae	<i>Coracina lineata</i>	Barred Cuckoo-shrike	V		1	
Artamidae	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		1	
Mammalia						
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	4	
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	14	

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road, Woolgoolga NSW

Family	Scientific Name	Common Name	Threatened Species Status		Number of Records	
			BC Act	EPBC Act	10km Locality	Subject Site
Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	V		10	
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		38	
Potoroidae	<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	1	
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	82	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		1	
Molossidae	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		1	
Vespertilionidae	<i>Chalinobius nigrogriseus</i>	Hoary Wattled Bat	V		8	
Vespertilionidae	<i>Kerivoula papuensis</i>	Golden-tipped Bat	V		2	
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		18	
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		6	
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		6	
Dugongidae	<i>Dugong dugon</i>	Dugong	E		4	
Balaenopteridae	<i>Megaptera novaeangliae</i>	Humpback Whale	V	V	4	
Flora						
Apocynaceae	<i>Marsdenia longiloba</i>	Slender Marsdenia	E	V	30	
Fabaceae (Caesalpinioideae)	<i>Senna acclinis</i>	Rainforest Cassia	E		3	
Fabaceae (Faboideae)	<i>Pultenaea maritima</i>	Coast Headland Pea	V		9	
Fabaceae (Faboideae)	<i>Sophora tomentosa</i>	Silverbush	E		7	
Orchidaceae	<i>Phaius australis</i>	Southern Swamp Orchid	E	E	1	
Proteaceae	<i>Hicksbeachia pinnatifolia</i>	Red Boppel Nut	V	V	1	

BIODIVERSITY IMPACT ASSESSMENT

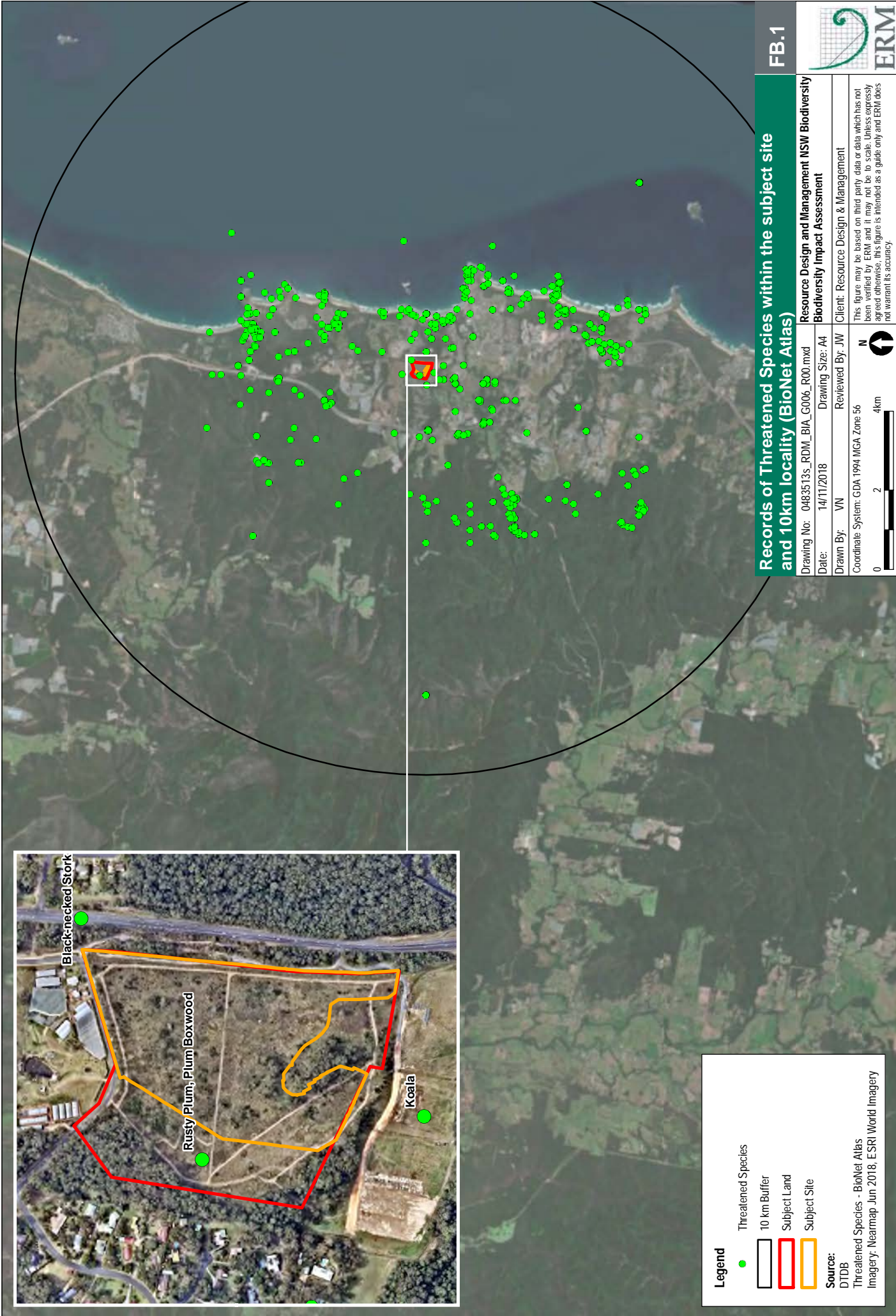
Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
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Family	Scientific Name	Common Name	Threatened Species Status		Number of Records	
			BC Act	EPBC Act	10km Locality	Subject Site
Proteaceae	<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	2	
Rutaceae	<i>Zieria prostrata</i>	Headland Zieria	E	E	3	
Santalaceae	<i>Thesium australe</i>	Austral Toadflax	V	V	8	
Sapotaceae	<i>Niemeyera whitei</i>	Rusty Plum, Plum Boxwood	V		49	1
Simaroubaceae	<i>Quassia</i> sp. Moonee Creek	Moonee Quassia	E	E	19	

CE = Critically Endangered; E = Endangered; V = Vulnerable; Mi = Migratory

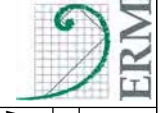
BC Act = NSW Biodiversity Conservation Act 2016

EPBC Act = Commonwealth Environment Protection and Biodiversity Conservation Act 1999



Records of Threatened Species within the subject site and 10km locality (BioNet Atlas)

FB.1



Drawing No: 0483513s_RDM_BIA_G006_R00.mxd	Resource Design and Management NSW Biodiversity
Date: 14/11/2018	Biodiversity Impact Assessment
Drawn By: VN	Client: Resource Design & Management
Reviewed By: JW	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
Coordinate System: GDA 1994 MCA Zone 56	

Legend

- Threatened Species
- 10 km Buffer
- Subject Land
- Subject Site

Source:
 DTDB
 Threatened Species - BioNet Atlas
 Imagery: Nearmap Jun 2018, ESRI World Imagery

0 2 4km

N

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
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APPENDIX C PMST REPORT



EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 26/10/18 10:56:08

[Summary](#)

[Details](#)

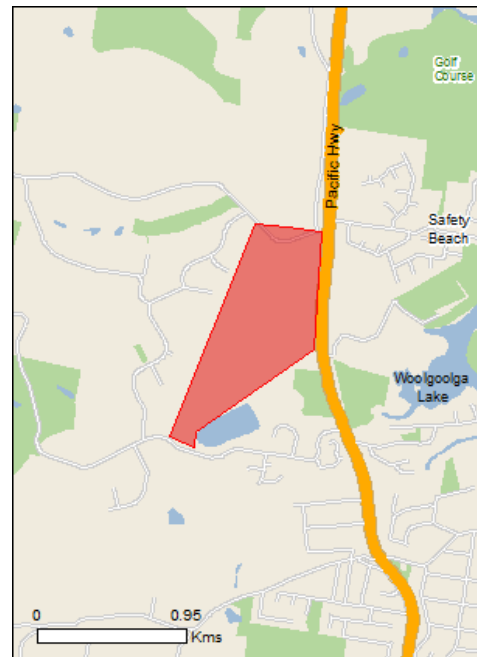
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

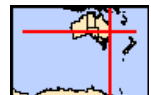
[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia
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[Coordinates](#)

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	73
Listed Migratory Species:	57

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	87
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	39
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [[Resource Information](#)]

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

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [[Resource Information](#)]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Boronia umbellata Orara Boronia [56301]	Vulnerable	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat likely to occur within area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Samadera sp. Moonee Creek (J.King s.n. Nov. 1949) [86885]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Tylophora woollsi [20503]	Endangered	Species or species habitat likely to occur within area
Zieria prostrata Headland Zieria [56782]	Endangered	Species or species habitat known to occur within area

Reptiles

Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area

Sharks

Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[[Resource Information](#)]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area

Name	Threatened	Type of Presence
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name

Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [\[Resource Information \]](#)

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

Name Birds	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
Rhipidura rufifrons Rufous Fantail [592]		to occur within area Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area

Mammals

Dugong dugon Dugong [28]		Species or species habitat may occur within area
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Reptiles

Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Coffs Coast	NSW
Forestry Management Areas in Coffs Harbour	NSW
Garby	NSW
Sherwood	NSW
UNE Special Management Zone No1	NSW

Regional Forest Agreements	[Resource Information]
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Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur

Name	Status	Type of Presence
Rattus rattus Black Rat, Ship Rat [84]		within area Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss,		Species or species

Name	Status	Type of Presence
Kariba Weed [13665]		habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar		
Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.096663 153.187452,-30.102493 153.18698,-30.106614 153.180243,-30.107393 153.180157,-30.106799 153.178741,-30.096255 153.183633,-30.096663 153.187367,-30.096663 153.187452

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

APPENDIX D

**THREATENED ECOLOGICAL COMMUNITIES AND
SPECIES LIKELIHOOD OF OCCURRENCE**

Table D.1 Threatened Ecological Community Occurrence and Risk Assessment

TEC name	EPBC Act	BC Act	Community Description	Likely of TEC Occurring in the Subject Site	Potential Impacts	Mitigation Measures	Risk Rating
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland Ecological Community	EEC	EEC	Coastal Swamp Oak Forest occurs in coastal catchments, mostly at elevations of less than 20 m above sea-level (ASL) that are typically found within 30 km of the coast. However, this distance varies by catchment and local conditions. On the mid and north coast of NSW the ecological community may also occur up to 50 m ASL on floodplains of, or coastal flats associated with, former or current coastal river systems (DoEE 2018b). Coastal Swamp Oak Forest is often found in association with other vegetation types such as coastal saltmarsh, mangroves, freshwater wetlands, littoral rainforests or swamp sclerophyll forests in a 'mosaic' of coastal floodplain communities. The structure of Coastal Swamp Oak Forest can vary from forest to woodland depending on its location in the landscape and disturbance history. The local expression of the ecological community is influenced by soils, history of inundation by tidal flows/estuarine system dynamics, groundwater salinity, site history, disturbance regimes and current land management. Many remaining patches of the ecological community contain regrowth from past clearance or other disturbances, and/or due to naturally occurring river and coastal dynamics. Some patches, for example where drainage is more impeded, may be expressed primarily as sedgeland or rushland, with a very sparse canopy (down to 10 per cent crown cover) of predominantly swamp oak. Other patches may just occur as canopy trees, over dense needle litter with sparse native groundcover (DoEE 2018b). The Subject Site is located within an area where this ecological community may occur (DoEE 2018a). Fine-scale mapping for the Coffs Harbour area (OEH 2012a and 2012b) indicates this ecological community is not present within the Subject Site.	Unlikely. The EEC has not being mapped within the Subject Site and is unlikely to occur based on the lack of key dominant species.	Negligible	NA	Low
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	CE		The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community is a complex of rainforest and coastal vine thickets on the east coast of Australia influenced by its proximity to the sea. The canopy, which protects less tolerant species and propagules in the understorey from salt laden winds, can range from patchy to closed and may include emergents as well as dead trees due to ongoing natural disturbance. The vegetation height depends on the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970) and tends to merge in a height continuum due to coastal processes. Plant diversity declines from a north to south direction with the species composition also differing with latitude subject to substrate and nutrient inflow (DoE 2015). The indicative distribution map for this ecological community suggest it is not present within Woolgoolga (DoEE 2018c). Fine-scale mapping for the Coffs Harbour area (OEH 2012a and 2012b) indicates this ecological community is not present within the Subject Site.	Unlikely. No evidence of the ecological community was noted within the Subject Site and it is unlikely to occur based on a lack of rainforest habitats.	Negligible	NA	Low
Lowland Rainforest of Subtropical Australia	CE		The ecological community occurs on basalt and alluvial soils, including sand and old/elevated alluvial soils as well as floodplain alluvia. It also occurs occasionally on historically enriched rhyolitic soils and basaltically enriched metasediments. Lowland Rainforest mostly occurs in areas <300 m above sea level. Aspect can result in the community being found at >300 m altitude on north-facing slopes, but typically 300 m defines the extent of the lowlands. In addition, Lowland Rainforest typically occurs in areas with high annual rainfall (>1300 mm). The ecological community is generally a moderately tall (≥ 20 m) to tall (≥ 30 m) closed forest (canopy cover $\geq 70\%$). Tree species with compound leaves are common and leaves are relatively large (notophyll to mesophyll). Typically there is a relatively low abundance of species from the genera <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Casuarina</i> . Buttresses are common as is an abundance and diversity of vines. The ecological community has the most diverse tree flora of any vegetation type in NSW (Floyd, 1990 in DSEWPC 2011), and the species composition of the canopy varies between local stands and between regions (Keith, 2004 in DSEWPC 2011). The canopy comprises a range of tree species but in some areas a particular species may dominate e.g. palm forest, usually dominated	Unlikely. No evidence of the ecological community was noted within the Subject Site and it is unlikely to occur based on a lack of rainforest habitats.	Negligible	NA	Low

TEC name	EPBC Act	BC Act	Community Description	Likely of TEC Occurring in the Subject Site	Potential Impacts	Mitigation Measures	Risk Rating
Subtropical and Temperate Coastal Saltmarsh	V		<p>by <i>Archontophoenix cunninghamiana</i> (bangalow palm) or <i>Livistona australis</i> (cabbage palm), and riparian areas dominated by <i>Syzygium floribundum</i> (syn. Waterhousea floribunda) (weeping satinash/weeping lilly pillily).</p> <p>The indicative map for this ecological community (DoEE 2018c) indicates Woolgoolga, including the Subject Site, is located in an area where this vegetation community 'may occur'. Fine-scale mapping for the Coffs Harbour area (OEH 2012a and 2012b) indicates this ecological community is not present within the Subject Site.</p> <p>The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence. In southern latitudes saltmarsh is often the main vegetation-type in the intertidal zone and commonly occurs in association with estuaries. It is typically restricted to the upper intertidal environment, occurring in areas within the astronomical tidal limit, often between the elevation of the mean high tide and the mean spring tide. However, exceptions may occur that retain a regular or intermittent tidal connection and these are still considered to be the ecological community (DSEWPC 2013).</p> <p>The ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally of less than 0.5 m height (with the exception of some reeds and sedges). Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats (DSEWPC 2013).</p> <p>The indicative distribution map for the ecological community (DoEE 2018e) indicates it occurs in the Coffs Harbour area. Fine-scale mapping for the Coffs Harbour area (OEH 2012a and 2012b) indicates this ecological community is not present within the Subject Site.</p>	<p>Unlikely.</p> <p>No evidence of the ecological community was noted within the Subject Site and it is unlikely to occur based on a lack of estuarine habitats.</p>	Negligible	NA	Low

Table D.2 Threatened Species Likelihood of Occurrence and Risk Assessment

Scientific Name Common Name	BC Act	EPBC Act	Species and Habitat Information	Likelihood of species occurring in the Subject Site	Potential Impacts	Mitigation Measures	Residual Risk Rating
Fauna Amphibia							
<i>Crinia tinnula</i> Wallum Froglet	V		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.	Potential. No records of the species occur for the Subject Site and the closest record is 3.6km (2007). Some suitable habitat is present in the wetland habitat located on the south-eastern portion of the Subject Site	The rezoning and future development of the site would not impact any known local population of wallum froglet. Any clearing of the mapped wetland habitat has the potential to add to the incremental decline of potential habitat available within the region.	The presence of potential habitat does not present any constraints to the proposed rezoning however, this wetland area should be avoided if possible during future project design. Any future development application that will encroach or alter these riparian areas should also be supported by targeted amphibian surveys. Adequate sediment and erosion measures will also be required.	Low
<i>Litoria aurea</i> Green and Golden Bell Frog	V		Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. The species can occur in disturbed areas.	Potential. No records of the species occur within the Subject Site or within the 10km locality. Some substandard potential habitat is present in the wetland habitat located on the south-eastern portion of the Subject Site.	Any clearing of the mapped wetland habitat has the potential to add to the incremental decline of potential habitat available within the region. The rezoning and future development of the site would not impact any known local population of green and golden bell frog.	The presence of potential habitat does not present any constraints to the proposed rezoning however, this wetland area should be avoided if possible during future project design. Any future development application that will encroach or alter these riparian areas should also be supported by targeted amphibian surveys. Adequate sediment and erosion measures will also be required.	Low
<i>Litoria longburgensis</i> Wallum Sedge Frog		V	The Wallum Sedge Frog is a small tree-frog found in ephemeral, seasonal and permanent wetlands with emergent reeds, ferns and/or sedges, in undisturbed coastal wallum swamps. There is no clear delineation between vegetation types in terms of their suitability for the species. DoEE (2018f) states that surveys indicate that the species frequently occurs in areas of sedge swamp habitat in preference to wet heath and, to a greater extent, dry heath. Suitable breeding habitat for the species occur in acidic, permanent to ephemeral, freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns, and occasionally <i>Melaleuca</i> (paperbark) woodlands.	Potential. No records of the species exists within the 10 km locality. There is a wetland habitat on the south-eastern portion of the Subject Site, which is considered to be substandard potential habitat for the species due to the lack of suitable shrub or tree habitat.	Any clearing of the mapped wetland habitat has the potential to add to the incremental decline of potential habitat available within the region. The rezoning and future development of the site would not impact any known local population of sedge frog.	The presence of potential habitat does not present any constraints to the proposed rezoning however, this wetland area should be avoided if possible during future project design. Any future development application that will encroach or alter these riparian areas should also be supported by targeted amphibian surveys. Adequate sediment and erosion measures will also be required.	Low
<i>Mixophyes balbus</i> Stuttering Frog, Southern Barred Frog (in Victoria)	V	E	The Stuttering Frog is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	Unlikely. No suitable habitat is present within the Subject Site.	Negligible	NA	Low

	E	E	E	Unlikely. No suitable habitat present within the Subject Site.	Negligible	NA	Low
<i>Mixophyes iteratus</i> Giant Barred Frog			Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.				
Reptilia							
<i>Hoplocephalus stephensii</i> Stephens' Banded Snake	V		The Stephens' Banded Snake inhabits rainforest and eucalyptus forests and rocky areas up to 950 m in altitude. The species is nocturnal and shelters between loose bark and tree trunks, amongst vines, or in hollow trunk limbs, rock crevices or under slabs during the day.	Potential. One record in 2003 of the species occurs at 5.3km south-west from the Subject Site. No other record of the species is known within the 10km locality. The areas of open forest along the western portion of the Subject Site and the adjacent council reserve provide potential habitat for this species. The small remnant habitats within the central area are isolated and less likely to be occupied by this species.	Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site	Low
Aves							
<i>Anthochaera phrygia</i> Regent Honeyeater Source: PMST	OE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests, particularly Box – Ironbark woodland and riparian forests of River Sheoak. The species inhabits woodlands that support a significantly high abundance and species richness of birds. These type of woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The species can also be found in drier coastal woodlands and forests in some years. Non-breeding flocks of the species can be seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. Although the species is a generalist forager, it feeds mainly on the nectar from a small number of eucalypts that produce high volumes of nectar (e.g. Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany).	Potential. Swamp Mahogany and ironbarks are present within the Subject Site. These trees are represent foraging resources for the species.	Negligible. Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site although this would need to be supported by additional survey and assessment.	Medium
<i>Artamus cyanopterus</i> Dusky Woodswallow	V		The Dusky Woodswallow 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. The species forages on invertebrates, mainly insects, which are captured whilst hovering or sallying above the	Possible. Suitable foraging and nesting habitat for the species is present in native vegetation within the Subject Site. One record of the species in 1983 occurs within the 10 km locality and at approximately 3km north-east from the Subject Site.	Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered.	Low

<p><i>Burhinus grallarius</i> Bush Stone-curlew</p>	<p>E</p>	<p>canopy or over water. It builds an open, cup-shape nest made of twigs, grass, fibrous rootlets and occasionally casuarina needles. Generally, nests are located on shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post.</p> <p>The Bush Stone-curlew is found throughout Australia. It inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. The species is largely nocturnal, being especially active on moonlit nights. It feed on insects and small vertebrates, such as frogs, lizards and snakes.</p> <p>It builds nest on the ground in a scrape or small bare patch.</p>	<p>Unlikely. No suitable habitat is present within the Subject Site. The native vegetation includes a moderate to dense shrub and ground layer.</p>	<p>Negligible</p>	<p>Biodiversity offsetting may also be considered as a viable option for future development of the site.</p>	<p>Low</p>
<p><i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo</p>	<p>V</p>	<p>The Glossy Black-cockatoo inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods.</p> <p>Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i>, and <i>A. gymmathera</i>. Belah is also utilised and may be a critical food source for some populations.</p> <p>In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (<i>Casuarina cristata</i>).</p> <p>Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill.</p>	<p>Potential. Forest Sheoak (<i>Allocasuarina torulosa</i>) is present in native vegetation within the Subject Site. The nearest records of the species (49 records between 1981 and 2018) are at 1.2 km from the Subject Site. No hollow bearing trees or suitable nest site recorded.</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential foraging habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site.</p>	<p>Low</p>
<p><i>Coracina lineata</i> Barred Cuckoo-shrike</p>	<p>V</p>	<p>The Barred Cuckoo-shrike inhabits rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit. They are active birds, frequently moving from tree to tree.</p>	<p>Potential. Suitable habitat for the species occurs in native vegetation within the Subject Site</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	<p>Low</p>
<p><i>Daphoenositta chrysoptera</i> Vanted Sittella</p>	<p>V</p>	<p>The Varied Sittella inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.</p> <p>The species feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and</p>	<p>Potential. Suitable foraging habitat for the species is present in rough barked trees within the native vegetation areas in the Subject Site. The closest record of the species, in 2000, is located at approximately</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be</p>	<p>Low</p>

<i>Dasyornis brachypterus</i> Eastern Bristlebird	E	E	<p>cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.</p> <p>The Eastern Bristlebird is present in three disjunct populations in NSW. The Subject Site is not located within the distribution area of the species. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a healthy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.</p>	<p>600m to the south-east from the Subject Site.</p> <p>Unlikely. No suitable habitat for the species is present within the Subject Site.</p>	<p>edge effects or degradation of any retained habitats.</p> <p>Negligible</p>	<p>considered Biodiversity offsetting may also be considered as a viable option for future development of the site</p> <p>NA</p>	Low
<i>Erythrorhynchus radiatus</i> Red Goshawk	CE	V	<p>The Red Goshawk is a raptorial bird endemic to Australia. It inhabits coastal and sub-coastal areas in wooded and forested lands; it has frequently been observed in riverine forests. It preys of medium to large fauna species, including other birds. The species prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds), and permanent water. Vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest and rainforest margins.</p>	<p>Potential. The PMST identified the species a likely to occur, however, no records of the species are known within the 10 km locality. Sclerophyll forest are present within the Subject Site with potential as foraging habitat for the species.</p>	<p>Any cleaning of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	Low
<i>Glossopsitta pusilla</i> Little Lorikeet	V	V	<p>The Little Lorikeet is a small parrot distributed widely across the coast and Great Divide regions. The species forages primarily in the canopy of open Eucalyptus forests and woodland. It also forages in Angophora, Melaleuca and other species including paddock, roadside remnants and urban trees. It feeds mainly on nectar and pollen, occasionally on native fruits.</p>	<p>Potential. Eucalypt trees are present in remnant vegetation within the Subject Site.</p>	<p>Any cleaning of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	Low
<i>Grantella picta</i> Painted Honeyeater	V	V	<p>The Painted Honeyeater is nomadic, and occurs at low densities throughout its range. Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.</p>	<p>Unlikely No suitable foraging habitat for the species is present within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	Low

<i>Lathamus discolor</i> Swift Parrot	E	CE, Ma	The Swift Parrot breeds in Tasmania and migrates to south-east Australia during its non-breeding stage (March to October). In the mainland, the species occurs in areas where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxyloyn</i>) and White Box (<i>E. albens</i>).	Potential. Suitable feeding trees for the species are present in remnant vegetation to be retained within the Subject Site.	Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site	Low
<i>Lophoclitia isura</i> Square-tailed Kite	V		The Square-tailed Kite is a raptorial bird. The species is found in a variety of timbered habitats including dry woodlands and open forests. The species shows a particular preference for timbered watercourses. It is a specialist predator on passerines, especially honeyeaters, and most particularly nestlings, and insects in tree canopies. It appears to occupy hunting ranges of more than 100km ² .	Potential. Some suitable feeding habitat for the species occurs in canopy stratum of forest within the Subject Site.	Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site	Low
<i>Merops ornatus</i> Rainbow Bee-eater		Ma, Mi	The Rainbow Bee-eater is the only bee-eater bird in Australia. It is a migratory bird found across Australia. The species breeds across its entire distribution range. The species occurs mainly in open forests and woodlands, shrublands, and in various cleared and semi-cleared habitats. It also occurs in inland and coastal sand dune systems, mangroves, heathlands, sedgelands, vine forests, vine thicket and on beaches. The species feeds mainly on insects.	Potential. Suitable foraging habitat is present within the Subject Site	Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site	Low
<i>Todiramphus chionis</i> Collared Kingfisher Source: BioNet	V		The Collared Kingfisher are birds virtually restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves. The species sometimes occur in terrestrial forests or woodlands bordering mangroves, where they will nest in holes in trees or in arboreal termittaria.	One record of the species exists (in 1991) within the 10 km locality and at approximately 1.3 km to the south-east from the Subject Site. No suitable habitat exists for the species within the Subject Site,	Negligible	NA	Low

	CE	V			Negligible	NA	Low
<i>Tumix melanogaster</i> Black-breasted Button-quail Source: PIMST				The Black-breasted Button-quail is a ground bird endemic to south-eastern Queensland and far north-eastern NSW. The species' preferred habitat includes drier low closed forests, including dry rainforests, wine forest and vine thickets, often in association with Hoop Pine, and Bottle-tree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Birds have been recorded using Lantana thickets at edges of rainforest or Lantana understorey of forest or rainforest, but it is not known if Lantana associations are suitable for sustaining breeding	The species has not been recorded within the 10 km locality. Surveys indicated that no suitable habitat for the species is present within the Subject Site.		
Forest Owls							
<i>Ninox strenua</i> Powerful Owl Source: BioNet	V			The Powerful Owl is a predatory bird found in woodlands, open sclerophyll forest, tall open wet forests and rainforests. The species required large tracts of forest or woodland habitat but can occur in fragmented landscapes. It roosts by day in dense vegetation containing species such as Turpentine (<i>Syncarpia glomulifera</i>), Black She-oak (<i>Allocasuarina littoralis</i>), Blackwood (<i>Acacia melanoxylon</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Cherry Ballart (<i>Exocarpos cupressiformis</i>) and a number of eucalypt species. It nests in large tree hollows (at least 0.5m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Potential. The nearest records of these forest owls species are located at 300m from the Subject Site. Suitable roosting habitat is present in remnant vegetation on the western portion of the Subject Site. No suitable breeding habitat is present in the Subject Site for these owls and they would not be dependant on any of the resources available.	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site	Low
<i>Tyto novaehollandiae</i> Masked Owl Source: BioNet	V			The Masked Owl is widely distributed across NSW. The species lives in dry eucalypt forests and woodlands from sea level to 1100m. Although the species is a forest owl, it often hunts along the edges of forests, including roadsides. The Masked Owl roosts and breeds in moist eucalypt forest gullies, using large tree hollows or sometimes caves for nesting.			
<i>Tyto tenebricosa</i> Sooty Owl Source: BioNet	V			The Sooty Owl occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. The Sooty Owl inhabits rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forest. It roosts by day in hollows of a tall forest tree or in heavy vegetation and nests in very large tree-hollows.			
<i>Apus pacificus</i> Fork-tailed Swift		Mi, Ma		The Fork-tailed Swift is a migratory bird that visits Australia during its non-breeding season. The species is almost exclusively aerial, flying from less than 1 metre to at least 300 metres above ground. It is an aerial eater believed to forage on insects.	Potential. These species are aerial vagrant and do not have specialised habitat requirements. The possibility of these species occasionally flying	The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be	Low

<p><i>Ardea ibis</i> Cattle Egret</p>	<p>Ma</p>	<p>The Cattle Egret is widespread across most of Australia. The species inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands. It often forages away from water on low lying grasslands, improved pastures and croplands. It is often found in cattle fields, farm areas with livestock and foraging in rubbish bins. It roosts in trees, or amongst ground vegetation in or near lakes and swamps. A breeding population is located from Newcastle (NSW) to Bundaberg (Qld). It also breeds in major inland wetlands in north NSW.</p>	<p>over the Subject Site cannot be precluded. However, the Subject Site does not provide resources critical for the survival of the species.</p>	<p>Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	<p>Low</p>
<p><i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle</p>	<p>V</p>	<p>The White-bellied Sea-eagle is large raptorial eagle that can be found in coastal and inland areas. The species habitats are characterized by the presence of large open water areas, including large rivers, swamps, lakes and the sea. Terrestrial habitats include coastal dunes, tidal flats, grasslands, heathland, woodland and forests (including rainforests). Breeding habitat is in tall open forests and tall woodlands, and swamp sclerophyll forests close to foraging habitats near water.</p>				
<p><i>Botaurus poiciloptilus</i> Australasian Bittern Source: PMST</p>	<p>E</p>	<p>The Australasian Bittern is a widespread bird but uncommon over south-eastern Australasia. The species favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). It is mainly nocturnal and forages on frogs, fish, yabbies, spiders, insects and snails. The species builds nests in densely-vegetated wetlands.</p>	<p>Unlikely. No preferred habitat is present within the Subject Site for these wetland and water dependent birds. There is a low likelihood that they may occur as infrequent visitors or fly over the site however would not be dependent on the resources present.</p>	<p>Negligible</p>	<p>NA</p>	
<p><i>Callidris ferruginea</i> Curlew Sandpiper Source: BioNet, PMST</p>	<p>E</p>	<p>The Curlew Sandpiper is a migratory bird inhabiting coastal habitats and sometimes freshwater wetlands. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.</p>				
<p><i>Ephippiorhynchus asiaticus</i> Black-necked Stork Source: BioNet</p>	<p>E</p>	<p>The key habitat for the Black-necked Stork are floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers. Secondary habitat for the species includes minor floodplains, coastal sandplain wetlands and estuaries. The species forages in waters 5-30cm deep for invertebrates and vertebrates.</p>				
<p><i>Grus rubicunda</i> Brolga Source: BioNet</p>	<p>V</p>	<p>The Brolga is dependent on wetlands, especially shallow swamps, for foraging. The species often feed in dry grassland, coastal mudflats or ploughed paddocks. The species breeds in wetland habitats where it builds a nest comprising a platform of grasses and sticks, augmented with mud on an island or in the water.</p>				
<p><i>Irediparra gallinacea</i> Comb-crested Jacana Source: BioNet</p>	<p>V</p>	<p>The Comb-crested Jacana is waterbird that occurs on permanent freshwater wetlands, mainly in coastal and subcoastal regions, including the central and north coast of NSW. The species forages on floating vegetation, especially water lilies, or fringing and aquatic vegetation.</p>				

<i>Ixobrychus flavicollis</i> Black Bittern Source: BioNet	V		The Black Bittern is a heron with a wide distribution. The species inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Diurnal roosting sites include trees or ground vegetation (e.g. reeds). Nests are built in overhanging branches.			
<i>Pandion cristatus</i> Eastern Osprey Source: BioNet	V	Ma, Mi	The Eastern Osprey is a large water-dependent bird of prey with global distribution. The species favour coastal areas, especially the mouths of large rivers, lagoons and lakes. It feeds on fish over clear open water.			
<i>Sictonetta naevosa</i> Freckled Duck Source: BioNet	V		The Freckled Duck prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times the species move to ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.			
Forest Doves						
<i>Ptilinopus magnificus</i> Wompoo Fruit-Dove Source: BioNet	V		The Wompoo Fruit-Dove is a large rainforest pigeon. The species occurs along the coast from the Hunter River in NSW to Cape York Peninsula. It is rare in Coffs Harbour.	Unlikely. A total of 105 records of these rainforest doves exist within the 10 km locality, the closest record is located at 1.5km to the south (recorded between 1989 and 2002). No suitable habitat is present for these species in the Subject Site.	NA	Low
<i>Ptilinopus regina</i> Rose-crowned Fruit-Dove Source: BioNet	V		The Rose-crowned Fruit-Dove is a rainforest dove distributed on the coast and ranged of eastern NSW and Queensland, from Newcastle to Cape York.			
<i>Ptilinopus superbus</i> Superb Fruit-Dove Source: BioNet	V		The Superb Fruit-Dove is a small pigeon that occurs in rainforests and similar closed forests along the coast of Queensland and NSW. It forages on fruits of figs and palms on the upper canopy. The species might also forage in eucalypt or acacia woodland where there are fruit-bearing trees.			
<i>Dasyurus maculatus</i> Spotted-tailed Quoll Source: BioNet, PMST	V	E	The Spotted-tailed Quoll is 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. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines	Unlikely The nearest record is approximately 600m to the south from the Subject Site and was latest recorded in 2006. The small size and history of previous disturbance would deter this species.	NA	Low

<p><i>Petaurides volans</i> Greater Glider Source: PMST</p>	<p>V</p>	<p>The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees. The greater glider is considered to be particularly sensitive to forest clearance.</p>	<p>Unlikely Limited substandard foraging habitat for the species occurs in remnant vegetation within the Subject Site. No roosting habitat is present and the species has not been recorded within the 10km locality.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>
<p><i>Petaurus australis</i> Yellow-bellied Glider Source: BioNet</p>	<p>V</p>	<p>The Yellow-bellied Glider is a nocturnal arboreal mammal found along the eastern coast of the western slopes of the Great Dividing Range, from southern Queensland to Victoria. The species occurs in tall mature eucalypt forests generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. It feeds primarily on insect exudates, nectar, sap, honeydew and manna with pollen and insects. It is a very mobile species and occupy large home ranges between 20 and 85 ha. It lives in dens in hollows of large trees.</p>	<p>Unlikely Limited foraging resources for the species occur in vegetated areas within the Subject Site although it is isolated from other areas of potential habitat and no suitable roosting or breeding habitat for the species is present. A total of ten records of the species exist within the 10km locality. The nearest record is at approximately 3km to the north-west from the Subject Site and was recorded in March 2018.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>
<p><i>Petaurus norfolcensis</i> Squirrel Glider Source: BioNet</p>	<p>V</p>	<p>The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and 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. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.</p>	<p>Potential. Limited foraging resources for the species occur in vegetated areas within the Subject Site. No suitable roosting or breeding habitat for the species is present therein. A total of 38 records of the species exist within the 10km locality. The nearest record is at approximately 2km to the south-west from the Subject Site and was recorded in 2010.</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	<p>Low</p>
<p><i>Petrogale penicillata</i> Brush-tailed Rock-wallaby Source: PMST</p>	<p>V</p>	<p>In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night.</p>	<p>Unlikely. No suitable habitat for the species occurs within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>

<p><i>Phascolarctos cinereus</i> Koala Source: BioNet, PMST</p>	V	V	<p>The Koala is an arboreal marsupial that inhabits eucalypt woodlands and forests. The species feed on the foliage of more than 70 species of eucalypt and 30 non-eucalypt species.</p>	<p>Potential. No Koalas were observed within the Subject Site although Koala feed trees are present in remnant vegetation and the site contains tertiary habitat as defined within the KPoM.</p>	<p>The areas of mapped koala habitat have been identified as having moderate conservation value and are not known to be utilised by the local population. Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential koala habitat available within the region.</p>	<p>Future development should be designed with due consideration of the KPoM and must be able to demonstrate that appropriate measures are taken to:</p> <ul style="list-style-type: none"> minimise barriers to koala movement; reduce the risk of koala mortality by road kill by appropriate road design, lighting and traffic speed limits; minimise the removal of koala tree species; provide preferred koala trees in landscaping where suitable; minimise threats to koalas by dogs ie. banning of dogs or confining of dogs to koala proof yards; and minimise removal or disturbance of koala habitat in bushfire APZ. <p>Where avoidance is not possible, the possibility to offset the impact on site by active management and/or enhancing retained areas of habitat off site may be considered a viable option in consultation with OEH.</p>	Low
<p><i>Potorous tridactylus</i> Long-nosed Potoroo Source: BioNet, PMST</p>	V	V	<p>The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. 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.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site. A record of the species in 2017 occurs at approximately 2.5km to the north-east from the Subject Site.</p>	Negligible	NA	Low
<p><i>Pseudomys novaehollandiae</i> New Holland Mouse, Pookila Source: PMST</p>		V	<p>The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes It is a social animal, living predominantly in burrows shared with other individuals Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site.</p>	Negligible	NA	Low

<p><i>Pteropus poliocephalus</i> Grey-headed Flying-fox Source: BioNet, PMST</p>	<p>V</p>	<p>V</p>	<p>Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.</p>	<p>Potential. Seasonal foraging resources occur across the subject site. A total of 82 records of the species occurs within the 10km locality. The closest record is at approximately 1km to the east within the Woolgoolga Lake Flying-Fox Camp.</p>	<p>No known permanent or temporary Flying-fox camps are present within the Subject Site. Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of seasonal foraging habitat only within the region.</p>	<p>The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site.</p>	<p>Low</p>
<p><i>Chalinolobus dwyeri</i> Large-eared Pied Bat, Large Pied Bat Source: PMST</p>	<p>V</p>	<p>V</p>	<p>The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. The species is found in well-timbered areas containing gullies. The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.</p>	<p>Unlikely. No suitable habitat is available within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>
<p><i>Chalinolobus nigrogriseus</i> Hoary Wattled Bat Source: BioNet</p>	<p>V</p>	<p>V</p>	<p>The Hoary Wattled Bat is widely distributed across northern Australia although absent from the arid centre. In north east NSW it extends from Port Macquarie in the south, north to the Queensland border. The species has been recorded as far west as Armidale and Ashford. In NSW, the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and healthy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat. Roosts in hollows and rock crevices. The species will occupy urban areas with suitable habitat.</p>	<p>Potential. The site represents a potential foraging/hunting resource for these microchiropteran bats.</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region.</p>	<p>The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	<p>Low</p>
<p><i>Kenivoula papuensis</i> Golden-tipped Bat Source: BioNet</p>	<p>V</p>	<p>V</p>	<p>The Golden-tipped Bat is found in rainforests and adjacent wet and dry sclerophyll forests up to 1000m. It is also found in tall open forests, <i>Cassuarina</i> dominated riparian forests and coastal Melaleuca forests. The bats will fly up to two kilometres from roosts to forage in rainforests and sclerophyll forests on mid and upper-slopes. The species roosts mainly in rainforests gullies on small first- and second-order streams, abandoned</p>	<p></p>	<p></p>	<p></p>	<p></p>

<p><i>Miniopterus australis</i> Little Bentwing-bat Source: BioNet</p>	<p>V</p>	<p>nesis, under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes. These bats can use multiple roosts and change roost regularly.</p> <p>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.</p> <p>Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.</p>			
<p><i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat Source: BioNet</p>	<p>V</p>	<p>Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves</p>			
<p><i>Mormopterus norfolkensis</i> Eastern Freetail-bat Source: BioNet</p>	<p>V</p>	<p>The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.</p>			
<p><i>Saccolaimus flaviventris</i> Yellow-bellied Sheathtail-bat Source: BioNet</p>	<p>V</p>	<p>The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.</p> <p>When foraging for insects, it flies high and fast over the forest canopy, but lower in more open country.</p> <p>This bat forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.</p>			
<p><i>Scoteanax rueppellii</i> Greater Broad-nosed Bat Source: PMST</p>	<p>V</p>	<p>The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is</p>			

<p><i>Argynnis hyperbius inconstans</i> Australian Fritillary Source: PMST</p>	<p>E</p>	<p>CE</p>	<p>most commonly found in tall wet forest. 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. Although this species usually roosts in tree hollows, it has also been found in buildings.</p>	<p>Unlikely. No suitable habitat is available within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>
<p><i>Phylodes imperialis smithersi</i> Pink Underwing Moth Source: PMST</p>	<p>E</p>	<p>E</p>	<p>The Australian Fritillary is a Nymphalid butterfly restricted to south-east Queensland and north-east NSW in open swampy coastal areas where the larval food plant Arrowhead Violet (<i>Viola betonicifolia</i>) occurs. Most recently known from a few widespread localities between Port Macquarie and Gympie, populations have declined dramatically to the extent that the butterfly has not been verified at any site for over a decade. The species is found in open swampy coastal habitat.</p> <p>The Southern Pink Underwing Moth is distributed from Nambour in south-eastern Queensland to Bellingen in northern NSW. In NSW it is known to occur in a small number of localities from the QLD border to Wardell, and there is a disjunct population in the Bellingen area. This moth is found in subtropical rainforest below about 600 m elevation. Potential breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, <i>Carronia multisepealea</i>, occurs in subtropical rainforest.</p>	<p>Unlikely. No suitable habitat is available within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>

Flora	V	V			Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low
Cryptostylis hunteriana Leafless Tongue-orchid Source:PMST	V	V		The species does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heap and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low
<i>Cynanchum elegans</i> White-flowered Wax Plant Source: PMST	E	E		The white-flowered Wax Plant is a climber or twiner with a highly variable form. It is restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honeymyrtle <i>Melaleuca armillaris</i> scrub to open scrub.	Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low
<i>Hicksbeachia pinnatifolia</i> Red Boppel Nut, Monkey Nut, Bopple Nut, Beef Nut, Rose Nut Source: BioNet, PMST	V	V		Red Boppel Nut is a small tree to 10 m tall. It is found in coastal areas of north-east NSW from the Nambucca Valley north to south-east Queensland. It occurs in subtropical rainforest, moist eucalypt forest and Brush Box forest.	Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low
<i>Macadamia integrifolia</i> Macadamia Nut, Queensland Nut Tree Source: PMST	V			The Macadamia Nut grows in remnant rainforest. White specimens have been collected from the North Coast of NSW (e.g. Lismore, Gross 1995), this species is not known to occur naturally in NSW.	Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low
<i>Macadamia tetraphylla</i> Rough-shelled Bush Nut Source: BioNet, PMST	V	V		The Rough-shelled Bush Nut is a small to medium-sized, usually densely bushy, tree growing up to 18m tall. It is found in subtropical rainforest, usually near the coast. The species is confined chiefly to the north of the Richmond River in north-east NSW, extending just across the border into Queensland. Many records, particularly those further south, are thought to be propagated.	Unlikely. No suitable habitat for the species is present within the Subject Site.	Negligible	NA	Low

<p><i>Marsdenia longiloba</i> Slender Marsdenia, Clear Milkvine Source: BioNet, PMST</p>	<p>E</p>	<p>V</p>	<p>Slender Marsdenia is a slender climber of the milk vine group. It occurs in subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops. It is associated species include <i>Eucalyptus crebra</i>, <i>E. microcorys</i>, <i>E. acmenoides</i>, <i>E. saligna</i>, <i>E. propinqua</i>, <i>Corymbia intermedia</i> and <i>Lophostemon confertus</i>.</p>	<p>Potential. Although no suitable habitat is present for the species within the Subject Site, some of the trees the species is associated with, occur therein. Twelve records of the species occur at 1.5 km to the west from the Subject Site, with the latest recorded in 2016.</p>	<p>Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential habitat available within the region. Future development is unlikely to exacerbate the existing degree of edge effects or degradation of any retained habitats.</p>	<p>The presence potential habitat does not present any constraints to the proposed rezoning. The areas of remnant vegetation along the western boundary of the site should be avoided if possible during future project design and opportunities for habitat creation and/or enhancement should be considered. Biodiversity offsetting may also be considered as a viable option for future development of the site</p>	<p>Low</p>
<p><i>Niemeyera whitei</i> Rusty Plum, Plum Boxwood Source:</p>	<p>V</p>	<p>The Rusty Plum is a small to medium-sized tree. The species is found in gully, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. It occurs on poorer soils in areas below 600 metres above sea level.</p>	<p>Unlikely. One record from 1991 of the Rusty Plum (<i>Niemeyera whitei</i>) exists within previously cleared areas in north-western portion of the Subject Site. The habitats available within the Subject Site are not consistent with the habitats preferred by this species and it is considered unlikely that this species would occur. The species was not recorded during surveys by ERM in November 2018.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>	
<p><i>Parsonia dorrigoensis</i> Milky Silkpod Source: PMST</p>	<p>E</p>	<p>The Milky Silkpod is a slender, trailing climber that grows to 5 m long. It is found only within NSW, with scattered populations in the north coast region between Kendall and Woolgoolga. The species is found in subtropical and warm-temperate rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>	
<p><i>Phaius australis</i> Southern Swamp Orchid, Lesser Swamp-orchid Source: BioNet, PMST</p>	<p>E</p>	<p>The Southern Swamp Orchid occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie. It occurs in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site. One record of the species occur within the 10km locality. The record is from 1991 and is located at approximately 1.2 km to the east from the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>	
<p><i>Pultenaea maritima</i> Coast Headland Pea Source: BioNet</p>	<p>V</p>	<p>The Coast Headland Pea is a prostrate, mat forming shrub with hairy stems. It occurs in New South Wales and Queensland. Within NSW, the species has been recorded from Newcastle north to Byron Bay on 16 headlands. Populations vary from a few plants to larger populations of many hundreds of individuals where the species is a major component of the Kangaroo Grass Headland community. Five sites occur within conservation reserves. The species occurs in grasslands, shrublands and heath on exposed coastal headlands and</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site. Nine records of the species occur within the 10km locality, the closest record is from 2010 and at approximately 2.7 km to the south-east from the Subject Site.</p>	<p>Negligible</p>	<p>NA</p>	<p>Low</p>	

<p><i>Samadera</i> sp. Moonee Creek (J.King s.n. Nov. 1949) Source: PMST</p>	<p>E</p>	<p>E</p>	<p>adjoining low coastal heath. It is found on clay or sandy loam or clay loam over sandstone at altitude 5–30 m. It is associated with <i>Banksia integrifolia</i> and <i>Themeda australis</i>.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site.</p>	<p>NA</p>	<p>Low</p>
<p><i>Senna acclivis</i> Rainforest Cassia Source: BioNet</p>	<p>E</p>	<p>The Rainforest Cassia is a shrub to 3 m tall with compound leaves. It occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. The species grows on the margins of subtropical, littoral and dry rainforests. It is often found as a gap phase shrub.</p>	<p>Unlikely. No suitable habitat for the species is present within the Subject Site. Three records of the species occur within the 10km locality, the closest record is from 2008 and at approximately 4 km to the south-west from the Subject Site.</p>	<p>NA</p>	<p>Low</p>	
<p><i>Sophora tomentosa</i> Silverbush Source: BioNet</p>	<p>E</p>	<p>Silverbush is a coastal shrub or small tree to 5 m high. It occurs in coastal areas in Queensland and northern NSW. It was previously common north from Port Stephens but is now uncommon and found only north of Old Bar, near Taree. The largest known population, at Port Macquarie, is estimated at up to 500 plants, other populations are of less than 20 plants. It is found in a number of other countries. The species occurs on coastal dunes.</p>	<p>Unlikely. Native grasslands are not present within the Subject Site. Seven records of the species occur within the 10km locality, the closest record is from 2017 and at approximately 1.2 km to the south-east from the Subject Site.</p>	<p>NA</p>	<p>Low</p>	
<p><i>Thesium australe</i> Austral Toadflax, Toadflax Source: BioNet, PMST</p>	<p>V</p>	<p>The Austral Toadflax is a small, straggling herb to 40 cm tall. It is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. It occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. It is often found in association with Kangaroo Grass (<i>Themeda australis</i>). The species is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.</p>	<p>Unlikely. Native grasslands are not present within the Subject Site. Eight records of the species occur from 2007 and at approximately 3.5km to the south-east from the Subject Site.</p>	<p>NA</p>	<p>Low</p>	
<p><i>Tylophora woolfsii</i> Cryptic Forest Twiner Source: PMST</p>	<p>E</p>	<p>The Cryptic Forest Twiner is a slender woody climber that grows to 3 m long. It is found from the NSW north coast and New England Tablelands to southern Queensland, but is very rare within that range. Known on the Tablelands from the Bald Rock and Boonoo Boonoo areas north of Tenterfield. This species</p>	<p>Unlikely. No suitable habitat is available within the Subject Site.</p>	<p>NA</p>	<p>Low</p>	

	E	E			grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.		Unlikely. No suitable habitat is available within the Subject Site.		Negligible		NA		Low
<p><i>Zieria prostrata</i> Headland Zieria Source: BioNet, PMST</p>					<p>The Headland Zieria is a prostrate shrub forming mats about 0.5 m in diameter. It is restricted to four coastal headlands in the Coffs Harbour area of north-east NSW. The species is found in low grassy heath on exposed sites and wind-pruned open to sparse shrubland on more sheltered aspects.</p>								

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW

APPENDIX E FLORA LIST

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road, Woolgoolga NSW

Table E.1 Flora List

Family	Scientific Name	Common Name	N, E, HTE	Growth Form	Wetland Area	IPF	Plot 1	Plot 2
Asparagaceae	<i>Asparagus aethiopicus</i>	Ground Asparagus	HTE, WoNS			1		1
Asparagaceae	<i>Asparagus asparagoides</i>	Bridal Creeper	HTE, WoNS			1		
Asteraceae	<i>Ageratum houstonianum</i>	Blue Billygoat Weed	E			1		
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel Bush	HTE			1		
Asteraceae	<i>Bidens pilosa</i>	Cobblers Pegs	HTE			1	1	
Asteraceae	<i>Centella asiatica</i>	Indian Pennywort, Gotu Cola	N	Forb (FG)		1		
Asteraceae	<i>Chrysanthemoides monilifera</i>	Bitou Bush, Boneseed	HTE, WoNS			1	1	1
Asteraceae	<i>Chrysocephalum apiculatum</i>	Common Everlasting, Yellow Buttons	N	Forb (FG)		1		
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	E			1	1	
Asteraceae	<i>Crepis capillaris</i>	Smooth Hawksbeard	E			1		
Asteraceae	<i>Euchiton involucratus</i>	Star Cudweed	N	Forb (FG)		1		
Asteraceae	<i>Ozothamnus diosmifolius</i>	Rice Flower, White Dogwood, Pill Flower, Sago Bush	N	Shrub (SG)		1	1	
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	WoNS			1	x	
Campanulaceae	<i>Lobelia gibbosa</i>	Tall Lobelia	N	Forb (FG)		1		
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot	N			1		1
Campanulaceae	<i>Lobelia stenophylla</i>	-	N	Forb (FG)	1	1		1
Casuarinaceae	<i>Allocasuarina torulosa</i>	Forest Oak	N	Tree (TG)				1
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	N	Forb (FG)		1	1	
Convolvulaceae	<i>Polymeria calycina</i>	-	N	Other (OG)			1	

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Family	Scientific Name	Common Name	N, E, HTE	Growth Form	Wetland Area	IPF	Plot 1	Plot 2
Cyperaceae	<i>Tetragia capillaris</i>	-	N	Grass & grasslike (GG)				1
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Common Bracken	N	Fern (EG)		1	1	
Dilleniaceae	<i>Hibbertia cistoides</i>	-	N	Shrub (SG)				1
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing Guinea Flower	N	Other (OG)		1	1	
Ericaceae (Epacridioideae)	<i>Leucopogon juniperinus</i>	Native Currant, Coastal Beard-heath	N	Shrub (SG)		1	1	1
Ericaceae (Epacridioideae)	<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	-	N	Shrub (SG)				1
Euphorbiaceae	<i>Euphorbia prostrata</i>	Red Caustic Weed	E			1		
Fabaceae (Caesalpinioideae)	<i>Senna pendula</i>	Senna	HTE			1		x
Fabaceae (Faboideae)	<i>Bossiaea stephensonii</i>	-	N	Shrub (SG)				1
Fabaceae (Faboideae)	<i>Chorizema parviflorum</i>	Eastern Flame Pea	N	Shrub (SG)				1
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	-	N	Other (OG)			1	1
Fabaceae (Faboideae)	<i>Goodia</i> sp.	-	N	Shrub (SG)			1	1
Fabaceae (Faboideae)	<i>Hardenbergia</i> sp.	-	N	Other (OG)				1
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	Purple Coral Pea, False Sarsaparilla, Waraburra	N	Other (OG)			1	1
Fabaceae (Faboideae)	<i>Jacksonia scoparia</i>	Winged Broom-pea, Dogwood	N	Shrub (SG)		1		
Fabaceae (Faboideae)	<i>Trifolium</i> sp.	a clover	E				1	1
Fabaceae (Mimosoideae)	<i>Acacia binervata</i>	Two-veined Hickory	N	Tree (TG)		1	1	1
Fabaceae (Mimosoideae)	<i>Acacia floribunda</i>	White Sally Wattle, Gossamer Wattle	N	Shrub (SG)		1	1	
Goodeniaceae	<i>Goodenia rotundifolia</i>	-	N	Forb (FG)				1

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Family	Scientific Name	Common Name	N, E, HTE	Growth Form	Wetland Area	IPF	Plot 1	Plot 2
Lamiaceae	<i>Plectranthus sp.</i>	-	E				1	
Lauraceae	<i>Cassytha glabella</i>	-	N	Other (OG)				1
Lauraceae	<i>unidentified plant</i>	-	N	Forb (FG)			1	
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush, Honey Reed	N	Grass & grasslike (GG)			1	1
Lomandraceae	<i>Lomandra multiflora</i>	Many-flowered Mat-rush	N	Grass & grasslike (GG)				1
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry	N	Other (OG)			1	1
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily	N	Other (OG)			1	1
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	E				1	1
Myrtaceae	<i>Eucalyptus carnea</i>	Broad-leaved White Mahogany	N	Tree (TG)				1
Myrtaceae	<i>Eucalyptus grandis</i>	Flooded Gum, Rose Gum	N	Tree (TG)		1		
Myrtaceae	<i>Eucalyptus microcorys</i>	Tallowwood	N	Tree (TG)			1	
Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt	N	Tree (TG)			1	1
Myrtaceae	<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum	N	Tree (TG)				1
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany	N	Tree (TG)		1		
Myrtaceae	<i>Eucalyptus siderophloia</i>	an Ironbark	N	Tree (TG)				1
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	N	Tree (TG)				
Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet	HTE					x
Orchidaceae	<i>Microtis parviflora</i>	Slender Onion Orchid	N	Forb (FG)		1		
Oxalidaceae	<i>Oxalis perennans</i>	-	N	Forb (FG)		1	1	1
Passifloraceae	<i>Passiflora suberosa</i>	Cork Passionflower	HTE			1	1	
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily	N	Forb (FG)			1	1

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Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road, Woolgoolga NSW

Family	Scientific Name	Common Name	N, E, HTE	Growth Form	Wetland Area	IPF	Plot 1	Plot 2
Phyllanthaceae	<i>Phyllanthus virgatus</i>	-	N	Forb (FG)		1		
Pinaceae	<i>Pinus elliotii</i>	Slash Pine	E			1		
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Apple Berry	N	Other (OG)				1
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues, Plantain	*		1	1	1	
Poaceae	<i>Briza minor</i>	Shivery Grass	E			1		
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass	N	Grass & grasslike (GG)			1	1
Poaceae	<i>Echinopogon nutans</i>	-	N	Grass & grasslike (GG)		1		1
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	HTE				1	
Poaceae	<i>Entolasia sp. 1</i>	-	N					1
Poaceae	<i>Entolasia stricta</i>	Wiry Panic	N	Grass & grasslike (GG)			1	1
Poaceae	<i>Holcus sp. 1</i>	-	E				1	
Poaceae	<i>Imperata cylindrica</i>	Blady Grass	N	Grass & grasslike (GG)			1	1
Poaceae	<i>Opismenus aemulus</i>	Australian Basket Grass, Wavy Beard Grass	N	Grass & grasslike (GG)			x	
Poaceae	<i>Paspalidium sp.</i>	-	N	Grass & grasslike (GG)				1
Poaceae	<i>Paspalum notatum</i>	Bahia Grass	E			1		
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	E				1	
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass	N	Grass & grasslike (GG)			1	1
Polygonaceae	<i>Acetosella vulgaris</i>	Sheep Sorrel	HTE				1	1

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW

Family	Scientific Name	Common Name	N, E, HTE	Growth Form	Wetland Area	IPF	Plot 1	Plot 2
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel, Blue Pimpernel	E			1		
Pteridaceae	<i>Cheilanthes distans</i>	Bristly Cloak Fern	N	Fern (EG)				x
Ranunculaceae	<i>Ranunculus inundatus</i>	River Buttercup	N	Forb (FG)	1			
Ranunculaceae	<i>Ranunculus plebeius</i>	Forest Buttercup	N	Forb (FG)		1		
Rubiaceae	<i>Opercularia diphylla</i>	-	N	Forb (FG)				x
Sapindaceae	<i>Dodonaea sp.</i>	-	N				1	1
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco Bush	E			1		
Stackhousiaceae	<i>Stackhousia viminea</i>	Slender Stackhousia	N	Forb (FG)			1	
Verbenaceae	<i>Lantana camara</i>	Lantana	HTE, WoNS			1	1	1
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	E			1		
Verbenaceae	<i>Verbena rigida</i>	Veined Verbena	E			1		
Violaceae	<i>Hybanthus stellarioides</i>	-	N	Forb (FG)			x	

E = Exotic; HTE = High Threat Exotic; N = Native; WoNS = Weed of National Significance;

IPF = Indicative Project Footprint

1 = Present

X = Present in area adjacent to the plot

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW

APPENDIX F TEST OF SIGNIFICANCE (BC ACT)

Test of Significance

The following Test of Significance (ToS) have been prepared in accordance with Section 7.3 of the BC Act and OEH (2018) *Threatened Species Test of Significance Guidelines*.

Koala (*Phascolarctos cinereus*) – Vulnerable

Koala – Species Overview

The Koala is an arboreal marsupial listed as vulnerable under the BC Act.

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. The species has been recorded within the Coffs Harbour Local Government Area. No known records of Koala are readily available within the Subject Site and the closest record is approximately 80 m to the south (dated from 2006 in the Council managed land) however this area has since been cleared and developed as a recreational sports ground.

The koala inhabit eucalypt woodlands and forests. The species feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Koalas are inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees, but will descend and traverse open ground to move between trees. Their home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Koalas are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

A review of the mapping included within the CHCC KPoM has identified 1.37 ha of Tertiary Koala Habitat and 0.1ha of Secondary Koala Habitat within the Subject Site. Based on the results of the field survey, koala habitat mapping has been refined based on the confirmed extent of koala feed trees: Tallowwood (*Eucalyptus microcorys*), Blackbutt (*Eucalyptus pilularis*), Small-fruited Grey Gum (*Eucalyptus propinquat*), Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*). The updated extent of Tertiary koala habitat has been mapped as:

- A 1.20 ha area located in the north-western and south-western portion of the Subject Site. This vegetation is in moderate to good condition with intact structural layers, including canopy, shrub and ground layer.
- 1.25 ha of low to moderate condition, isolated remnants are mapped within the centre of the Subject Site and include two separate fragmented patches (0.12ha and 1.13ha).

Test of Significance

(a)	<p><i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i></p>
	<p>The areas of mapped koala habitat within the subject site have been identified as having moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population. While koalas have not been recorded on site and do not present a direct constraint to the planning proposal, future development should be designed with due consideration of the KPoM and must be able to demonstrate that appropriate measures are taken to:</p> <ul style="list-style-type: none"> ■ minimise barriers to koala movement; ■ reduce the risk of koala mortality by road kill by appropriate road design, lighting and traffic speed limits;

	<ul style="list-style-type: none"> ■ minimise the removal of koala tree species; ■ provide preferred koala trees in landscaping where suitable; ■ minimise threats to koalas by dogs ie. banning of dogs or confining of dogs to koala proof yards; and ■ minimise removal or disturbance of koala habitat in bushfire APZ. <p>Where avoidance is not possible, the possibility to offset the impact on site by active management and/or enhancing retained areas of habitat offsite may be considered a viable option in consultation with OEH.</p> <p>Based on the application of the mitigation measures outlined above, any future development or activity is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>
(b)	<i>in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i>
	<i>‘(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i>
	Not applicable
	<i>‘(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.</i>
	Not applicable
(c)	<i>in relation to the habitat of a threatened species or ecological community:</i>
	<i>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>
	Up to 0.1 ha Secondary Koala Habitat and 2.45 ha of Tertiary Koala Habitat may be cleared as part of any future proposed development.
	<i>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</i>
	The development of this site will not further isolate or fragment any known habitat linkages for the local population of koala.
	<i>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality</i>
	The areas of mapped koala habitat within the subject site have been identified as having moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population.

(d)	<i>whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>
	The proposed development is not located within areas listed as Critical Habitat Declarations in the Register of Declared Areas of Outstanding Biodiversity Value in NSW.
(e)	<i>whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key of a key threatening process.</i>
	<p>Future development of this site is likely to include the following KTP:</p> <ul style="list-style-type: none"> • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands • Clearing of native vegetation • Competition and grazing by the feral European Rabbit, <i>Oryctolagus cuniculus</i> (L.) • Infection of frogs by amphibian chytrid causing the disease chytridiomycosis • Invasion and establishment of exotic species: • Infection of native plants by <i>Phytophthora cinnamomi</i> • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants <p>Any future development applications will need to consider the impacts and mitigation of these KTP.</p>

Conclusion

The areas of mapped koala habitat within the subject site have been identified as having moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population.

Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential koala habitat available within the region and will not result in any significant impact to the local population.

Future development should be designed with due consideration of the KPOM and must be able to demonstrate that appropriate measures are taken to:

- minimise barriers to koala movement;
- reduce the risk of koala mortality by road kill by appropriate road design, lighting and traffic speed limits;
- minimise the removal of koala tree species;
- provide preferred koala trees in landscaping where suitable;
- minimise threats to koalas by dogs ie. banning of dogs or confining of dogs to koala proof yards; and
- minimise removal or disturbance of koala habitat in bushfire APZ.

Where avoidance is not possible, the possibility to offset the impact on site by active management and/or enhancing retained areas of habitat offsite may be considered a viable option in consultation with OEH.

Regent Honeyeater (*Anthochaera phrygia*)

Regent Honeyeater – Species Overview

The Regent Honeyeater is a woodland and forest bird listed as critically endangered under the BC Act.

The Regent Honeyeater mainly inhabits temperate woodlands and open forests, particularly Box – Ironbark woodland and riparian forests of River Sheoak. The species inhabits woodlands that support a significantly high abundance and species richness of birds. These type of woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The species can also be found in drier coastal woodlands and forests in some years. Non-breeding flocks of the species can be seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. Although the species is a generalist forager, it feeds mainly on the nectar from a small number of eucalypts that produce high volumes of nectar (e.g. Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany).

Swamp Mahogany and ironbarks are present within the Subject Site. These trees represent foraging resources for the species.

Regent Honeyeater has not been recorded within the Subject Site or the 10km locality between January 1980 and November 2018 as per results of searches in the BioNet Atlas.

Test of Significance

(a)	<p><i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i></p>
	<p>The rezoning proposal will not result in negative effects on feeding trees for the Regent Honeyeater.</p> <p>The possibility exists that up to 2.55ha of remnant vegetation, which includes Swamp Mahogany and Ironbarks, may be cleared for future residential development. The Regent Honeyeater has not been recorded within the Subject Site or the 10 km locality. Therefore, it is not likely that the loss of potential feeding trees will result in an adverse effect on the life cycle of the species such that a viable local population is likely to be placed at risk of extinction.</p> <p>Future development of this site can be designed to minimise impact to potential foraging resources for the species and offsetting may be a viable option.</p>
(b)	<p><i>in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i></p> <p><i>‘(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i></p>
	<p>Not applicable</p>
	<p><i>‘(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.</i></p>
	<p>Not applicable</p>

(c)	<i>in relation to the habitat of a threatened species or ecological community:</i>
	<i>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>
	<p>The rezoning proposal will not result in negative effect on the extent of potential feeding resources for the species.</p> <p>The possibility exists that up to 2.55ha of remnant vegetation, which includes Swamp Mahogany and Ironbarks, may be cleared for future residential development.</p>
	<i>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</i>
	<p>The development of this site will not further isolate or fragment any remnant vegetation with potential feeding resources for the species.</p>
	<i>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality</i>
	<p>The areas likely to be removed for future residential development have low ecological or conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by a local population.</p>
(d)	<i>whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>
	<p>The proposed development is not located within areas listed as Critical Habitat Declarations in the Register of Declared Areas of Outstanding Biodiversity Value in NSW.</p>
(e)	<i>whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key of a key threatening process.</i>
	<p>Future development of this site is likely to include the following KTP:</p> <ul style="list-style-type: none"> • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands • Clearing of native vegetation • Competition and grazing by the feral European Rabbit, <i>Oryctolagus cuniculus</i> (L.) • Infection of frogs by amphibian chytrid causing the disease chytridiomycosis • Invasion and establishment of exotic species: • Infection of native plants by <i>Phytophthora cinnamomi</i> • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants <p>Any future development applications will need to consider the impacts and mitigation of these KTP.</p>

Conclusion

The remnant vegetation likely to be cleared as part of future residential development within the subject site have been identified as having low to moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population.

Any clearing of potential foraging resources for the species has the potential to add to decline in feeding resources for the species. However, it is considered that the potential foraging resources to be cleared are minimal when compared to more substantial feeding resources available for the species elsewhere within the wider locality. Therefore, it is considered the future indicative proposal will not result in any significant impact to a local population.

Where avoidance is not possible, the possibility to offset the impact on site by active management and/or enhancing retained areas of habitat may be considered a viable option in consultation with OEH.

BIODIVERSITY IMPACT ASSESSMENT

Proposed Rezoning of Part Lot 202 DP874273, Bark Hut Road,
Woolgoolga NSW

APPENDIX G

**SIGNIFICANT IMPACT ASSESSMENT: MATTERS OF
NATIONAL ENVIRONMENTAL SIGNIFICANCE (EPBC ACT)**

Assessment of Significance

Koala (*Phascolarctos cinereus*) – EPBC Act status: Vulnerable

Species Overview

The Koala is an arboreal marsupial listed as vulnerable under the BC Act.

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. The species has been recorded within the Coffs Harbour Local Government Area. No known records of Koala are readily available within the Subject Site and the closest record is approximately 80 m to the south (dated from 2006 in the Council managed land) however this area has since been cleared and developed as a recreational sports ground.

The koala inhabit eucalypt woodlands and forests. The species feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Koalas are inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees, but will descend and traverse open ground to move between trees. Their home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Koalas are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

A review of the mapping included within the CHCC KPoM has identified 1.37 ha of Tertiary Koala Habitat and 0.1ha of Secondary Koala Habitat within the Subject Site. Based on the results of the field survey, koala habitat mapping has been refined based on the confirmed extent of koala feed trees: Tallowwood (*Eucalyptus microcorys*), Blackbutt (*Eucalyptus pilularis*), Small-fruited Grey Gum (*Eucalyptus propinquat*), Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*). The updated extent of Tertiary koala habitat has been mapped as:

- A 1.20 ha area located in the north-western and south-western portion of the Subject Site. This vegetation is in moderate to good condition with intact structural layers, including canopy, shrub and ground layer.
- 1.25 ha of low to moderate condition, isolated remnants are mapped within the centre of the Subject Site and include two separate fragmented patches (0.12ha and 1.13ha).

Assessment of Significance

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The areas of mapped koala habitat within the subject site have been identified as having moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population.

Future development of this site will not will not result in long-term decrease in the size of an important population of koala.

Reduce the area of occupancy of an important population.

An important koala population is not known to occur within the subject site or immediately locality.

Fragment an existing important population into two or more populations

An important koala population is not known to occur within the subject site or immediately locality.

Adversely affect habitat critical to the survival of the species

No areas of Koala habitat are listed in the Register of Critical Habitat under the EPBC Act

Disrupt the breeding cycle of an important population

An important koala population is not known to occur within the subject site or immediately locality.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Field surveys have identified three already fragmented patches of tertiary koala habitat within the subject site, none of which show any evidence of being utilised by the local koala population. Development within this site has the potential to add to the incremental decline of potential habitat available within the region although it will not impact the availability of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Educational information will be provided to future residents on the potential and real negative effects that exotic, invasive and domestic species might cause on native flora and fauna including the koala. Restrictions on future residents regarding exotic pets ownership may be considered as part of future development applications.

Introduce disease that may cause the species to decline; or

The proposed development is not likely to result in introduction of disease to koalas.

Interfere substantially with the recovery of the species.

A recovery plan for koala has not yet being prepared.

Conclusion

The areas of mapped koala habitat within the subject site have been identified as having moderate conservation value only, do not form part of any identified habitat linkages and are not known to be utilised by the local population.

Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential koala habitat available within the region although is unlikely to result in any significant impact to any local or important population of koala.

Regent Honeyeater (*Anthochaera phrygia*)

Species Overview

The Regent Honeyeater is a woodland and forest bird listed as critically endangered under the EPBC Act.

The Regent Honeyeater mainly inhabits temperate woodlands and open forests, particularly Box – Ironbark woodland and riparian forests of River Sheoak. The species inhabits woodlands that support a significantly high abundance and species richness of birds. These type of woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The species can also be found in drier coastal woodlands and forests in some years. Non-breeding flocks of the species can be seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. Although the species is a generalist forager, it feeds mainly on the nectar from a small number of eucalypts that produce high volumes of nectar (e.g. Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany).

Swamp Mahogany and ironbarks are present within the Subject Site. These trees represent foraging resources for the species.

Regent Honeyeater has not been recorded within the Subject Site or the 10km locality between January 1980 and November 2018 as per results of searches in the BioNet Atlas.

Assessment of Significance

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population.

The Regent Honeyeater has not been reported as recorded within the Subject Site or the 10km locality between January 1980 and November 2018 as per records held in the NSW BioNet Atlas. Although some feeding resources occur within the Subject Site, any population of the species is known to occur therein. Therefore, the action is unlikely to result in an impact that would lead to a long-term decrease in the size of a population of the species.

Reduce the area of occupancy of the species.

A population of the Regent Honeyeater is not known to occur within the Subject Site or immediately locality.

Fragment an existing population into two or more populations

A Regent Honeyeater population is not known to occur within the Subject Site or immediately locality.

Adversely affect habitat critical to the survival of the species

No areas of Regent Honeyeater habitat are listed in the Register of Critical Habitat under the EPBC Act

Disrupt the breeding cycle of a population

A Regent Honeyeater population is not known to occur within the Subject Site or immediately locality.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Field surveys have identified Swamp Mahogany and Ironbarks occurring in remnant vegetation within the Subject Site. The rezoning proposal will not result in loss of these trees. The possibility exists that up to 2.55ha of remnant vegetation currently present as isolated fragments within a cleared landscape will be cleared for future residential development. This area might include Swamp

Mahogany or Ironbarks which are potential feeding habitat for the Regent Honeyeater. However, due to the vegetation likely to be removed having a low ecological value and limited potential feeding resources for the species, it is not considered the vegetation to be cleared represent critical feeding habitat for the species such that their loss would result in the Regent Honeyeater population to decrease.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

Educational information will be provided to future residents on the potential and real negative effects that exotic, invasive and domestic species might cause on native flora and fauna including the woodland and forest birds such as the Regent Honeyeater. Restrictions on future residents regarding exotic pets ownership may be considered as part of future development applications.

Introduce disease that may cause the species to decline; or

The proposed development is not likely to result in introduction of disease to Regent Honeyeater.

Interfere with the recovery of the species.

The objectives of the recovery plan for Regent Honeyeater (Commonwealth of Australia 2016) are:

- Reverse the long-term population trend of decline and increase the numbers of regent honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to
- Enhance the condition of habitat across the regent honeyeaters range to maximise survival and reproductive success, and provide refugia during periods of extreme environmental fluctuation.

The rezoning proposal and future residential development will not contravene the objectives of the recovery plan for the Regent Honeyeater as the species is not known to occur within the Subject Site.

Conclusion

Potential foraging resources for the Regent Honeyeater are present within the Subject Site. Given that no population of the species is known to occur within the Subject Site or the 10km locality, the rezoning proposal is unlikely to result in significant effects on the species.

Any clearing of the mapped open forest habitat has the potential to add to the incremental decline of potential feeding habitat available within the region only and will not result in any significant impact to any local or important population of Regent Honeyeater.

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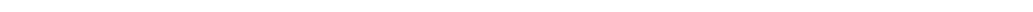
ERM's Newcastle Office

Level 1 Watt Street Commercial Centre
45 Watt Street
Newcastle NSW
2300

T: +61 2 4903 5500

www.erm.com

Appendix G ~ Engineering Infrastructure Report



Engineering Infrastructure Report

Bark Hut Road, Woolgoolga NSW

Part Lot 202, DP 874273



March 2019

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Limitations Statement

The sole purpose of this report and the associated services performed by Resource Design and Management Pty Ltd is to provide an Engineering Infrastructure Report for the subject site.

Resource Design and Management Pty Ltd derived the data in this report primarily from a number of sources which included site inspections, correspondence regarding the proposal, examination of records in the public domain, interviews with individuals with information about the site or the project, and field explorations conducted on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further examination / exploration of the site and subsequent data analyses, together with a re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, Resource Design and Management Pty Ltd may have relied upon and presumed accurate certain information (or absence thereof) relative to the site. Except as otherwise stated in the report, Resource Design and Management Pty Ltd has not attempted to verify the accuracy of completeness of any such information (including for example survey data supplied by others).

The findings, observations and conclusions expressed by Resource Design and Management Pty Ltd in this report are not and should not be considered an opinion concerning the completeness and accuracy of information supplied by others. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings and conclusions are based solely upon site conditions, information and drawings supplied by the Client etc. in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the provisions of the agreement between Resource Design and Management Pty Ltd and the Client. Resource Design and Management Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

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1. Background

Resource Design and Management Pty Ltd (RDM) has been engaged to provide an engineering assessment and report to support the proposed rezoning of land for low density residential purposes.

The development site comprises the property located at Bark Hut Rd, Woolgoolga, NSW, formally described as Part Lot 202 DP 874273, and has a total area of 16.41 hectares.

The purpose of this report is to consider engineering constraints for the **northern portion** of the site **only** (refer to **Figure 1** below) and provide preliminary information on the potential development of approximately 180 residential lots on the site.

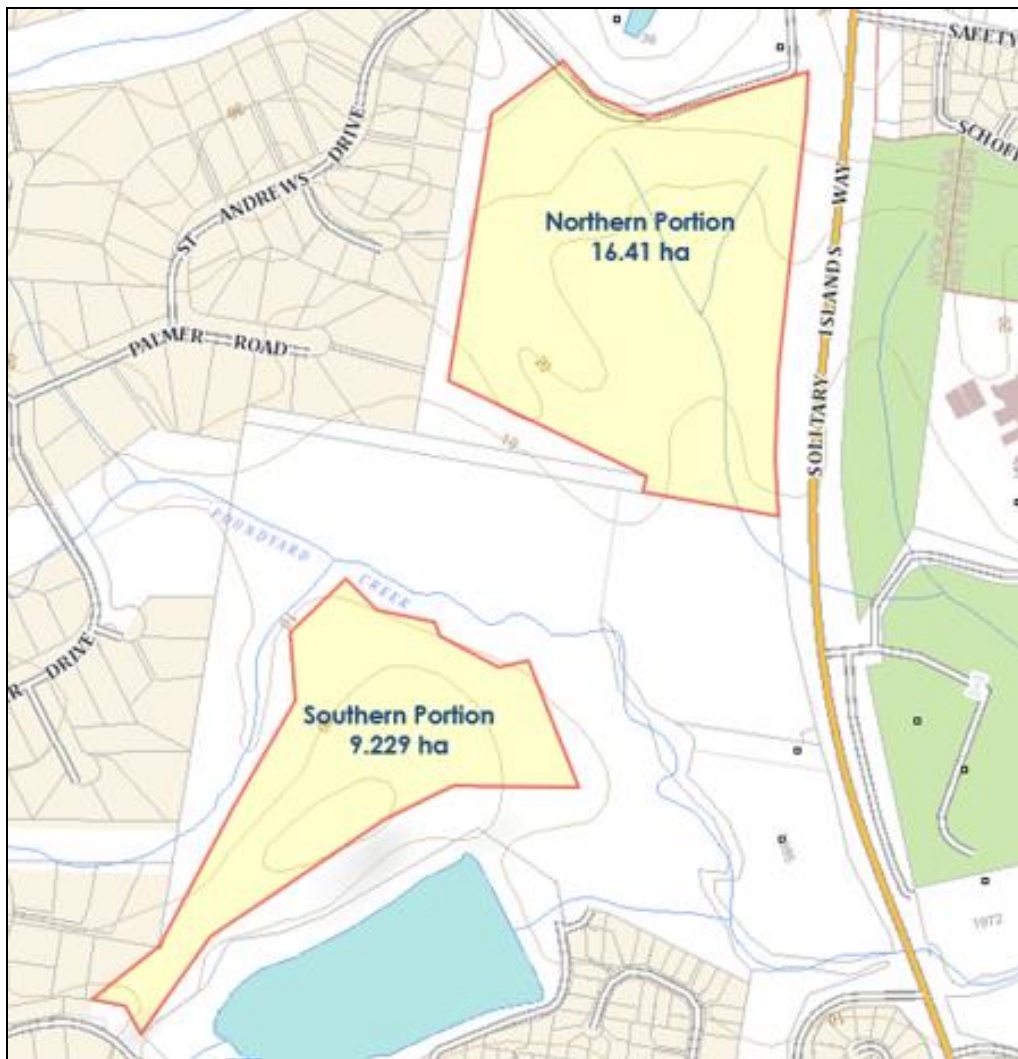


Figure 1: Locality Map – Both Precincts

Source: Six Maps

2. Site Context

2.1 Existing Site

The subject site is located approximately 22 km north of Coffs Harbour and 1.4 km northwest of Woolgoolga. The site is situated west of the old Pacific Highway, known as Solitary Islands Way and is bounded to the north by Bark Hut Road, and to the south by the West Woolgoolga Sports Complex.

The site is comprised of two distinct areas of approximately 25.64 hectares in total, with the northern and southern section's being around 16.41 ha and 9.23 ha, respectively. This can be seen in Figure 1 above.

This report considers only the northern portion. An aerial photograph of the subject site is provided as **Figure 2**.



Figure 2: Aerial Photograph of the subject land

Source: Six Maps

The subject site is mostly cleared with remnant Dry Sclerophyll Forest existing on the western and southern boundaries of the site.

The site falls generally from north to south, with a maximum RL 38 AHD at the north western boundary, falling to approximately RL 9.5m AHD at the south eastern boundary of the site. The slope of the surface is generally around 10%, with isolated areas reaching up to 25% steep and as flat as 1%.

2.2 Zoning

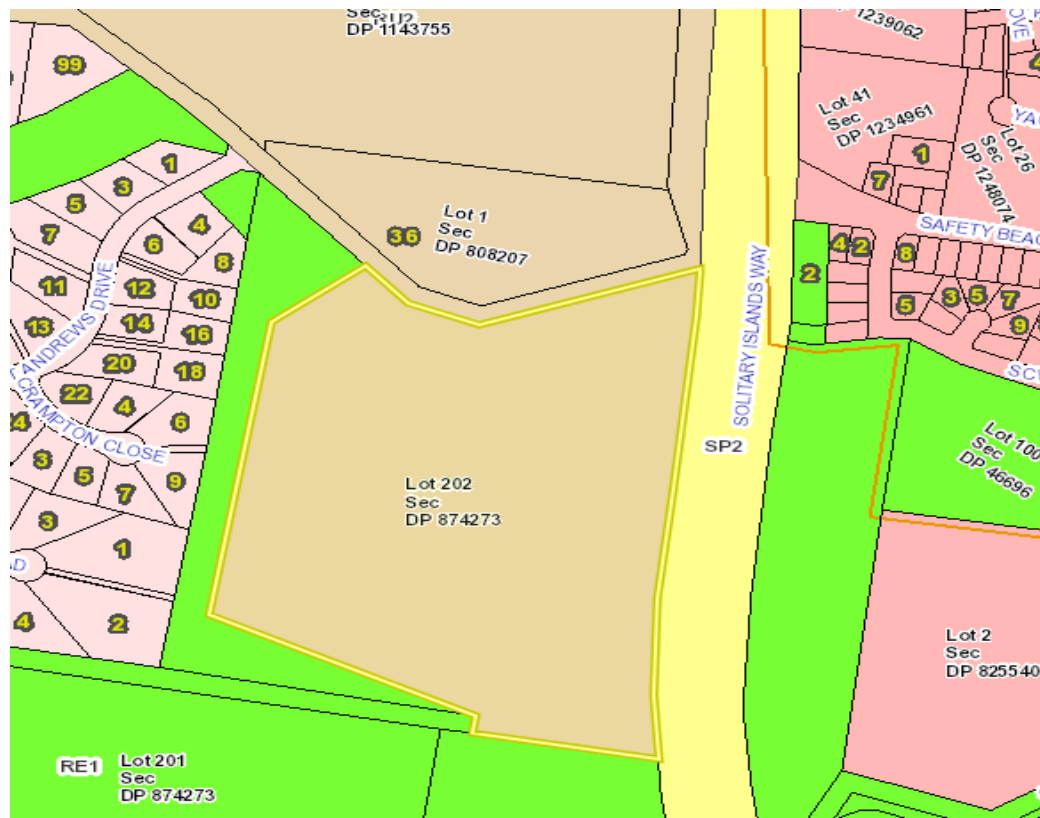
Presently the site is zoned RU2 Rural Landscape (refer to **Figure 3** below).

Abutting the site to the south is the proposed West Woolgoolga Sports Complex zoned RE1 Public Recreation. Beyond the West Woolgoolga Sports Complex is a residential area zoned R2 Low Density Residential.

To the west of the site a strip of RE1 land along the boundary exists. Beyond this area is a rural residential area zoned R5 Large Lot Residential.

To the east of the site is Solitary Islands Way. Further east is a strip of RE1 zoning before entering a R2 Low Residential zone.

To the north of the site is Bark Hut Road. Beyond Bark Hut Road the land is zoned RU2 Rural Landscape.



- | | | | |
|---|----------------------------|---|--------------------------|
|  | RE1 Public Recreation |  | RU2 Rural Landscape |
|  | R2 Low Density Residential |  | R5 Large Lot Residential |

Figure 3: Current Land Use Zones under Coffs Harbour LEP 2013

Source: CHCC Mapping

2.3 Development

The proposed development provides for a residential subdivision creating approximately 180 lots, with an average area of approximately 550m².

The proposed development will comprise the following works;

- bulk earthwork;
- the construction of internal road networks and footpaths;
- upgrade of the adjoining existing road and path network;
- extension of the existing Council water and sewer infrastructure to the site;
- the construction of reticulated water and sewer infrastructure to service the proposed residential lots;
- the provision of electricity and telecommunication infrastructure;
- and the construction of a stormwater drainage network, including provision for stormwater detention and stormwater quality improvement.

The following section provides comment on the proposed engineering infrastructure required to adequately service the proposed development.

3. Infrastructure and Services

3.1 Traffic

The site currently has direct vehicular access from Bark Hut Road and Solitary Islands Way. Bark Hut Road is a 6m wide Council sealed rural road within a 15m wide road reserve. A future road intersection is proposed at the southern boundary of the site, to service the site and the proposed West Woolgoolga Sports Complex. The Traffic Impact Assessment prepared by George Stulle provides further detailed information regarding this proposed intersection and expected traffic movements.

According to CHCC development specifications, a designated local road can have a maximum traffic volume of 2000 vehicles per day. Refer to **Figure 4** below.

Road Type	Max Traffic Volume (vpd) ⁽¹⁾	Max Speed ⁽²⁾ (km/h)	Carriageway Width (m) ⁽³⁾		Parking Provision Within Road	Kerbing ⁽⁴⁾	Footpath Required	Bicycle Path Required	Verge Width (each side)
			Min	Max					
Access Street	300	25	Single Lane ⁽⁵⁾ 3.5	6.0 ⁽⁵⁾	1 verge space per 2 lots ⁽⁵⁾	Rollover / Flush	No	No	See Note ⁽⁶⁾
			Two Lane 5.5	7.0	Carriageway	As above	Yes	No	See Note ⁽⁶⁾
Local Street	2,000	40	7.0	8.0	Carriageway	As above	1.2m wide ⁽⁷⁾	No	Min 4.0m
Collector Street	6,000 (with access to lots)	50 ⁽⁸⁾	9.0 ⁽¹⁰⁾	11.0	Carriageway or indented parking	Rollover 9.0m ⁽⁹⁾ SA 11.0m	1.2m wide both sides	No 1.0m gap in proturb for cyclist ⁽¹⁰⁾	Min 4.0m ⁽¹⁴⁾
(Commercial)	10,000 (no access to single dwelling residential lots)	60 ⁽¹¹⁾	13.0 (On bus routes 13.0 ⁽¹⁰⁾)	13.0	Parking not permitted on carriageway for sub-arterial roads ⁽¹²⁾	Barrier	If required 1.2m wide footpath and/or 2.0m bicycle path one side only ⁽¹³⁾	If required 2.0m bicycle path one side only in the verge, or two 1.5m wide bicycle lanes on carriage way ⁽¹³⁾	Min 4.5m

NOTES:

- (1) For single dwelling allotments apply traffic generation rate of 10 vehicles per day (vpd)/allotment (equivalent to approximately one vehicle per hour(vph) in the peak hour) unless a lower rate can be demonstrated. Lower rates can be applied to multi-unit dwellings based on locally derived rates.
- (2) See **Design speed and Horizontal curves and tangent lengths** on designing for specific operating speeds.
- (3) Widening required at bends to allow for wider vehicle paths (using Austroads Turning Templates).
- (4) Where kerbing is not required a flush pavement edge treatment can be used. Maximum carriageway widths required if barrier kerb used.
- (5) Requires:
 - Provision for widening to 6.0m if necessary in the future. Concrete.
 - Verge parking as noted with scope for additional spaces (see **Parking**)
- (6) Minimum width required to provide for pedestrians, services, drainage, landscape and preservation of existing trees. Add additional width on one side for future widening of carriageway to 5.0m if required. For two lane carriageway design, no provision for widening required.
- (7) A minimum of one footpath on one side of the street to be constructed initially with provision to construct a second footpath if required by residents in the future.
- (8) Reduced speeds are required at designated pedestrian/bicycle crossing. A speed of 20km/h is desirable, achieved by the road design principles outlined in AUS-SPEC.
- (9) Barrier kerbing may be used if required for drainage purposes without reducing the carriageway width.
- (10) On bus routes, 9.0m travelled way with 2.0m wide indented parking and bus bays defined by kerbed protuberances. Where bicycle way can be anticipated, a bicycle lane is required along the kerb.
- (11) Speed on local sub-arterial road not to exceed legal limit.
- (12) If required, to be provided in parking areas which can be exited in a forward direction.
- (13) Required only if part of a pedestrian/bicycle network.
- (14) Provide adequate road reserve width for widening of carriageway for future bus route if required.

Figure 4: Characteristics of Roads in Residential and Industrial Road Networks

Source: CHCC AUS-SPEC 2008

Based on the NSW Roads and Maritime Service (RMS) Technical Direction – Guide to Traffic Generating Development, Updated Traffic Surveys (August 2013), residential dwelling developments generate 7.4 daily vehicle trips per dwelling, and 0.78 weekday peak hour trips per dwelling. Refer **Figure 5**.

Rates
Daily vehicle trips = 10.7 per dwelling in Sydney, 7.4 per dwelling in regional areas
Weekday average evening peak hour vehicle trips = 0.99 per dwelling in Sydney (maximum 1.39), 0.78 per dwelling in regional areas (maximum 0.90).
Weekday average morning peak hour vehicle trips = 0.95 per dwelling in Sydney (maximum 1.32), 0.71 per dwelling in regional areas (maximum 0.85).
(The above rates do not include trips made internal to the subdivision, which may add up to an additional 25%).

Figure 5: Low Density Residential Dwellings

Source: RMS

The proposed approximate 180 residential dwellings will produce 1332 vehicle movements per day, and 156 vehicle movements during peak hour.

The expected traffic generated by the residential development will not generate traffic volumes sufficient to warrant a designation larger than local road within the site’s internal road network. With the development of the site, it is considered that a new asphalt sealed road network, generally to local road specifications, be constructed in accordance with Council.

3.2 Road Network

The development proposes to provide a Council road network to service the proposed dwellings. The road will be a flexible pavement with an asphalt wearing course.

The proposed roads will be constructed to local road standard, being 7m wide carriageway within a 15m wide road reserve.

The perimeter roads will have 8m wide carriageway within a 16m wide road reserve to comply with Planning for Bush Fire Protection requirements.

All roads will be two-way, 3% crossfall with roll kerb and gutter on each side of the road. The proposed road network will have a minimum longitudinal gradient of 0.5% and will not exceed 16%. Access gradients to each lot will not exceed 14%.

The road network will be designed to ensure service vehicles can undertake all necessary turning movements within the site.

3.2 Footpaths and Cycleways

A 1.2m wide concrete footpath will be provided on one side of each street within the site in accordance with Council requirements for local roads.

An additional footpath network will be provided within the site, providing a pedestrian link from the northern extent of the site through to the recreational zone to the south of the site.

Solitary Islands Way benefits from a two-way shared path located on the eastern road shoulder. In the vicinity of Centenary Drive however, East – West access to the shared path is limited to a road underpass at Woolgoolga Creek bridge and potential crossing facilities at Newman’s Road if Council upgrades the intersection in the future. Both these options are too far removed from the West Woolgoolga playing fields to serve as safe pedestrian and cycle access.

The proposed new development shared intersection would provide opportunity to incorporate pedestrian refuge facilities on Solitary Islands Way to service both the West Woolgoolga Sports Complex and the proposed residential development.

3.4 Earthworks

The general landform of the site maintains slopes that are suitable for dwelling construction and the provision of infrastructure to service the future lots. A geotechnical investigation will need to be undertaken in the future to inform the detailed design of the proposed development. The investigation will inform the soil types, strengths, stability, or the presence of hard rock or groundwater levels present on the site. The geotechnical results will determine the road pavement type and thickness and building foundation requirements.

Coffs Harbour City Council (CHCC) Mapping shows that majority of the site is classified as Class 5 Acid Sulfate Soils, which is the lowest possible risk class. It is considered unlikely that development of the property into residential allotments will encounter any underlying acid sulfate soils (refer to

Figure 6 below).

The lowest portion of the site is classified as Class 4 Acid Sulfate Soils by CHCC mapping. The Acid Sulfate Soil Manual states that within a Class 4 zoned area, Acid Sulfate Soils must be considered where:

- Works extend beyond 2m below the natural ground surface.
- Works may lower the water table beyond 2m below the natural ground surface.

Given that the Class 4 zoned area is located in the lowest area of the site, this area of the site is proposed to be utilised for stormwater quantity and quality control. It is unlikely that excavation beyond 2m will occur or any works resulting in the lowering of the water table beyond 2m below the natural ground surface.

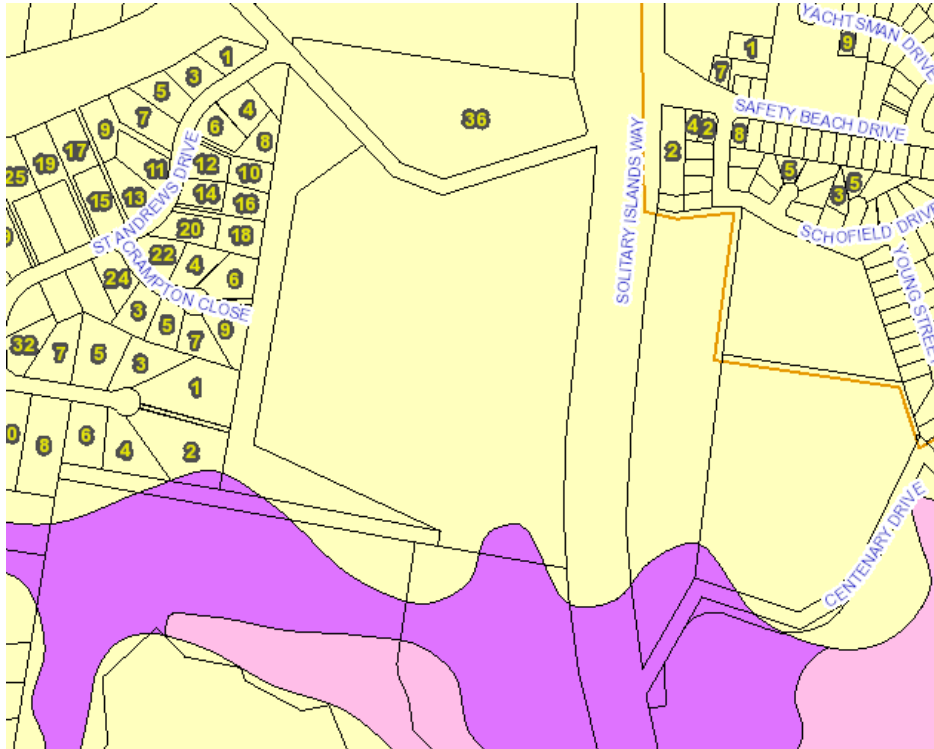


Figure 6: Acid Sulfate Soils

Source CHCC Mapping

Council mapping shows that none of the site has been used for banana cultivation and is not considered a potential contamination risk.

The relatively minor slope grades within the site allow for minimal bulk earthworks requirements. It is envisaged that the road network will generally conform to the existing landform and will require only minor earthworks to provide for balanced cut to fill for the final landform. Some isolated ridges and gullies exist within the site. These will be cut and filled to provide a consistent final landform, with due consideration to stormwater drainage throughout the site

3.5 Water Supply

The site is bounded to the east and west by adjoining residential developments. These developments are serviced by Council water infrastructure. Further, a 150mm diameter water main is located along Bark Hut Road along the northern boundary of the site, and a 375mm diameter trunk water main is located along Solitary Islands Way along the western boundary of the site.

A 150mm diameter water main traverses the centre of the site, from east to west. The valve on this main is permanently closed and is only opened to provide a secondary feed to the subdivisions to the east and west of the site when required.

Preliminary investigations indicate that adequate water supply is available to the site from the existing mains surrounding the site.

The existing water infrastructure is shown below in **Figure 7**.

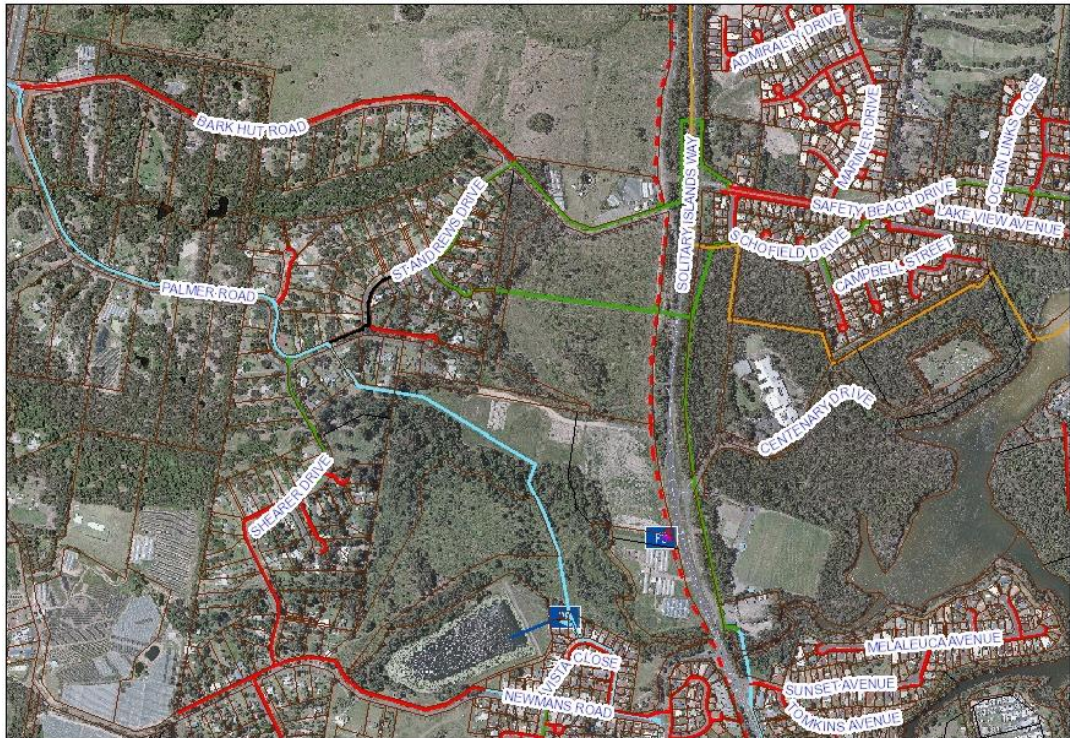


Figure 7: Existing Trunk Water Main

Source CHCC Mapping

3.6 Sewer Reticulation

Existing Council sewerage infrastructure is located within the existing residential developments to the east and the south of the site.

Preliminary investigations indicate that the site can be serviced by a gravity sewer network to a single new sewer pump station located in the lowest southern portion of the site. The sewer pump station would then convey the sewage through a new rising main to discharge to Council's existing sewer network. Council's existing sewer network conveys the sewage to the Woolgoolga Sewage Treatment Plant.

It is expected that augmentation of the existing Council sewer network may be required to convey the additional sewer load to the Woolgoolga Sewage Treatment Plant. There is adequate treatment capacity within the Woolgoolga Sewage Treatment Plant to cater for the additional load.

The existing sewer infrastructure is shown in **Figure 88** below.

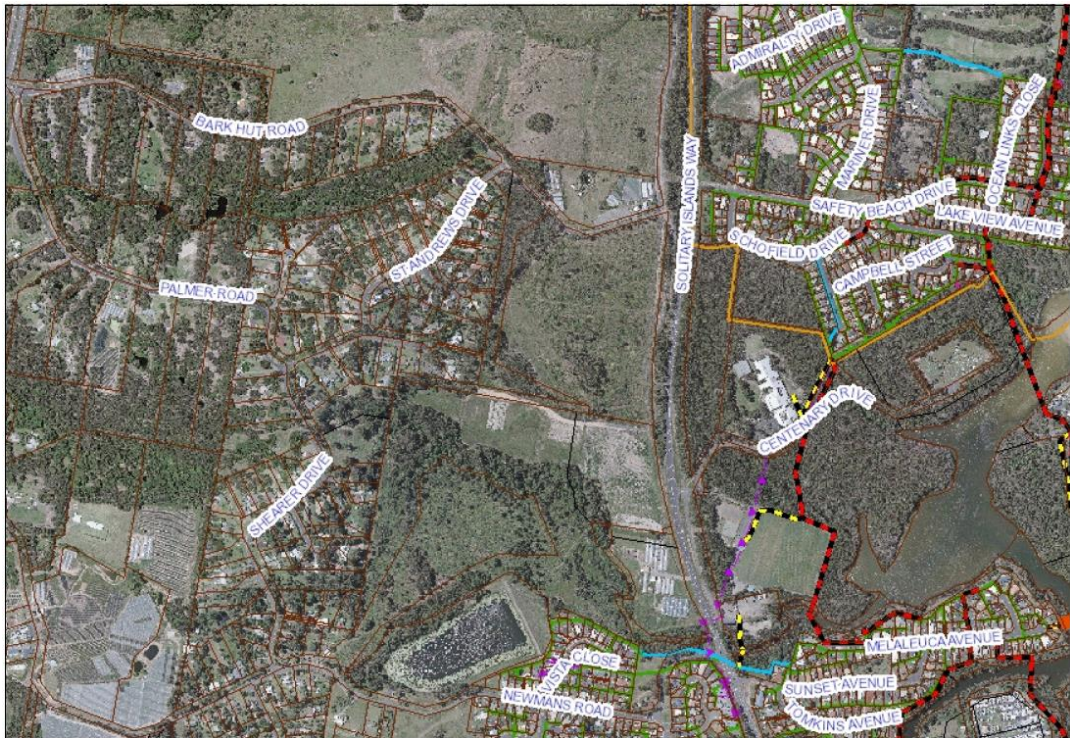


Figure 8: Existing Trunk Sewer Infrastructure

Source CHCC Mapping

3.7 Electricity and Telecommunications

Electricity and telecommunications networks were identified in the immediate vicinity of the site. No approaches have been made to Essential Energy or telecommunications providers at this point in time, however supply is not expected to pose any constraint to development.

Detail design of the electrical and telecommunications networks will determine the effects of additional loads on the existing systems, and any potential upgrades of existing infrastructure to cater for the additional loads.

4. Stormwater Management

4.1 Stormwater Quantity and Detention

The development proposes to dedicate the low-lying area to the south east of the site for the purpose of stormwater quality and quantity control.

A combined stormwater bioretention basin/detention basin is proposed to treat stormwater flows to a quality that meets Coffs Harbour City Council's stormwater quality objectives. The basin would also be designed to retain up to the 1% AEP storm event and maintain discharge rates from the site at pre-development flow rates.

General industry guides suggest that an area of between 2 to 5% of the total developed area is required to adequately treat stormwater generated by the development. The development has provided an area of at least 5% of the total developed site for the purpose of stormwater management.

Detailed design of the proposed drainage network will include a detailed analysis of the existing drainage network to ensure that all Council requirements with respect to urban drainage are met.

4.5 Flooding

Almost the entirety of the site is situated above Council's Flood Planning Level, with only the small portion of low-lying land at the southern boundary of the site identified as being below Council's Flood Planning Level. The area identified as being below the Flood Planning Level has been designated for stormwater management purposes. Therefore, there will be no residential land located on this portion of land.

In addition to this, the site has adequate fall to efficiently convey stormwater runoff, via piped drainage system and designated overland flow routes, to minimise any potential localised flooding caused by the development.

Flooding is not considered to be a constraint to the development of the site as shown in **Figure 9** below.

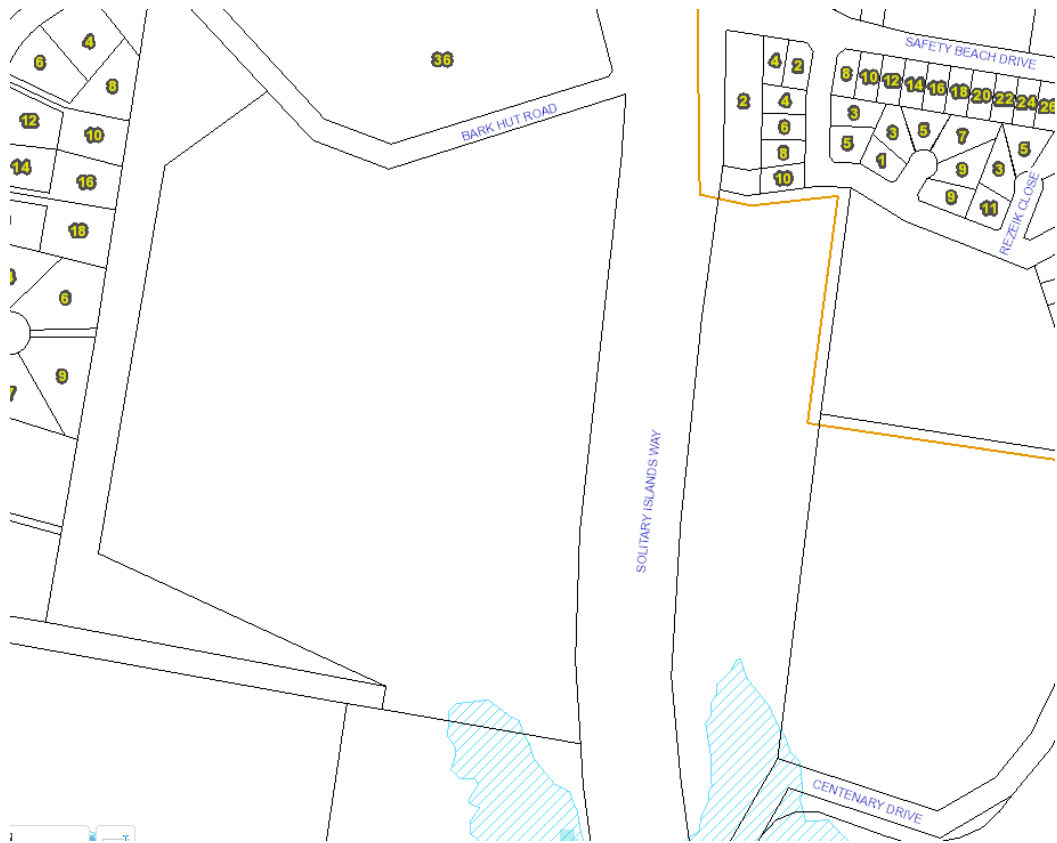
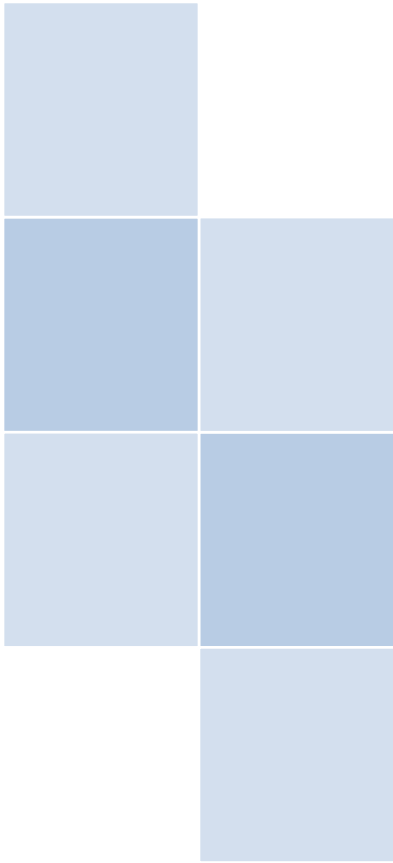


Figure 9: Flooding Extents
 Source CHCC Mapping

Appendix H ~ Traffic Impact Assessment





Bark Hut Road Residential Development Planning Proposal – Traffic Impact Assessment

Part Lot 202, DP 874273 Bark Hut Road,
Woolgoolga

22 March 2019



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1 Introduction

1.1 Scope

This Traffic Impact Assessment forms part of the necessary investigations to support the lodgement of a Planning Proposal for residential development of the subject land, Part Lot 202, DP 874273 Bark Hut Road, Woolgoolga.

The Planning Proposal is a result of an identified need for additional residential land in both the North Coast Regional Plan 2036 and Coffs Harbour City Council's Local Growth Management Strategy (LGMS) 2008 – Urban Land Component.

In addition, in January 2018, Urban Economics prepared a detailed Residential Land Demand Analysis relevant to the area, which concluded that:

'It is estimated that there is only three years of serviced residential zoned land supply available to the market within the Study Area, including land that is currently not being developed and subject to owner intents and commercial viabilities.'

The principal objective of the Planning Proposal is therefore to rezone land for residential development. Subject to the rezoning of the land, the intention will be to progress with a development application for residential development, ensuring there is sufficient residential land made available to meet present and future demand for affordable housing and lifestyle choices.

The development conceptually proposes 180 residential lots comprising predominantly low density housing.

Access to the development is proposed via a new 'T' intersection on Solitary Islands Way at the southern boundary of the property. The southern property boundary is common with the Coffs Harbour City Council West Woolgoolga Playing fields land.

Preliminary discussion with Coffs Harbour City Council has demonstrated that investigation of a shared intersection on Solitary Islands Way, servicing both the playing fields and the proposed residential development is warranted.

This report assesses a preliminary concept design for the proposed shared intersection.

2 Existing Conditions

2.1 Location

The proposed development is located on Part Lot 202, DP 874273 Bark Hut Road, Woolgoolga. The property has frontage to Bark Hut Road and to Solitary Islands Way.



Part Lot 202, DP 874273 Bark Hut Road, Woolgoolga.

2.2 Existing Road Network

Solitary Islands Way is a two-lane rural road serving as a collector road parallel to the Pacific Highway. The road provides access between the coastal villages of Safety Beach, Mullaway, Arrawarra Beach, Arrawarra, Corindi and Red Rock and the services located in Woolgoolga.

The road comprises 3.0m + travel lanes, wide shoulders and a two-way shared path located on the eastern road shoulder.

Solitary Islands Way has an 80km/h speed limit adjacent the subject site. An existing 'T' intersection serving the Woolgoolga High School and Woolgoolga playing fields is located within the zone opposite the West Woolgoolga Playing fields land.

Bark Hut Road is a two-lane road with a minor collector function in the local road network. It intersects with Solitary Islands Way approximately 650m north of the subject site. The Solitary Islands Way / Bark Hut Road intersection comprises a Type CHR right turn treatment and a Type AUL left turn treatment.

Development of the subject land and Councils West Woolgoolga playing fields could require a new, or multiple new intersections on Solitary Islands Way as the existing Bark Hut Road intersection is too far north to provide serviceable access to either development.

2.3 Existing Traffic Volumes

The RMS Pacific Highway Upgrade Sapphire to Woolgoolga Planning and design documents show that traffic volumes on the old Pacific Highway (Solitary Islands Way) at Woolgoolga prior to the Pacific Highway Bypass were in the order of 15,000 – 18,000 vehicles per day.

Post by-pass volumes on the old Pacific Highway (Solitary Islands Way) have seen around a 50% decrease in daily traffic with a substantial decrease in heavy vehicle traffic. This results in significant capacity within the Solitary Islands Way and connecting road network to accommodate increases in traffic from on-going residential development.

Coffs Harbour City Council traffic count data from 2016 shows that Solitary Islands Way now carries in the order of 7,700 vehicles per day adjacent the subject sites.

Solitary Islands Way 2016	AADT	Northbound		Southbound	
		AM Peak	PM Peak	AM Peak	PM Peak
200m North of Centenary Drive	7700	240	405	471	369

3 The Proposed Development

3.1 Development Description

The proposed residential development will comprise of low density residential housing. For assessment purposes this report assumes the development comprises of 180 low density residential lots.

The proposed internal road network will be designed in accordance with the Coffs Harbour Development Specifications with the main circulation carriageway ‘Local Street’ intersecting with a new Austroads standard ‘T’ intersection on Solitary Islands Way.

The new intersection is proposed to be located on or near the common property boundary with the West Woolgoolga Playing Fields land. This intersection location minimises impact on the existing Solitary Islands Way/Centenary Drive intersection and provides an opportunity for shared access to the two developments.

4 Traffic Impact Assessment

4.1 Development Traffic Generation

Traffic generation for the proposed residential development can be derived from RMS Guide to Traffic Generating Developments 3.3.1;

For Low density dwellings:

Daily Vehicle trips = 9 per dwelling

Weekday peak hour vehicle trips = 0.85 per dwelling

For a development of 180 low density residential Lots the likely traffic generation would be:

Daily Vehicle trips = 180 x 9 = **1620 trips per day**

Weekday peak hour vehicle trips = 180 x 0.85 = **153 vph**

4.2 Traffic Growth

Traffic growth over the next ten years on Solitary Islands Way and the surrounding road network will predominantly be a function of new residential development in the Woolgoolga Residential Release areas.

Bark Hut Road Residential Development Planning Proposal–Traffic Impact Assessment
 A conservative traffic growth factor for the area would be 1.0% per annum. From section 2.3 daily traffic volumes on Solitary Islands Way in 2029 will therefore be;

Solitary Islands Way 2029	AADT	Northbound		Southbound	
		AM Peak	PM Peak	AM Peak	PM Peak
200m North of Centenary Drive	8851	276	465	541	424

4.3 Directional distribution

Assuming all traffic will access the final development from the proposed Solitary Islands Way 'T' intersection, a significantly higher proportion of vehicle trips can be assumed to be southbound to and from Woolgoolga.

Assuming 10% of traffic to and from the north, the likely distribution of the peak hour trips from the ultimate development will be;

Morning Peak Hour			Afternoon Peak Hour		
In	Out	Total	In	Out	Total
L 27	L 12	153	L 82	L 9	153
R 4	R 110		R 7	R 55	

AM – 20 in / 80 out, PM – 60 / 40

4.4 Development Access Assessment

A SIDRA model of the proposed Solitary Islands Way intersection, adopting peak flows on the road network from Section 2.3 and 4.3, shows 2029 intersection performance for residential development traffic to be generally at Level of Service A with the right turn movement from the site progressing to LOS B.

SIDRA summary output for the model is included in Appendix B. Intersection assessment criteria are shown in the table below.

Level of Service	Average Delay per Vehicle (secs/veh)	Give Way & Stop Signs
A	< 14	Good operation
B	15 to 28	Acceptable delays & spare capacity
C	29 to 42	Satisfactory, but accident study required
D	43 to 56	Near capacity & accident study required
E	57 to 70	At capacity, requires other control mode

4.5 Combined Playing Fields and Development Access assessment

It is understood from discussion with Coffs Harbour City Council that development of the West Woolgoolga playing fields will not be required until toward the end of the 10-year planning horizon assessed in this report.

Bark Hut Road Residential Development Planning Proposal–Traffic Impact Assessment
 The Coffs Harbour Sports Facility Plan 2016 shows staged development of the West Woolgoolga Playing fields over several years (Appendix C). The Stage 1 development includes ‘multipurpose fields with capacity for touch football, cricket, rugby union, rugby league and AFL. The Stage 1 plan also shows provision for an amenities block and development of a proposed community Multipurpose Centre

Car parking capacity for the Stage 1 development is shown to be approximately 100 spaces.

Once operational, traffic generation from the playing fields will generally be sporadic during weekdays with peak usage outside of peak traffic flow times on weekends. Results of analysis in section 4.4 of this report shows that the proposed intersection will have significant spare capacity to cater for weekday traffic generation from the West Woolgoolga Playing fields even on completion of full residential development.

A SIDRA sensitivity analysis of the proposed intersection however has been carried out assuming shoulder peak flows from the full residential development on 2029 weekend peak flows.

Residential development shoulder peak flows were calculated based on 60% of morning peak. Playing fields traffic generation assumes 100 cars leaving the car park over the peak hour with an additional 50 external pick-up movements. Playing field trip distribution is adjusted to 40/60 north - south.

Combined shoulder peak residential and Saturday morning Stage 1 playing field traffic.		
In	Out	Total
L 31 R 15	L 57 R 141	244

Saturday morning peak flows (11am -12 noon) were adopted from the 2016 traffic study and adjusted for growth to 2029.

The SIDRA analysis demonstrates that the intersection still has significant capacity to cater for the combined additional traffic generation from the proposed full residential development and the Stage 1 playing fields development with movements remaining at Level of Service A to LOS B.

The full Woolgoolga Playing Fields Masterplan development could see in the order of 226 car parking bays and 4 bus parking bays. Similar trip distribution with 226 cars leaving the car park over the peak hour with an additional 100 external pick-up movements yields;

Combined shoulder peak residential and Saturday morning Stage 1 playing field traffic.		
In	Out	Total
L 46 R 25	L 117 R 202	390

A SIDRA analysis based on full development and an additional 10 years growth to 2039 shows only the right turn movement from the site at Level of Service D. This clearly demonstrates that the proposed intersection will have adequate capacity to cater for the full residential development and likely future development of the West Woolgoolga Playing fields.

4.6 Road Safety

Solitary Islands Way has an 80km/h speed limit on departure from the 50km/h built up area limit north of Poundyard Creek. The 80 zone extends past the existing Centenary Drive 'T' intersection serving the Woolgoolga High School and Woolgoolga playing fields. The Centenary Drive intersection includes a protected right turn and modified northbound acceleration lane on Solitary Islands Way directly opposite the West Woolgoolga Playing fields land.



Solitary Islands Way, Centenary Drive intersection

The existing Centenary Drive intersection configuration extends across the full frontage of the Woolgoolga Playing Fields land limiting any opportunity to develop a new intersection to service the playing fields other than directly opposite Centenary Drive. This would require construction of a roundabout or traffic control signals at Centenary Drive which would have significant negative impacts;

- High Cost
- Not possible to Stage
- Roundabout or traffic signals not warranted for intermittent peak flows associated with school and playing fields
- Would require redesign of West Woolgoolga playing fields masterplan.

The 2016 West Woolgoolga Playing fields masterplan does indicate development of a new intersection on Solitary Islands Way close to the northern boundary of the playing fields land. This however would be difficult to achieve as the intersection would clash with the existing Centenary Drive acceleration lane.

The new 'shared' intersection proposed to be located on or near the common property boundary with the West Woolgoolga Playing Fields land allows the intersection location to move further north and provides adequate separation to the existing Centenary Drive intersection.

The proposed intersection location has good sight distance characteristics to both the north and south and will only require minor adjustment to the existing Centenary Drive intersection north bound acceleration lane.

The shared intersection arrangement reduces the need for multiple intersections on Solitary Islands Way which represents sound traffic planning practice.



Solitary Islands Way, sight distance to the north of proposed intersection.



Solitary Islands Way, sight distance to the south of proposed intersection.

The proposed modification to the Centenary Drive north bound acceleration lane would be facilitated by the reduction of the 80km/h Solitary Islands Way speed zone to 60 or 50km/h. This would be consistent with the development of the West Woolgoolga Playing fields and the additional pedestrian and cycle traffic generated by the playing fields. The reduced speed zone would also be more consistent with promoting safe pedestrian and cycle access to the existing High School and playing fields.

A concept layout of the proposed new intersection and speed zone is included in Appendix D. The concept design shows that the new intersection can fit in with a Centenary Drive north bound acceleration lane length in the order of 105m which meets relevant standards for the reduction in speed limit.

4.7 Bark Hut Road/Solitary Island Way intersection

The subject site has frontage to Bark Hut Road which is a two-lane rural standard road. Bark Hut Road intersects with Solitary Islands Way approximately 650m north of the subject site's northern boundary. The Solitary Islands Way / Bark Hut Road intersection comprises of a Type CHR right turn treatment and a Type AUL left turn treatment.

Primary vehicular access from the proposed development to Bark Hut Road would be undesirable due to the resulting steep grades on any access road approach to Bark Hut Road. Bark Hut Road also has poor horizontal and vertical geometry adjacent the subject site.

The significant majority of trip origin/destination for the proposed development would be to the south. The additional travel time and distance required for residential and service vehicle trips for the proposed development if Bark Hut Road was to be developed as the primary road access would represent poor Transport Planning practice.

The additional 2.0 kilometres per trip (approximately) added to the overall development vehicle kilometres travelled (vkt) would yield poor results in terms of fuel efficiency, fuel consumption, environmental quality, energy conservation, economic value and road safety.

Primary development access to Bark Hut Road would also rule out the economic and community benefits of developing a shared access arrangement with Council land to the south of the site.

It is proposed that only emergency vehicle access be provided from the development site to Bark Hut Road. This would have no impact on traffic levels of service or road safety on Bark Hut Road.

4.8 Construction Access

The proposed shared intersection location will provide an opportunity to stage road and intersection works for both the proposed residential development and the West Woolgoolga Playing fields to ensure safe access can be achieved during the construction phase of both projects.

4.9 Pedestrian and Cycle access

Solitary Islands Way benefits from a two-way shared path located on the eastern road shoulder. In the vicinity of Centenary Drive however, East – West access to the shared path is limited to a road underpass at Woolgoolga Creek bridge and potential crossing facilities at Newman's Road if Council upgrades the intersection in the future. Both these options are too far removed from the West Woolgoolga playing fields to serve as safe pedestrian and cycle access.

The proposed new development shared intersection would provide opportunity to incorporate pedestrian refuge facilities on Solitary Islands Way to service both the West Woolgoolga Playing fields and the proposed residential development.

5 Recommendations

1. Post by-pass volumes on the old Pacific Highway (Solitary Islands Way) indicate a significant capacity within the Solitary Islands Way and connecting road network to accommodate increases in traffic from on-going residential development.
2. The subject site has frontage to Bark Hut Road which is a two-lane rural standard road. Bark Hut Road intersects with Solitary Islands Way approximately 650m north of the subject site's northern boundary. The additional travel time and distance required for residential and service vehicle trips for the proposed development if Bark Hut Road was to be developed as the primary road access would represent poor Transport Planning practice.
3. The proposed development of the West Woolgoolga playing fields and residential land north of the playing fields site could both require new intersections on Solitary Islands Way. A single intersection serving both properties is the preferred option for future service planning for the two sites.
4. A new intersection located on or near the common property boundary of the proposed residential land and the West Woolgoolga Playing Fields land will limit the proliferation of new intersections on Solitary Islands Way. The proposed intersection will have minimal impact on the existing Solitary Islands Way/Centenary Drive intersection and provide an opportunity for shared access to the two developments.
5. As part of the detailed design and construction of the new shared intersection, Council should consider making application for reduction of the 80km/h Solitary Islands Way speed zone to 60 or 50km/h. This would be consistent with the development of the West Woolgoolga Playing fields and the additional pedestrian and cycle traffic generated by the playing fields. The reduced speed zone would also be more consistent with promoting safe pedestrian and cycle access to the Woolgoolga High School and existing playing fields.
6. A new intersection located on or near the common property boundary of the proposed residential land and the West Woolgoolga Playing Fields land will provide opportunity to incorporate pedestrian refuge facilities on Solitary Islands Way to service both the West Woolgoolga Playing fields and the proposed residential development.
7. Concept design and traffic flow modelling of the proposed shared intersection shows that subject to detail design, the intersection can meet relevant Austroads standards and will provide sufficient traffic capacity to cater for full development of both the Bark Hut Road residential land and the West Woolgoolga Playing Fields.
8. The proposed shared intersection location will provide an opportunity to stage road and intersection works for both the proposed residential development and the West Woolgoolga Playing fields to ensure safe access can be achieved during the construction phase of both projects.
9. The traffic impact assessment shows that the proposed intersection concept meets the relevant criteria in support of a Planning Proposal for residential development of the subject land, Part Lot 202, DP 874273 Bark Hut Road, Woolgoolga.
10. Further discussion should be held with Coffs Harbour City Council on the timing, design and cost sharing of works required for the proposed Solitary Islands Way shared intersection.

6 References

Roads and Maritime Services Guide to Traffic Engineering Developments

Coffs Harbour Highway Planning Sapphire to Woolgoolga section ENVIRONMENTAL ASSESSMENT - MAIN VOLUME NOVEMBER 2007

Coffs Harbour Sports Facility Plan 2016

Austrroads Guide to Road Design

Appendix A – CHCC Solitary Islands Way Traffic Count Data

Coffs Harbour City Council - Traffic Data Weekly Vehicle Counts North Bound (Virtual Week)

Filter time: 16:21 Friday, 15 July 2016 => 14:10 Tuesday, 2 August 2016 (17.9093)

Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Speed range: 10 - 160 km/h.

Direction: North (bound), P = North, Lane = 0-16 Separation: GapX

> 0 sec, Span 0 - 100 metre Name: Default Profile

Scheme: Vehicle classification (AustRoads94)

Units: Metric (metre, kilometre, m/s, km/h, kg, tonne)

In profile: Vehicles = 69493 / 137923 (50.39%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-686

Site: CCC3.0.1NS

Description: Solitary Island Way 200m Nth of Centenary Way

Filter time: 16:21 Friday, 15 July 2016 => 14:10 Tuesday, 2 August 2016 Scheme: Vehicle classification (AustRoads94)

Filter: Cls(1-10) Dir(N) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages		
								1 - 5	1 - 7	
0000-0100	4.3	4.3	6.0	5.5	5.5	12.3	15.0	5.0	7.9	
0100-0200	3.3	1.7	2.5	4.5	2.0	5.7	7.3	2.8	4.0	
0200-0300	1.0	2.3	0.5	2.0	2.5	6.3	5.0	1.7	3.0	
0300-0400	5.0	4.7	7.5	5.5	4.0	6.3	5.3	5.3	5.4	
0400-0500	9.7	12.0	8.5	8.5	10.5	10.0	6.3	10.0	9.4	
0500-0600	132.7	135.7	139.5	130.0	123.0	77.0	58.3	132.5	110.9	
0600-0700	191.0	219.7	214.5	185.0	197.0	131.3	81.7	202.1	170.2	
0700-0800	194.0	205.0	204.5	180.0	191.0	154.3	101.7	195.7	173.1	
0800-0900	238.0	244.3	248.0	233.5	233.0	178.3	158.0	239.7	215.8	
0900-1000	229.7	222.7	213.5	233.5	224.0	244.0	204.0	224.9	224.6	
1000-1100	238.0	257.0	241.5	248.5	263.0	306.7	270.0	249.3	262.3	
1100-1200	284.3	270.7	289.0	272.0	309.0	346.0	287.0	283.8	294.7	
1200-1300	311.7	291.7	283.5	286.5	304.5	342.0	291.7	296.6	303.3	
1300-1400	283.0	265.7	281.0	268.0	316.0	306.0	283.3	281.3	285.8	
1400-1500	294.3	219.3	301.5	320.0	322.5	296.3	315.3	285.8	292.4	
1500-1600	396.7	419.0	388.0	410.0	415.5	288.3	280.7	405.0	362.5	
1600-1700	419.0	380.0	405.0	416.5	349.0	246.3	237.0	392.3	342.1	
1700-1800	372.7	407.0	412.5	383.5	375.0	244.0	215.7	387.4	334.9	
1800-1900	196.0	218.5	201.0	216.5	201.7	151.7	121.3	205.4	182.4	
1900-2000	112.3	177.0	135.0	152.0	134.7	98.0	77.0	139.1	121.9	
2000-2100	57.7	96.0	87.5	114.0	97.3	76.3	49.0	88.3	79.8	
2100-2200	42.0	45.5	56.0	72.0	64.7	54.7	30.0	55.6	51.2	
2200-2300	25.0	21.5	28.5	30.5	44.7	38.3	16.7	30.8	29.7	
2300-2400	11.0	11.0	15.5	9.5	16.3	22.3	7.7	12.8	13.6	
Totals										
0700-1900	3457.3	3400.8	3469.0	3468.5	3504.2	3104.0	2765.7	3447.0	3273.9	
0600-2200	3860.3	3939.0	3962.0	3991.5	3997.8	3464.3	3003.3	3932.1	3697.0	
0600-0000	3896.3	3971.5	4006.0	4031.5	4058.8	3525.0	3027.7	3975.8	3740.2	
0000-0000	4052.3	4132.2	4170.5	4187.5	4206.3	3642.7	3125.0	4132.9	3880.9	
AM Peak	1100	1100	1100	1100	1100	1100	1100			
	284.3	270.7	289.0	272.0	309.0	346.0	287.0			
PM Peak	1600	1500	1700	1600	1500	1200	1400			
	419.0	419.0	412.5	416.5	415.5	342.0	315.3			

Coffs Harbour City Council - Traffic Data
Weekly Vehicle Counts South Bound (Virtual Week)

Filter time: 16:21 Friday, 15 July 2016 => 14:10 Tuesday, 2 August 2016 (17.9093)

Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Speed range: 10 - 160 km/h.

Direction: South (bound), P = North, Lane = 0-16 Separation: GapX

> 0 sec, Span 0 - 100 metre Name: Default Profile

Scheme: Vehicle classification (AustRoads94)

Units: Metric (metre, kilometre, m/s, km/h, kg, tonne)

In profile: Vehicles = 68390 / 137923 (49.59%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-687

Site: CCC3.0.1NS

Description: Solitary Island Way 200m Nth of Centenary Way

Filter time: 16:21 Friday, 15 July 2016 => 14:10 Tuesday, 2 August 2016 Scheme: Vehicle classification (AustRoads94)

Filter: Cls(1-10) Dir(S) Sp(10,160) GapX(>0) Span(0 - 100) Lane(0-16)

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages		
								1 - 5	1 - 7	
0000-0100	1.7	3.0	2.0	2.5	5.5	7.3	10.0	2.8	4.8	
0100-0200	2.3	2.0	1.5	2.5	1.0	5.0	5.0	1.9	2.9	
0200-0300	2.7	2.0	2.0	1.5	2.0	3.3	4.3	2.1	2.7	
0300-0400	6.0	9.0	8.0	6.5	5.0	7.7	4.7	7.0	6.7	
0400-0500	15.3	15.0	13.0	11.5	11.0	7.7	9.7	13.5	11.9	
0500-0600	66.3	66.7	73.5	72.5	65.0	25.7	19.0	68.4	53.1	
0600-0700	144.0	151.7	154.0	161.0	153.0	93.0	58.3	151.9	126.5	
0700-0800	289.3	311.7	325.0	286.0	271.5	158.3	119.0	297.3	244.4	
0800-0900	428.7	491.0	460.5	525.0	461.5	305.0	244.0	471.1	405.6	
0900-1000	315.7	323.3	326.5	332.0	344.5	372.7	266.7	326.9	324.5	
1000-1100	350.0	291.3	281.0	279.5	324.5	372.3	287.0	307.8	315.1	
1100-1200	280.0	283.7	296.0	292.0	306.0	355.0	326.7	289.9	306.9	
1200-1300	278.7	254.3	269.0	304.0	288.0	302.0	281.0	276.8	281.7	
1300-1400	267.0	254.7	227.0	228.5	247.5	255.0	251.0	247.6	249.4	
1400-1500	297.7	224.3	304.5	268.5	283.0	255.7	257.0	273.2	267.6	
1500-1600	369.0	378.5	392.5	342.0	362.0	249.7	238.3	368.8	324.8	
1600-1700	327.3	334.5	327.0	353.5	303.3	241.7	236.7	326.8	297.6	
1700-1800	287.7	312.0	302.0	297.5	307.7	238.3	210.0	300.8	275.2	
1800-1900	159.0	193.5	156.0	161.5	170.3	145.7	102.0	167.5	152.9	
1900-2000	52.7	79.5	86.5	74.5	85.7	63.7	55.7	74.7	69.7	
2000-2100	43.0	40.5	46.0	41.0	49.3	52.0	38.3	44.3	44.6	
2100-2200	15.3	29.0	22.0	22.5	38.3	34.0	21.0	25.7	26.3	
2200-2300	9.3	13.0	13.5	14.5	20.7	24.3	9.0	14.3	15.1	
2300-2400	5.3	6.5	9.5	5.5	9.0	10.7	6.3	7.2	7.6	
Totals										
0700-1900	3650.0	3652.8	3667.0	3670.0	3669.8	3251.3	2819.3	3654.5	3445.7	
0600-2200	3905.0	3953.5	3975.5	3969.0	3996.2	3494.0	2992.7	3951.1	3712.7	
0600-0000	3919.7	3973.0	3998.5	3989.0	4025.8	3529.0	3008.0	3972.6	3735.4	
0000-0000	4014.0	4070.7	4098.5	4086.0	4115.3	3585.7	3060.7	4068.3	3817.5	
AM Peak	0800	0800	0800	0800	0800	0900	1100			
	428.7	491.0	460.5	525.0	461.5	372.7	326.7			
PM Peak	1500	1500	1500	1600	1500	1200	1200			
	369.0	378.5	392.5	353.5	362.0	302.0	281.0			

Appendix B – SIDRA Summary Output

MOVEMENT SUMMARY Solitary Islands Way intersection 2029 AM peak (residential)

▽ Site: 101 [Bark Hut Road Development]

Concept Solitary Islands Way intersection 2029 AM peak (residential)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Solitary Islands Way											
1	L2	28	0.0	0.015	5.5	LOS A	0.0	0.0	0.00	0.58	49.1
2	T1	291	3.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		319	2.7	0.152	0.5	NA	0.0	0.0	0.00	0.05	59.2
North: Solitary Islands Way											
8	T1	569	3.0	0.298	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
9	R2	3	0.0	0.002	5.5	LOS A	0.0	0.0	0.00	0.59	49.0
Approach		573	3.0	0.298	0.1	NA	0.0	0.0	0.00	0.00	59.9
West: Concept Access Road											
10	L2	13	0.0	0.013	6.7	LOS A	0.0	0.3	0.35	0.58	48.6
12	R2	116	0.0	0.405	21.3	LOS B	1.7	12.2	0.83	1.00	36.7
Approach		128	0.0	0.405	19.9	LOS B	1.7	12.2	0.78	0.96	37.6
All Vehicles		1020	2.5	0.405	2.7	NA	1.7	12.2	0.10	0.14	57.0

MOVEMENT SUMMARY Solitary Islands Way intersection 2029 PM peak (residential)

▽ Site: 101 [Bark Hut Road Development]

Concept Solitary Islands Way intersection 2029 PM peak (residential)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Solitary Islands Way											
1	L2	86	0.0	0.046	5.5	LOS A	0.0	0.0	0.00	0.58	49.1
2	T1	489	3.0	0.256	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		576	2.6	0.256	0.9	NA	0.0	0.0	0.00	0.09	58.7
North: Solitary Islands Way											
8	T1	446	3.0	0.233	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
9	R2	6	0.0	0.003	5.5	LOS A	0.0	0.0	0.00	0.59	49.0
Approach		453	3.0	0.233	0.1	NA	0.0	0.0	0.00	0.01	59.8
West: Concept Access Road											
10	L2	9	0.0	0.012	7.9	LOS A	0.0	0.3	0.47	0.64	47.6
12	R2	58	0.0	0.234	20.9	LOS B	0.8	5.9	0.82	0.94	37.0
Approach		67	0.0	0.234	19.0	LOS B	0.8	5.9	0.77	0.90	38.2
All Vehicles		1096	2.6	0.256	1.7	NA	0.8	5.9	0.05	0.10	57.9

Site Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY Solitary Islands Way intersection 2029 Sat morning peak (residential + playing fields stage 1)

Site: 101 [Bark Hut Road Development]

Concept Solitary Islands Way intersection 2029 Sat morning peak (residential + playing fields stage 1)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
		Total veh/h	HV %				Vehicles veh	Distance m				
South: Solitary Islands Way												
1	L2	33	0.0	0.018	5.5	LOS A	0.0	0.0	0.00	0.58	49.1	
2	T1	419	3.0	0.219	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		452	2.8	0.219	0.4	NA	0.0	0.0	0.00	0.04	59.4	
North: Solitary Islands Way												
8	T1	429	3.0	0.225	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
9	R2	16	0.0	0.009	5.5	LOS A	0.0	0.0	0.00	0.59	49.0	
Approach		445	2.9	0.225	0.2	NA	0.0	0.0	0.00	0.02	59.7	
West: Concept Access Road												
10	L2	60	0.0	0.070	7.6	LOS A	0.2	1.7	0.44	0.68	47.9	
12	R2	148	0.0	0.496	22.3	LOS B	2.4	16.6	0.84	1.05	36.1	
Approach		208	0.0	0.496	18.1	LOS B	2.4	16.6	0.73	0.94	38.9	
All Vehicles		1105	2.3	0.496	3.7	NA	2.4	16.6	0.14	0.20	55.8	

MOVEMENT SUMMARY Solitary Islands Way intersection 2039 Sat morning peak (residential + playing fields full dev)

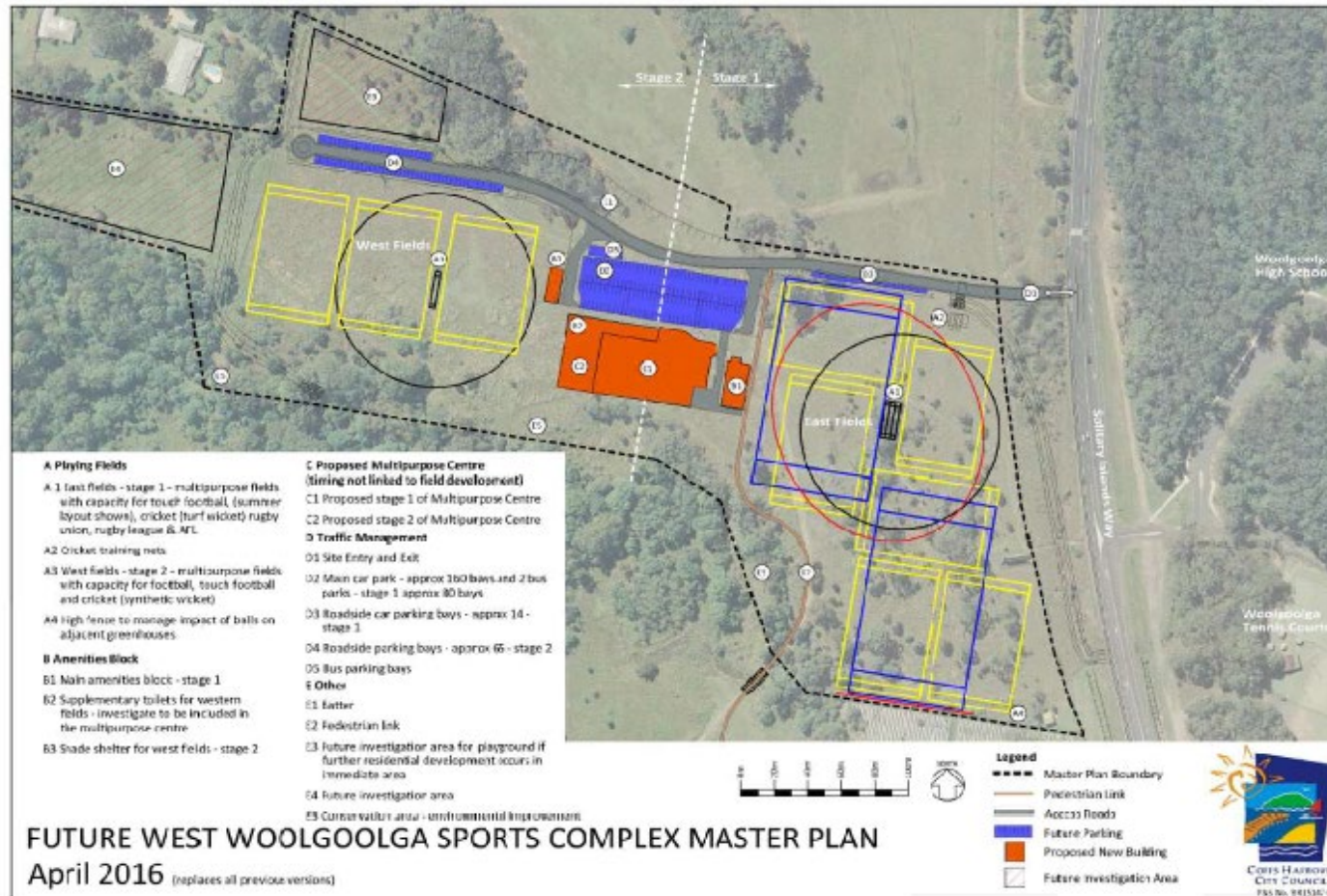
Site: 101 [Bark Hut Road Development]

Concept Solitary Islands Way intersection 2039 Sat morning peak (residential + playing fields full dev)
 Giveaway / Yield (Two-Way)

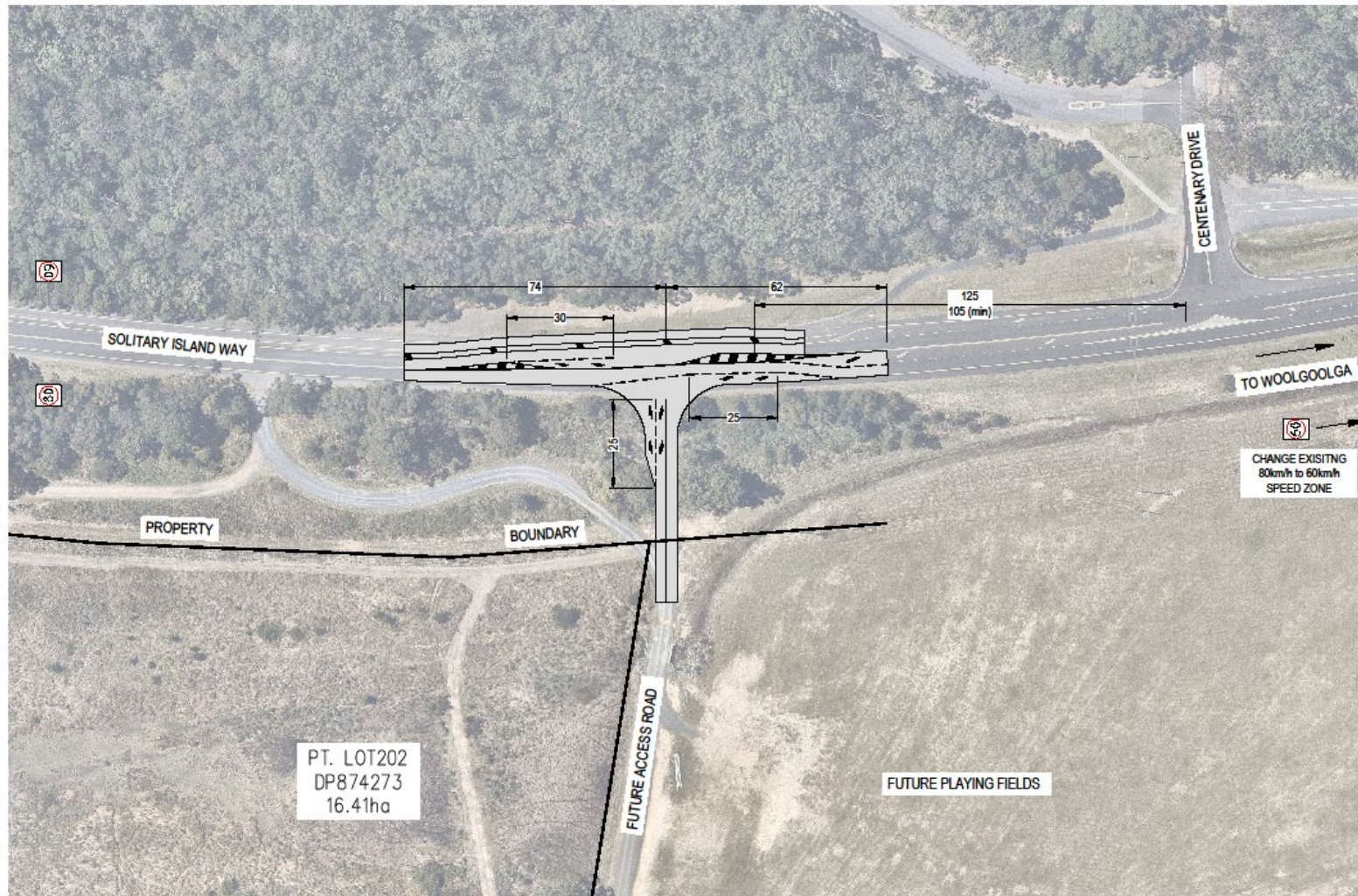
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
		Total veh/h	HV %				Vehicles veh	Distance m				
South: Solitary Islands Way												
1	L2	48	0.0	0.026	5.5	LOS A	0.0	0.0	0.00	0.58	49.1	
2	T1	463	3.0	0.242	0.0	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		512	2.7	0.242	0.5	NA	0.0	0.0	0.00	0.05	59.2	
North: Solitary Islands Way												
8	T1	475	3.0	0.248	0.0	LOS A	0.0	0.0	0.00	0.00	59.9	
9	R2	26	0.0	0.014	5.5	LOS A	0.0	0.0	0.00	0.59	49.0	
Approach		501	2.8	0.248	0.3	NA	0.0	0.0	0.00	0.03	59.5	
West: Concept Access Road												
10	L2	123	0.0	0.153	8.1	LOS A	0.6	3.9	0.49	0.74	47.4	
12	R2	213	0.0	0.865	49.1	LOS D	7.0	49.0	0.96	1.47	25.1	
Approach		336	0.0	0.865	34.1	LOS C	7.0	49.0	0.79	1.20	30.4	
All Vehicles		1348	2.1	0.865	8.8	NA	7.0	49.0	0.20	0.33	51.0	

Appendix C – West Woolgoolga Playing Fields Masterplan

Coffs Harbour Sports Facility Plan 2016



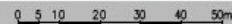
Appendix D – Solitary Islands Way shared intersection concept design



PROJECT: Bark Hut Road

DATE: 29th November 2018
DWG. No. 18065-03

SCALE 1:1000 at A3



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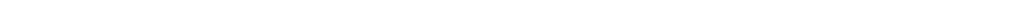
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INTERSECTION PLAN

PT.LOT 202 DP 874273

ANNEXURE
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Appendix I ~ Preliminary Land Contamination Report





Preliminary Site Investigation

Site off Bark Hut Road, Woolgoolga, NSW

Reference No. 30012537-01 Rev2
Prepared for Resource Design and Management
20 December 2018

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SMEC Company Details

Approved by:	Daniel Saunders		
Address:	Level 5, 20 Berry Street, North Sydney, NSW, 2060		
Signature:			
Tel:	02 423 066 956		
Email:	Daniel.Saunders@smec.com	WebSite:	www.smec.com

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Executive Summary

Resource Design and Management are seeking to submit a Development Application to re-zone a parcel of land to carry out residential land development. The parcel of land is situated proximal to the intersection of Bark Hut Road and Solitary Islands Way (Old Pacific Highway), Woolgoolga, NSW (the Site).

Currently the Site is identified as part of Lot 202 DP 874273 (northern portion only) and is zoned as 'Rural Landscape' under Coffs Harbour Local Environment Plan 2013. SMEC understand that the Site is intended for residential development and proposed to be rezoned for this purpose. To assist in the Development Application (DA) for rezoning, SMEC have prepared this Preliminary Site Investigation is required to assess potential contamination issues.

This report presents findings from desktop investigations and a Site inspection undertaken across the Site in November 2018. The scope of the Preliminary Site Investigation is summarised below:

- A desktop review of relevant information, including:
 - Review of published information relating to the Site including geological, acid sulfate soil, hydrogeological, hydrological, soil types, topographical, and/or land use maps State and Local Environmental Planning maps, Heritage mapping and Ecological Constraints mapping
 - Review of historical aerial photographs and mapping
 - Review of historical business activities at the Site
 - Review of NSW Environmental Protection Authority (EPA) contaminated land and POEO licence online databases
 - Search of nearby registered groundwater bores.
- A Site walkover by an experienced environmental scientist to identify potentially contaminating activities and adjoining sensitive receptors.
- A Site interview was carried out with a neighbouring landowner who was familiar with the Site.
- Preparation of this report presenting the findings of this PSI and conclusion with respect to the objectives in Section 1.2.

Key findings of the Preliminary Site Investigation are summarised below:

Prior to 1942, historical mapping showed the Site to comprise 'scattered timber' or 'camouflage cover or medium timber'. Since 1956, historical aerial photography shows most of the Site to comprise what appears to be natural woodland like that of the surrounding area. Some land clearing is apparent in the central and south-east portions, possibly associated with the drainage lines and eroded soil landscapes. Between 1964 to 1974, the remnant trees and vegetation appear to have undergone periods of clearing and a possible earthen dam appears to intercept drainage line. Since that time, the Site appears to have remained unused or rural grazing pastures until the present day with minor alterations including the formation of onsite access tracks.

Three areas of environmental concern (AEC) have been identified within or proximal to the Site, including:

- AEC 1 – Site wide application of herbicides and pesticides for crop growing
- AEC 2 – Site wide and localised occurrence of fill and/or unauthorised wastes (where observed)
- AEC 3 – Off-site possible application of herbicides and/or pesticides

The analytical results of the limited intrusive soil investigation indicate that there were no exceedances of adopted assessment criteria. SMEC considers that there is a low potential for soil contamination to be present at the Site within the identified AECs (refer to Figure 4, Appendix A).

SMEC recommend that an Unexpected Finds Protocol be developed prior to the commencement of site construction activities. The purpose of the Unexpected Finds Protocol will be to provide a structured approach to the management of unexpected finds of contamination during the construction activities. This could be prepared as part of the Contractor's Construction Environmental Management Plan, or equivalent. Additional sampling and testing may be required at construction stages based on unexpected finds.

It should be noted that if excavated material is proposed to be taken offsite for disposal to a licensed landfill facility, soil will require sampling and testing for waste classification prior to disposal in accordance with the NSW EPA *Waste Classification Guidelines* (November 2014). If contamination is observed/detected during this testing, it is also recommended that the underlying soils are assessed through validation sampling.

1 Introduction

1.1 General

Resource Design and Management Pty Ltd are seeking to submit a Development Application to re-zone a parcel of land to carry out residential land development. The parcel of land is situated proximal to the intersection of Bark Hut Road and Solitary Islands Way (Old Pacific Highway), Woolgoolga, NSW (the Site).

Currently the Site is identified as part of Lot 202 DP 874273 (northern portion only) and is zoned as 'Rural Landscape' under Coffs Harbour Local Environment Plan 2013. SMEC understand that the Site is intended for residential development and proposed to be rezoned for this purpose. To assist in the Development Application (DA) for rezoning, SMEC have prepared this Preliminary Site Investigation is required to assess potential contamination issues.

1.2 Objectives

The objectives of the Preliminary Site Investigation (PSI) are to:

- Assess the likelihood for contamination to be present at the nominated Sites from past or present activities
- Provide recommendations on the need for further investigations.

1.3 Scope of works

To fulfil the above objectives of the PSI, SMEC have undertaken the following scope of work:

- A desktop review of relevant information, including:
 - Review of published information relating to the Site including geological, acid sulfate soil, hydrogeological, hydrological, soil types, topographical, and/or land use maps, State and Local Environmental Planning maps, Heritage mapping and Ecological Constraints mapping
 - Review of historical aerial photographs and mapping
 - Review of historical business activities at the Site
 - Review of NSW Environmental Protection Authority (EPA) contaminated land and POEO licence online databases
 - Search of nearby registered groundwater bores
- A Site walkover by an experienced environmental scientist to identify potentially contaminating activities and adjoining sensitive receptors.
- A Site interview was carried out with a neighbouring landowner who was familiar with the Site.
- Preparation of this report presenting the findings of this PSI and conclusion with respect to the objectives in Section 1.2

It is noted that no previous environmental reports (if any) were made available at the time of this assessment.

1.4 Published guidelines

The assessment has been undertaken in general accordance with applicable guidelines including:

- National Environment Protection Council, National Environmental Protection (Assessment of Site Contamination) Measure, 2013
- NSW EPA, Guidelines for the NSW Site Auditor Scheme (3rd edition), 2017
- NSW Office of Environment and Heritage, Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites, 1997 (reprinted 2011)
- State Environmental Planning Policy No.55 - Contaminated Land, 1998

2 Site Information

2.1 Site description and zoning

Table 1 Site description and zoning

ASPECT	DESCRIPTION
Title Identifier	Part Lot 202 DP874273 (Northern portion only)
Address	Site proximal to the intersection of Bark Hut Road and Solitary Islands Way (Old Pacific Highway), Woolgoolga, NSW
Area	An irregular shaped parcel of land approximately 16.6 ha. Figure 1 Appendix A shows the Site layout.
Zoning	The Site is currently characterised as 'Rural Landscape' (Coffs Harbour Local Environmental Plan, 2013). The Site is listed as a State Environmental Planning Policy Strategic Land Use Area for Future Residential Growth.
Current Land use	The Site's current land use is characterised as 'Grazing, native vegetation' (ALUM, Office of Environment and Heritage, 2007)
Proposed land use	SMEC understand that the proposed land use is for a residential development
Surrounding land use	The Site is presently surrounded by: North: Bark Hut Road is adjacent the Site's northern boundary. Bark Hut Road follows a ridge line. An area of agricultural land use is located beyond Bark Hut Road to the north. South: The area immediately to the south of the Site is vacant, unused land zoned as 'Public Recreation' land (Coffs Harbour Environmental Plan, 2013). Recent aerial photography indicates that the land to the south has been built up with imported soils. East: Solitary Islands Way is orientated parallel with the Site's eastern boundary. Woolgoolga High School is located approximately 150m to the east of the Site. West: An area of residential land use is located to the west

2.2 Topography and landforms

The Site slopes to the south and southeast downward from an approximate elevation of 30m AHD in the north to approximately 10m AHD in the south-east. The north-western corner of the site appears to be a local rise within a ridgeline, oriented east-west along Bark Hut Road.

Figure 1, Appendix A shows the topography across the Site.

2.3 Vegetation

The Site comprises a dense area of woodland within the north-west portion as well as sporadic pockets of trees across the entire Site. These trees are described as *Eucalyptus Grandis* (Fisher, 1996).

2.4 Regional geology

Reference to the 1:250,000 Dorrigo-Coffs Harbour Geological Series maps shows the Site is underlain by the Coramba Beds comprising lithofeldspathic wacke, minor siltstone, siliceous siltstone, mudstone, metabasalt, chert and jasper, rare calcareous siltstone and felsic volcanics.

A narrow band of alluvial fan deposits are present from the middle of the Site to the south eastern corner. These deposits comprise fluviially deposited quartz-lithic sand, silt, gravel and clay.

Figure 2 Appendix A shows the regional geology mapping beneath the Site.

2.5 Regional lithology

Reference to the NSW OEH (website) eSPADE online interactive mapping tool, indicates that:

- The project Site is situated on 'Megan' soils
- Landscape consists of rolling low hills, slopes typically 5-20%.
- Soils are typically moderately deep to deep (>100cm), well drained structured Red Earths, Brown Earths and Red and Brown Podzolic Soils.
- Soil type qualities and limitations:
 - Strongly acid, stony soils of high erodibility, aluminium toxicity potential and low subsoil fertility. Steep slopes (localised), mass movement hazards (localised); high water erosion hazard (localised), foundation hazard (localised).
 - Typical land uses for this soil type includes banana plantations, urban developments and grazing pastures.

Further information on the Megan soils is presented within Appendix B .

2.6 Hydrology and hydrogeology

Site drainage is expected to follow an unnamed drainage line which appears to flow south and south-east across the Site, exiting in the south-east corner. This drainage line converges with a second unnamed drainage line off-Site near Woolgoolga High School before discharging into Woolgoolga Lake some 800m south-east of the Site.

Site drainage does not appear to interact with Poundyard Creek and a large unnamed detention pond, located approximately 170m and 570m south of the Site, respectively.

There are 10 registered groundwater bores located within a 500m radius of the Site. Details of registered groundwater bores are presented within Table 3 below:

Table 2 Summary of registered groundwater bores proximal to the Site

BOREHOLE ID	AUTHORISED PURPOSE	DRILLED DEPTH (M BGL)	STANDING WATER LEVEL (M BGL)	YIELD (L/S)	DISTANCE AND DIRECTION FROM SITE
GW302448	Domestic	42.0	Unknown	Unknown	65m (N)
GW302452	Domestic Stock	61.0	Unknown	Unknown	210m (SW)
GW302453	Domestic Stock	120.0	Unknown	Unknown	230m (SW)
GW304272	Domestic	48.0	18.0	0.69	270m (NW)
GW073243	Domestic Stock	53.0	10.0	0.61	270m (W)
GW300594	Domestic Stock	38.0	4.0	0.61	295m (SW)
GW065654	Domestic Stock	40.0	9.0	0.10	295m (SW)
GW300270	Domestic	73.0	9.0	0.19	355m (NW)
GW300031	Irrigation, Recreation (groundwater)	31.0	4.0	2.59	465m (NW)
GW063941	Domestic	31.0	Unknown	Unknown	500m (S)

m BGL = metres below ground level
L/S = litres per second

2.7 Acid Sulfate Soil risk

A review of the Acid Sulfate Soils risks maps (viewed online via the NSW OEH eSPADE online interactive mapping tool) indicates that a small area (approximately 0.2 ha) within the south eastern portion of the Site is located over the edge of an alluvial plain where there is a 'Low Probability' of Acid Sulfate Soils (ASS) to occur '>3m below the ground surface' (or in other words, ground surface elevation is more than 4m above Australian Height Datum).

The remainder of the Site is not mapped within an area of Acid Sulfate Soils occurrence.

Figure 2 Appendix A includes the Acid Sulfate Soil Risk Mapping for the Site.

Additional information in relation to the likelihood of Acid Sulfate Soils at the Site is presented in a Geotechnical Investigation report, separate to this report.

3 Site history and observations

3.1 General

Site history information was compiled based on a review of the following information sources:

- Review of historical aerial photography (1956, 1964, 1974, 1984, 1994, 2001, 2011 and 2018)
- Review of available historical mapping (1942, 1974)
- A search of historical business activities listings
- A search of NSW EPA Contaminated Land and POEO licence records.

A Site inspection was carried out by an experienced environmental scientist from SMEC to make Site observations and confirm Site history information. A Site interview was carried out with a neighbouring landowner who was familiar with the Site.

3.2 Historical aerial photography

Historical aerial photographs obtained and reviewed as part of this PSI are represented within Figure 3, Appendix A. Site features and surrounding Site conditions from the period of 1956 to 2018 are summarised in Table 4:

Table 3 Summary of Historical Aerial Photography

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
Aerial Photo 1956 Black and white	<p>Onsite: Most of the Site appears to be covered by dense vegetation. The vegetation appears to comprise natural woodland like that of the surrounding area. The central eastern and south-eastern portions of the Site appear to be partially cleared land, noting this appears to correspond with alluvial fan deposits and site drainage lines (refer to Section 2.4). This area appears to have sparse vegetation and potentially eroded landscape.</p> <p>Offsite: The vegetation appears to comprise natural woodland, particularly to the north and west. Parcels of land immediately north of Bark Hut Road and approximately 100m west of the Site appears to have been cleared of trees and is being used for crop growing*. Two rectangular structures (possible residential dwellings / sheds) are located north of Bark Hut Road. Land to the south of the Site has been partially cleared, possibly for grazing or for crop growing</p>
Aerial Photo 1964 Black and white	<p>Onsite: The Site remains largely unchanged since 1956 aside from some apparent tree clearing within the western portion of the Site.</p> <p>Offsite: The surrounding areas appear largely unchanged since 1956 with some exceptions. Additional rectangular structures appear to have been constructed on the parcel of land immediately north of Bark Hut Road. The area to the west used for crop growing appears to have expanded; the eastern extent of this crop growing land is now approximately 25m west of the Site. Some additional tree clearing appears to have been undertaken approximately 300m south-west of the Site.</p>
Aerial Photo 1974 Black and white	<p>Onsite: The Site appears to have been almost totally cleared of trees and other vegetation aside from sparse patches within the north-west and north-east. Site drainage lines appear to begin within the central portion of the Site and extend towards the south-east corner of the Site. A possible earthen dam appears to intercept drainage near the southern boundary. Potential scour and erosion scarring can be seen.</p> <p>Offsite: Much of woodland to the north, west and south of the Site appears to have been cleared, only sporadic patches remain. A large earthen dam appears approximately 500m to the south of the Site.</p>
Aerial Photo 1984	<p>This aerial photo was noted to have poor resolution.</p> <p>Onsite: The Site remains largely unchanged since 1974 aerial photograph.</p>

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
Black and white	<p>Offsite: Multiple residential dwellings appear to have been constructed offsite to the west. A small parcel of land approximately 300m to the south of the Site appears to be being used to grow an unknown crop type.</p> <p>Several structures/ buildings possibly associated with Woolgoolga High School have been constructed since 1974 beyond Solitary Islands Way approximately 200m east of the Site.</p> <p>It appears that a crop growing* is being grown immediately north of Bark Hut Road approximately 20m north of the Site. A private dam has been constructed approximately 150m north of the Site beyond Bark Hut Road.</p>
Aerial Photo 1994 Colour	<p>Onsite: The Site remains largely unchanged since 1974 aerial photograph aside from some apparent tree clearing along the northern Site boundary and north-west corner of the Site.</p> <p>Offsite: Additional residential dwellings have been constructed offsite to the west. The crop growing* area located approximately 300m to the south of the Site has expanded since 1984.</p>
Aerial Photo 2001 Colour	<p>Onsite: Two vehicle trackways, one orientated north-south and one orientated east-west dissect the Site. No further tree/vegetation clearance appears to have occurred since 1994.</p> <p>Offsite: A series of trackways cross each other in a grid pattern on the parcel of land immediately offsite to the south.</p>
Aerial Photo 2011 Colour	<p>Onsite: Only the east west orientated vehicle trackway is visible on the aerial photograph.</p> <p>Offsite: The parcel of land immediately north of Bark Hut Road appears to be being utilised for crop growing*, however, the crops appear to either be undercover or contained within elongated greenhouses.</p>
Aerial Photo 2018 Colour	<p>Onsite: Additional vehicle trackways are present onsite, one of which extends along the length of the northern, eastern and western boundary, another dissects the south-west corner of the Site.</p> <p>Offsite: Land immediately to the south of the Site was cleared of vegetation and imported soils were placed onto the land circa 2013. Additional soils appear to have been imported and placed on this land from 2016 to the present day.</p>
<p>*Crop growing types in areas surrounding the Site remain unknown. Anecdotal information suggests a former banana farm on the property north of Bark Hut Road (refer to Section 3.7).</p>	

3.3 Historical mapping and records

Site features and surrounding Site conditions from available Historical Mapping (1942 and 1974) are summarised in Table 5 below.

Table 4 Summary of Historical Mapping

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
Historical Mapping 1942	<p>The historical mapping shows various topographic features associated with the regions agricultural / rural landuse. The Site is mapped within an area identified as ‘scattered timber’ or ‘camouflage cover or medium timber.’</p> <p>In offsite areas, it is noteworthy that two banana plantations are identified on the map, located approximately 1km east and 1.5km south of the Site respectively. Banana plantations are considered a potentially contaminating activity that is common to the Woolgoolga region.</p>
Historical Mapping 1974	<p>The historical map indicates that the northern portion of the Site comprises ‘dense woodland’. An unnamed drainage line is shown to dissect the Site, originating within the middle portion and exiting the Site along the southern Site boundary (similar to topographic mapping).</p>

A review of Historical Business Directory records from 1950, 1961 and 1970 (Universal Business Directories, 2018) has been undertaken. There do not appear to be any businesses registered to the Site or nearby surrounding areas during these periods.

3.4 NSW EPA online searches

3.4.1 Contaminated Land database

A search of the NSW EPA Contaminated Land database was carried out on 21 November 2018. The search indicated one notification of the United Petroleum Service Station is located approximately 860m south-east of the Site. The EPA has completed an assessment of the contamination at the Site and decided that regulation under the Contaminated Land Management Act 1997 is not required. The location of this service station is unlikely to impact the Site.

3.4.2 Protection of the Environment Operations (POEO) Licences database

A search of NSW EPA currently and formerly licensed activities under the Protection of the Environment Operations Act (POEO) 1997 was carried out on 21 November 2018. A summary of these activities and locations is presented in Table 6. The relative proximity if these activities are unlikely to impact the Site.

Table 5 Summary of POEO database search

LICENCE NO.	NAME	LOCATION (PROXIMITY TO SITE)	LICENCE STATUS	ACTIVITY TYPE
13278	Fulton Hogan Construction PTY Ltd	Pacific Highway Sapphire to Woolgoolga Upgrade (907m south-west of Site)	Surrendered	Crushing, grinding or separating, land based extractive activity, road construction
4017	Forestry Corporation of New South Wales	Approximately 1.2 km south-west of the Site	Current	Logging operations
20590	OHL Construction Pacific Pty Ltd	Approximately 2km south-west of the Site	Current	Crushing, grinding or separating, land-based extractive activity, road Construction.
4653 and 6630	Luhrmann Environment Management Pty Ltd/Robert Orchard/Sydney Weed and Pest Management Pty Ltd	NSW waterways*, including stormwater drainage lines	Surrendered on 20 November 2014	Application of Herbicides

* SMEC consider a low potential for this licenced activity to have occurred at the Site noting the scale of this licence applies to all of NSW waterways.

3.5 Site history summary

Prior to 1942, historical mapping showed the Site to comprise 'scattered timber' or 'camouflage cover or medium timber'. Since 1956, historical aerial photography shows most of the Site to comprise what appears to be natural woodland like that of the surrounding area. Some land clearing is apparent in the central and south-east portions, possibly associated with the drainage lines and eroded soil landscapes. Between 1964 to 1974, the remnant trees and vegetation appear to have undergone periods of clearing and a possible earthen dam appears to intercept drainage line. Since that time, the Site appears to have remained unused or rural grazing pastures until the present day with minor alterations including the formation of onsite access tracks.

3.6 Site observations

A SMEC Associate Environmental Scientist (Ms Sarah Viney) attended the Site to make site observations on 23 November 2018. Site observations were made via accessible trackways and trails allowing for broad Site viewing. Site

observations of the ground surface could not occur in all areas due to property size and presence of vegetation. Selected site photographs are included below, and the following relevant observations were made for this PSI

- The northern portion of the Site slopes moderately toward the south before levelling off within the southern portion (Photograph 1)
- Site is vegetated with shrubs and grasses. Native woodland vegetation was observed within the north-west portion of the Site and within remnant stands across the Site. Evidence of clearing activities was noted with stockpiles of timber (Photograph 6)
- Multiple unsealed access tracks cross the Site (Photograph 7)
- Some unauthorised dumping of waste/ fill stockpiles was noted along northern and eastern boundaries adjacent to Bark Hut Road and Solitary Islands Way. Areas are shown on Figure 4, Appendix A. Wastes observed included plastic household rubbish, fence posts, pumping hose, and rusted metal (Photograph 4 and Photograph 5)
- South west portion of Site is low lying and 'boggy' terrain with reeds (Photograph 3 and Photograph 8)
- Fence lines were noted along the northern, western and eastern boundaries. No fence line present along southern boundary of the Site.

In addition to this Senior Geotechnical Engineer Mark Maharaj attended site on 18 December 2018. Key findings of this inspection included identification of an inferred excavation area and subsequent capping with shallow fill in the south-west of the site.

3.7 Site interview

A SMEC Senior Geotechnical Engineer (Mr Mark Maharaj) conducted a site interview on the 18 December 2018 with the owner of a neighbouring property to the north of Bark Hut Road. Key findings of the interview indicate that:

- The neighbouring property owner was familiar with the Site for the past 30 years. The Site was not known to have any crops during this period. A bulldozer was previously noted on the Site possibly associated with dam construction. There were no observations to indicate that illegal fly tipping or waste disposal historically occurred at the Site.
- The property to the north of Bark Hut Road was previously utilised as a banana farm. Whilst not witnessed, the farm owner indicated this property would have been subject to pesticide application in the past and referred to a 'Farming management plan' being in place, possibly associated with this activity. The farm owner now grows blueberry, chilli and okra, with separate leased areas being used for cucumber and beans.
- Pesticide application methods remain unknown, noting there is potential that aerial spraying could result in pesticide residues to drift onto the investigation Site.



Photograph 1: Looking south from northern portion of Site



Photograph 2: Looking north-west from south-western portion of the Site



Photograph 3: Looking north-east from the southern portion of the Site.



Photograph 4: Scrap metal located near the eastern Site boundary within north-western portion of Site. Potentially indicative of buried fill within this area.



Photograph 5: Evidence of unauthorised dumping of wastes / fill stockpiles located within north-east corner of Site



Photograph 6: Timber stockpile within central northern portion of Site



Photograph 7: View south from western access track



Photograph 8: Looking north from southern access track

4 Areas of Environmental Concern

4.1 Potential Sources of Contamination

Based on the Site history, observations made during the Site inspection, and site interview with a neighbouring property owner the following activities have been identified as potential sources of contamination at the Site:

- Application of herbicides and pesticides associated with crop growing activities
- Unauthorised dumping of wastes along roadside areas and site trails
- Placement of fill of unknown origin and quality.

4.2 Areas of Environmental Concern and Contaminants of potential Concern

Three potential areas of environmental concern (AEC) were assessed at the Site. A summary of AECs and associated contaminants of potential concern (CoPCs) are summarised within Table 6. A preliminary assessment of the likelihood for contamination to be present within each AEC was based on desktop information, Site observations and experience on similar Sites.

Figure 4, Appendix A includes the location of AECs assessed within this Preliminary Site investigation.

Table 6 Summary of identified AECs

AEC NO.	POTENTIAL AECs	POTENTIALLY CONTAMINATING ACTIVITY	CoPCs	LIKELIHOOD OF POTENTIAL CONTAMINATION* (LOW, MODERATE, HIGH)
AEC 1	Site wide	Site wide application of herbicides/pesticides for crop growing	Herbicides, pesticides, arsenic	Low – Historical aerial photographs suggest rural landuse with potential for grazing pastures. Crop growing noted in surrounding properties. A low likelihood of potential contamination remains due to limited information on previous rural landuse.
AEC 2	Site wide and localised occurrences of filling and/or unauthorised wastes (where observed)	Site wide and localised occurrence of fill (proximal to northern and eastern and south western boundaries).	Heavy metals, PAHs, TPH, BTEX, PCB, OCP, OPP, Phenols, asbestos	Low to moderate – Moderate likelihood in areas where unauthorised wastes/fill stockpiles were observed. Low likelihood remains across remainder of Site where observations of ground surface are limited by vegetation cover. Site interview with neighbouring property owner did not indicate there was illegal fly tipping or waste dumping on the property.
AEC 3 (Offsite)	Offsite nearby crop growing (north and west of Site)	Possible application of herbicides and pesticides associated with crop growing activities	Herbicides, pesticides, arsenic	Low – Unknown crop growing activities in nearby offsite areas have the potential to include banana plantations, common within this region of NSW. Site interview with neighbouring property owner indicated former banana farm on property to the north of Bark Hut Road. Pesticide application is likely in these areas; however, application methods and farming practices are unknown. There remains a low likelihood for onsite impacts noting site topography could receive surface water runoff from properties to the west only. Properties to the north of Bark Hut Road are sloped away from the Site.

* This is a qualitative assessment of the potential for contamination to be present within the AEC, not the impact (financial or other) associated with the contamination (if present)

5 Conceptual site model

5.1 Conceptual site model overview

A preliminary Conceptual Site Model (CSM) has been prepared which presents potential source(s), pathway(s) and ecological/human receptor(s) linkages. Potential source(s), pathway(s) and ecological/human receptor(s) were identified during the PSI. The preliminary CSM should form the basis for decisions regarding the scope of works for further assessment and the ongoing contamination management and remediation options.

The CSM is made up of contaminants of potential concern (CoPC) and receptors that could be exposed to the CoPC.

5.2 Sources

The potential contamination sources are the AECs as summarised in Table 6 in Section 4.

Contaminants of potential concern include:

- Herbicides (phenoxy acid)
- Organochlorine / Organophosphorus pesticides (OC/OPP)
- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn)
- Polycyclic aromatic hydrocarbons (PAHs) / Phenols
- Total recoverable hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX)
- Asbestos (presence/absence)

5.3 Exposure pathways

The pathways of exposure consist of:

- A transport mechanism
- A route of exposure.

Based on site information, there is potential for the following contamination pathways to exist at the site:

- Disturbance of potential soil contamination and exposure by ingestion, dermal contact or inhalation
- Air transport of particulates (dust) and exposure by inhalation
- Migration of contaminated run-off and exposure to ecological receptors (aquatic ecosystems)

5.4 Potential receptors

5.4.1 Human receptors

Based on the information available, potential human receptors have been assessed to include:

- Future Site residents, visitors and workers
- Site workers during future construction works or maintenance activities
- Surrounding residential/rural site occupants and workers.

5.4.2 Ecological receptors

The current ecological receptors are native and exotic vegetation species.

Based on the proposed residential land zoning, the site could potentially be used as a growing medium or be accessible to ecological receptors. If soils are contaminated where there could be leaching into groundwater or migration to surface water, then aquatic receptors in the nearest surface water receptor would need to be considered.

5.4.3 Potential source-pathway-receptor linkages

Potential source-pathway-receptor (S-P-R) linkages are where soil, surface water and/or groundwater contamination (if present) has the potential for adverse impact on human health or ecological values for the Site via complete exposure pathways. Limited details were available at the time of this PSI as to the proposed residential development. Table 7 summarises the plausible source-pathway-receptor linkages for each of the identified human and ecologically sensitive receptors.

Table 7 Potential S-P-R Linkages

SOURCE	CoPCs	PATHWAY	RECEPTOR
AEC 1 and AEC 2 – Onsite contamination in topsoil and/or fill soils to be disturbed during construction at the Site	Topsoil: Herbicides, pesticides, arsenic Fill: Heavy metals, PAHs, TPH, BTEX, PCB, OCP, OPP, Phenols, asbestos	Dermal Contact. Oral Ingestion of Potentially Contaminated Soil Migration of contaminated dust Migration of contaminated runoff (soil or water)	Future Site residents at soil reuse location Site workers during future construction works and maintenance activities Surrounding residential/rural site occupants and workers Aquatic ecosystems in surface water receptors adjacent to soil disposal location
AEC 3 (offsite) – Offsite contamination in surface water / sediment runoff or air drift migrating onto to Site	Topsoil: Herbicides, pesticides, arsenic	Migration of contaminated dust/residues from aerial spraying Migration of contaminated runoff (soil or water)	Future Site residents at soil reuse location Site workers during future construction works and maintenance activities. Surrounding residential/rural site occupants and workers Aquatic ecosystems in surface water receptors adjacent to soil disposal location

5.4.4 Site history data gaps

Data gaps were noted including:

- The proposed development details were not supplied at the time of this PSI.
- Limited information of previous rural activities at the Site and surrounding areas. Aerial photographs suggest the potential for onsite pasture grazing at the Site and crop growing (unknown crop type) in nearby properties surrounding the Site.
- Additional anecdotal information obtained during Site interviews with a neighbouring property owner, indicates a former banana farm to the north of Bark Hut Road. There remains potential for pesticide application to have occurred in offsite areas, although methods of application and farming management practices remain unknown.
- Section 10.7 (5) planning certificates were not made available or reviewed as part of this PSI. Planning certificates contain information around various environmental constraints including potential contamination.
- No previous environmental reports or assessments were known or made available for review during this PSI. If required by the proposed development, the findings of further studies (including site history) carried out may be of relevance to this PSI.

SMEC consider the above data gaps may be addressed through a limited soil sampling and analysis carried out within the following sections of this PSI.

6 Sampling and Analysis Plan

The data quality objectives (DQO) in Table 8 were developed for this project and are based on the requirements detailed in ASC NEPM (2013 as amended). The sampling and analysis schedule completed for this project is described in Table 8 below. Sampling locations are shown on Figure 5, Appendix A.

Table 8 Data Quality Objectives

STEP	TASKS
Step 1 State the problem	<p>The primary objectives of the assessment programs were to:</p> <ul style="list-style-type: none"> Assess the potential for soil contamination to be present at the nominated site Provide recommendations on the need for further investigations and/or management. <p>The main problems are:</p> <ul style="list-style-type: none"> How many samples should be collected? What media should be sampled? What sample layout should be used to achieve the above objectives? What analytes should be tested?
Step 2 Identify the decisions / goal of the study	<p>The key decisions to be made include:</p> <ul style="list-style-type: none"> Is contamination likely to be present the Site that would pose a risk to future receptors of the proposed development? If so, what additional investigation/management or remediation is required to further assess these risks? Based on the results of the preliminary investigation, will other media (soil, groundwater, surface water) require assessment?
Step 3 Identify information inputs	<ul style="list-style-type: none"> A review of site history information undertaken at the Site; Field observations, PID screening results, soil laboratory results; Applicable NSW EPA endorsed guidelines.
Step 4 Define the study boundaries	<p>The study boundary is the defined by the boundary of the site, as shown on Figure 1, Appendix A. Vertically, the study boundary is defined by the depth of fill, which is expected to be less than 1m.</p>
Step 5 Develop the analytical approach (decision rule)	<p>The decision rule for soil will be as follows:</p> <ul style="list-style-type: none"> A data validation assessment will be carried out for all data collected with respect to quality assurance and quality control (QA/QC) and conclude if the data collected is useable, partially useable with some limitations, or unusable in forming conclusions to the assessment. Where contaminant concentrations for each sample are below the investigation levels then no action will be required with respect to that contaminant or area; Where contaminant concentrations are reported to exceed the investigation levels, additional assessment or remediation or management will be required.
Step 6 Specify performance or acceptance criteria	<p>We have assumed the following to be true in the absence of contrary evidence (i.e. the null hypothesis):</p> <ul style="list-style-type: none"> Contamination at the Site currently poses a potential risk to human and environmental receptors. <p>The possibility exists of making the following decision errors based on the data obtained during this investigation:</p>

STEP	TASKS
	<ul style="list-style-type: none"> • Type 1 error – Deciding the above null hypothesis is false, when it is true. • Type 2 error – Deciding the above null hypothesis is true, when it is false. <p>The consequence of making a Type 1 error is more detrimental as it can result in adverse consequences or may include material impact to human and environmental health. The consequence of making a Type 2 error may result in ‘over-conservatism’ and unnecessary expense of conceptual remediation options and capping design.</p> <p>The potential for decision errors will be minimised by completing a robust QA/QC program and by completing an investigation that has an appropriate sampling and analytical density for the purposes of the investigation.</p>
<p>Step 7</p> <p>Optimise the design for obtaining data</p>	<p>Preliminary soil sampling was proposed to assess the likelihood for contamination at the Site within the contamination sources identified. Based on site history information, detailed site investigations involving systematic (grid-based) soil sampling, groundwater and/or surface water sampling were not required at this stage.</p> <p>The following sampling design was adopted:</p> <ul style="list-style-type: none"> • A total of 12 soil sampling locations (designated TP01 to TP12) as shown on Figure 5, Appendix A. Considering the Site area, this number of test pits is considered to provide a broad spatial coverage to gain an appreciation of the soil conditions of these areas. This limited number of sampling locations have been positioned judgmentally to target accessible areas of the Site. Soil contaminant concentrations may vary in other unassessed portions of the Site. • Soil samples for contamination were collected within near surface soil (less than 0.1m), within drainage lines/sediments, fill materials and past the depth of contamination (if and where observed). The sampling and analysis schedule completed for this project is described in Section 8 below. • Soil headspace screening was carried out using a calibrated Photo-ionisation detector to check for presence of volatile contamination (if any) • A SMEC experienced environmental scientist reviewed logs of the subsurface conditions were reviewed, and discussions were held with field engineers that completed this work. Copies of logs are included within Appendix F . Selected soil samples were then scheduled for analytical testing for the contaminants of potential concern (CoPCs).

7 Assessment Criteria

7.1 General

Evaluation against assessment criteria is used to identify levels of contamination that may pose ecological or health risks to potential receptors or future users of the site.

The National Environment Protection (Assessment of Site Contamination) Measure (NEPM) was first published in 1999 and updated in 2013 by the National Environment Protection Council (NEPC) and provides national standards for a variety of environmental issues, including the assessment of site contamination in Schedule B (1) *Guideline on Investigation Levels for Soil and Groundwater*.

The NEPM requires consideration be given to Health-based Investigation Levels (HIL), Health-based Screening Levels (HSL) for petroleum hydrocarbons, Ecological Investigation Levels (EIL), Ecological Screening Levels (ESL) for petroleum hydrocarbons, Management Limits, asbestos criteria and aesthetic issues. The following section outlines the rationale for the selection of the appropriate levels for this PSI.

Adopted assessment criteria thresholds are shown on data summary tables presented in Appendix D The adopted soil assessment criteria for this investigation were:

Health based criteria

- NEPM 2013 Table 1A (1) Health-based investigation level (HIL A – Residential)
- NEPM 2013 Table 1A (3) Health-based screening level for Vapour Intrusion (HSL A and HSL B Low-high density residential 0-<1m)
- CRC Care 2011 Table 4 Health-based screening level for Direct contact (HSL A Residential low density)
- CRC Care 2011 Table B4 Health-based screening level for Direct contact (HSL B Residential high density)
- CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m
- NEPM 2013 Table 1B (7) Management Limits (Residential, parkland and public open space-coarse texture).

Ecological based criteria

- NEPM 2013 Table 1B (5) and Table 1B (6) Generic Ecological Investigation / Screening Levels (EILs – Urban Residential and public open space)
- NEPM 2009 – Schedule B(1) Generic EILs for metals. *Note: The NEPM 2013 Table 1B (1) to Table 1B (4) provides values for site-specific Ecological Investigation Levels (EILs – Urban Residential and public open space) for soil physical-chemical parameters. These were not derived for this assessment.*

7.2 Health Investigation Levels (HILs) and Health Screening Levels (HSLs)

Health investigation levels (HIL) are scientifically based, generic assessment criteria designed to be used in the first stage (Tier 1 or 'screening') of an assessment of potential risks to human health from chronic exposure to contaminants. Soil HILs apply to the first three metres below the surface for residential use. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use settings:

- HIL A – residential with garden/accessible soil (home grown produce <10 per cent fruit and vegetable intake, (no poultry), also includes children's day care centres, preschools and primary schools)
- HIL B – residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats
- HIL C – public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate
- HIL D – commercial/industrial such as shops, offices, factories and industrial sites.

The relevance of Health Screening Levels (HSLs) depends upon potential petroleum hydrocarbon contamination. HSLs also consider vapour intrusion for chemicals in groundwater, and soil-vapour.

As the land use is proposed to be rezoned to residential development HIL A (residential with garden/accessible soil) criteria is considered appropriate.

For this assessment, we have conservatively assumed a soil type of sand and coarse-grained soils for application of relevant criteria. For application of HSLs, since soils will be disturbed during excavation we have adopted a depth range of 0 to <1m.

7.3 Ecological investigation levels

Ecological investigation levels (EILs) are relevant where ecological receptors are likely to be present and exposure pathways are complete. As presented in Appendix D, Analytical results were compared with the NEPM (2013) Generic Ecological Investigation Levels (EILs) to determine potential risks to current and future ecological receptors at the site for select analytes (As, DDT, lead and Naphthalene). For other analytes (including Cu, Cr, Ni and Zn) the EIL values rely on site-specific inputs and calculations which have been calculated using the NEPM (2013) ASC Toolbox. As this is a preliminary, SMEC adopted the NEPM (2009) Schedule B1 Generic EILs for these metals as preliminary screening criteria.

7.4 Asbestos Criteria

The adopted site screening level in accordance with NEPM (2013) includes no visible asbestos for surface soil. There is potential for asbestos containing materials (ACM) is identified on the ground surface or in fill material. To verify the presence of asbestos, selected samples of fill and topsoil materials were tested for asbestos presence/absence. If asbestos is present, then a further assessment was required to quantify the risks in NEPM (2013). If asbestos is absent, then a low potential for asbestos contamination may be assessed.

7.5 Management Limits

Management Limits have been considered as investigation levels. The purpose of these is to avoid or minimise potential effects of petroleum hydrocarbons. The ASC NEPM Schedule B (1) identifies these effects as:

- Formation of observable LNAPL
- Fire and explosive hazards; and
- Effects on buried infrastructure.

8 Environmental Field Investigation

8.1 Field Sampling

Soil sampling was undertaken at a total of 12 test pits (designated TP01 to TP12) as shown on Figure 5, Appendix A . Test pits were excavated with a 3.5 tonne excavator with a 300mm toothed bucket. Test pit locations were excavated to depths ranging from surface to 3.0m and were extended past the base of the fill into natural soils or practical refusal, whichever occurred first.

Soil sampling was carried out during excavation of geotechnical test pits by a SMEC Senior geotechnical engineer (Mr Mark Maharaj), who is trained and experienced in environmental soil sampling. Sampling was conducted to the rationale in Section 6. Soil types were logged in general accordance with Australian Standards. Descriptions included soil type (using the unified soil classification system (USCS)) and apparent indicators of contamination such as discolouration, staining or odours.

Each soil sample was collected within clean laboratory-supplied containers. A new pair of nitrile gloves were worn during the collection of each sample and during logging. Samples were collected in duplicate in zip lock bags and screened with a calibrated photo-ionisation detector (PID). Field quality control is discussed further in Section 8.3.

8.2 Laboratory Testing

All primary and intra-laboratory duplicate samples were sent to ALS Environmental, Smithfield NSW (primary laboratory). Some samples for asbestos analysis were subcontracted to ASET laboratory for asbestos identification testing. One inter-laboratory duplicate was sent directly to Envirolab Services Pty Ltd, Chatswood NSW (secondary laboratory). All laboratories were NATA accredited for the analyses performed. Laboratory reports with accompanying Chain of Custody (COC) documentation are included within Appendix E . Samples were selected for analysis based on the observations in the field and analysed for the respective CoPC as shown in Table 9 below.

Table 9 Sampling and Analysis Schedule

AEC	DESCRIPTION	NUMBER OF SAMPLING LOCATIONS (IDENTIFIERS)	TESTING SUITE NUMBER OF PRIMARY SAMPLES ANALYSED			
			Herbicides (phenoxy acid)	Pesticides (OCP / OPP)	Heavy metals	TRH, BTEX, PAH/Phenols, PCB and asbestos
AEC 1	Site wide	12 (TP01 to TP12)	12	12	12	-
AEC 2	Site wide and localised occurrences of filling and/or unauthorised wastes (where observed)	4 (TP01, TP09 and TP11 and TP12)	-	-	3	6
AEC 3 (Offsite)	Offsite nearby crop growing (north and west of Site)	6 (TP01*, TP02*, TP03*, TP04*, TP07 within drainage line, TP08 within low lying soils)* *Analysis already carried out as part of AEC 1	1	1	1	-
Total - Primary samples			13	13	16	6
Total – Field duplicates (intra- or inter-laboratory duplicates)			0	0	2	2

8.3 Quality Assurance and Quality Control

Data Quality Indicators for the project were based on the field and laboratory considerations in NEPM Schedule B2 Appendix B, (NEPC 1999) which include:

- Completeness – a measure of the amount of useable data (expressed as %) from a data collection activity;
- Comparability – the confidence (expressed qualitatively) that data may be equivalent for each sampling and analytical event;
- Representativeness – the confidence (expressed qualitatively) that data are representative of each media present on the site;
- Precision – A quantitative measure of the variability (or reproducibility) of data; and
- Accuracy – a quantitative measure of the closeness of reported data to the true value.

8.3.1 Sample Handling, Storage and Transportation

Sampling was carried out as per SMEC standard operating procedures. Samples were stored in appropriately preserved sample containers provide by the laboratory. All sample jars and bags were immediately placed into an ice-filled chest to maintain the samples below the recommended preservation temperature of less than 6°C for the duration of fieldwork.

All samples were promptly transported to the laboratory with relevant Chain of Custody (COC) documentation within one day of sampling. The COC form was completed with the sample names, sampling date and required analyses.

8.3.2 Laboratories

Primary and secondary samples were submitted to a National Association Testing Authority (NATA) accredited laboratory (ALS Environmental, North Sydney NSW). Analytical methods complied with NEPM and NSW EPA requirements.

The laboratory Certificate of Analysis, Sample Receipt Advice and COC information are provided in Appendix E

8.3.3 Documentation

COC documentation was signed and dated by the laboratories, and laboratory Sample Receipt Advice was provided stating that all samples:

- Were received in good order.
- Were presented in adequate sample containers.
- That all samples submitted for volatiles were correctly contained with no headspace.
- That all samples were labelled appropriately according to current quality field sampling protocols.

The laboratory Sample Receipt Advice/Notifications notes that samples were received with an attempt to chill evident.

The chain of custody and sample receipt are presented in Appendix E

8.3.4 Field duplicates

Two intra-laboratory duplicate samples and one inter-laboratory triplicate sample was analysed. Intra-laboratory samples were analysed with the primary laboratory ALS Environmental and the interlaboratory sample was analysed with the secondary laboratory, Envirolab.

A summary of quality control duplicate samples is presented in Table 10.

Table 10 Quality control duplicate samples

PRIMARY SAMPLE	DUPLICATE SAMPLE	QA SAMPLE LABORATORY
TP02 - 1.0m	QC1	ALS
TP09 – 0.5m	QC2	ALS
TP09-0.5m	QC3	Envirolab*

*Results still pending from laboratory.

Relative percent differences (RPD) were calculated using the method advised in Section 8.2.6 of AS4482.1-2005. RPDs are presented Table D2, Appendix D .Appendix E All RPDs comparison results were within the accepted criteria (that is, less than 50%).

8.4 Laboratory QAQC

8.4.1 Methods

The laboratory used NATA accredited testing procedures. Analytical methods were in accordance with NEPM (2013) testing procedures. An exception was as follows:

- Two soil samples analysed for asbestos (namely TP01-0.1m and TP12-0.1m) where the laboratory was required to sub-sample from a single container. The laboratory indicated that the NATA accreditation does not apply to these samples. The data is considered useable in the context of this preliminary assessment.
- All tests are NATA accredited except for asbestos analysis to a detection limit of 0.001%. NATA News March 2014, p.7, states in relation to AS4964: *“This is a qualitative method with a nominal reporting limit of 0.01%” and that currently in Australia “there is no validated method available for the quantification of asbestos”*. Accordingly, NATA Accreditation does not cover the performance of this service.

8.4.2 Spikes, blanks and duplicates

All of the blanks, matrix spikes, surrogate spikes, laboratory control samples and duplicates conducted by the analysing laboratories were within accepted criteria.

8.4.3 QA/QC decision error limits

There are two main sources of potential errors:

- Sampling errors, which occur when the samples collected are not representative of the conditions within the investigation area
- Measurement errors, which occur during sample collection, handling, preparation, analysis and data reduction.

The types of decision errors are outlined within Table 8 in Section 6. The potential for decision errors was minimised by completing a robust QA/QC program and by completing an investigation that has an appropriate sampling and analytical density for the purposes of the investigation.

8.4.4 QA/QC summary

Based on the assessment carried out, the data was assessed to be suitable for the purposes of this assessment.

9 Results

9.1 Field observations

A site walkover was undertaken on 23 November 2018, with key observations detailed in Section 3.6. There were no visual or olfactory signs of contamination identified.

9.2 Subsurface conditions

Test pit logs are included in Appendix F .

Soils encountered at the Site typically consisted of a relatively thin layer of topsoil (typically 0.1m thick) comprising brown sandy silt or dark brown silty clay (low lying). Fill materials were encountered at TP09 and TP11 (between 0.4 and 1.1m thick) comprising silty clay, mottled red-grey, brown, orange with gravel, cobbles and/or boulders, which appeared to be locally derived materials. described as overlaying a mottled red brown, clayey silt/silly clay residual soil.

There were no visual or olfactory signs of contamination (such as staining or odours) identified within these layers. Soil screening using a photo-ionisation detector (PID) was carried out to check the presence of volatile contamination. The results recorded at each location were negligible (less than 2ppm) indicating a low potential for volatile contamination within sampled layers. The results of PIDs are recorded on test pit logs.

9.3 Laboratory results

Soil sample concentrations were recorded below the adopted assessment criteria. Except for heavy metals, the remaining contaminant concentrations were generally below the laboratory detection limit.

The laboratory analysis reports are included in Appendix E .

10 Conclusions and Recommendations

10.1 Conclusions

The Site appears to have a history of rural land use. Prior to 1942, historical mapping showed the Site to comprise 'scattered timber' or 'camouflage cover or medium timber'. Since 1956, historical aerial photography shows most of the Site to comprise what appears to be natural woodland like that of the surrounding area. Some land clearing is apparent in the central and south-east portions, possibly associated with the drainage lines and eroded soil landscapes. Between 1964 to 1974, the remnant trees and vegetation appear to have undergone periods of clearing and a possible earthen dam appears to intercept drainage line. Since that time, the Site appears to have remained unused or rural grazing pastures until the present day with minor alterations including the formation of onsite access tracks.

Three areas of environmental concern (AEC) have been identified within or proximal to the Site, including:

- AEC 1 – Site wide application of herbicides and pesticides for crop growing
- AEC 2 – Site wide and localised occurrence of fill and/or unauthorised wastes (where observed)
- AEC 3 – Off-site possible application of herbicides and/or pesticides.

The analytical results of the limited intrusive soil investigation indicate that there were no exceedances of adopted assessment criteria. SMEC considers that there is a low potential for soil contamination to be present at the Site within the identified AECs (refer to Figure 4, Appendix A).

10.2 Recommendations

SMEC recommend that an Unexpected Finds Protocol be developed prior to the commencement of site construction activities. The purpose of the Unexpected Finds Protocol will be to provide a structured approach to the management of unexpected finds of contamination during the construction activities. This could be prepared as part of the Contractor's Construction Environmental Management Plan, or equivalent. Additional sampling and testing may be required at construction stages based on unexpected finds.

It should be noted that if excavated material is proposed to be taken offsite for disposal to a licensed landfill facility, soil will require sampling and testing for waste classification prior to disposal in accordance with the NSW EPA Waste Classification Guidelines (November 2014). If contamination is observed/detected during this testing, it is also recommended that the underlying soils are assessed through validation sampling.

11 References

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Appendix A Site figures

Figure 1 – Site Location and Layout

Figure 2 – Geology and ASS Risk Mapping

Figure 3 – Historical Aerial Photography (1956, 1964, 1974, 1984, 1994, 2001, 2011 and 2018)

Figure 4 – Areas of Environmental Concern

Figure 5 – Test pit locations



LEGEND

Site Boundary

Acid Sulfate Soil Risk


Low Probability Alluvial Plain above 4m AHD

Geology

Alluvial Fan Deposits (Q_avf)

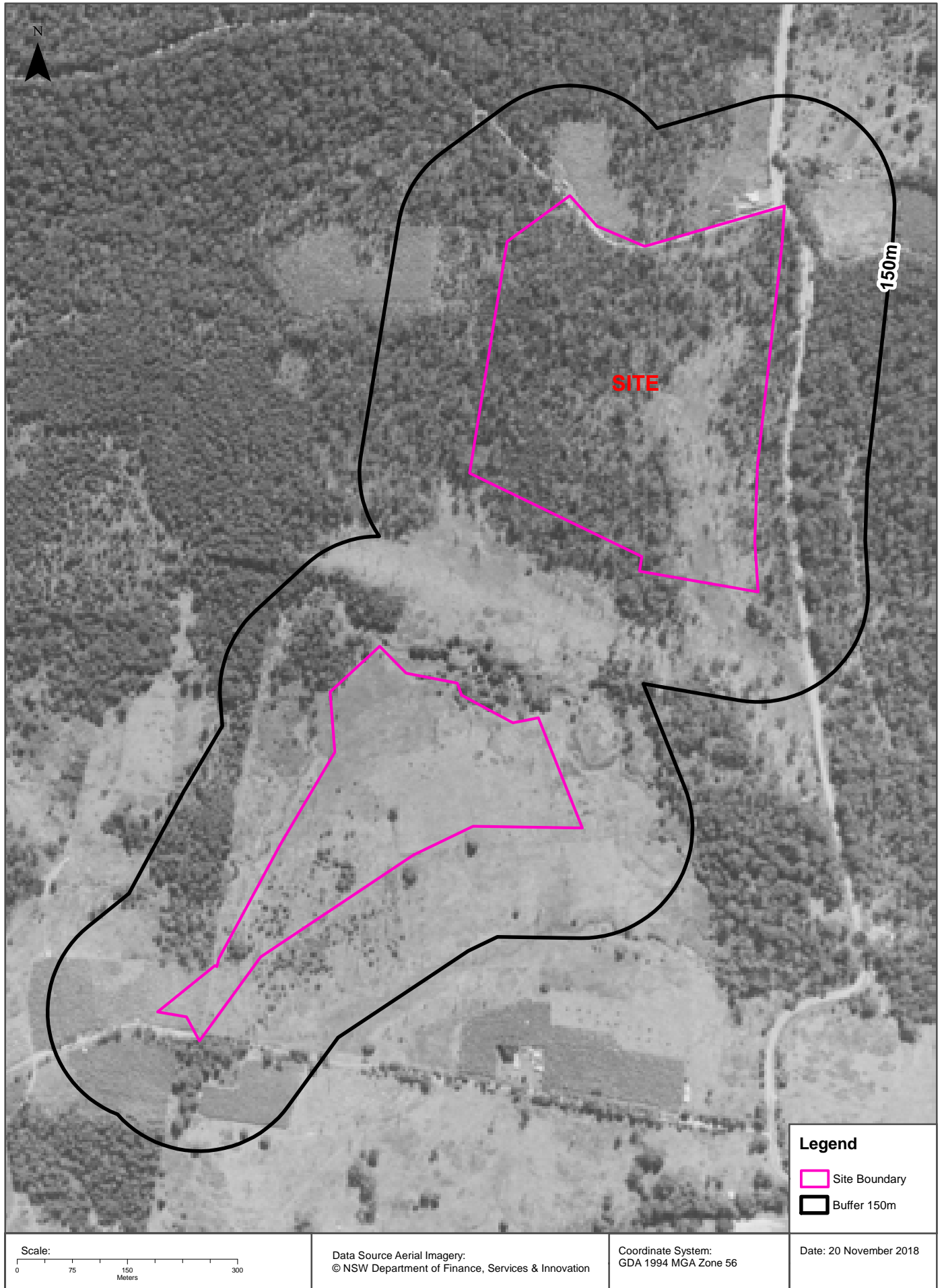
Tournaisian to Pennsylvanian, Coramba beds (Ccoc)



<p>FIG NO. 2 FIGURE TITLE Site Geology and Acid Sulfate Soil Risk Mapping</p>	<p>DATE 26/11/2018</p> <p>0 12.5 25 50 75 100 1:2,500 Meters</p>	<p>PAGE SIZE A3</p> <p>COORDINATE SYSTEM GDA 1994 MGA Zone 56</p>	<p>© SMEC Australia Pty Ltd 2018. All Rights Reserved</p> <p><small>Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this map is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.</small></p> 
<p>PROJECT NO. 30012537 PROJECT TITLE Preliminary Site Investigation - Woolgoolga</p>	<p>CREATED BY SV14139 SOURCES NearMap(2018)</p>		<p><small>Last updated by: SV14139 on 26/11/2018 at 15:41</small></p>

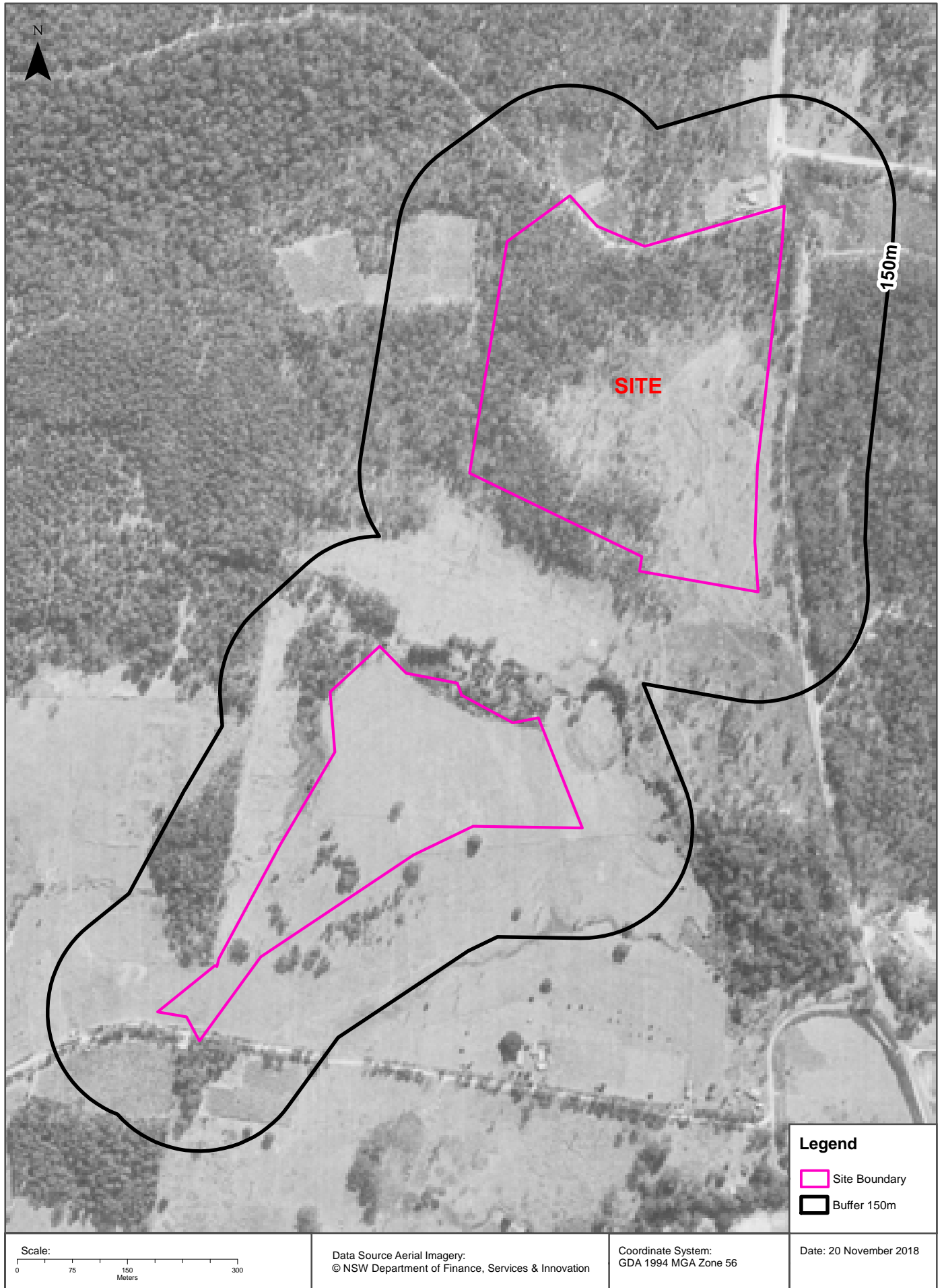
Aerial Imagery 1956

Bark Hut Road, Woolgoolga, NSW 2456



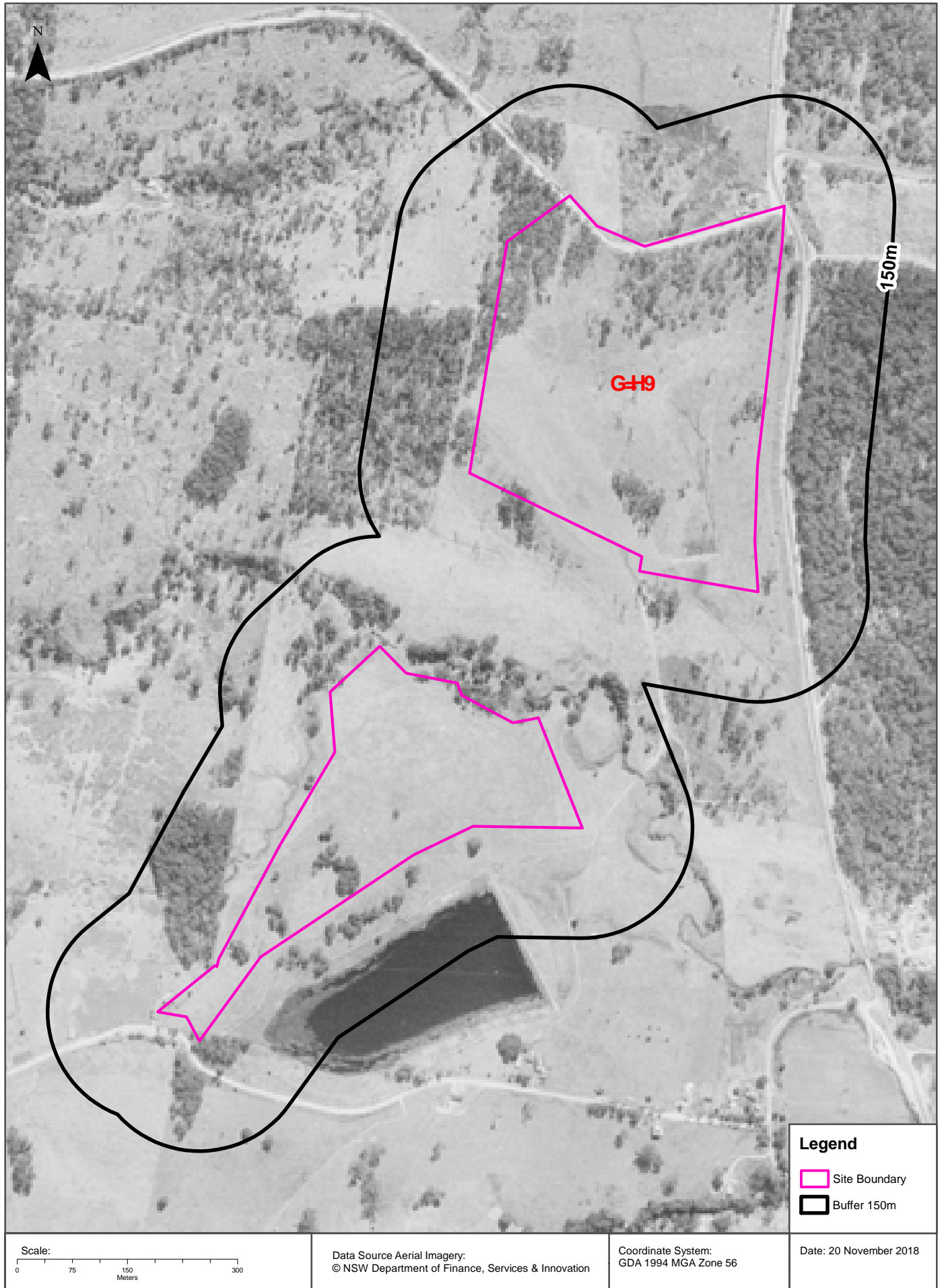
Aerial Imagery 1964

Bark Hut Road, Woolgoolga, NSW 2456



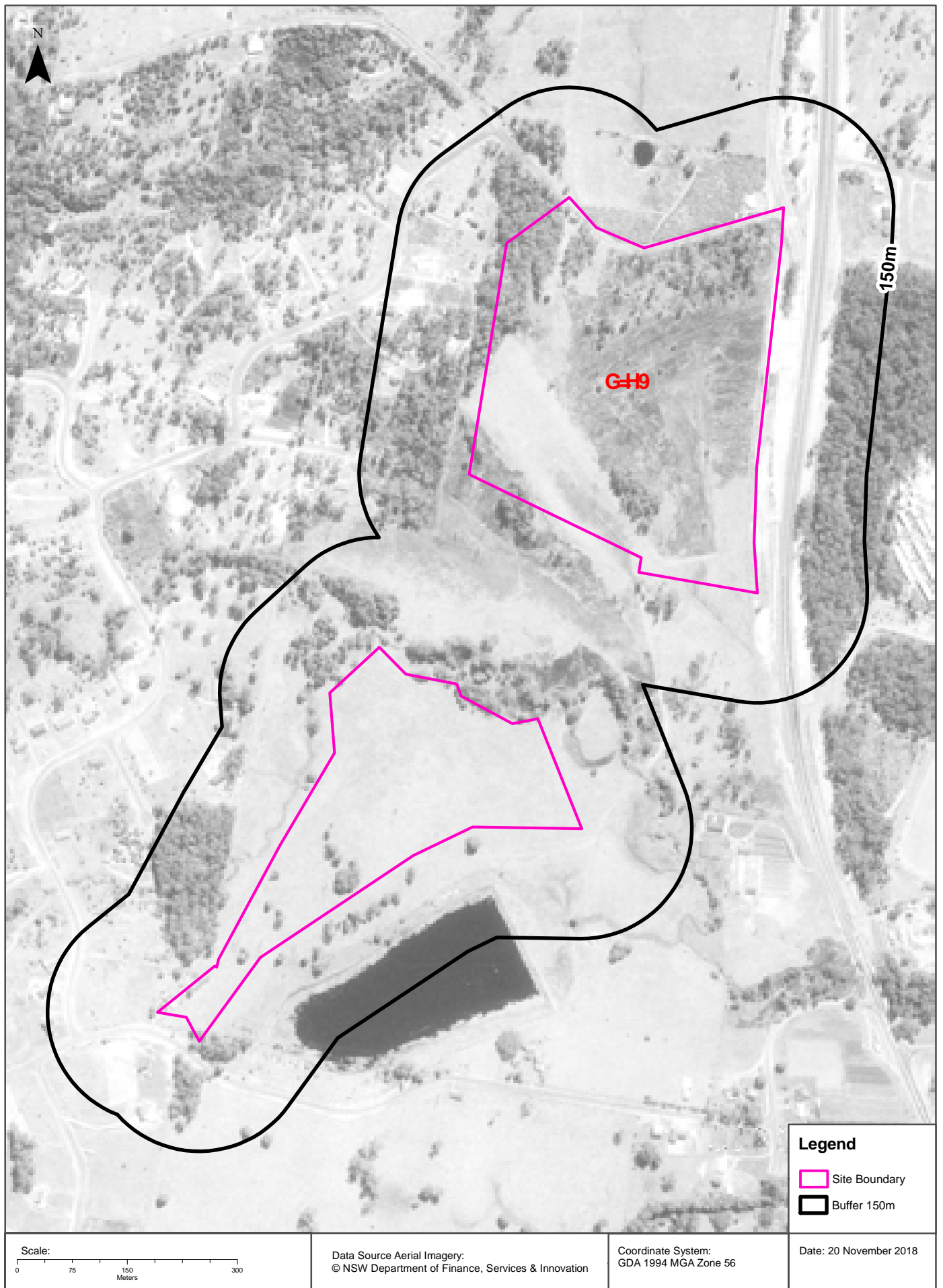
Aerial Imagery 1974

Bark Hut Road, Woolgoolga, NSW 2456



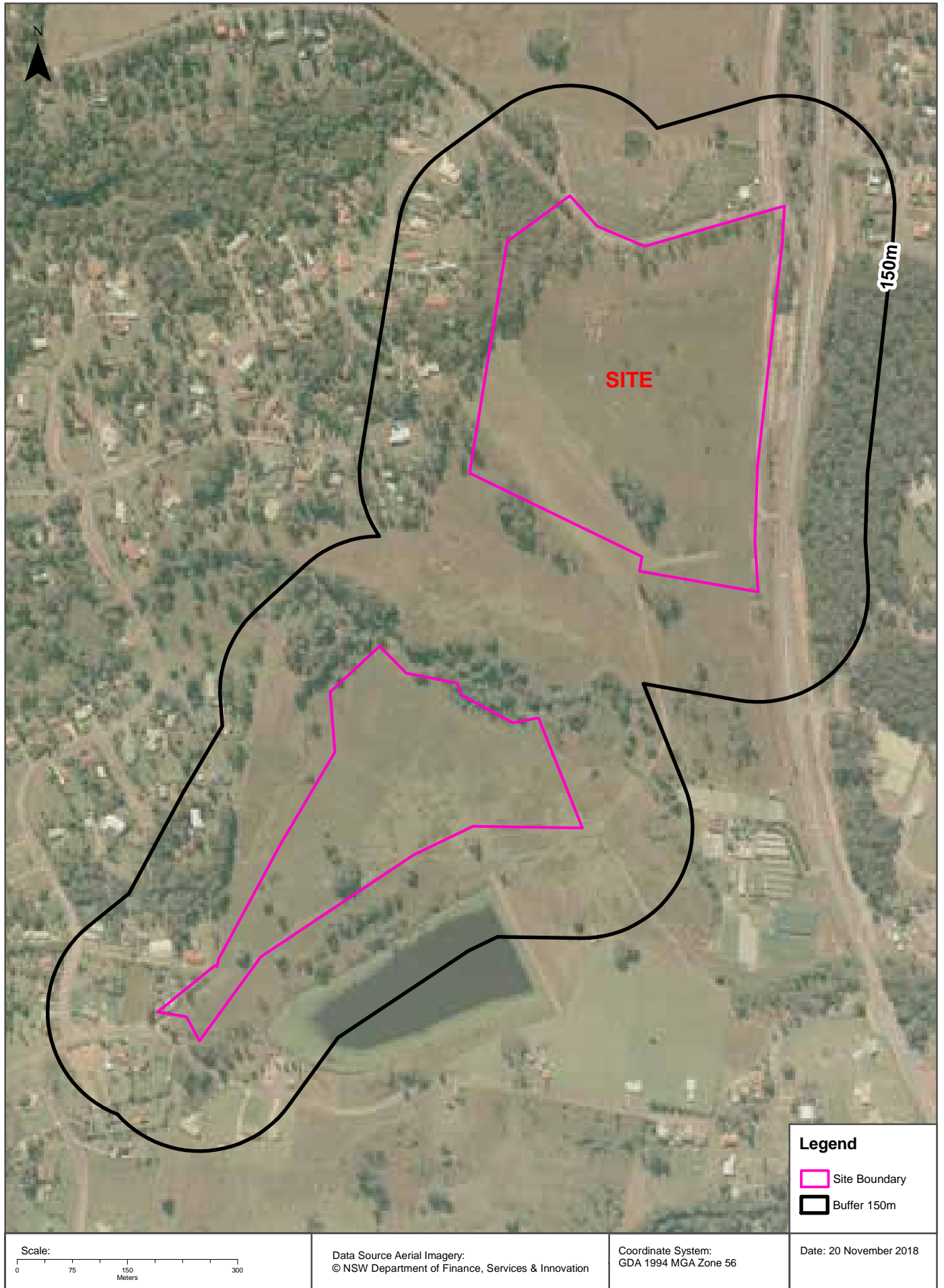
Aerial Imagery 1984

Bark Hut Road, Woolgoolga, NSW 2456



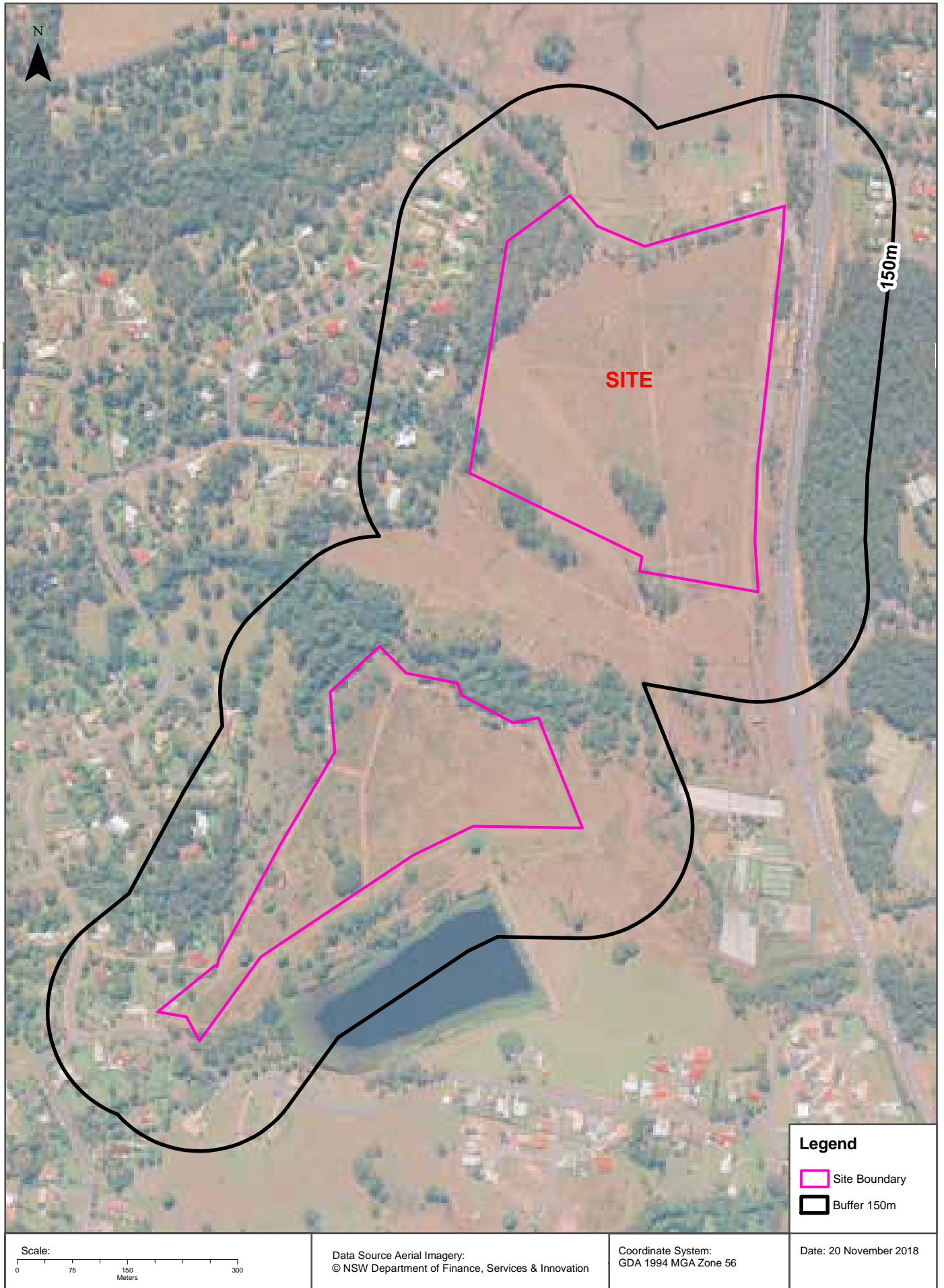
Aerial Imagery 1994

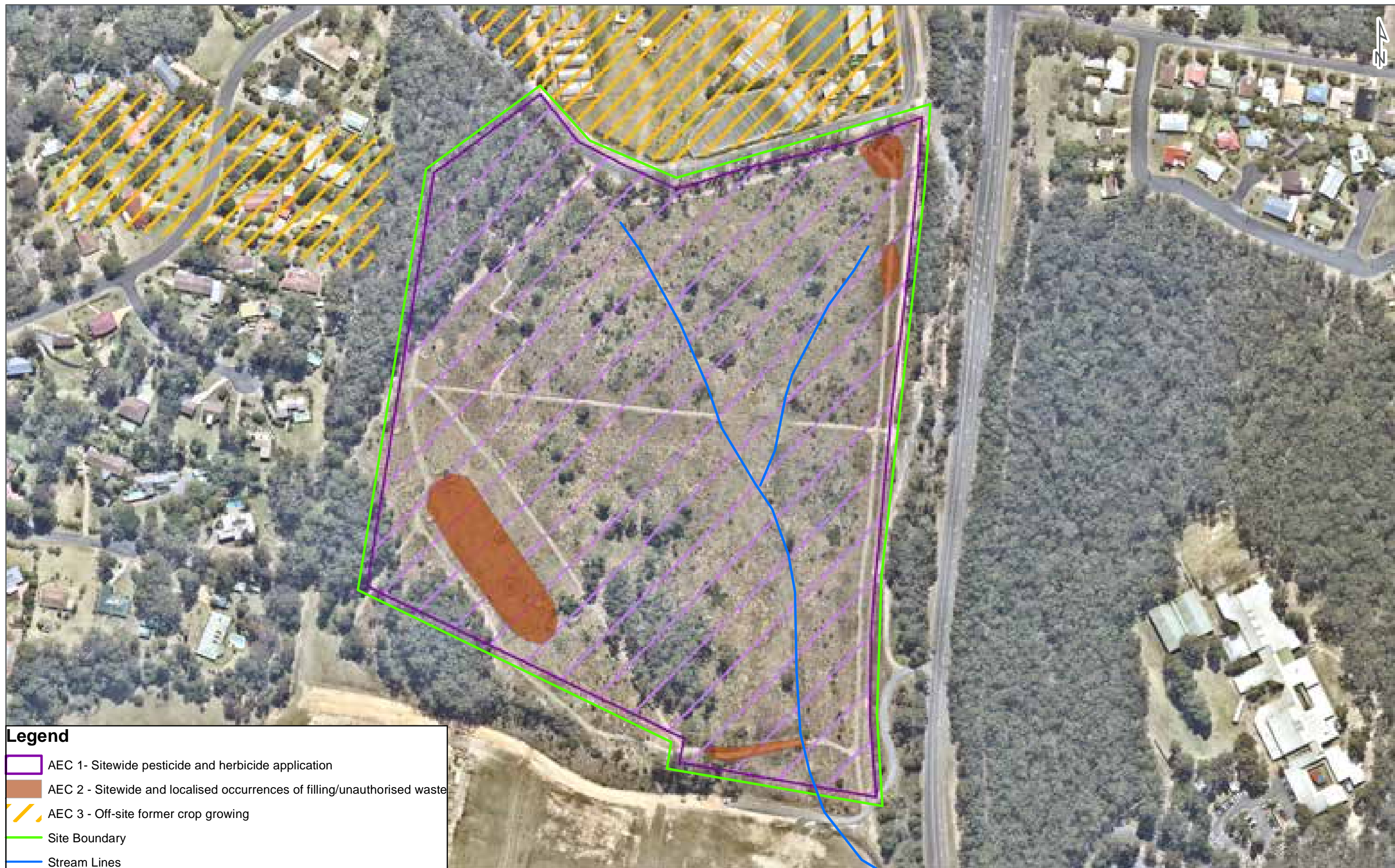
Bark Hut Road, Woolgoolga, NSW 2456



Aerial Imagery 2001

Bark Hut Road, Woolgoolga, NSW 2456










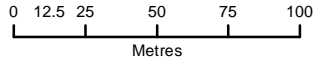
Legend	
	AEC 1- Sitewide pesticide and herbicide application
	AEC 2 - Sitewide and localised occurrences of filling/unauthorised waste
	AEC 3 - Off-site former crop growing
	Site Boundary
	Stream Lines

FIG NO. 4 FIGURE TITLE Areas of Environmental Concern	DATE 20/12/2018		PAGE SIZE A3	COORDINATE SYSTEM GDA 1994 MGA Zone 56	© SMEC Australia Pty Ltd 2018. All Rights Reserved
PROJECT NO. 30012537 PROJECT TITLE Preliminary Site Investigation - Woolgoolga	CREATED BY EC13990	SOURCES NearMap(2018)	<small>Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this map is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.</small>		





TEST PIT LOCATION DETAILS

ID	EASTING	NORTHING
TP01	518016.000	6670368.000
TP02	517892.000	6670388.000
TP03	517721.000	6670396.000
TP04	517774.000	6670305.000
TP05	517883.000	6670238.000
TP06	517938.000	6670256.000
TP07	517954.000	6670159.000
TP08	517946.000	6670016.000
TP09	517946.000	6670009.809
TP10	517734.000	6670091.000
TP11	517748.000	6670118.000
TP12	517810.000	6670051.000

LEGEND

- TP06 SMEC TEST PIT
- 2x Ø200 RCP CULVERTS
- INFERRED EXTENT OF FILL
- SITE BOUNDARY
- APPROXIMATE LOCATION OF TELSTRA SERVICES
- APPROXIMATE LOCATION OF COUNCIL WATER MAIN

NOT FOR CONSTRUCTION

150 mm ON ORIGINAL

DRAWING FILE LOCATION / NAME V:_Vault\Projects\30012537\CAD\DWG\02_GT_Geotech\30012537-DD-GT-0101.dwg		PLOT DATE 20 Dec 2018		TIME 15:03:49	
EXTERNAL REFERENCE FILES		REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.
<p style="margin: 0;">Fig No.5 Test Pit Locations</p>		01	20.12.18	PRELIMINARY DESIGN - ISSUED FOR REVIEW	001
		APPROVAL	TITLE	NAME	SCALES AT A3 SIZE DRAWING SCALE 1:2500
		DRAFTER	TITLE	NAME	
		DRAFTING CHECK	TITLE	NAME	
		DESIGNER	TITLE	NAME	
		DESIGN CHECK	TITLE	NAME	
PROJECT MANAGER	TITLE	NAME	DESIGNER SMC AUSTRALIA PTY LTD © ABN 47 065 475 149 52 VICTORIA STREET GRAFTON NSW, 2460 PH 02 6642-7737 SMC PROJECT No 30012537		
PROJECT DIRECTOR	TITLE	NAME		CLIENT Resource Design and Management	
PROJECT TITLE		SCALE	PHASE		PROJECT / DRAWING No.
PRELIMINARY SITE INVESTIGATION LOT 202, DP 874273, WOOLGOOLGA GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION PLAN		1:2500@A3	PRELIMINARY	30012537-DD-GT-0101	01



Appendix B Soil landscape information

me**MEGAN**

Megan (**me**) soil landscape; on Mount Browne Road 2 km south-east of Upper Orara.

Landscape— rolling low hills to hills on Late Carboniferous metasediments of the Coffs Harbour association in the Coast Range and Gleniffer-Bonville Hills. Local relief to 90 m, occasionally to 200 m; slopes typically 5 - 20%, occasionally to 33%; elevation to 317 m. Partially cleared, tall open-forest and tall closed-forest.

Soils— moderately deep to deep (>100 cm), well-drained structured Red Earths (Gn3.11), Brown Earths (Gn3.21), Brown Podzolic Soils (Db4.11) and Red Podzolic Soils (Dr2.11), with moderately deep to deep (>100 cm), structured Yellow Earths (Gn3.21; Gn3.71) and Yellow Podzolic Soils (Dy4.11) in drier situations, and moderately deep to deep (>120 cm), well-drained Krasnozems (Gn3.11; Gn3.14) in the moistest sites.

Qualities and Limitations— strongly acid, stony (localised) soils of high erodibility, aluminium toxicity potential and low subsoil fertility. Steep slopes (localised); mass movement hazard (localised); high water erosion hazard (localised); foundation hazard (localised).

LOCATION

Rolling hills in the Coast Range and northern Gleniffer-Bonville Hills, particularly as shallower, lower slopes beneath steep mid-slopes (Bobo (**bo**), Never Never (**nn**) or Suicide (**su**) soil landscapes). Type location is the Bruxner Park Flora Reserve (area reference 5 09***E, 66 52***N).

LANDSCAPE

Geology and Regolith

Late Carboniferous Coffs Harbour association metasediments of the Coramba and Brooklana Beds and

the Moombil Siltstone (Cccs/Ccbf/Ccmf), comprising a thick turbidite sequence dominated by siliceous mudstone, lithofeldspathic wacke and siltstone with minor metabasalt, felsic volcanics, chert and jasper. Lithology can change abruptly over short distances. These rocks are typically moderately to highly fractured, cleaved and deformed. Metamorphism generally increases from north to south. Regolith is typically 100 cm or less of ferruginised and kaolinised decomposed rock overlying largely fresh fractured rock and typically underlying more than 100 cm of more pedologically altered materials.

Topography

Rolling low hills to hills with moderately broad crests (100 - 300 m) and moderately long to long slopes (100 - 500 m). Local relief to 90 m, occasionally to 200 m; slopes 5 - 20%, occasionally to 33%; elevation up to 317 m west of Sealys Lookout.

Vegetation

Mostly uncleared, tall open-forest in the north and tall closed-forest in the south. Because of climatic variation, the native vegetation varies markedly from north to south across this landscape.

Tall open-forest (wet sclerophyll forest) dominated by tallowwood (*Eucalyptus microcorys*) and Sydney blue gum (*E. saligna*) [Forest Types 46 and 47] occurs extensively on crests and slopes. The drier exposed crests are occupied by tall open-forest dominated by narrow-leaved white mahogany (*E. acmenoides*), spotted gum (*Corymbia maculata*), grey ironbark (*E. paniculata*) and small-fruited grey gum (*E. propinqua*) [Forest Types 60 and 74].

Moderately sheltered valley floors are dominated by brush box (*Lophostemon confertus*) [Forest Type 53] with a dense rainforest understorey, whilst the most sheltered gullies harbour various types of depauperate rainforest. Common dominant species include hoop pine (*Araucaria*

cunninghamii) [Forest Type 21], yellow carabeen (*Sloanea woollsii*), crabapple (*Schizomeria ovata*), sassafras (*Doryphora sassafras*), corkwood (*Caldcluvia paniculosa*) and silver sycamore (*Cryptocarya glaucescens*) [Forest Type 2/3], and sassafras, fig, e.g., Moreton Bay fig (*Ficus macrophylla*), giant stinging tree (*Dendrocnide excelsa*) and grey myrtle (*Backhousia myrtifolia*) [Forest Type 6/23]. The boundary between tall open-forest and tall closed-forest on lower valley sides is often abrupt and pronounced.

Rainforest becomes more prevalent towards the south, becoming dominated by black booyong (*Argyrodendron actinophyllum*), coachwood (*Ceratopetalum apetalum*) and crabapple (*Schizomeria ovata*) [Forest Type 5/11], with species such as tallowwood (*E. microcorys*), blackbutt (*E. pilularis*) [Forest Type 36], Sydney blue gum (*E. saligna*) [Forest Types 46 and 47] and brush box (*Lophostemon confertus*) [Forest Type 53] persisting on more exposed north-facing slopes.

Land Use

Partially cleared and used for a variety of purposes, including banana plantations and (increasingly) urban development around Coffs Harbour and Woolgoolga as well as grazing on improved pastures in the Orara and Bucca valleys. Parts of this landscape are also contained within Orara East, Lower Bucca and Wedding Bells State Forests, plus Bruxner Park Flora Reserve.

Existing Land Degradation

Moderate, occasionally high erosion of forestry works where vegetation has been cleared, resulting in exposure of hardsetting soil materials (**me2**); also moderately deep, discontinuous gully erosion along drainage lines in cleared areas, particularly upslope of the Kooralbyn (**ko**) soil landscape.

Included Soil Landscapes

Small areas of the Suicide (**su**) soil landscape have been included as localised areas of steep to very steep mid-slopes.

SOILS

Dominant Soil Materials

me1— Brownish black earthy loam (topsoil— A horizon)

Colour	brownish black (7.5YR 3/2) to dark brown (7.5YR 3/4)
Texture Structure	loam to loam, fine sandy earthy
Fabric	rough-faced peds
Field pH	mildly to moderately acid (pH 6.5 - 5.0)
Coarse fragments	usually a few angular fragments of substrate (6 - 60 mm)
Roots	abundant to common
Exposed condition	loosely coherent when dry; soft when moist
Permeability	moderately high
Type location	upper Boambee Creek Valley (Map reference 5 0475°E, 66 4550°N); Coffs Harbour Planning Soil Data System card 21; 0 - 20 cm.

me2— Dark reddish brown pedal clay loam (topsoil— A horizon; subsoil; B₁ horizon)

Colour	brownish black (7.5YR 3/2) through dark reddish brown (5YR 3/3) to reddish brown (5YR 4/8) in moister areas
Texture Structure	clay loam to silty clay loam moderately pedal; sub-angular blocky peds (10 - 50 mm)
Fabric	rough to smooth-faced peds
Field pH	mildly to moderately acid (pH 6.0 - 5.0)
Coarse fragments	common angular fragments of substrate (6 - 60 mm)
Roots	common
Exposed condition	coherent to hardsetting when dry; firm when moist
Permeability	moderate
Type location	upper Boambee Creek Valley (Map reference 5 0475°E, 66 4550°N); Coffs Harbour Planning Soil Data System card 21; 20 - 50 cm.

me3— Reddish brown pedal light clay (subsoil— B horizon)

Colour	dark reddish brown (2.5YR 3/6) to bright reddish brown (5YR 5/8) in moister areas and orange (7.5YR 6/8) in drier situations; commonly with reddish brown to yellow orange mottles (2 - 20%)
Texture Structure	light clay moderately and occasionally strongly pedal; sub-angular blocky and occasionally polyhedral peds (20 - 50 mm)
Fabric	smooth-faced peds
Field pH	moderately acid (pH 5.0 - 4.5)
Coarse fragments	common angular fragments of substrate (6 - 60 mm)
Roots	few
Exposed condition	coherent to hardsetting when dry; firm when moist
Permeability	moderately low
Type location	upper Boambee Creek Valley (Map reference 5 0475°E, 66 4550°N); Coffs Harbour Planning Soil Data System card 21; 50 - 350 cm.

me4— Reddish brown to orange silty clay loam to silty light clay (subsoil— C horizon)

Colour	reddish brown (2.5YR 4/6) to bright reddish brown (5YR 5/6) in moister areas; orange (7.5YR 6/6) to dull yellow orange (10YR 7/4) in drier areas; commonly with yellow orange mottles (2 - 20%)
Texture Structure	silty clay loam to silty light clay massive to strongly pedal; sub-angular blocky peds (20 - 50 mm)
Fabric	earthy to smooth-faced peds
Field pH	moderately acid (pH 5.0 - 4.5)
Coarse fragments	common angular fragments of substrate (6 - 60 mm)

Roots	few
Exposed condition	coherent to hardsetting when dry; usually soft and sticky when moist
Permeability	moderate
Type location	1 km east of Karangi Dam opposite old mill (Map reference 5 0320°E, 66 5250°N); Orara-Bucca Urban Study Soil Data System card 29; 120 - 250 cm.

Occurrence and Relationships

Crests and slopes. Typically up to 40 cm of **me2** overlies up to 75 cm of **me3** (moderately deep, well-drained structured Red Earths (Gn3.11), Brown Earths (Gn3.21) and, in drier situations, Yellow Earths (Gn2.21) and structured Yellow Earths (Gn3.71)). On occasions, **me2** is as little as 5 cm deep and is overlain by up to 15 cm of brownish black earthy loam (**me1**). **me3** may either overlie shattered rock at as little as 110 cm depth or overlies as much as 110 cm of bright reddish brown to orange, silty clay loam to silty light clay (**me4**) (moderately deep to deep, well-drained, structured Red Earths (Um6.33) and in the very moistest situations on lower slopes and valley floors, Krasnozems (Gn3.11; Gn3.14)). Alternatively, up to 35 cm of **me1** overlies up to 60 cm of **me3**, which itself overlies over 25 cm of **me4** (moderately deep, well-drained Red Podzolic Soils (Dr2.11) and Brown Podzolic Soils (Db4.11) and, in drier situations, Yellow Podzolic Soils (Dy4.11)). Soil depth generally exceeds 120 cm.

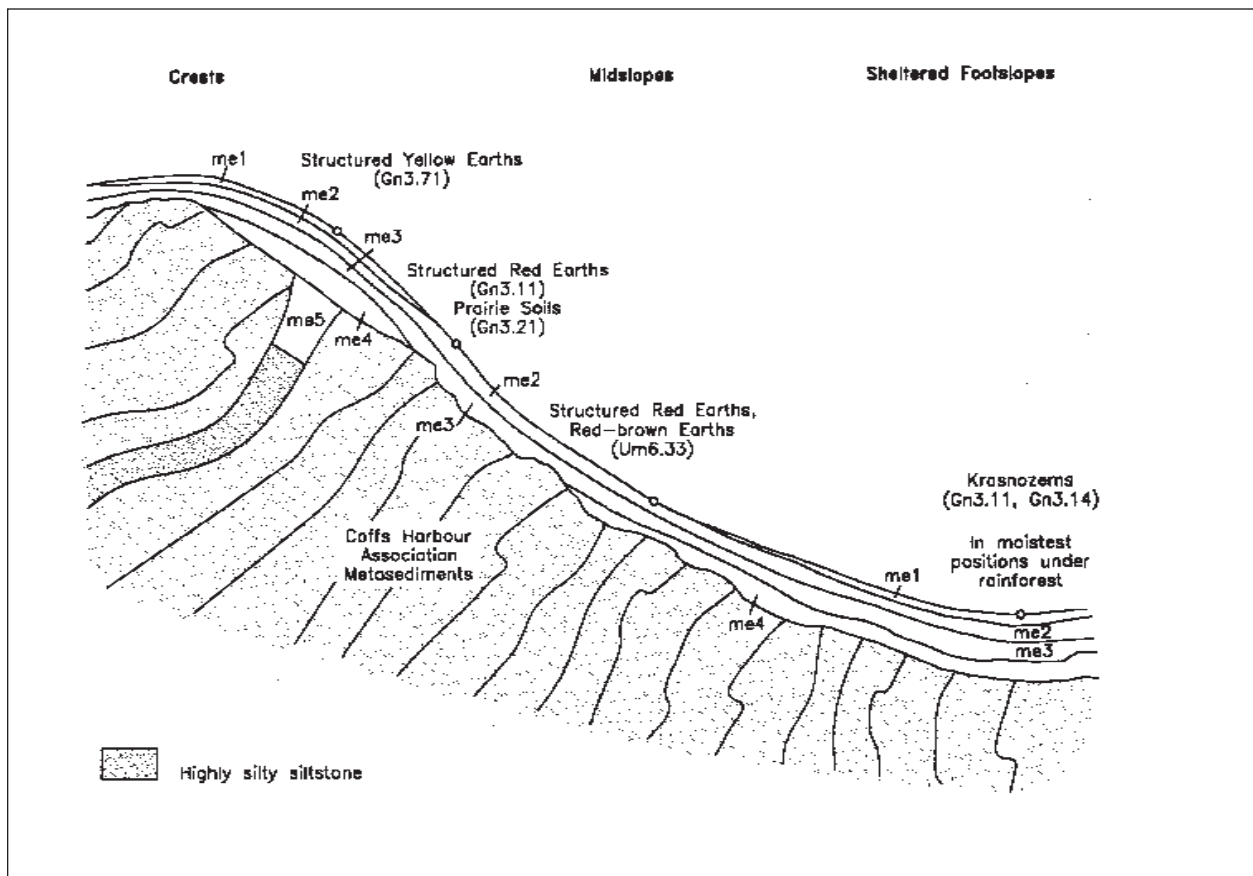
QUALITIES AND LIMITATIONS

Landscape Limitations

Steep slopes (localised)
Mass movement hazard (localised)
High water erosion hazard (localised)
Foundation hazard (localised)

Soil Limitations

me1	Low wet bearing strength High organic matter Strong acidity Stoniness (localised)
me2	Low wet bearing strength High erodibility Strong to very strong acidity Aluminium toxicity potential Low fertility High organic matter (localised) Hardsetting surface (when exposed) Stoniness (localised)
me3	High erodibility Low permeability High aluminium toxicity potential Low fertility Stoniness (localised)



■ Distribution diagram of Megan soil landscape showing the occurrence and relationship of dominant soil materials.

me4	High plasticity Low wet bearing strength Low permeability Extreme erodibility Strong to very strong acidity High aluminium toxicity potential Low fertility Stoniness (localised)
------------	--

Note: Laboratory test data was not obtained for any soil materials within this landscape in the Coffs Harbour region. Soil limitations are based on field observation and laboratory test results from similar soil materials from this soil landscape in the adjacent Dorrigo soil landscape report (Milford 1996).

Soil Fertility

Soil Material as Plant Growth Media. Moderately low (**me1**) to low to very low (**me2** to **me4**) suitability. Topsoil **me1** is moderately well structured with very high organic matter, moderate CEC, low available phosphorus and moderate acidity; **me2** has high organic matter but low CEC, low available phosphorus and strong acidity. Subsoil materials **me3** to **me4** are very strongly acid and very low in chemical fertility, with very low CEC, very low available phosphorus, very low organic matter, and high aluminium toxicity potential.

Soil Profile as Plant Growth Media. Generally moderately low to low suitability.

Erodibility

	K factor	Non-concentrated flows	Concentrated flows	Wind
me1	0.026	moderate	moderate	low
me2	0.040	high	high	low
me3	0.039	high	high	low
me4	0.059	very high	very high	low

Erodibility (non-dispersed PSA)

	K factor	Non-concentrated flows	Concentrated flows	Wind
me4	0.091	very high	extreme	low

Erosion Hazard

	Non-concentrated flows	Concentrated flows	Wind
land clearing	moderate	high	low
grazing	low	moderate	low
cultivation	high	high	low

Foundation Hazard

Foundation hazard is generally moderate. Localised limitations include soil materials **me1** to **me4** with high foundation hazard ratings, particularly **me4** which exhibits low wet bearing strength and high to extreme erodibility, and localised steep slopes with high potential for mass movement.

Urban Capability

Generally moderate limitations for urban development.

Septic Effluent Disposal

Generally low suitability for septic disposal systems due to slowly permeable soils (**me1**, **me3**, **me4**), low CEC, localised stoniness and localised steep slopes.

Rural Capability

Generally moderate limitations for grazing, with high to severe limitations for cultivation.

Appendix C Desktop study results (Lot Search)



LOTSEARCH
LOTSEARCH ENVIRO PROFESSIONAL

Date: 19 Nov 2018 09:35:49

Reference: LS004639 EP

Address: Bark Hut Road, Woolgoolga, NSW 2456

Disclaimer:

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features. You should obtain independent advice before you make any decision based on the information within the report. The detailed terms applicable to use of this report are set out at the end of this report.

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Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a confidence is given under the field heading “LocConf” or “Location Confidence”.

LC Code	Location Confidence
Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	Dept. Finance, Services & Innovation	19/11/2018	19/11/2018	Daily	-	-	-	-
Topographic Data	Dept. Finance, Services & Innovation	17/07/2018	17/07/2018	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	17/10/2018	17/10/2018	Monthly	1000	0	0	1
Contaminated Land Records of Notice	Environment Protection Authority	13/11/2018	13/11/2018	Monthly	1000	0	0	0
Former Gasworks	Environment Protection Authority	06/11/2018	06/11/2018	Monthly	1000	0	0	0
National Waste Management Facilities Database	Geoscience Australia	06/11/2018	07/03/2017	Quarterly	1000	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	06/11/2018	06/11/2018	Monthly	2000	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	11/01/2018	11/01/2018	As required	1000	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	01/11/2018	01/11/2018	Monthly	1000	0	0	2
Delicensed POEO Activities still Regulated by the EPA	Environment Protection Authority	01/11/2018	01/11/2018	Monthly	1000	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	01/11/2018	01/11/2018	Monthly	1000	3	3	6
UPSS Environmentally Sensitive Zones	Environment Protection Authority	14/04/2015	12/01/2010	As required	1000	1	1	1
UBD Business Directory 1982 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1982 (Road & Area Matches)	Hardie Grant			Not required	150	-	13	13
UBD Business Directory 1970 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1970 (Road & Area Matches)	Hardie Grant			Not required	150	-	27	27
UBD Business Directory 1961 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1961 (Road & Area Matches)	Hardie Grant			Not required	150	-	21	21
UBD Business Directory 1950 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1950 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500	0	0	0
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500	-	10	10
Cattle dips of the Northern Rivers region	NSW Dept. of Primary Industries	06/10/2017	06/10/2017	Annually	1000	0	0	0
Points of Interest	Dept. Finance, Services & Innovation	12/10/2018	12/10/2018	Quarterly	1000	0	0	16
Tanks (Areas)	Dept. Finance, Services & Innovation	15/10/2018	15/10/2018	Quarterly	1000	0	0	0
Tanks (Points)	Dept. Finance, Services & Innovation	15/10/2018	15/10/2018	Quarterly	1000	0	0	0
Major Easements	Dept. Finance, Services & Innovation	12/10/2018	12/10/2018	Quarterly	1000	0	0	4
State Forest	Dept. Finance, Services & Innovation	18/01/2018	18/01/2018	As required	1000	0	0	2
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	18/01/2018	30/09/2017	Annually	1000	0	0	1

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000	1	1	2
Botany Groundwater Management Zones	NSW Department of Primary Industries	15/03/2018	01/10/2005	As required	1000	0	0	0
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000	0	1	61
Geological Units 1:250,000	NSW Dept. of Industry, Resources & Energy	20/08/2014		None planned	1000	2	-	2
Geological Structures 1:250,000	NSW Dept. of Industry, Resources & Energy	20/08/2014		None planned	1000	0	-	4
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000	0	0	0
Soil Landscapes	NSW Office of Environment & Heritage	12/08/2014		None planned	1000	2	-	9
Atlas of Australian Soils	CSIRO	19/05/2017	17/02/2011	As required	1000	2	2	2
Environmental Planning Instrument - Acid Sulfate Soils	NSW Department of Planning and Environment	23/10/2018	12/10/2018	As required	500	2	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	2	3	3
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000	0	0	0
Dryland Salinity Potential of Western Sydney	NSW Office of Environment & Heritage	12/05/2017	01/01/2002	None planned	1000	-	-	-
Mining Subsidence Districts	Dept. Finance, Services & Innovation	13/07/2017	01/07/2017	As required	1000	0	0	0
SEPP 14 - Coastal Wetlands	NSW Planning and Environment	17/12/2015	24/10/2008	Annually	1000	0	0	0
SEPP 26 - Littoral Rainforest	NSW Planning and Environment	17/12/2015	05/02/1988	Annually	1000	0	0	0
SEPP 71 - Coastal Protection	NSW Planning and Environment	17/12/2015	01/08/2003	Annually	1000	1	1	1
SEPP Major Developments 2005	NSW Planning and Environment	09/03/2013	25/05/2005	Under Review	1000	0	0	0
SEPP Strategic Land Use Areas	NSW Planning and Environment	01/08/2017	28/01/2014	Annually	1000	1	1	1
EPI - Land Zoning	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	1000	2	10	51
EPI - Minimum Lot Size	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	0	1	-	-
EPI - Height of Buildings	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	0	1	-	-
EPI - Floor Space Ratio	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	0	0	-	-
EPI - Land Application	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	0	1	-	-
EPI - Land Reservation Acquisition	NSW Planning and Environment	23/10/2018	12/10/2018	Quarterly	0	0	-	-
State Heritage Register - Curtilages	NSW Office of Environment & Heritage	18/10/2018	19/01/2018	Quarterly	1000	0	0	0
Environmental Planning Instrument - Heritage	NSW Department of Planning and Environment	10/09/2018	27/07/2018	Quarterly	1000	0	0	1
Bush Fire Prone Land	NSW Rural Fire Service	08/08/2018	31/07/2018	Quarterly	1000	3	3	3
Vegetation of Coffs Harbour LGA	NSW Office of Environment & Heritage	06/01/2016	31/12/2012	None planned	1000	5	8	19
RAMSAR Wetlands	Commonwealth of Australia Department of the Environment	08/10/2014	24/06/2011	As required	1000	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	2	2	5
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	9	9	12
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	13/11/2018	13/11/2018	Daily	10000	-	-	-

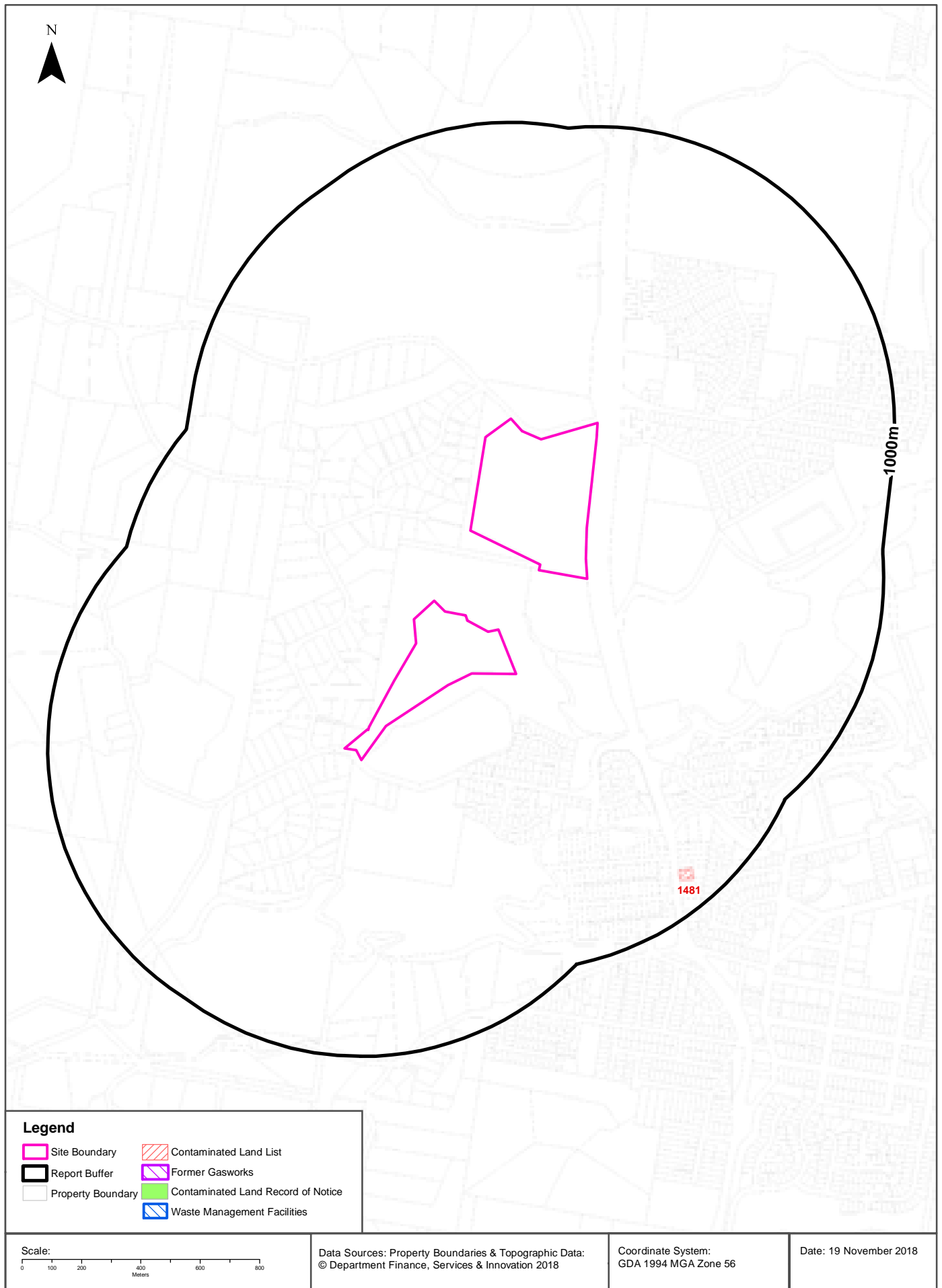
Aerial Imagery 2018

Bark Hut Road, Woolgoolga, NSW 2456



Contaminated Land & Waste Management Facilities

Bark Hut Road, Woolgoolga, NSW 2456



Contaminated Land & Waste Management Facilities

Bark Hut Road, Woolgoolga, NSW 2456

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist (m)	Direction
1481	United Petroleum Service Station	56 Clarence Street	Woolgoolga	Service Station	Regulation under CLM Act not required	Current EPA List	Premise Match	862m	South East

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Contaminated Land & Waste Management Facilities

Bark Hut Road, Woolgoolga, NSW 2456

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

Former Gasworks

Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist (m)	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

EPA PFAS Investigation Program

Bark Hut Road, Woolgoolga, NSW 2456

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Id	Site	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

EPA Other Sites with Contamination Issues

Bark Hut Road, Woolgoolga, NSW 2456

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill

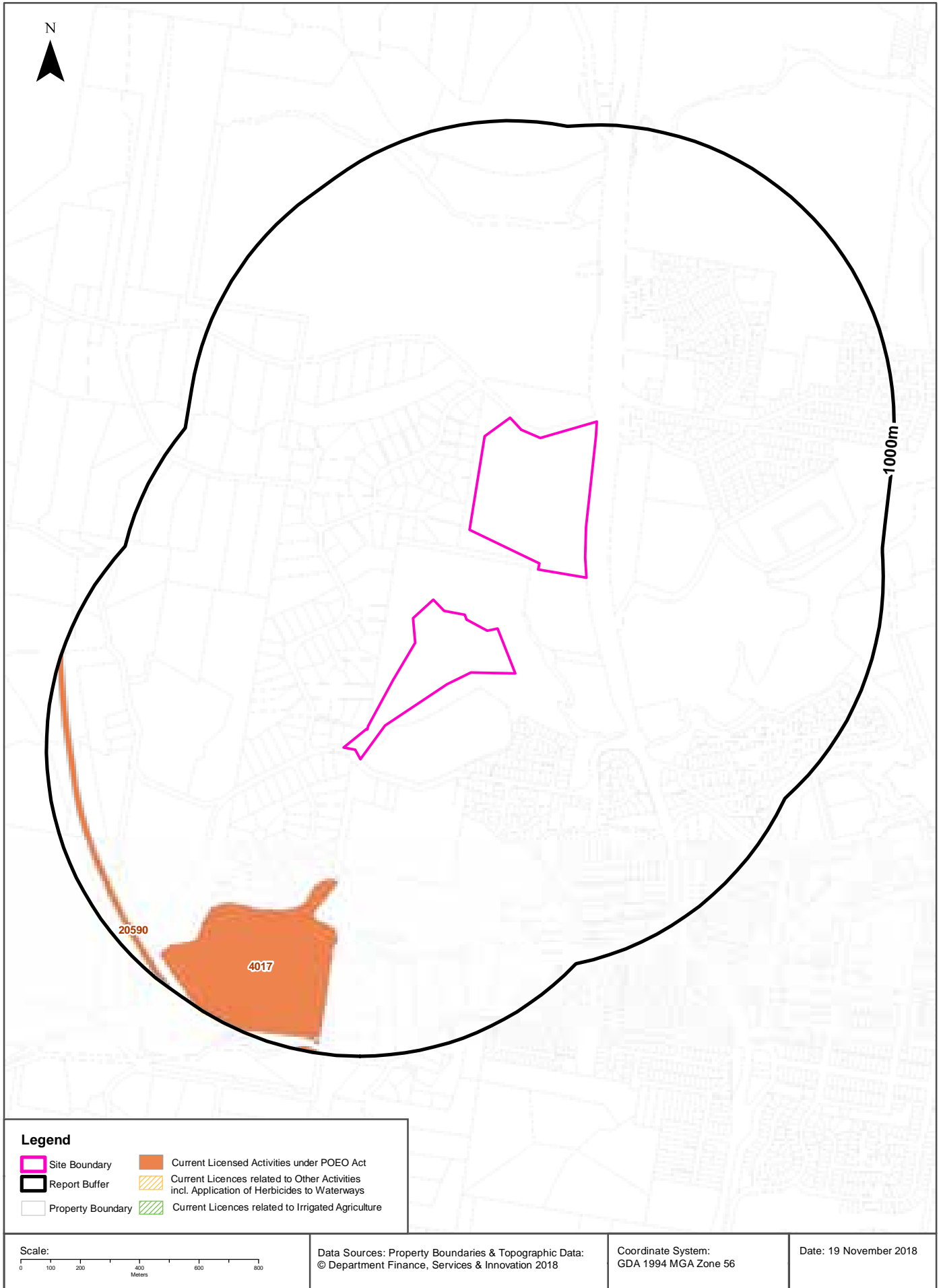
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Current EPA Licensed Activities

Bark Hut Road, Woolgoolga, NSW 2456



EPA Activities

Bark Hut Road, Woolgoolga, NSW 2456

Licensed Activities under the POEO Act 1997

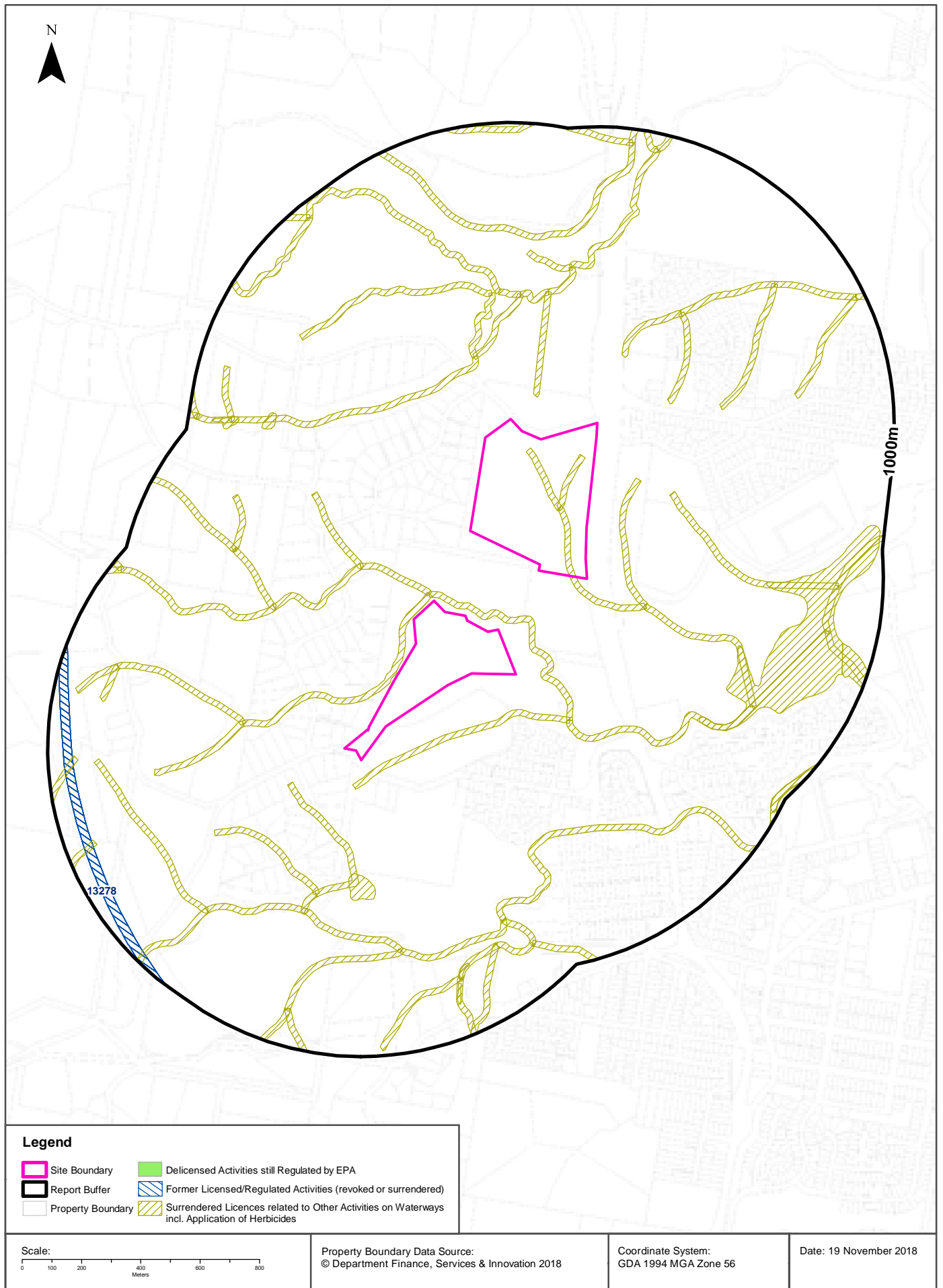
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
4017	FORESTRY CORPORATION OF NEW SOUTH WALES	UPPER NORTH EAST REGION (UNER) MEANS THE STATE FORESTS AND CROWN -TIMBER LANDS (EX. PLANTATIONS) .	ITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW 2450	COFFS HARBOUR	Logging operations	Network of Features	417m	South West
20590	OHL CONSTRUCTION PACIFIC PTY LTD		Pacific Highway, WOOLGOOLGA, NSW 2456		Crushing, grinding or separating, Land-based extractive activity, Road construction	Road Match	901m	South West

POEO Licence Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

Delicensed & Former Licensed EPA Activities

Bark Hut Road, Woolgoolga, NSW 2456



EPA Activities

Bark Hut Road, Woolgoolga, NSW 2456

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

Delicensed Activities Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
13278	FULTON HOGAN CONSTRUCTION PTY LTD	Pacific Highway Sapphire to Woolgoolga Upgrade, Pacific Highway, SAPPHIRE	Surrendered	09/08/2010	Crushing, grinding or separating	Road Match	907m	South West
13278	FULTON HOGAN CONSTRUCTION PTY LTD	Pacific Highway Sapphire to Woolgoolga Upgrade, Pacific Highway, SAPPHIRE	Surrendered	09/08/2010	Land-based extractive activity	Road Match	907m	South West
13278	FULTON HOGAN CONSTRUCTION PTY LTD	Pacific Highway Sapphire to Woolgoolga Upgrade, Pacific Highway, SAPPHIRE	Surrendered	09/08/2010	Road construction	Road Match	907m	South West

Former Licensed Activities Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

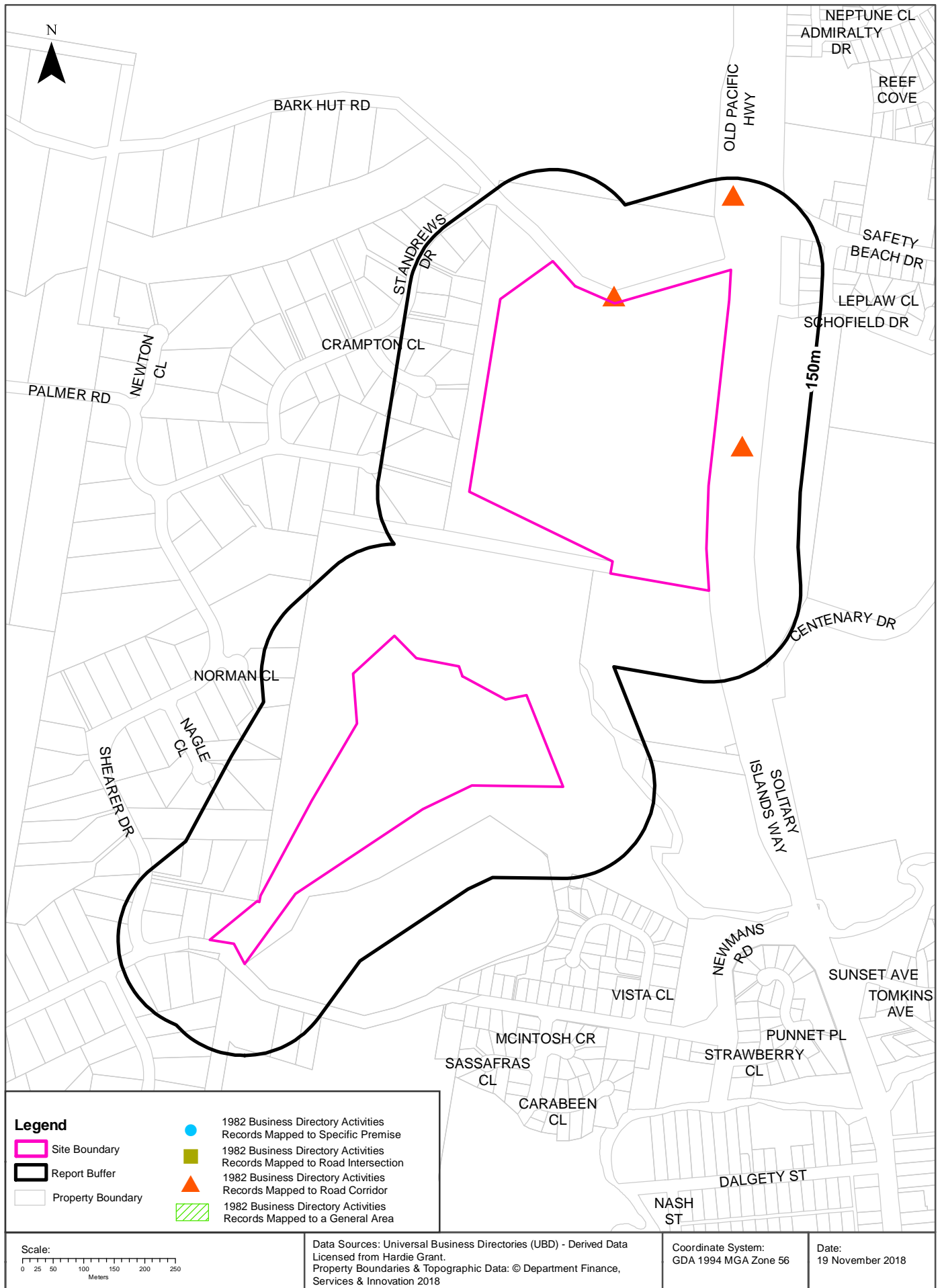
UPSS Sensitive Zones

Bark Hut Road, Woolgoolga, NSW 2456



1982 Historical Business Directory Records

Bark Hut Road, Woolgoolga, NSW 2456



Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

1982 Business Directory Records Premise or Road Intersection Matches

Records from the 1982 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1982 Business Directory Records Road or Area Matches

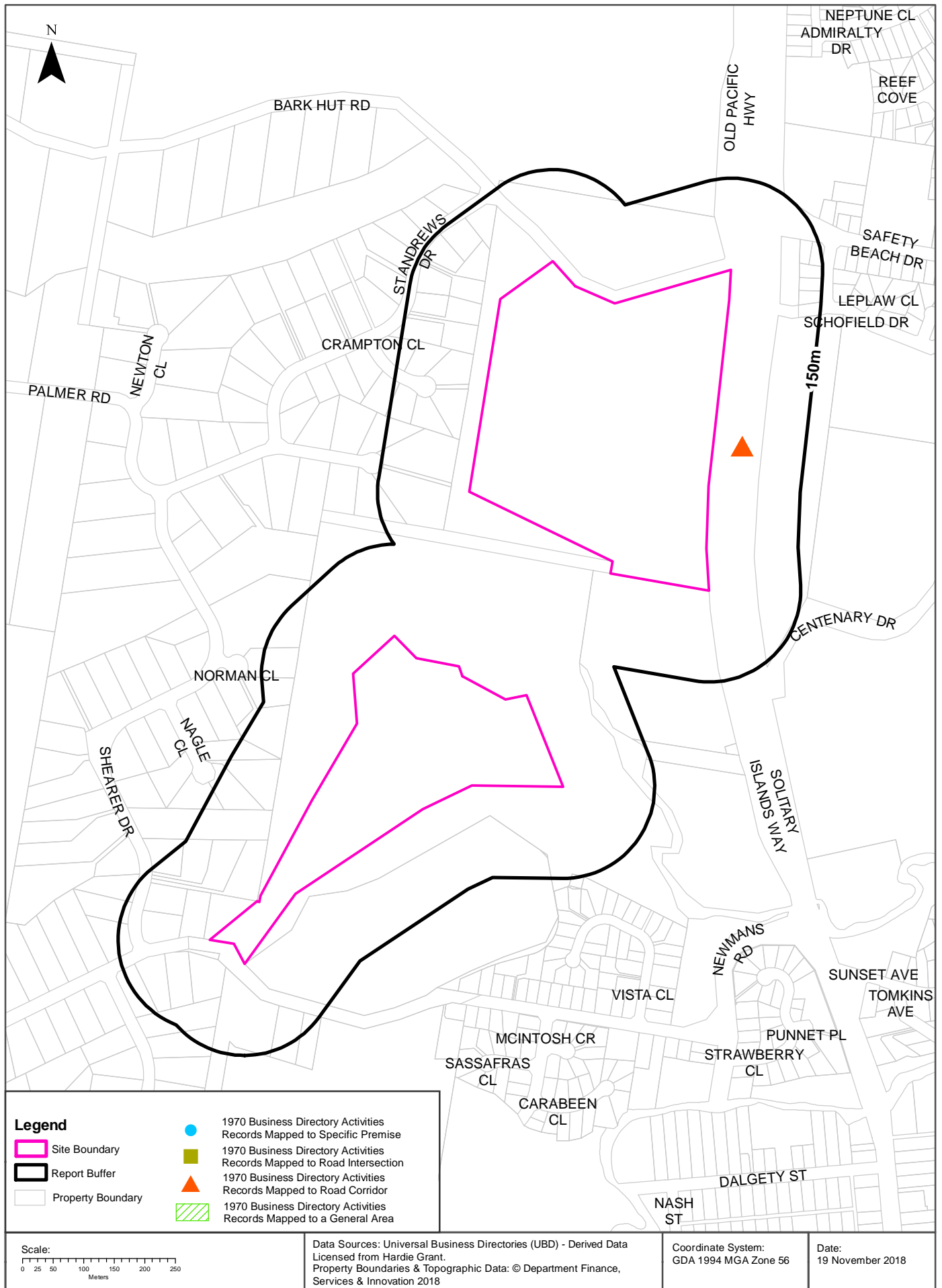
Records from the 1982 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
MOTOR GARAGES /OR ENGINEERS &/OR SERVICE STATIONS.	BP Woolgoolga Roadhouse Pacific Highway, Woolgoolga.,	98392	Road Match	0m
Not Listed	Colonial Surfside Caravan Park, Pacific Highway., Woolgoolga	98408	Road Match	0m
Not Listed	Featherstone, W. D. & M.Carrier, Pacific Highway., Woolgoolga	98412	Road Match	0m
Not Listed	Fountain's Motel, Pacific Highway., Woolgoolga	98415	Road Match	0m
Not Listed	Grafton Woolgoolga Bus Service, Bark Hut Rd., Woolgoolga	98418	Road Match	0m
Not Listed	Parbury Henty & Co. Pty. Ltd.. Tmbr.Mrcht.,Pacific Highway., Woolgoolga	98436	Road Match	0m
Not Listed	Pine Lodge Motel, Pacific Highway., Woolgoolga	98437	Road Match	0m
Not Listed	Strawberry Patch, The, Grngrcr.,Pacific Highway., Woolgoolga	98453	Road Match	0m
Not Listed	Suncoast Auto Port.Pacific Highway, Mullaway. 248., Woolgoolga	98454	Road Match	0m
Not Listed	Suncoast Motel, Pacific Highway, Mullaway. 248., Woolgoolga	98455	Road Match	0m
Not Listed	Woolgoolga Motor Inn, Pacific Highway., Woolgoolga	98465	Road Match	0m
Not Listed	Woolgoolga Road House, Pacific Highway., Woolgoolga	98469	Road Match	0m
Not Listed	Hall, O. J. & Son, Tmbr. Mrcht., Old Pacific Highway., Woolgoolga	98423	Road Match	91m

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1970 Historical Business Directory Records

Bark Hut Road, Woolgoolga, NSW 2456



Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

1970 Business Directory Records Premise or Road Intersection Matches

Records from the 1970 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1970 Business Directory Records Road or Area Matches

Records from the 1970 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

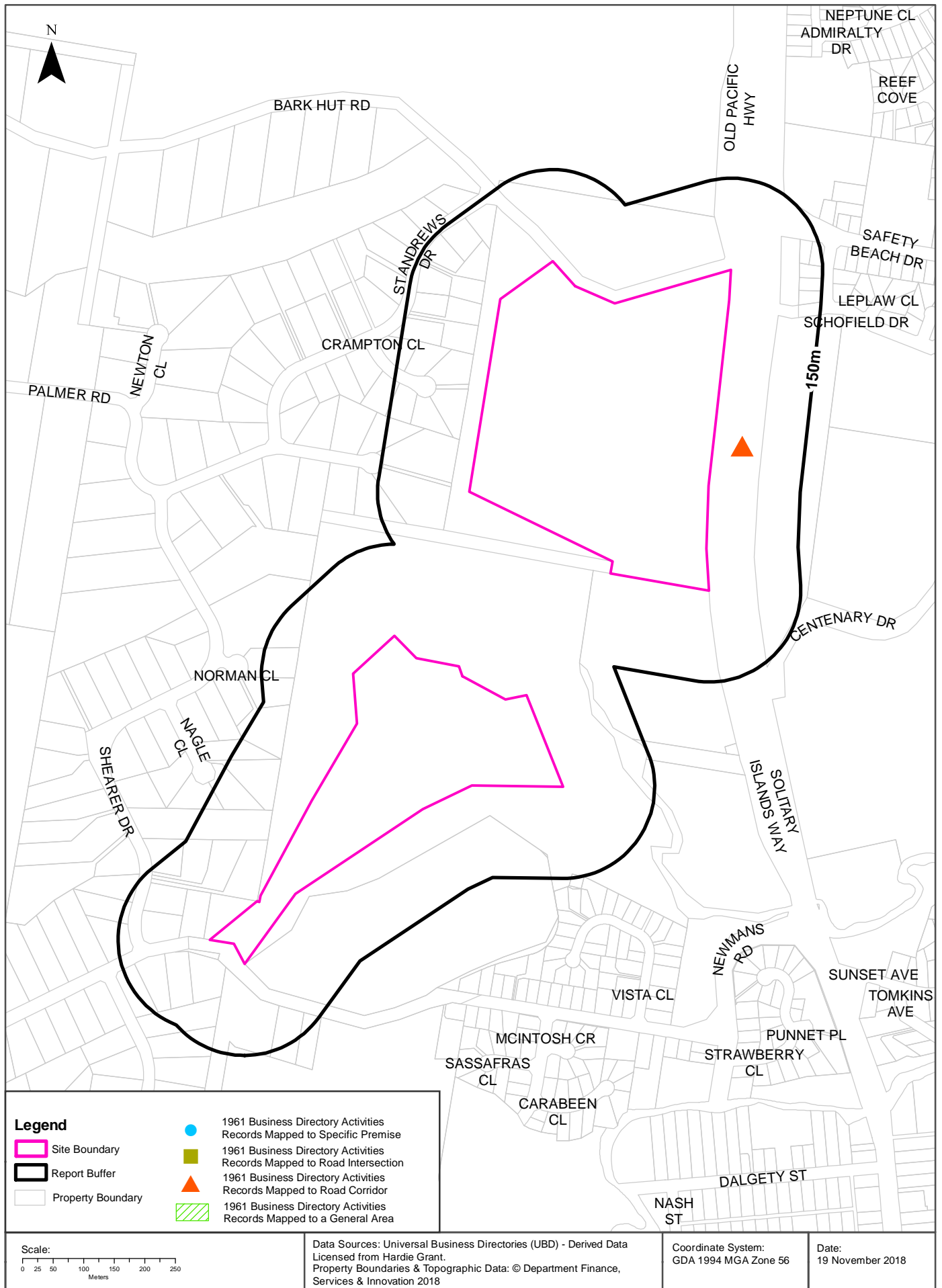
Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
MILK VENDORS	Bp Woolgoolga Service Station Pacific Highway, Woolgoolga	616442	Road Match	0m
BOTTLED GAS-SUPPLIERS &/OR REFILLERS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616348	Road Match	0m
CAFES, TEA ROOMS & COFFEE LOUNGES, ETC.	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616360	Road Match	0m
MILK BARS & CONFECTIONERY SHOPS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616433	Road Match	0m
MOTOR GARAGES & ENGINEERS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616457	Road Match	0m
TYRE DEALERS, RETREADERS & VULCANIZERS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616493	Road Match	0m
CARRIERS & CARTAGE CONTRACTORS	Ellis, C. E., Pacific Hghwy., Woolgoolga	616371	Road Match	0m
MOTELS	Fountains Motel, Pacific Hghwy. , Woolgoolga	616449	Road Match	0m
CAFES, TEA ROOMS & COFFEE LOUNGES, ETC.	Golden Fleece Service Station & Restaurant, Pacific Hghwy., Woolgoolga	616361	Road Match	0m
MOTOR SERVICE STATIONS- PETROL, OILS, ETC.	Golden Fleece Service Station & Restaurant, Pacific Hghwy., Woolgoolga	616464	Road Match	0m
MILK BARS & CONFECTIONERY SHOPS	Golden Fleece Service Station, Pacific Hghwy., Woolgoolga	616436	Road Match	0m
BOX & CASE MERCHANTS &/OR MANUFACTURERS	Hall, O. J. & Son, Pacific Hghwy., Woolgoolga	616352	Road Match	0m
TIMBER MERCHANTS & SAWMILLERS	Hall, O. J. & Son, Pacific Hghwy., Woolgoolga	616488	Road Match	0m
ASSOCIATIONS, SOCIETIES, CLUBS & SPORTING BODIES	Masonic Lodge, Pacific Hghwy., Woolgoolga	616331	Road Match	0m
TIMBER MERCHANTS & SAWMILLERS	Parbury Henty & Co. Pty. Ltd., Pacific Hghwy., Woolgoolga	616490	Road Match	0m
AGRICULTURAL MACHINERY REPAIRERS	Ratcliffe, L., Pacific Hghwy., Woolgoolga	616322	Road Match	0m
MOTOR GARAGES & ENGINEERS	Ratcliffe, L., Pacific Hghwy., Woolgoolga	616459	Road Match	0m
WELDERS-ELECTRIC &/OR OXY	Ratcliffe, L., Pacific Hghwy., Woolgoolga	616498	Road Match	0m

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
FRUITERERS & GREENGROCERS	Strawberry Patch (The), Pacific Hghwy., Woolgoolga	616396	Road Match	0m
CAFES, TEA ROOMS & COFFEE LOUNGES, ETC.	Suncoast Auto Chef, Pacific Hghwy, Mullaway, Woolgoolga	616364	Road Match	0m
LOCAL BODIES	Woolgoolga Bushfire Brigade, Pacific Hghwy., Woolgoolga	616429	Road Match	0m
BOAT, LAUNCH & YACHT BUILDERS &/OR REPAIRERS	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616344	Road Match	0m
MOTOR BODY BUILDERS & REPAIRERS	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616454	Road Match	0m
MOTOR CAR &/OR TRUCK DEALERS-NEW &/OR USED	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616456	Road Match	0m
MOTOR PAINTERS & PANEL BEATERS	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616461	Road Match	0m
MOTOR RUSTPROOFING SPECIALISTS	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616462	Road Match	0m
MOTOR TOWING SERVICES	Woolgoolga Smash Repairs, Pacific Hghwy., Woolgoolga	616467	Road Match	0m

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1961 Historical Business Directory Records

Bark Hut Road, Woolgoolga, NSW 2456



Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

1961 Business Directory Records Premise or Road Intersection Matches

Records from the 1961 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1961 Business Directory Records Road or Area Matches

Records from the 1961 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

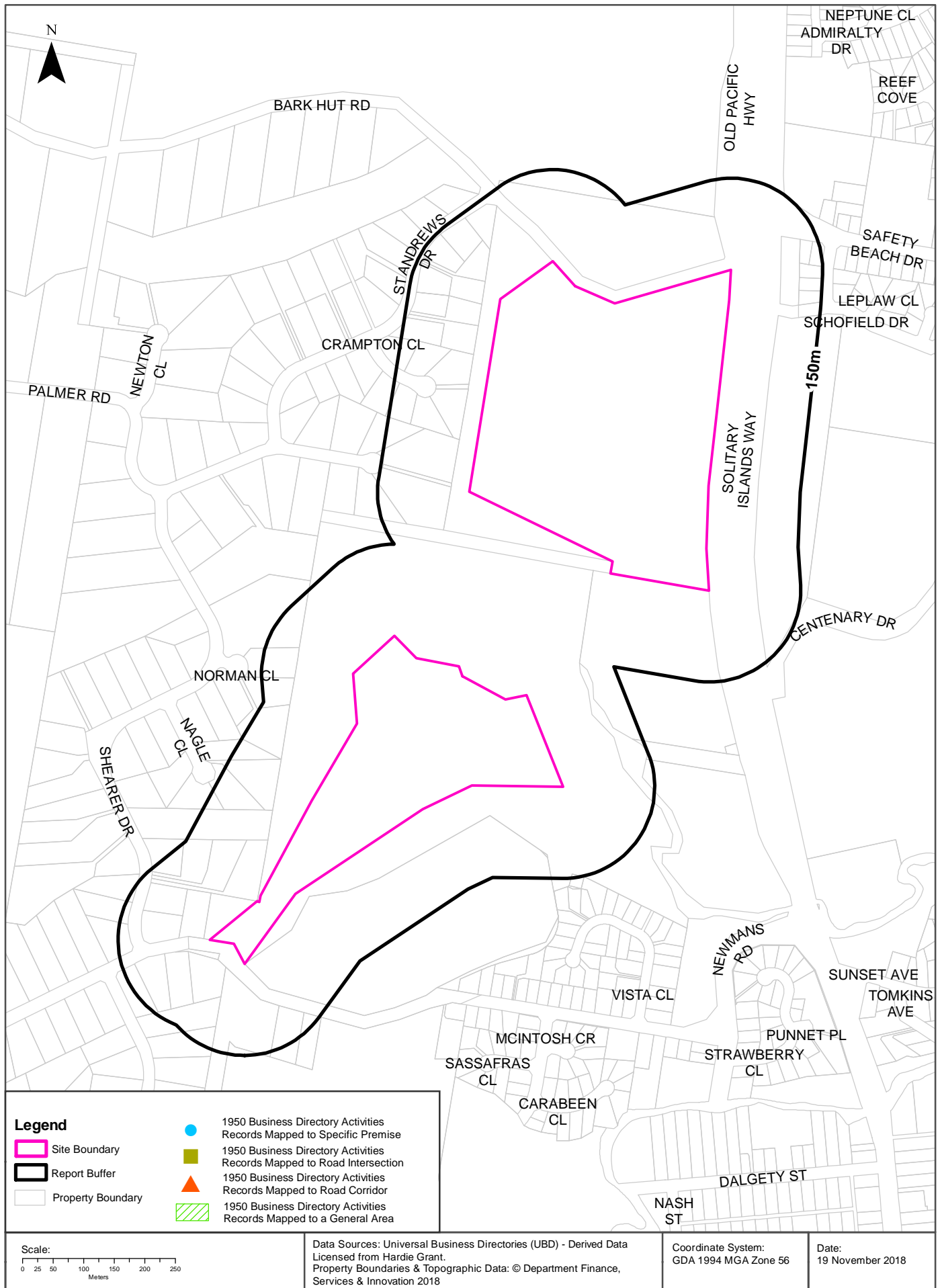
Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
MOTOR GARAGES & ENGINEERS	Clouten's, H., Golden Fleece Service Station, Pacific Highway., Woolgoolga	178249	Road Match	0m
MINERAL SANDS-SEPARATION SPECIALISTS	Freeman, R. S., Pacific Highway, Woolgoolga	178237	Road Match	0m
MOTOR GARAGES & ENGINEERS	Greentrees Motors, Pacific Highway., Woolgoolga	178250	Road Match	0m
AGRICULTURAL MACHINERY DEALERS	Greentrees Motors, Pacific Highway., Woolgoolga	177971	Road Match	0m
ENGINEERS-GENERAL, MFRG. & MECHANICAL	Greentrees Motors, Pacific Highway., Woolgoolga	178205	Road Match	0m
INSURANCE AGENTS	Greentrees Motors, Pacific Highway., Woolgoolga	178228	Road Match	0m
MOTOR BODY BUILDERS & REPAIRERS	Greentrees Motors, Pacific Highway., Woolgoolga	178246	Road Match	0m
MOTOR CAR & TRUCK DEALERS-NEW & USED	Greentrees Motors, Pacific Highway., Woolgoolga	178248	Road Match	0m
MOTOR PAINTERS & PANEL BEATERS	Greentrees Motors, Pacific Highway., Woolgoolga	178255	Road Match	0m
MOTOR SERVICE STATIONS	Greentrees Motors, Pacific Highway., Woolgoolga	178258	Road Match	0m
WELDERS-ELECTRIC &/OR OXY	Greentrees Motors, Pacific Highway., Woolgoolga	178279	Road Match	0m
ELECTRICAL SUPPLIES & APPLIANCES RETAILERS	Greentree's Woolgooga Garage and Service Station, Pacific Highway., Woolgoolga	178000	Road Match	0m
REFRIGERATOR DEALERS & SERVICEMEN.	Greentree's Woolgoolga Garage and Service Station, Pacific Highway., Woolgoolga	178268	Road Match	0m
MEDICAL PRACTITIONERS	Macpherson, J. R., Pacific Highway., Woolgoolga	178231	Road Match	0m
HAIRDRESSERS (GENT.'S) & TOBACCONISTS	McPherson, C., Pacific Highway., Woolgoolga	178216	Road Match	0m
TIMBER MERCHANTS & SAWMILLERS	Moller, J. J. Pacific Highway., Woolgoolga	178278	Road Match	0m
MOTOR SERVICE STATIONS	Sun Coast Service Station, Pacific Highway., Mullaway, via Woolgoolga	178259	Road Match	0m
MOTOR GARAGES & ENGINEERS	Sykes, A. F., Pacific Highway., Woolgoolga	178252	Road Match	0m
BAKERS-BREAD	Towner, S. E., Pacific Highway., Woolgoolga	177975	Road Match	0m

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
CAFES, TEA ROOMS & COFFEE LOUNGES, ETC.	Woolgoolga Service Station, Pacific Highway., Woolgoolga	177986	Road Match	0m
MOTOR GARAGES & ENGINEERS	Woolgoolga Service Station, Pacific Highway., Woolgoolga	178253	Road Match	0m

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1950 Historical Business Directory Records

Bark Hut Road, Woolgoolga, NSW 2456



Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

1950 Business Directory Records Premise or Road Intersection Matches

Records from the 1950 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1950 Business Directory Records Road or Area Matches

Records from the 1950 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer			

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

Dry Cleaners, Motor Garages & Service Stations Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer					

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

Bark Hut Road, Woolgoolga, NSW 2456

Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
MOTOR GARAGES /OR ENGINEERS &/OR SERVICE STATIONS.	BP Woolgoolga Roadhouse Pacific Highway, Woolgoolga.,	98392	1982	Road Match	0m
MOTOR GARAGES & ENGINEERS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616457	1970	Road Match	0m
MOTOR GARAGES & ENGINEERS	Clouten's, H., Golden Fleece Service Station, Pacific Highway., Woolgoolga	178249	1961	Road Match	0m
MOTOR SERVICE STATIONS- PETROL, OILS, ETC.	Golden Fleece Service Station & Restaurant, Pacific Hghwy., Woolgoolga	616464	1970	Road Match	0m
MOTOR GARAGES & ENGINEERS	Greentrees Motors, Pacific Highway., Woolgoolga	178250	1961	Road Match	0m
MOTOR SERVICE STATIONS	Greentrees Motors, Pacific Highway., Woolgoolga	178258	1961	Road Match	0m
MOTOR GARAGES & ENGINEERS	Ratcliffe, L., Pacific Hghwy., Woolgoolga	616459	1970	Road Match	0m
MOTOR SERVICE STATIONS	Sun Coast Service Station, Pacific Highway., Mullaway, via Woolgoolga	178259	1961	Road Match	0m
MOTOR GARAGES & ENGINEERS	Sykes, A. F., Pacific Highway., Woolgoolga	178252	1961	Road Match	0m
MOTOR GARAGES & ENGINEERS	Woolgoolga Service Station, Pacific Highway., Woolgoolga	178253	1961	Road Match	0m

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Cattle Dips

Bark Hut Road, Woolgoolga, NSW 2456

Cattle Dips of the Northern Rivers Region

Cattle dip sites within the dataset buffer:

Dip Name	Road	Town	Dip Status	Licence / Lease Status	Licence / Lease Expiry Date	Distance	Direction
N/A	No records in buffer						

Cattle dip site data provided by the NSW Department of Primary Industries.

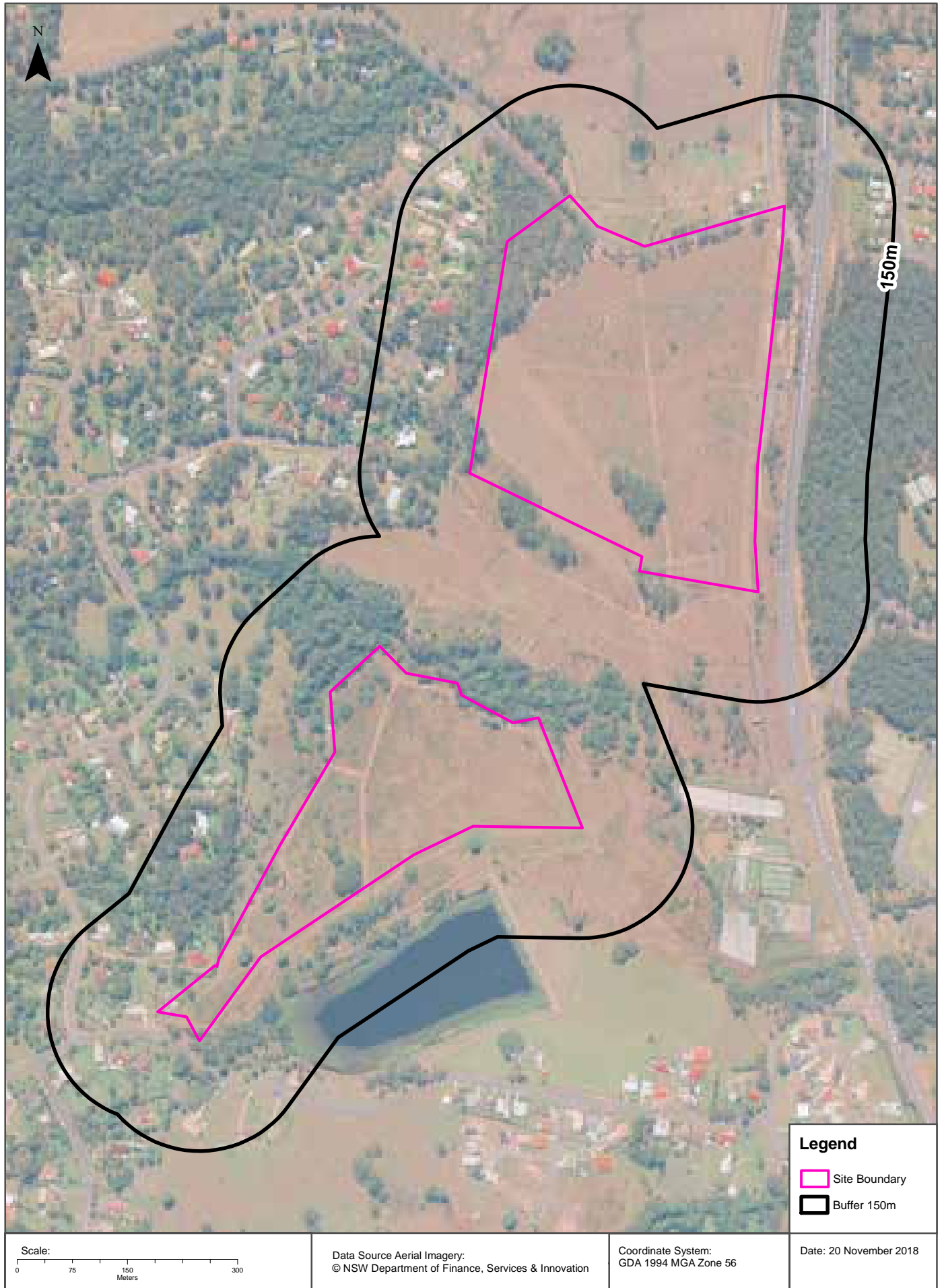
Aerial Imagery 2011

Bark Hut Road, Woolgoolga, NSW 2456



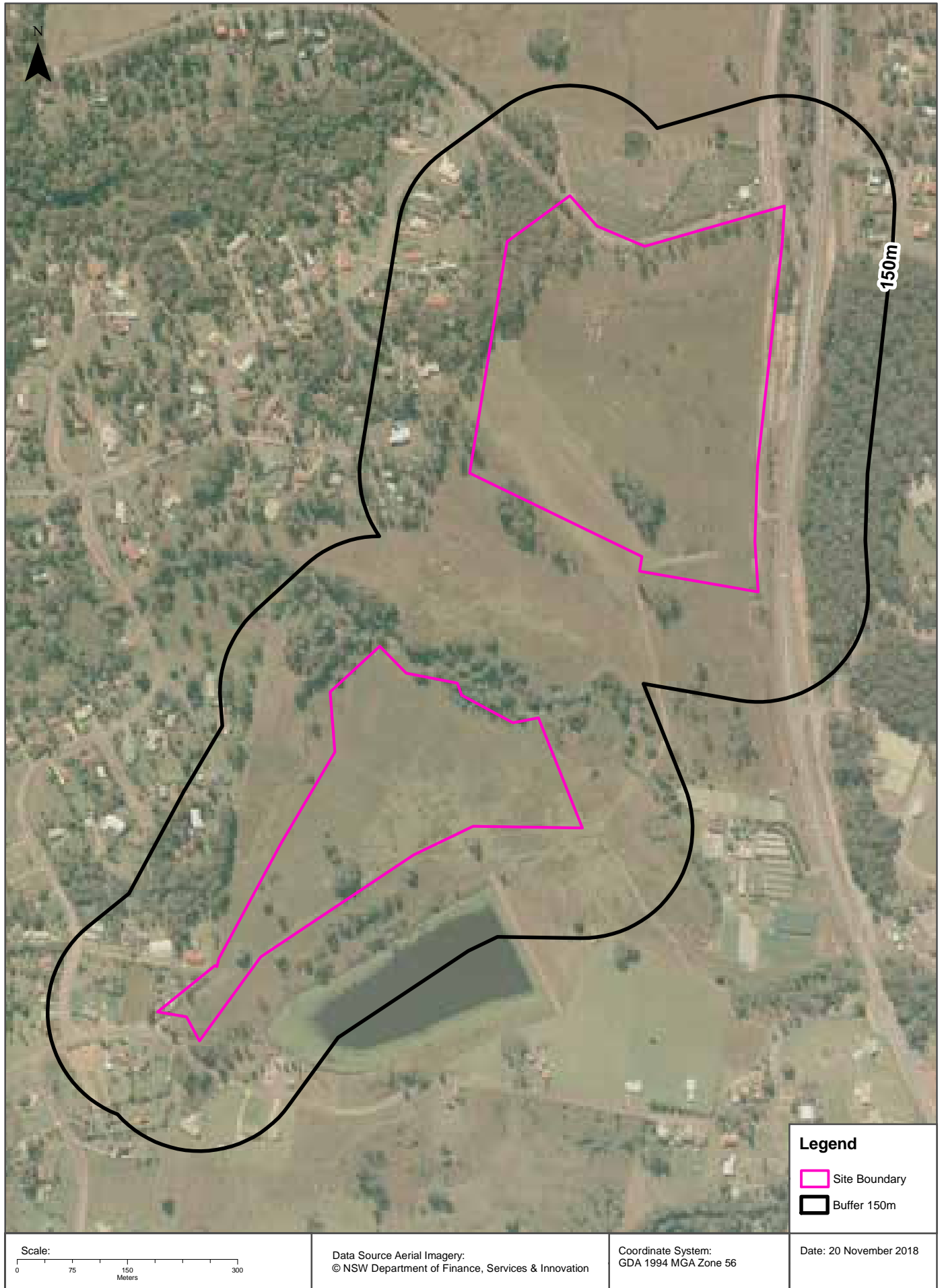
Aerial Imagery 2001

Bark Hut Road, Woolgoolga, NSW 2456



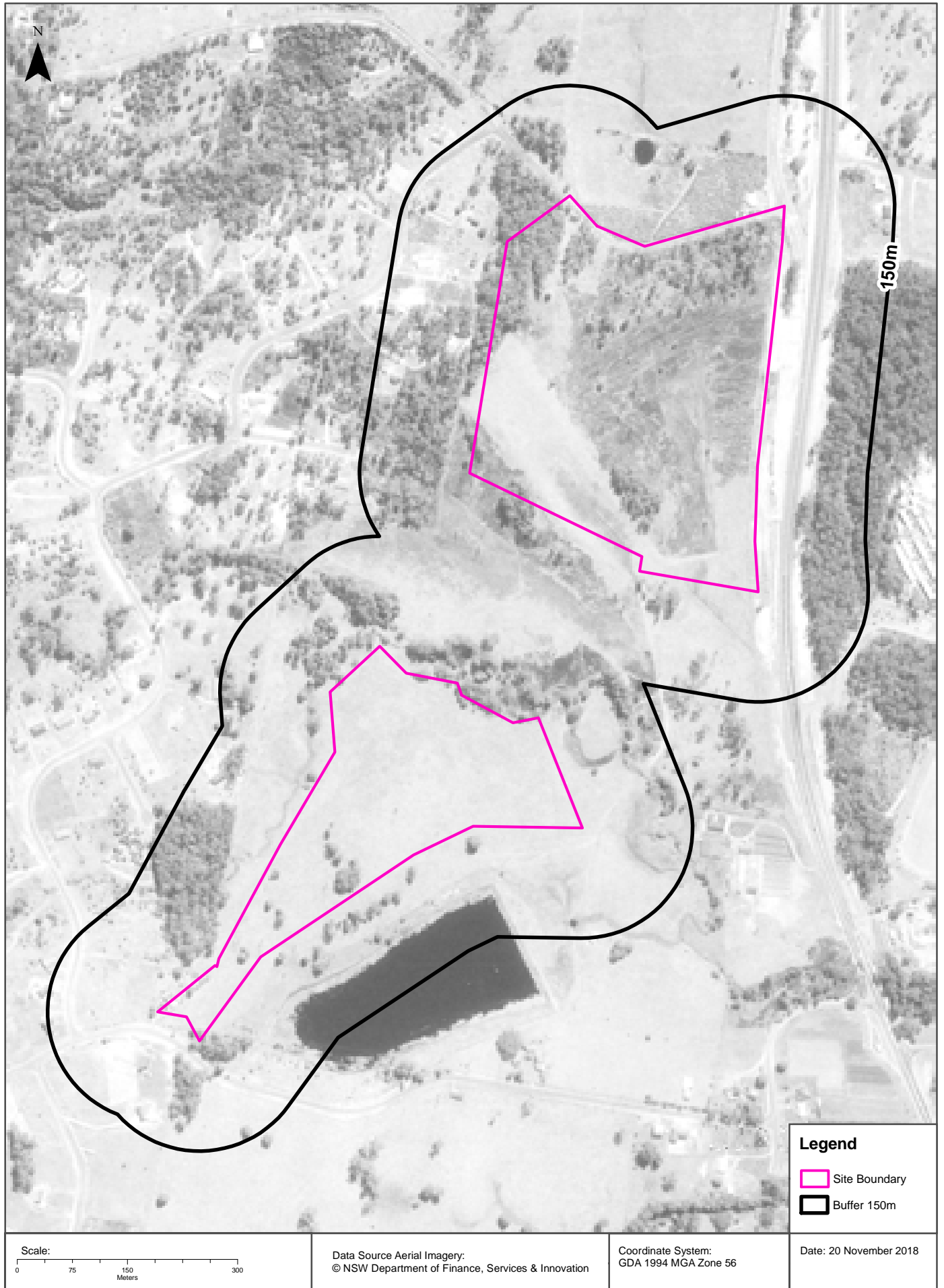
Aerial Imagery 1994

Bark Hut Road, Woolgoolga, NSW 2456



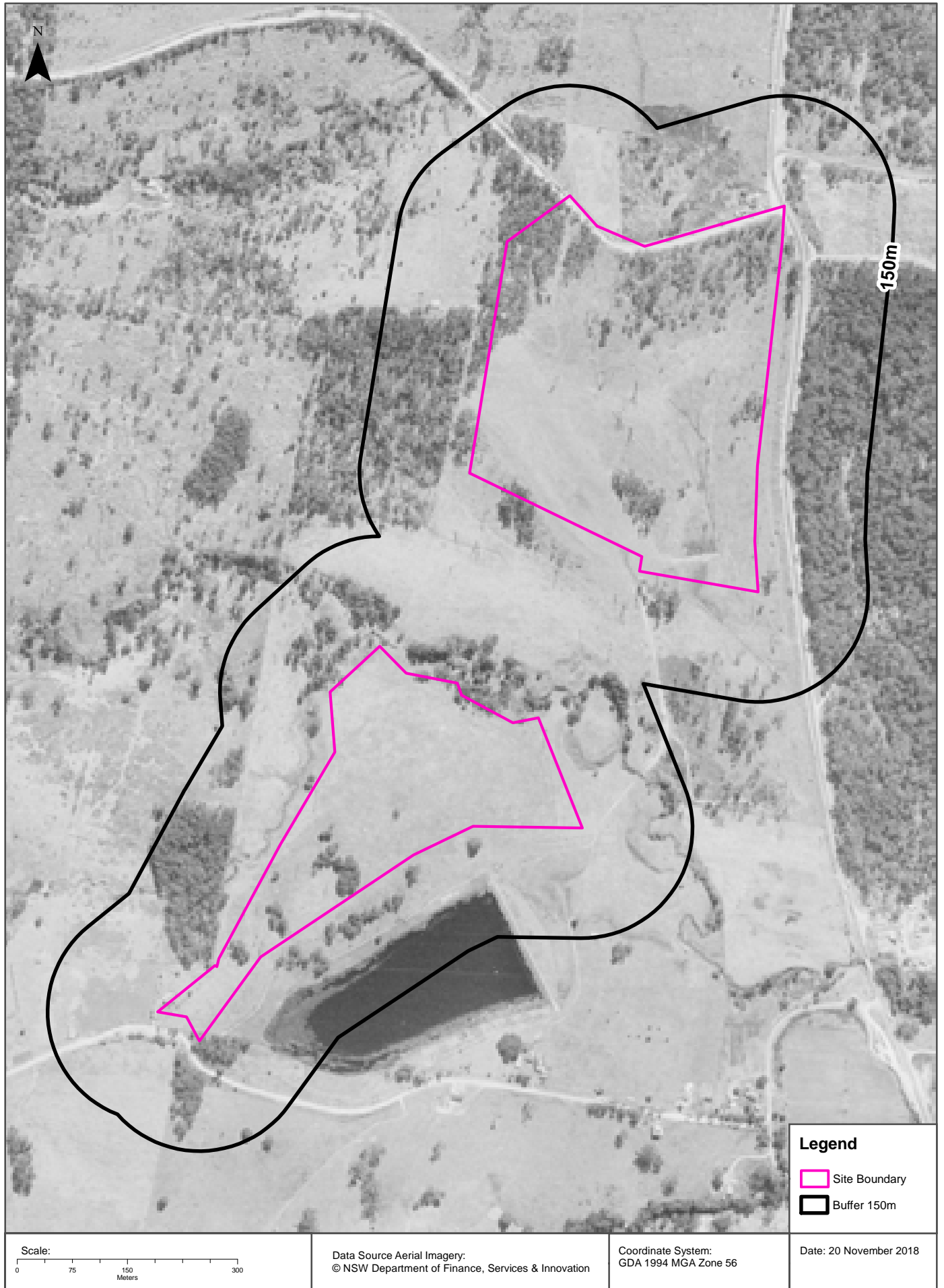
Aerial Imagery 1984

Bark Hut Road, Woolgoolga, NSW 2456



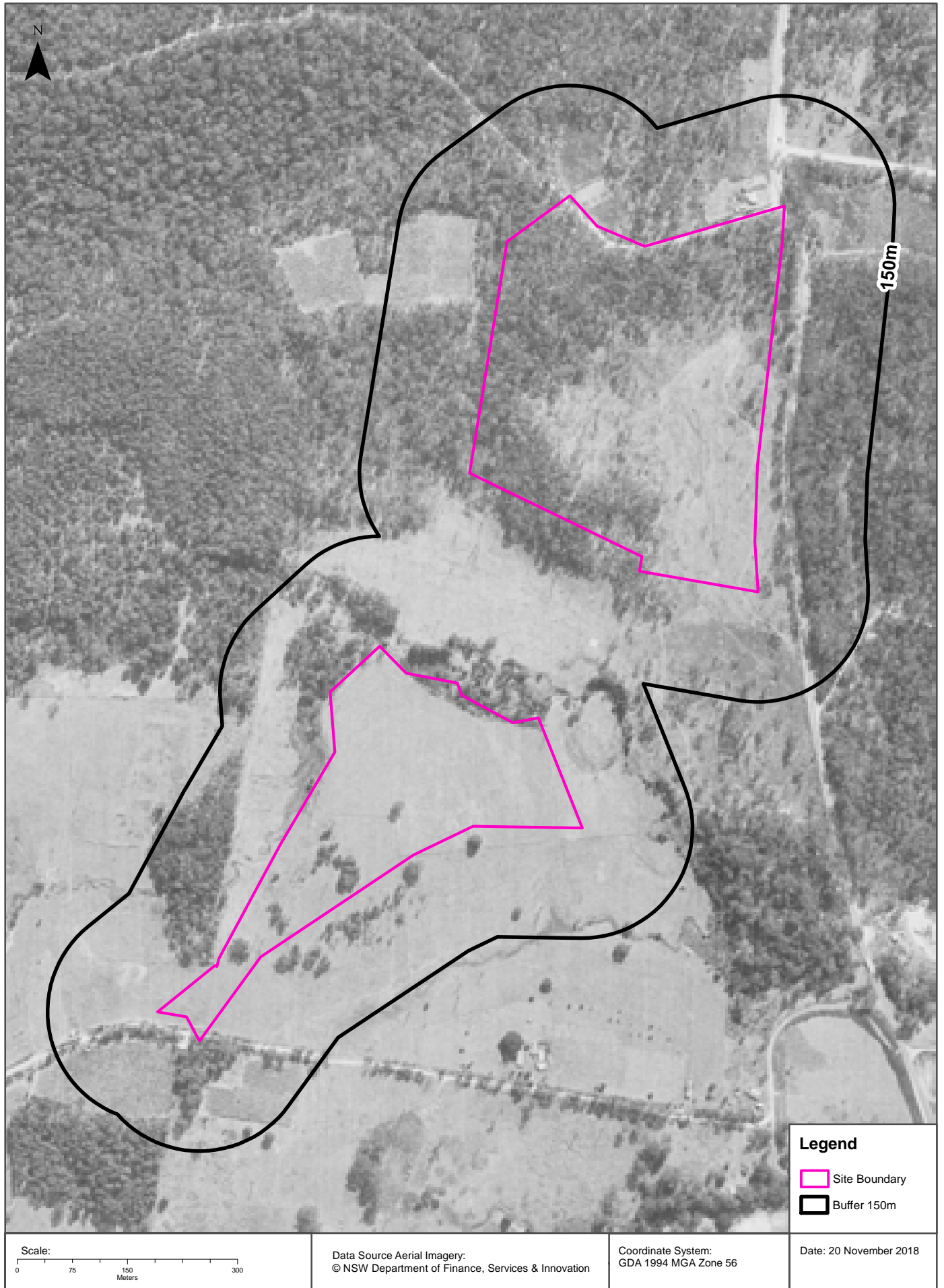
Aerial Imagery 1974

Bark Hut Road, Woolgoolga, NSW 2456



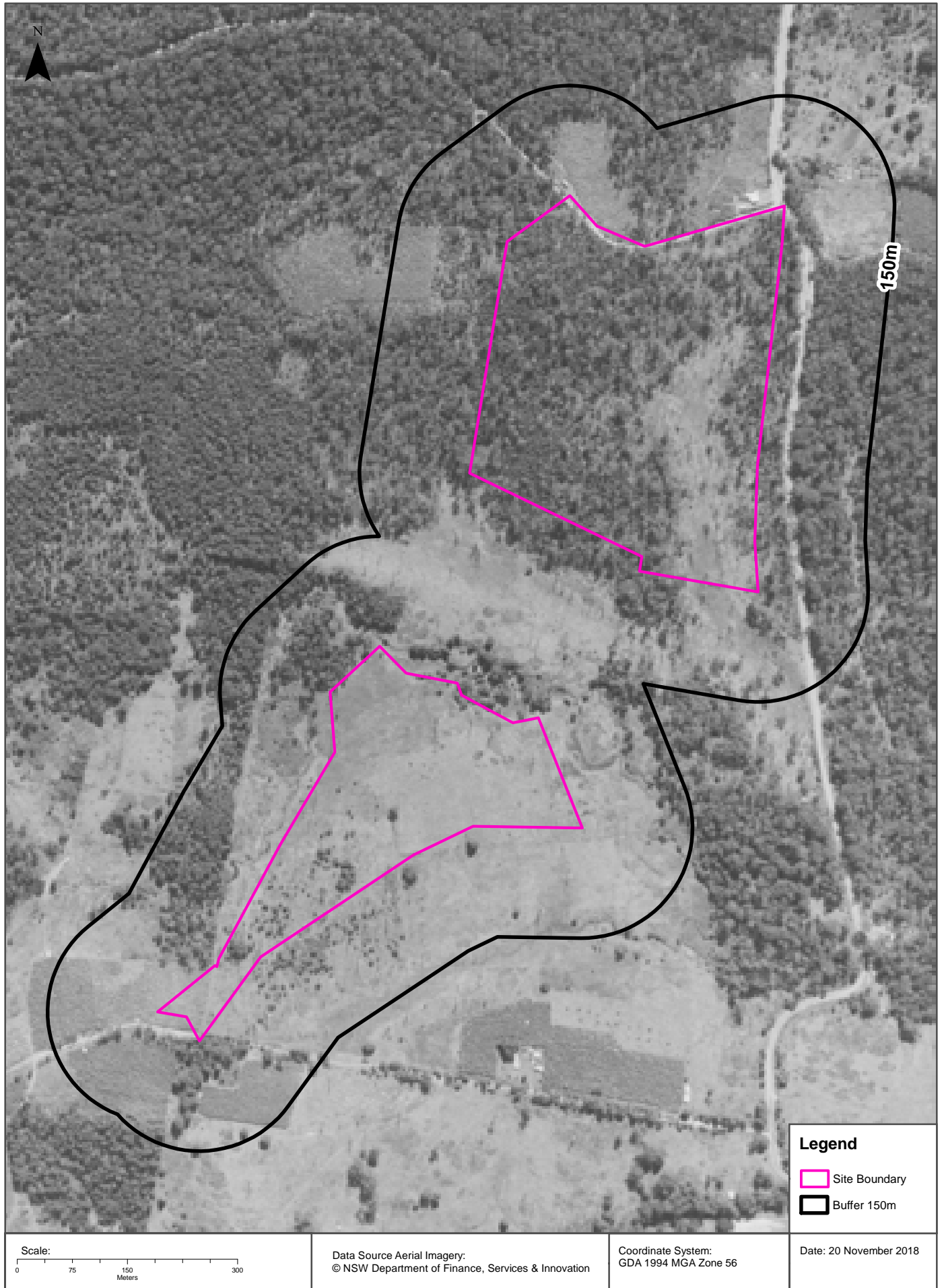
Aerial Imagery 1964

Bark Hut Road, Woolgoolga, NSW 2456



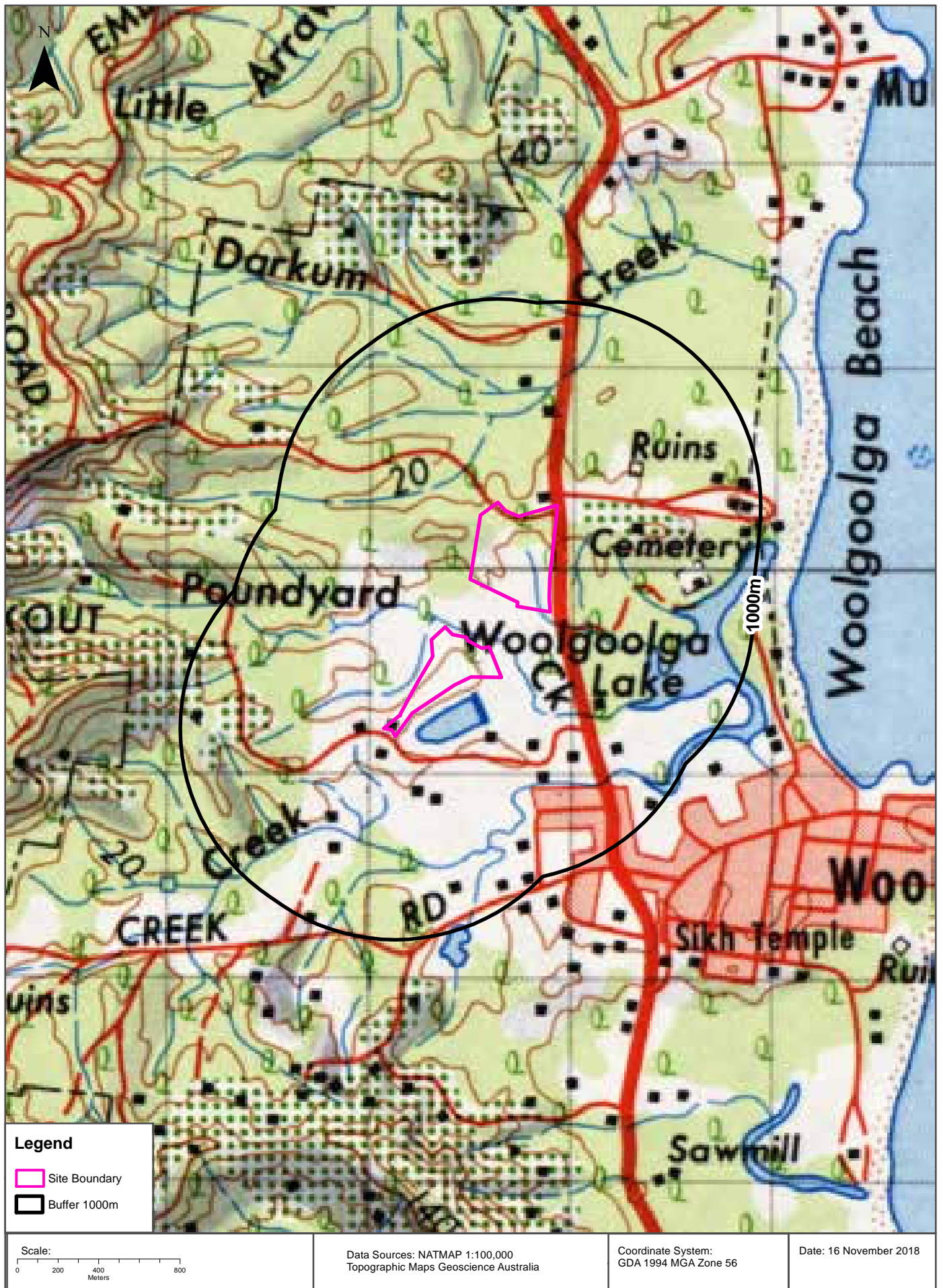
Aerial Imagery 1956

Bark Hut Road, Woolgoolga, NSW 2456



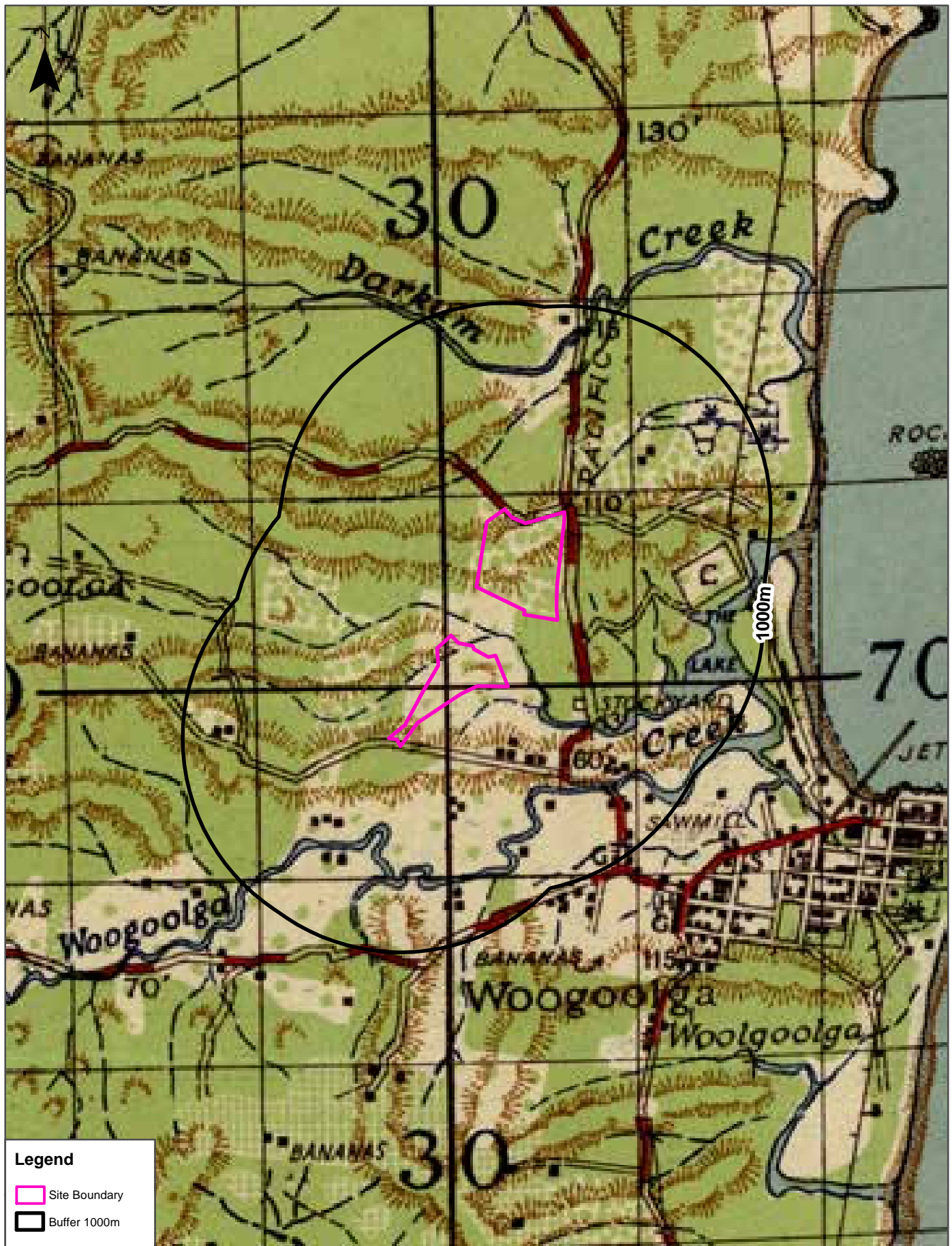
Historical Map 1974

Bark Hut Road, Woolgoolga, NSW 2456



Historical Map 1942

Bark Hut Road, Woolgoolga, NSW 2456



Legend

- Site Boundary
- Buffer 1000m

Scale:

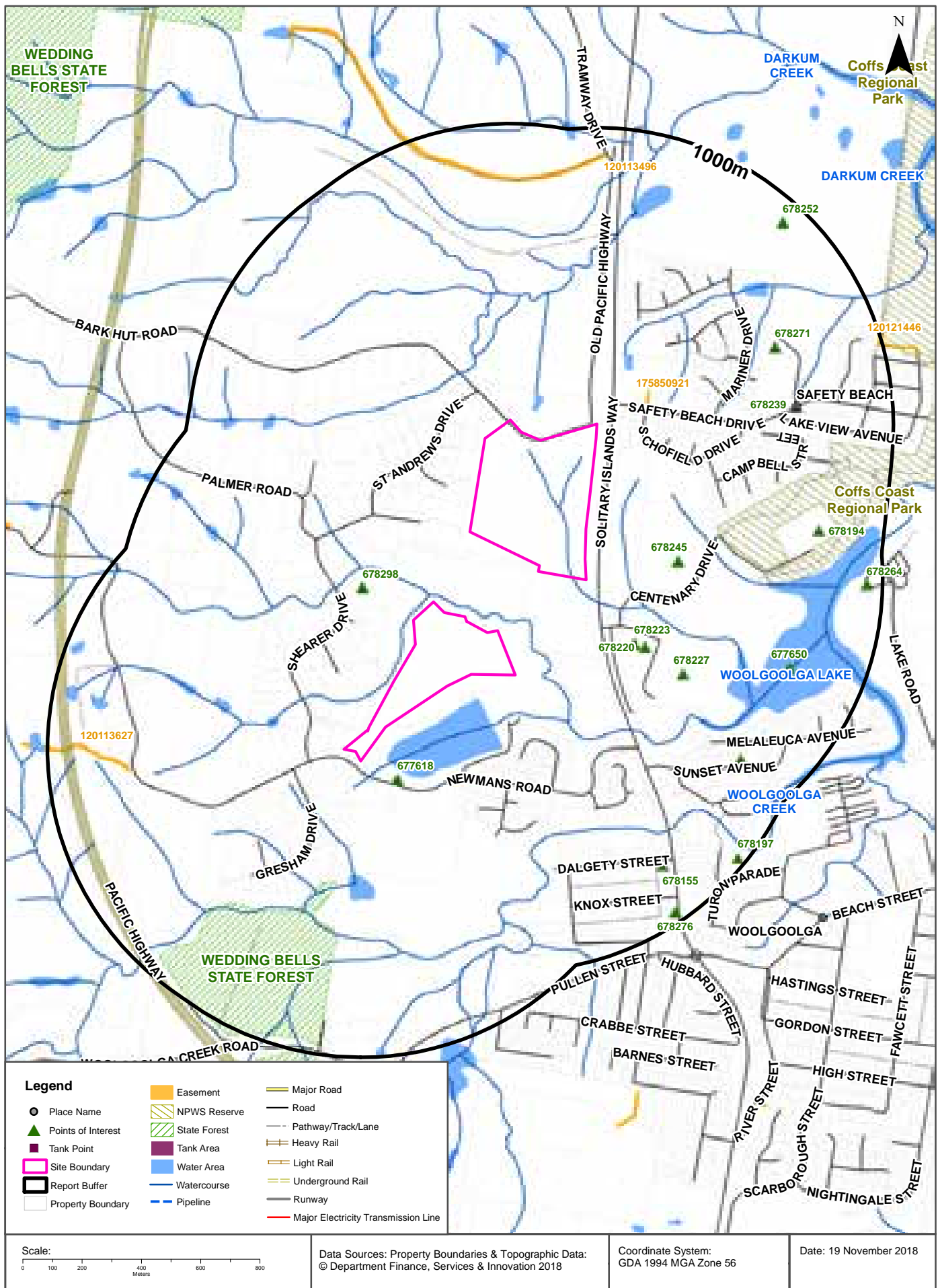
Data Sources: Australia 1:63360
Produced by Australian Section Imperial General Staff

Coordinate System:
GDA 1994 MGA Zone 56

Date: 16 November 2018

Topographic Features

Bark Hut Road, Woolgoolga, NSW 2456



Topographic Features

Bark Hut Road, Woolgoolga, NSW 2456

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
677618	Firestation - Bush	COUNTRY CLUB RFB	137m	South West
678298	Park	Park	204m	West
678223	Sports Court	TENNIS COURTS	270m	South East
678220	Sports Court	TENNIS COURTS	301m	South East
678245	High School	WOOLGOOLGA HIGH SCHOOL	313m	East
678227	Sports Field	WOOLGOOLGA SPORTSGROUND	455m	South East
678271	Club	WOOLGOOLGA DIGGERS GOLF CLUB	654m	North East
678239	Town	SAFETY BEACH	676m	North East
677650	Natural Waterbody	WOOLGOOLGA LAKE	746m	East
678194	Cemetery	WOOLGOOLGA CEMETERY	780m	East
678196	Park	Park	799m	South East
678155	Fire Station	WOOLGOOLGA FIRE STATION	813m	South East
678252	Golf Course	Golf Course	925m	North East
678264	Picnic Area	Picnic Area	945m	East
678276	Roadside Rest Area	REST AREA	965m	South East
678197	Park	Park	971m	South East

Topographic Data Source: © Land and Property Information (2015)

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Topographic Features

Bark Hut Road, Woolgoolga, NSW 2456

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
	No records in buffer					

Tanks Data Source: © Land and Property Information (2015)

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Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
175850921	Primary	Right of way	4 & 6 m	182m	North East
120113627	Primary	Undefined		724m	South West
120113496	Primary	Undefined		806m	North
120121446	Primary	Undefined		987m	North East

Easements Data Source: © Land and Property Information (2015)

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Topographic Features

Bark Hut Road, Woolgoolga, NSW 2456

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
360	WEDDING BELLS	417m	South West
360	WEDDING BELLS	985m	South

State Forest Data Source: © Land and Property Information (2015)

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National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

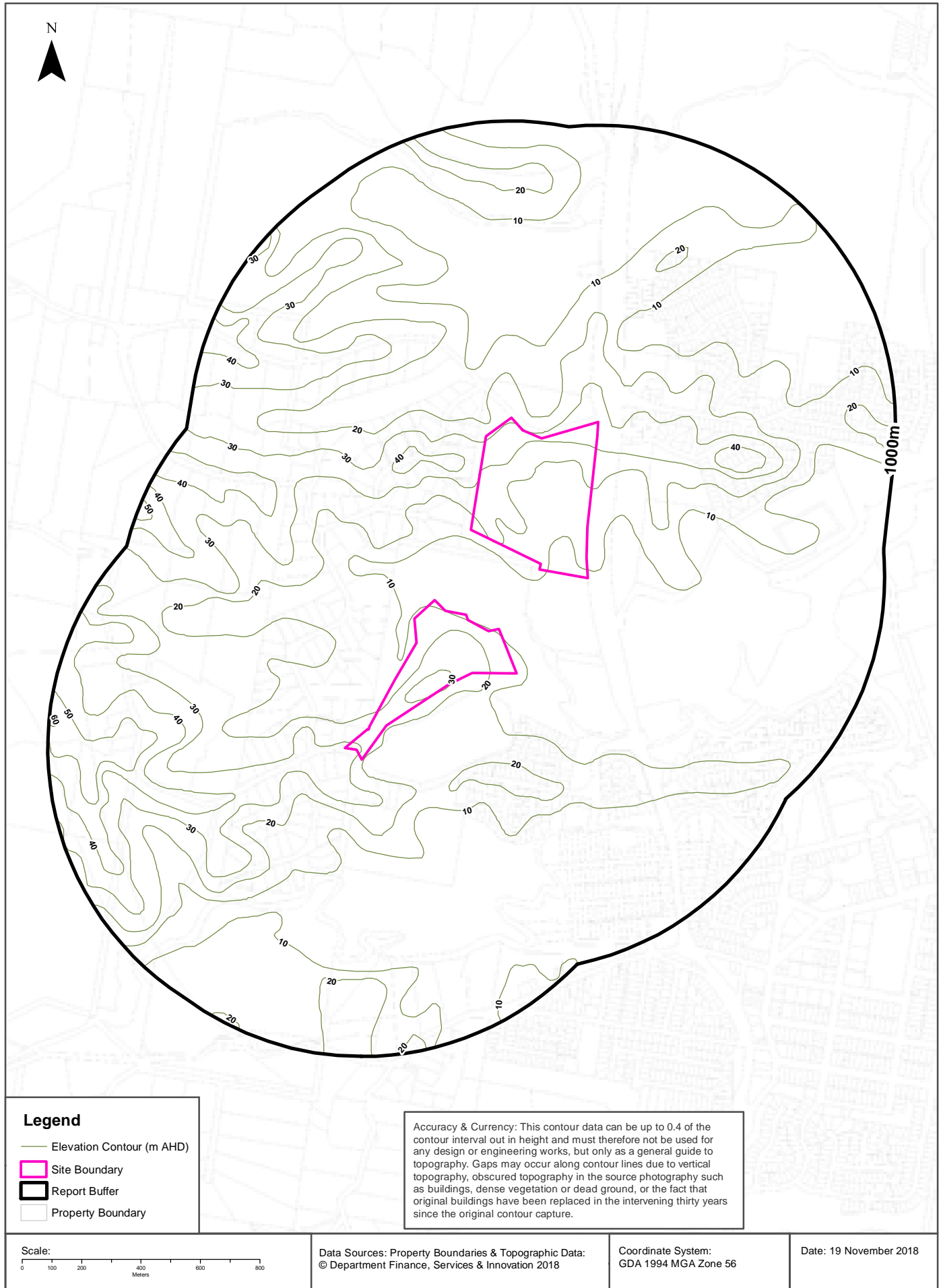
Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N1002	REGIONAL PARK	Coffs Coast Regional Park	03/10/2003	437m	South

NPWS Data Source: © Land and Property Information (2015)

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Elevation Contours (m AHD)

Bark Hut Road, Woolgoolga, NSW 2456



Hydrogeology & Groundwater

Bark Hut Road, Woolgoolga, NSW 2456

Hydrogeology

Description of aquifers on-site:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Description of aquifers within the dataset buffer:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity
Porous, extensive highly productive aquifers

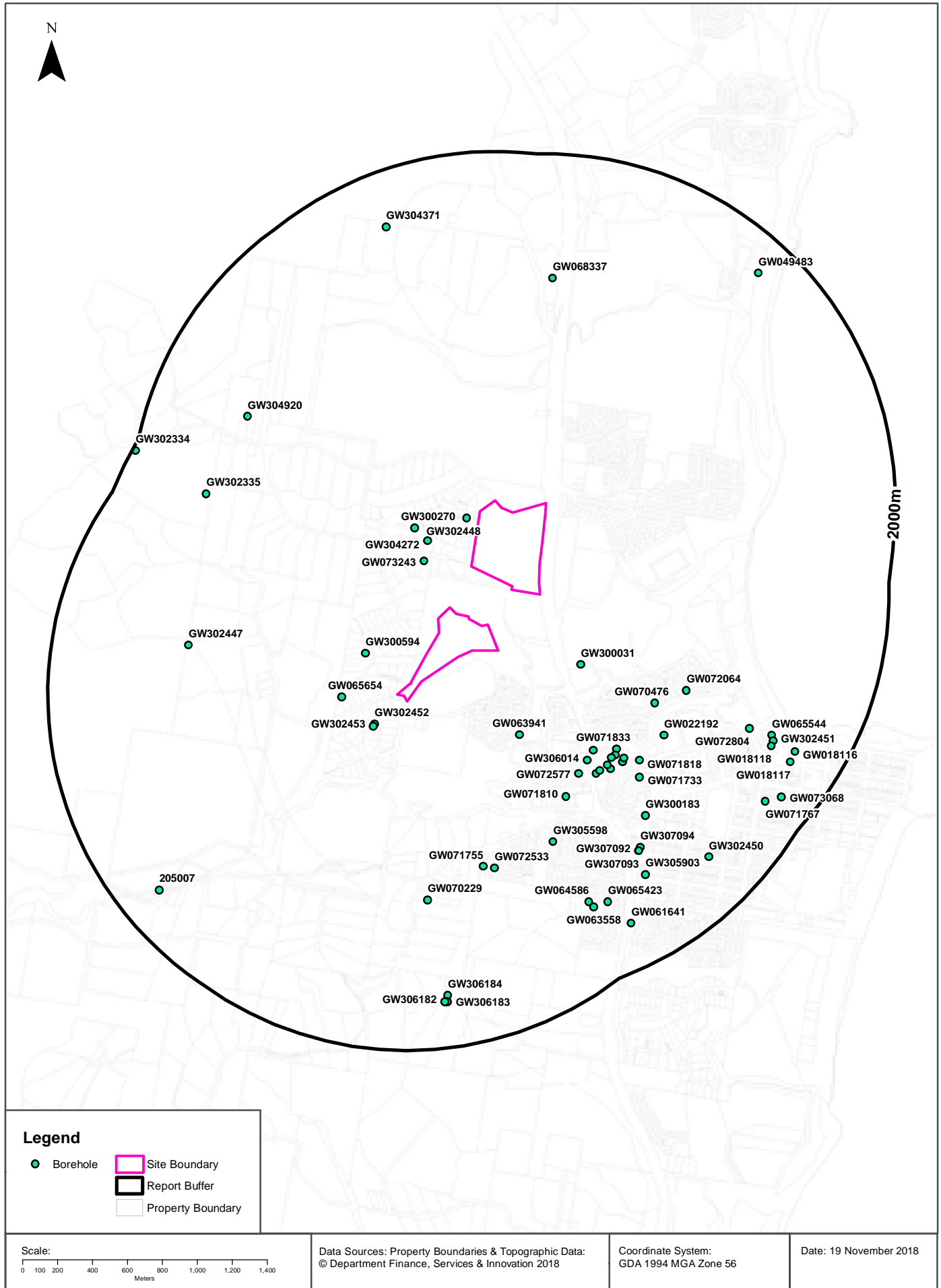
Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
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Botany Groundwater Management Zones

Groundwater management zones relating to the Botany Sand Beds aquifer within the dataset buffer:

Management Zone No.	Restriction	Distance	Direction
N/A	No records in buffer		

Botany Groundwater Management Zones Data Source : NSW Department of Primary Industries



Hydrogeology & Groundwater

Bark Hut Road, Woolgoolga, NSW 2456

Groundwater Boreholes

Boreholes within the dataset buffer:

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW302 448	30BL150 739	Bore		Domestic	Domestic		01/12/1992	42.00	42.00					67m	North
GW302 452	30BL176 330	Bore		Domestic	Domestic, Stock		09/11/1994	61.00	61.00					213m	South West
GW302 453	30BL176 330	Bore		Domestic	Domestic, Stock		09/11/1994	120.00	120.00					228m	South West
GW304 272	30BL181 072	Bore	Private	Domestic	Domestic		22/08/2003	48.00	48.00	660	18.00	0.6940		269m	North West
GW073 243	30BL176 329	Bore	Private	Domestic	Domestic, Stock		10/11/1994	53.00	53.00	Good	10.00	0.6100		270m	West
GW300 594	30BL176 649	Bore		Domestic	Domestic, Stock		13/01/1995	38.00	38.00	Good	4.00	0.610		295m	South West
GW065 654	30BL138 480	Bore	Private	Domestic	Domestic		16/11/1988	40.00	40.00		9.00	0.100		316m	South West
GW300 270	30BL145 157	Bore	Private	Domestic	Domestic		21/06/1992	73.00	73.00	Good	9.00	0.189		355m	North West
GW300 031	30BL176 683, 30CA30 2702	Bore		Irrigation, Recreation (groundwater)	Domestic, Stock		07/11/1994	31.00	31.00	Good	4.00	2.590		465m	South East
GW063 941	30BL135 175	Bore	Private	Domestic	Domestic		01/09/1986	31.00	31.00					498m	South
GW306 015	30BL184 223	Well	Private	Monitoring Bore	Monitoring Bore		21/06/2006	7.00	7.00		1.00			792m	South East
GW306 014	30BL184 222	Well	Private	Monitoring Bore	Monitoring Bore		21/06/2006	8.00	8.00		5.70			811m	South East
GW072 577	30BL154 217	Bore	Private	Domestic	Domestic		20/02/1994	30.00	30.00	Good		1.020		843m	South East
GW071 833	30BL154 144	Bore	Private	Domestic	Domestic		15/02/1994	12.00	12.00	Good	6.00	0.610		883m	South East
GW071 423	30BL153 516	Bore	Private	Domestic	Domestic		06/12/1993	21.00	21.00	Good	5.00	0.730		896m	South East
GW305 289	30BL182 625	Bore		Domestic	Domestic		25/06/2004	18.00	18.00		3.00	0.180		901m	South East
GW306 013	30BL183 493	Well	Private	Monitoring Bore	Monitoring Bore		21/06/2006	8.00	8.00		3.40			902m	South East
GW305 388	30BL178 719	Bore	Private	Monitoring Bore	Monitoring Bore		12/10/2005							903m	South East
GW070 476	30BL150 984	Bore	Private	Domestic	Domestic		01/11/1992	54.00	54.00	1800	20.00	2.2730	10.00	906m	South East
GW070 088	30BL150 439, 30BL178 713	Bore	Private	Domestic, Irrigation, Stock	Domestic		12/08/1992	24.00	24.00	Good	9.00	1.263		908m	South East
GW071 810	30BL154 031, 30WA30 2699	Bore	Private	Domestic	Domestic		11/02/1994	15.00	15.00	Good	5.00	0.630		923m	South
GW303 191	30BL179 900	Bore	Private	Domestic	Domestic									936m	South East
GW071 773	30BL153 805	Bore	Private	Domestic	Domestic		14/02/1994	13.00	13.00	Good	6.00	0.610		950m	South East
GW071 424	30BL153 517	Bore	Private	Domestic	Domestic		03/12/1993	15.00	15.00	Good	3.00	1.230		958m	South East
GW072 064	30BL176 565	Bore	Private	Domestic	Domestic		18/12/1994	24.00	24.00	Good	9.00	1.265		1004m	South East

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW071 818	30BL154 087	Bore	Private	Domestic	Domestic		14/02/1994	13.00	13.00	Good	6.00	0.610		1026m	South East
GW071 755	30BL153 541	Bore	Private	Domestic	Domestic		02/12/1993	15.00	15.00	Good	4.00	1.600		1044m	South
GW022 192		Well	Private		Irrigation		01/07/1964	3.70	3.70	0-500 ppm				1069m	South East
GW072 533	30BL153 593	Bore	Private	Domestic	Domestic, Stock		06/12/1993	17.00	17.00		1.00	0.610		1081m	South
GW071 733	30BL153 165	Bore		Domestic	Domestic, Stock		22/02/1994	50.00	51.00	Good		0.480		1087m	South East
GW305 598	30BL181 603	Bore	Private	Domestic	Domestic		23/01/2006	24.00	24.00	610	5.70	1.516		1140m	South
GW070 229	30BL150 738	Bore	Private	Domestic	Domestic		05/10/1992	24.00	24.00	Good	6.00	0.578		1145m	South
GW302 447	30BL153 189	Bore		Domestic	Domestic		12/10/1993	72.00	72.00					1224m	West
GW300 183	30BL144 174	Bore	Private	Domestic	Domestic		25/08/1992	36.00	36.00	Good	9.00	0.758		1268m	South East
GW068 337	30BL140 234	Bore	Private	Domestic, Stock			08/11/1989	70.00	70.00		21.00	0.400		1287m	North
GW307 094		Bore	Private		Monitoring Bore	Beard - MW3	10/06/2011	5.60	5.60		2.50			1391m	South East
GW307 092		Bore	Private		Monitoring Bore	Beard - MW1	08/06/2011	6.50	6.50		2.60			1402m	South East
GW307 093		Bore	Private		Monitoring Bore	Beard - MW2	08/06/2011	5.50	5.50		2.40			1402m	South East
GW072 804	30BL155 387	Bore		Domestic	Domestic, Stock		31/08/1994	15.00	15.00	Good	3.00	0.490		1426m	South East
GW304 920	30BL180 125	Bore		Monitoring Bore	Monitoring Bore		17/06/2002	25.30	25.30					1437m	North West
GW302 335	30BL143 111	Bore		Domestic, Irrigation	Stock		26/06/1992	42.00	42.00	Good	12.00	0.505		1505m	West
GW064 586	30BL137 236	Bore	Private	Domestic, Stock	Domestic, Stock		01/01/1988	33.00	33.00	Good				1530m	South
GW305 903	30BL178 898	Bore	Private	Domestic	Domestic		01/02/2000	100.00			70.00	5.000		1537m	South East
GW065 544	30BL142 970, 30BL143 271	Bore	Private	Irrigation, Test Bore	Irrigation		29/04/1991	31.00	31.00		6.90	1.000		1555m	South East
GW063 558	30BL137 224	Bore	Private	Domestic, Stock	Domestic, Stock		01/01/1988	27.00	27.00	Good				1568m	South
GW065 423	30BL138 164	Bore	Private	Domestic	Domestic		05/08/1988	21.00	21.00	Good		2.000		1570m	South
GW302 451	30BL176 659	Bore		Domestic	Domestic, Stock		17/01/1995	18.00	18.00	Salty				1578m	South East
GW018 118	30BL011 858	Well	Local Govt	Waste Disposal	Not Known		01/12/1955	6.10	6.10					1587m	South East
GW304 371	30BL182 082	Bore	Private	Domestic	Domestic		09/09/2003	42.00	42.00	980	10.00	1.515		1685m	North
GW302 450	30BL176 044	Bore		Domestic	Domestic		15/09/1994	33.00	33.00	Good	9.00	0.100		1691m	South East
GW306 184	30BL183 892	Bore	Private	Domestic	Domestic		13/11/2005	54.00	54.00	520	18.00	0.316		1702m	South
GW018 116	30BL011 859	Well	Local Govt	Waste Disposal	Not Known		01/01/1961	7.30						1717m	South East
GW018 117	30BL011 860	Well	Local Govt	Waste Disposal	Not Known		01/01/1961	5.50	5.50					1728m	South East
GW306 182	30BL183 892	Bore	Private	Domestic	Domestic		11/11/2005	61.00	61.00					1737m	South
GW306 183	30BL183 892	Bore	Private	Domestic	Domestic		12/11/2005	85.00	85.00					1737m	South
GW061 641	30BL133 934	Bore	Private	Domestic	Domestic		01/10/1985	18.00	18.00					1738m	South East
GW071 767	30BL153 737	Bore	Private	Domestic	Domestic		20/02/1994	20.00	27.00					1755m	South East
205007					UNK								26.53	1764m	South West

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW049483	30BL109572	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/07/1979	12.20	12.20					1792m	North East
GW073068	30BL176056	Bore	Private	Domestic	Domestic		20/09/1994	14.30	14.30	S.Salty	1.50	1.500		1807m	South East
GW302334	30BL143111	Bore		Domestic, Irrigation	Stock		25/06/1992	61.00	61.00	Good	27.00	0.126		1980m	West

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Hydrogeology & Groundwater

Bark Hut Road, Woolgoolga, NSW 2456

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

Groundwater No	Drillers Log	Distance	Direction
GW302448	0.00m-12.00m BROWN GREY WACKY SHALE 12.00m-42.00m GREY WACKY	67m	North
GW302452	0.00m-2.00m CLAY 2.00m-4.00m SHALE 4.00m-61.00m MOSTLY BASALT	213m	South West
GW302453	0.00m-3.00m CLAY 3.00m-6.00m SHALE 6.00m-120.00m MOSTLY BASALT	228m	South West
GW304272	0.00m-0.30m BROWN TOPSOIL 0.30m-1.00m BROWN CLAY 1.00m-6.00m BROWN SHALE 6.00m-9.00m BROWN SHALE 9.00m-24.00m BASALT 24.00m-29.00m CRACKY BASALT (W/B) 29.00m-42.00m BASALT 42.00m-46.00m CRACKY BASALT (W/B) 46.00m-48.00m BASALT	269m	North West
GW073243	0.00m-12.00m Shale 12.00m-16.00m Broken Shale 16.00m-48.00m Mostly Basalt 48.00m-51.00m Broken Shale 51.00m-53.00m Basalt	270m	West
GW300594	0.00m-3.00m CLAY 3.00m-8.00m SHALE 8.00m-34.00m BASALT 34.00m-35.00m BROKEN BASALT 35.00m-38.00m BASALT	295m	South West
GW065654	0.00m-2.00m TOPSOIL 2.00m-5.00m HARD RED CLAY 5.00m-9.00m SHALE 9.00m-20.00m BASALT 20.00m-24.00m SHATTERED BASALT 24.00m-28.00m BASALT 28.00m-29.00m SHALE BLACK 29.00m-40.00m BASALT	316m	South West
GW300270	0.00m-6.00m BROWN SHALE 6.00m-31.00m BASALT 31.00m-36.00m CRACKY BASALT 36.00m-73.00m BASALT	355m	North West
GW300031	0.00m-6.00m Clay 6.00m-12.00m Shale Soft 12.00m-21.00m Shale Hard 21.00m-24.00m Shale - broken 24.00m-31.00m Basalt	465m	South East
GW063941	0.00m-2.00m Soil 2.00m-22.00m Shale Water Supply 22.00m-24.00m Coal Shale 24.00m-29.00m Basalt Broken Rock Water Supply 29.00m-31.00m Basalt	498m	South
GW072577	0.00m-13.00m Colored Clays 13.00m-18.00m Grey Shale 18.00m-30.00m Black Shale	843m	South East
GW071833	0.00m-6.00m Dry Clay 6.00m-8.00m Wet Black Clay	883m	South East

Groundwater No	Drillers Log	Distance	Direction
GW071423	14.00m-18.00m Gravel/clay 18.00m-20.00m Soft Shale	896m	South East
GW305289	0.00m-1.20m soil 1.20m-9.00m clay 9.00m-18.00m dec shale	901m	South East
GW070476	0.00m-0.30m Topsoil 0.30m-4.00m Clay - brown 4.00m-12.00m Shale - brown 12.00m-30.00m Shale - black 30.00m-49.00m Slate - black hard 49.00m-54.00m Slate - black & reef quartz 54.00m-54.00m Slate - black	906m	South East
GW070088	0.00m-1.00m SHALE FILL 1.00m-1.30m BLACK SOIL 1.30m-5.00m BROWN CLAY 5.00m-6.00m GREY CLAY 6.00m-12.00m SOFT BROWN SHALE 12.00m-12.30m CEMENTED WASHED GRAVELS 12.30m-18.00m SOFT BROWN SHALE 18.00m-20.00m HARD " " 20.00m-24.00m FRACTURED HARD BROWN SHALE	908m	South East
GW071810	0.00m-12.00m Colored Clays 12.00m-15.00m Broken Shale	923m	South
GW071773	0.00m-8.00m Dry Clay 8.00m-10.00m Swamp Black Clay 10.00m-13.00m Gravel	950m	South East
GW071424	8.00m-15.00m Gravel & Some Shale	958m	South East
GW072064	0.00m-0.30m Black Topsoil 0.30m-0.90m Clay Fill 0.90m-6.00m Brown Clay 6.00m-12.00m Grey Clay 12.00m-19.00m Grey Shale 19.00m-24.00m Broken Grey Shale	1004m	South East
GW071818	0.00m-6.00m Dry Clay 6.00m-10.00m Wet Black Clay	1026m	South East
GW071755	2.00m-10.00m Soft Shale 12.00m-15.00m Broken Rock/basalt	1044m	South
GW022192	0.00m-0.61m Loam 0.61m-3.66m Gravel Creek Water Supply	1069m	South East
GW072533	0.00m-2.00m Clay 2.00m-8.00m Shale 8.00m-14.00m Basalt 14.00m-16.00m Broken Rock/basalt 16.00m-17.00m Basalt	1081m	South
GW071733	0.00m-6.00m CLAY 6.00m-12.00m BLACK SHALE 12.00m-16.00m GRAVEL/SHALE 16.00m-51.00m BASSALT	1087m	South East
GW305598	0.00m-0.60m shale, fill 0.60m-2.00m clay, brown pug 2.00m-4.50m shale, brown 4.50m-5.00m basalt 5.00m-19.00m basalt 19.00m-23.00m basalt. broken 23.00m-24.00m basalt	1140m	South
GW070229	0.00m-0.30m Black Topsoil 0.30m-6.00m Red Clay 19.00m-24.00m Cracky Basalt	1145m	South
GW302447	0.00m-8.00m SOFT BROWN SHALE 8.00m-36.00m BASALT 36.00m-72.00m BLACK PRESSURED SHALE	1224m	West
GW300183	0.00m-0.30m BLACK TOPSOIL 0.30m-2.30m BROWN CLAY 2.30m-18.00m BROWN SHALE 18.00m-30.00m BROWN SHALE 30.00m-31.00m BASALT 31.00m-36.00m BROKEN BASALT	1268m	South East

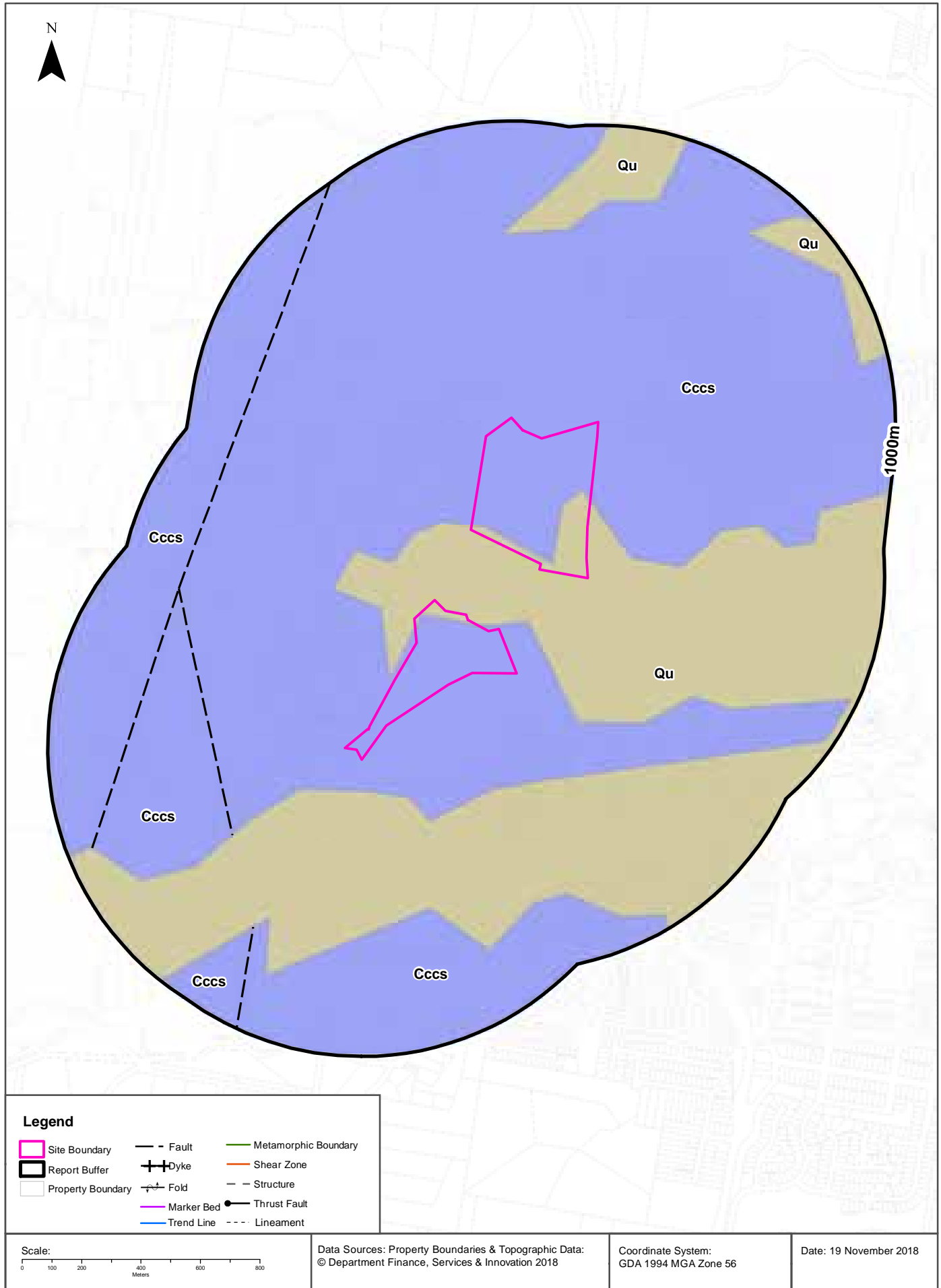
Groundwater No	Drillers Log	Distance	Direction
GW068337	0.00m-2.00m Fill 2.00m-13.00m Clay 13.00m-21.00m Soft Shale 21.00m-24.00m Hard Shale 24.00m-58.00m Basalt 58.00m-61.00m Quartz Seams 61.00m-70.00m Basalt	1287m	North
GW307094	0.00m-0.20m Fill; Concrete 0.20m-1.50m Silty Clay; high plasticity, red-brown, stiff, slightly moist 1.50m-2.50m Clay, Gravelly; medium plasticity, light brown, hard, slightly moist 2.50m-3.00m Silty Clay; high plasticity, light brown, hard, slightly moist 3.00m-5.60m Clay, Gravelly; medium plasticity, light brown, hard, slightly moist, wet @ 5.5m	1391m	South East
GW307092	0.00m-0.20m Fill; concrete 0.20m-0.50m Fill; Gravelly Sandy Clay; low plasticity, green grey, firm, slightly moist 0.50m-6.50m Silty Clay; high plasticity, orange-grey with mottled red, very stiff, slightly moist, frequent localised gravels/subang	1402m	South East
GW307093	0.00m-0.20m Fill; Concrete 0.20m-5.50m Silty Clay; high plasticity, red-brown, very stiff, slightly moist, gravels frequent from 1.3m, light brown, subangular	1402m	South East
GW072804	0.00m-6.00m Sand 6.00m-13.00m Sand & Loam 13.00m-15.00m Shale interbedded with gravel	1426m	South East
GW304920	0.00m-1.80m clay silty, high plasticity 1.80m-7.80m lithic sandstone 7.80m-22.00m Argillite	1437m	North West
GW302335	0.00m-6.00m BROWN SHALE 6.00m-34.00m BASALT 34.00m-39.00m CRACKY BASALT 39.00m-42.00m BASALT	1505m	West
GW064586	0.00m-8.00m Shale Soft 8.00m-12.00m Shale 12.00m-22.00m Basalt 22.00m-24.00m Basalt Broken Water Supply 24.00m-28.00m Basalt 28.00m-31.00m Basalt Broken Water Supply 31.00m-33.00m Basalt	1530m	South
GW065544	0.00m-2.00m WHITE SAND 2.00m-4.00m BROWN SAND 4.00m-6.00m COFFEE ROCK 6.00m-8.00m BROWN SAND 8.00m-11.00m CLAY 11.00m-12.00m BLUE SHALE 12.00m-16.00m FRACTURED SHALE 16.00m-18.00m BROWN SHALE 18.00m-31.00m BASALT	1555m	South East
GW063558	0.00m-4.00m Clay 4.00m-10.00m Shale 10.00m-19.00m Basalt 19.00m-20.00m Basalt Broken Water Supply 20.00m-22.00m Basalt 22.00m-25.00m Basalt Broken Water Supply, Rock Broken 25.00m-27.00m Basalt	1568m	South
GW065423	0.00m-2.00m CLAY 2.00m-8.00m SOFT SHALE 8.00m-16.00m MID HARD SHALE 16.00m-21.00m BROKEN ROCK	1570m	South
GW302451	0.00m-2.00m TOP SAND 2.00m-8.00m COFFEE ROCK 8.00m-12.00m SAND 12.00m-13.00m BLACK CLAY 13.00m-15.00m GRAVEL & SALT WATER 15.00m-18.00m SHALE	1578m	South East
GW018118	0.00m-2.44m Sand 2.44m-3.05m Sandstone Black 3.05m-6.10m Sand	1587m	South East

Groundwater No	Drillers Log	Distance	Direction
GW304371	0.00m-3.00m CLAY/SHALE FILL 3.00m-12.00m BROWN SHALE HARD 18.00m-24.00m GREY SHALE VOLCANIC HARD 24.00m-29.00m CRACKY BASALT BLACK (W/B) 29.00m-36.00m BLACK BASALT 36.00m-40.00m BROKEN BLACK BASALT (W/B) 40.00m-42.00m BASALT BLACK	1685m	North
GW302450	0.00m-1.00m TOPSOIL 1.00m-10.00m BROWN CLAY 10.00m-12.00m FRACTURED META SEDIMENT 12.00m-33.00m SHALE	1691m	South East
GW306184	0.00m-12.00m Shale, yellow 12.00m-16.00m Shale, brown 16.00m-31.00m Basalt 31.00m-36.00m Basalt, cracky, water bearing 36.00m-54.00m Slate, black, hard, leafy	1702m	South
GW018117	0.00m-2.44m Sand 2.44m-3.05m Sandstone Black 3.05m-5.49m Sand Water Supply	1728m	South East
GW306182	0.00m-0.30m Topsoil 0.30m-2.00m Clay, yellow 2.00m-40.00m Basalt 40.00m-61.00m Slate, black, hard, leafy	1737m	South
GW306183	0.00m-0.50m Topsoil, grey 0.50m-3.00m Clay, yellow 3.00m-5.00m Shale, yellow 5.00m-42.00m Basalt 42.00m-85.00m Slate, black, hard, leafy	1737m	South
GW061641	0.00m-2.00m Fill 2.00m-5.00m Clay 5.00m-8.00m Shale 5.00m-8.00m Gravel Soil Hard 8.00m-16.00m Shale White Hard Soft Water Supply 16.00m-18.00m Shale	1738m	South East
GW071767	0.00m-6.00m Coloured Clay 6.00m-9.00m Weathered Shale 9.00m-27.00m Black Shale	1755m	South East
GW049483	0.00m-2.00m Soil Black 2.00m-6.70m Clay 6.70m-12.20m Quartzite Soak	1792m	North East
GW073068	0.00m-5.10m Sand 5.10m-7.60m Clay Blue 7.60m-10.60m Fractured Metasediment 10.60m-14.30m Shale And Quartz Large	1807m	South East
GW302334	0.00m-3.00m BROWN SHALE 3.00m-31.00m BASALT 31.00m-36.00m CRACKY BASALT 36.00m-61.00m BASALT	1980m	West

Drill Log Data Source: NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corp
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Geology 1:250,000

Bark Hut Road, Woolgoolga, NSW 2456



Geology

Bark Hut Road, Woolgoolga, NSW 2456

Geological Units

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Cccs	Lithofeldspathic wacke, minor siltstone, siliceous siltstone, mudstone, metabasalt, chert & jasper, rare calcareous siltstone & felsic volcanics 'Coffs Harbour Association' (Cc)	Coramba beds			Palaeozoic			1:250,000
Qu	Undifferentiated Quaternary sediments including: alluvial mud, silt, sand, gravel deposits, & swamp deposits; coastal sand beaches & dunes; estuarine deposits				Cainozoic			1:250,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Cccs	Lithofeldspathic wacke, minor siltstone, siliceous siltstone, mudstone, metabasalt, chert & jasper, rare calcareous siltstone & felsic volcanics 'Coffs Harbour Association' (Cc)	Coramba beds			Palaeozoic			1:250,000
Qu	Undifferentiated Quaternary sediments including: alluvial mud, silt, sand, gravel deposits, & swamp deposits; coastal sand beaches & dunes; estuarine deposits				Cainozoic			1:250,000

Geological Structures

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Dataset
Fault		Fault, Inferred	UNE	1:250,000
Fault		Fault, Inferred	UNE	1:250,000
Fault		Fault, Inferred	UNE	1:250,000
Fault		Fault, Inferred	UNE	1:250,000

Geological Data Source : NSW Department of Industry, Resources & Energy

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Naturally Occurring Asbestos Potential

Bark Hut Road, Woolgoolga, NSW 2456

Naturally Occurring Asbestos Potential

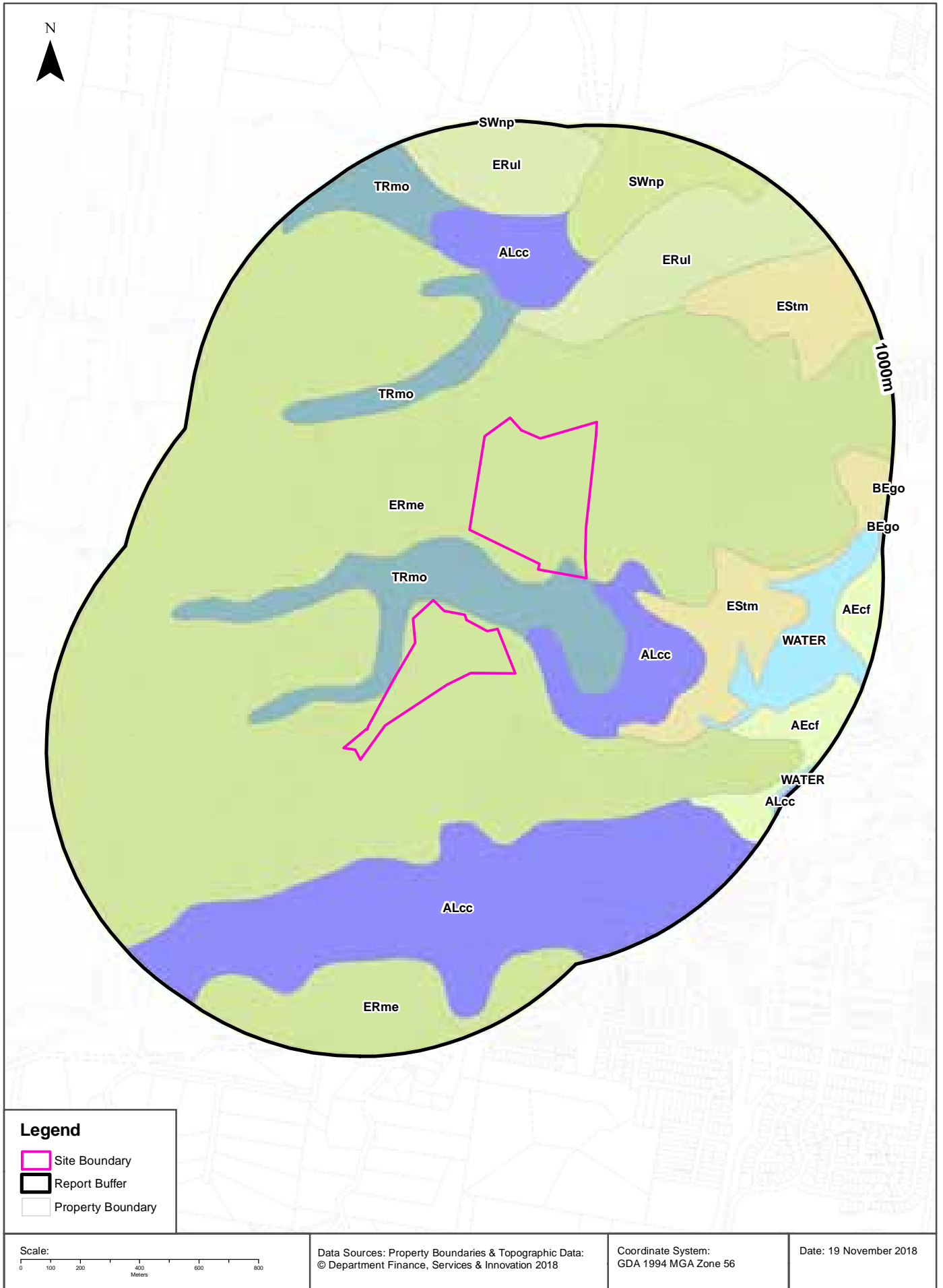
Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Mining Subsidence District Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy

Soil Landscapes

Bark Hut Road, Woolgoolga, NSW 2456



Soils

Bark Hut Road, Woolgoolga, NSW 2456

Soil Landscapes

What are the onsite Soil Landscapes?

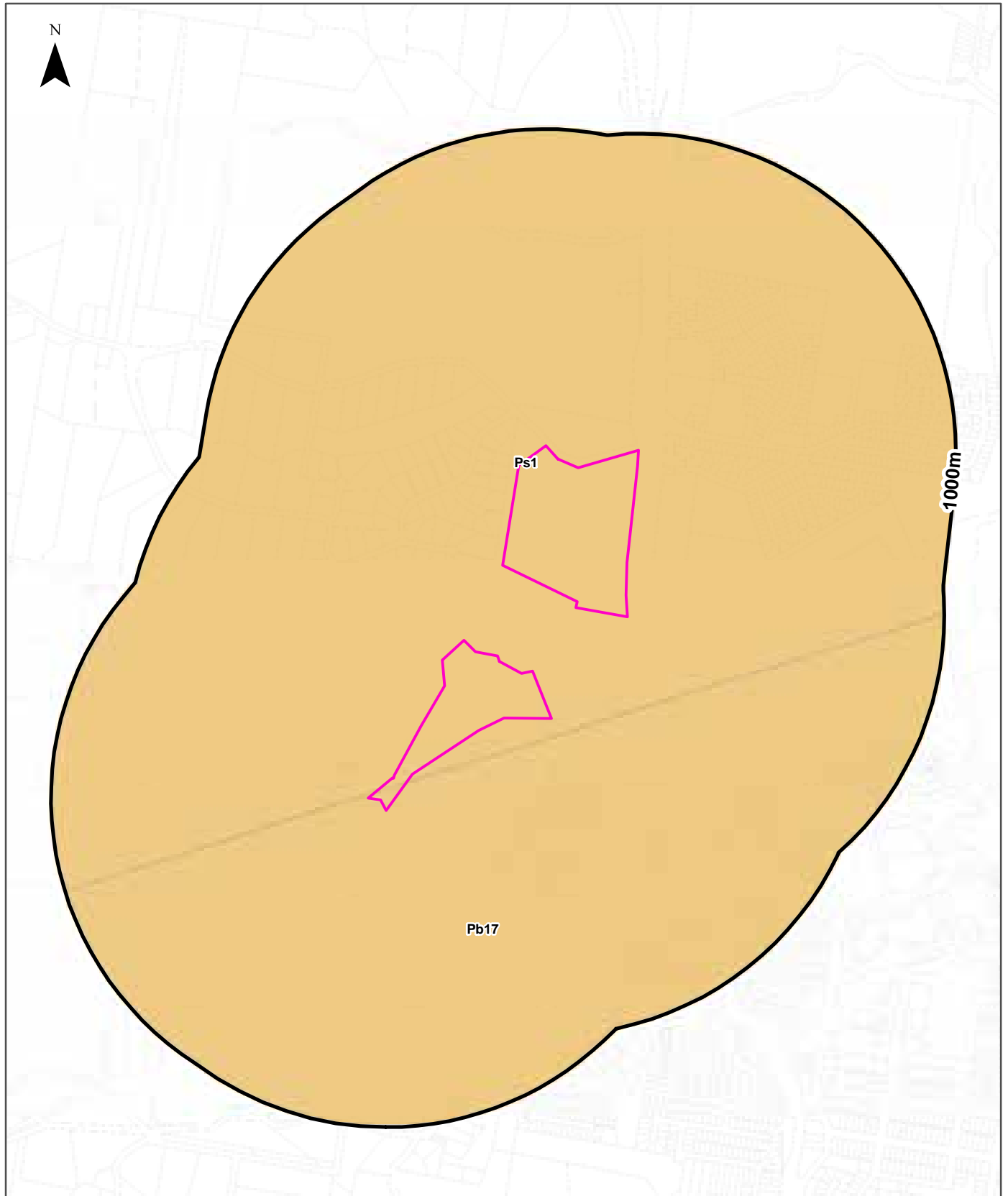
Soil Code	Name	Group	Process	Map Sheet	Scale
ERme	MEGAN		EROSIONAL	Coffs Harbour	1:100,000
TRmo	MOONEE		TRANSFERRAL	Coffs Harbour	1:100,000

What are the Soil Landscapes within the dataset buffer?

Soil Code	Name	Group	Process	Map Sheet	Scale
AEcf	COFFS HARBOUR		AEOLIAN	Coffs Harbour	1:100,000
ALcc	COFFS CREEK		ALLUVIAL	Coffs Harbour	1:100,000
BEgo	GOOLAWAH		BEACH	Coffs Harbour	1:100,000
ERme	MEGAN		EROSIONAL	Coffs Harbour	1:100,000
ERul	ULONG		EROSIONAL	Coffs Harbour	1:100,000
EStm	TOORMINA		ESTUARINE	Coffs Harbour	1:100,000
SWnp	NEWPORTS CREEK		SWAMP	Coffs Harbour	1:100,000
TRmo	MOONEE		TRANSFERRAL	Coffs Harbour	1:100,000
WATER	WATER		WATER	Coffs Harbour	1:100,000

Soils Landscapes Data Source : NSW Office of Environment and Heritage

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Legend		Australian Soil Classification Orders				
Site Boundary	Anthrosol	Dermosol	Kandosol	Podosol	Tenosol	No Data
Report Buffer	Calcarosol	Ferrosol	Kurosol	Rudosol	Vertosol	
Property Boundary	Chromosol	Hydrosol	Organosol	Sodosol	Lake	
Scale: 		Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2018		Coordinate System: GDA 1994 MGA Zone 56		Date: 19 November 2018

Soils

Bark Hut Road, Woolgoolga, NSW 2456

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

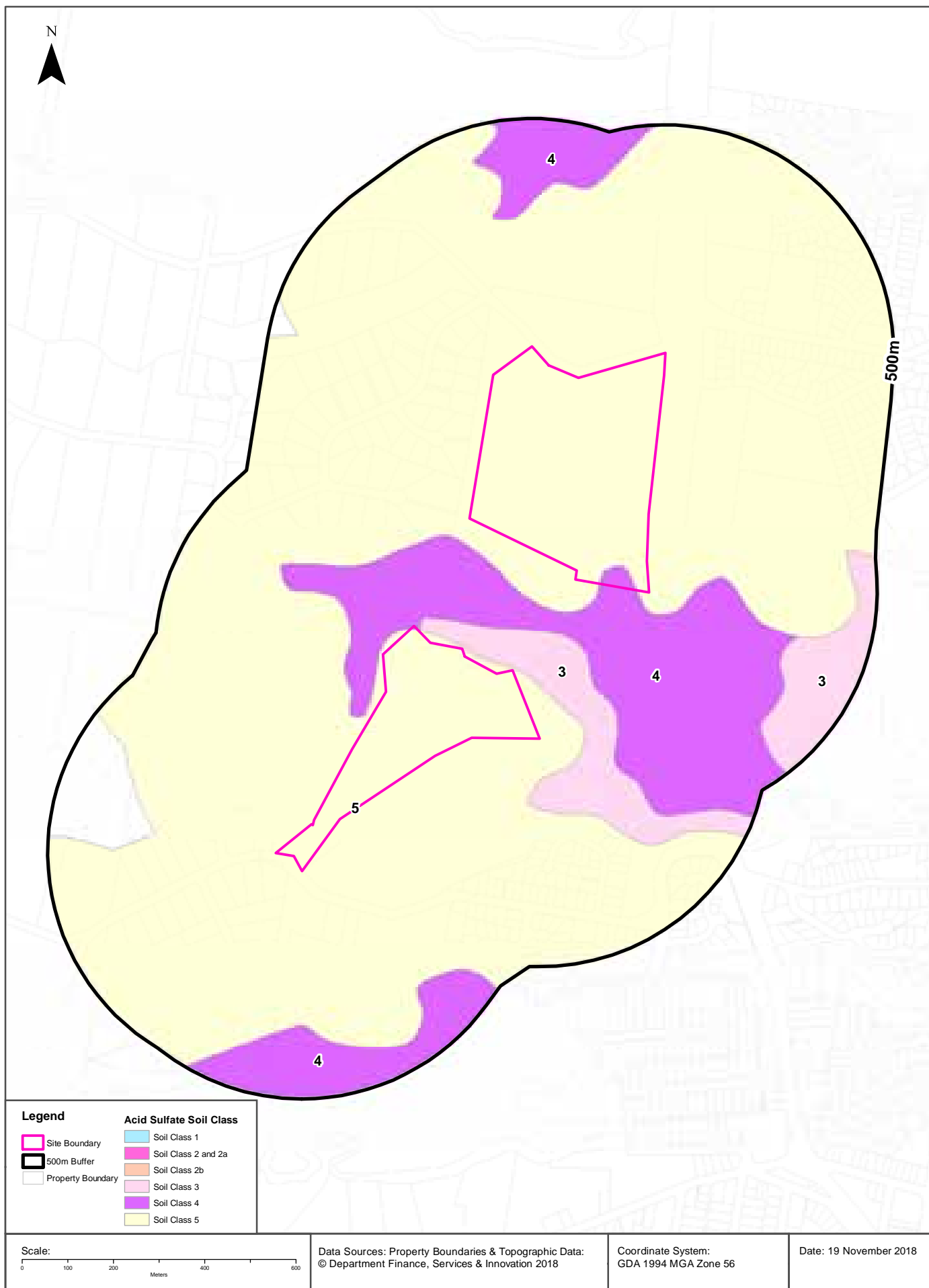
Map Unit Code	Soil Order	Map Unit Description	Distance
Pb17	Chromosol	Hilly areas alternating with small wet flats: hilly areas of hard acidic red soils (Dr2.21 and Dr2.11) possibly with other (D) soils, and small wet flats of such soils as (Gn3.94). Soils data are limited.	0m
Ps1	Chromosol	Steep hills and ridges: chief soils are friable acidic red soils (Dr4.21) and hard acidic red soils (Dr2.21) probably with other (D) soils, not described at present. Associated are (Um4.2) (Gn2.24), and (Gn2.44) soils on the steeper and relatively drier slopes; and (Gn4.14) and (Gn3.14) soils on the relatively more humid slopes.	0m

Atlas of Australian Soils Data Source: CSIRO

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Acid Sulfate Soils

Bark Hut Road, Woolgoolga, NSW 2456



Acid Sulfate Soils

Bark Hut Road, Woolgoolga, NSW 2456

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI
4	Works more than 2 metres below natural ground surface present an environmental risk; Works by which the watertable is likely to be lowered more than 2 metres below natural ground surface, present an environmental risk	Coffs Harbour Local Environmental Plan 2013

If the on-site Soil Class is 5, what other soil classes exist within 500m?

Soil Class	Description	EPI	Distance	Direction
N/A				

Acid Sulfate Data Source Accessed 23/10/2018: NSW Crown Copyright - Planning and Environment
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Acid Sulfate Soils

Bark Hut Road, Woolgoolga, NSW 2456

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m
A	High Probability of occurrence. >70% chance of occurrence.	1m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

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Dryland Salinity

Bark Hut Road, Woolgoolga, NSW 2456

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A	N/A	N/A

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Dryland Salinity Potential of Western Sydney

Dryland Salinity Potential of Western Sydney within the dataset buffer?

Feature Id	Classification	Description	Distance	Direction
N/A	Outside Data Coverage			

Dryland Salinity Potential of Western Sydney Data Source : NSW Office of Environment and Heritage

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Mining Subsidence Districts

Bark Hut Road, Woolgoolga, NSW 2456

Mining Subsidence Districts

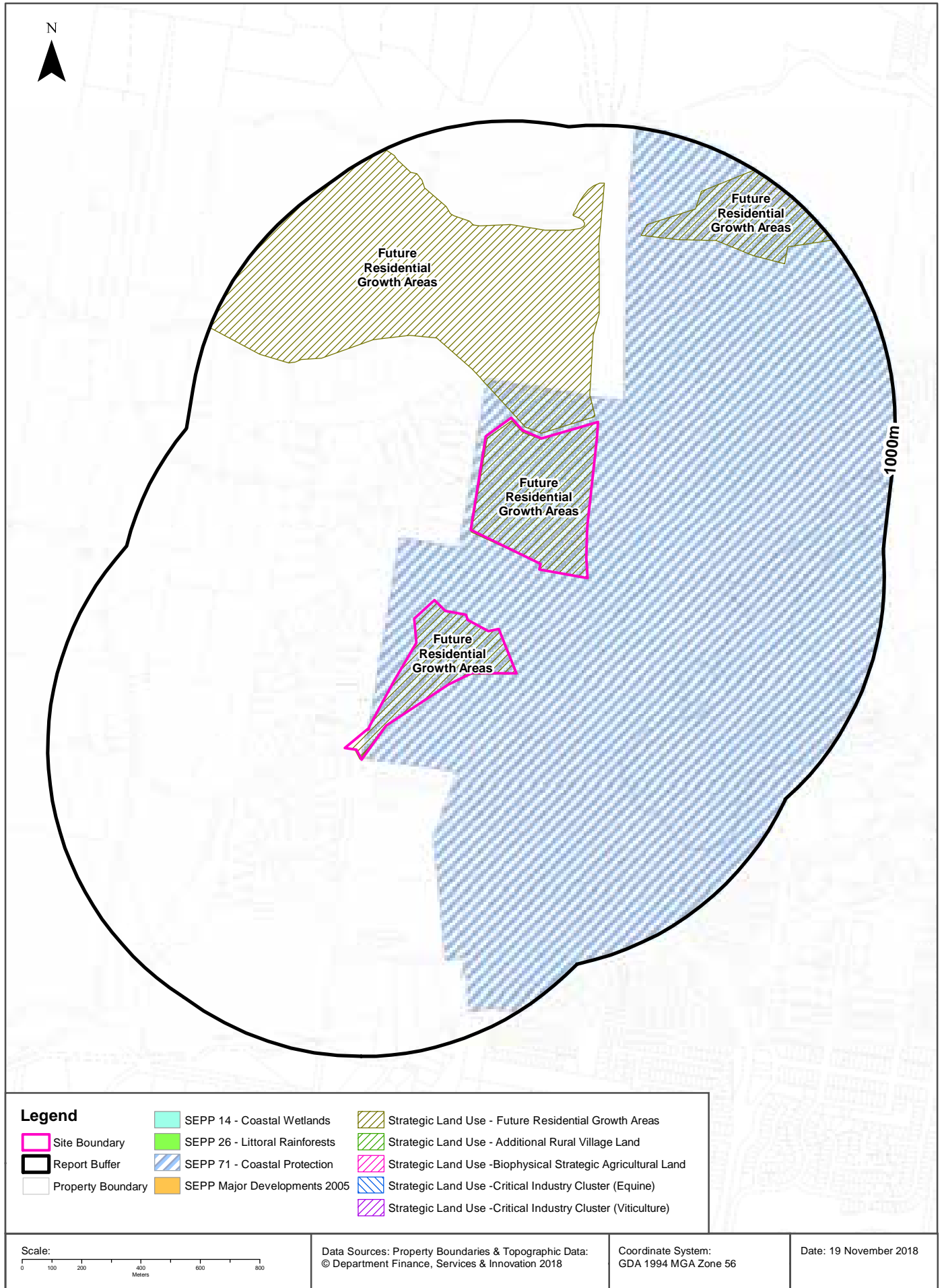
Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)
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State Environmental Planning Policy

Bark Hut Road, Woolgoolga, NSW 2456



Environmental Zoning

Bark Hut Road, Woolgoolga, NSW 2456

State Environmental Planning Policy Protected Areas

Are there any State Environmental Planning Policy Protected Areas onsite or within the dataset buffer?

Dataset	Onsite	Within Site Buffer	Distance
SEPP14 - Coastal Wetlands	No	No	N/A
SEPP26 - Littoral Rainforests	No	No	N/A
SEPP71 - Coastal Protection Zone	Yes - SEPP71 covers 98.98% of the site	Yes	0m

SEPP Protected Areas Data Source: NSW Department of Planning & Environment
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State Environmental Planning Policy Major Developments (2005)

State Environmental Planning Policy Major Developments within the dataset buffer:

Map Id	Feature	Effective Date	Distance	Direction
N/A	No records within buffer			

SEPP Major Development Data Source: NSW Department of Planning & Environment
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State Environmental Planning Policy Strategic Land Use Areas

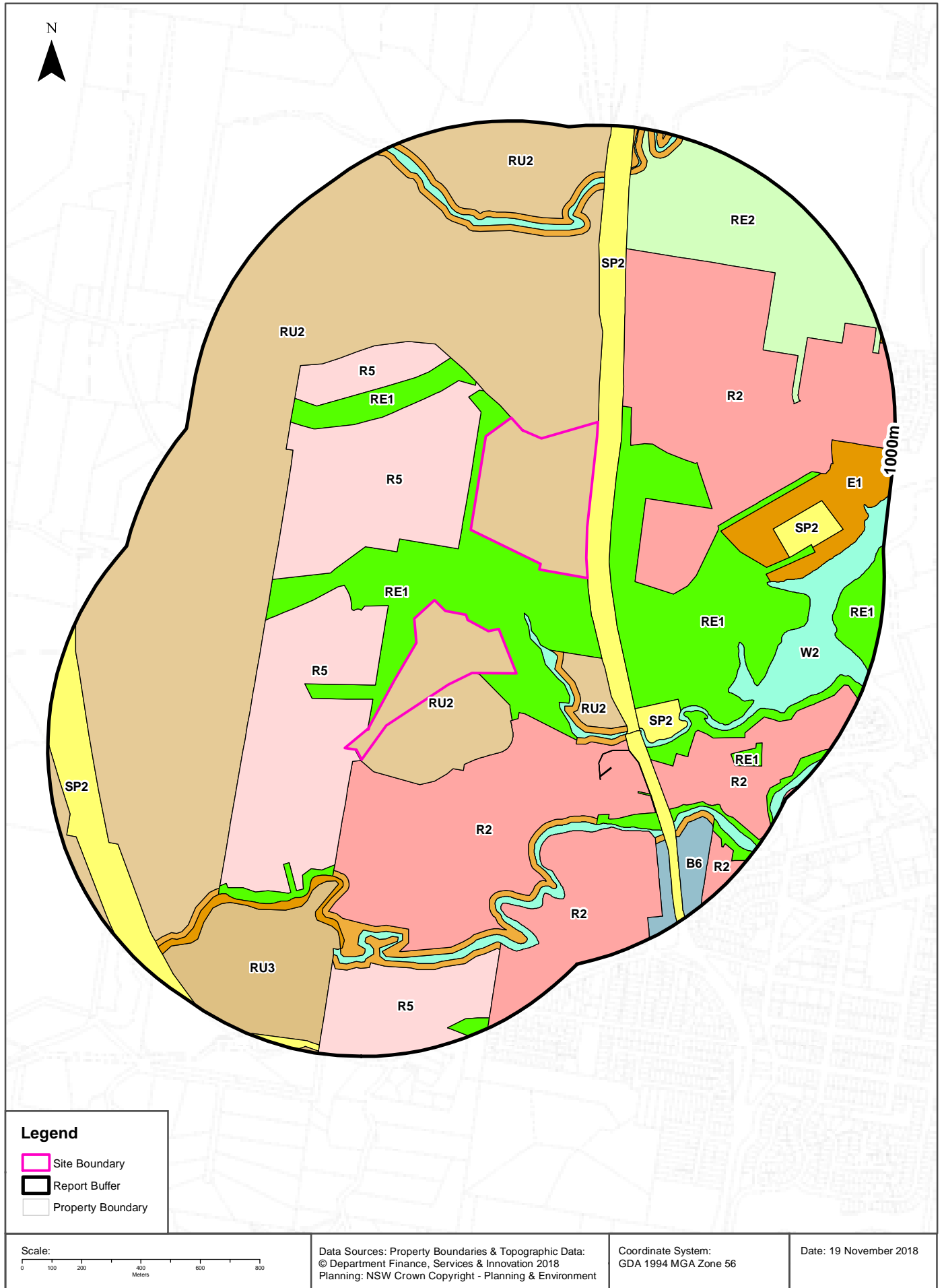
State Environmental Planning Policy Strategic Land Use Areas onsite or within the dataset buffer:

Strategic Land Use	SEPPNo	Effective Date	Amendment	Amendment Year	Distance	Direction
Future Residential Growth Areas	2007	28/01/2014	Coal Seam Gas	2014	0m	Onsite

SEPP Strategic Land Use Data Source: NSW Department of Planning & Environment
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EPI Planning Zones

Bark Hut Road, Woolgoolga, NSW 2456



Environmental Planning Instrument

Bark Hut Road, Woolgoolga, NSW 2456

Land Zoning

What Environmental Planning Instrument Land Zones exist within the dataset buffer?

Zone	Description	Purpose	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RU2	Rural Landscape		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		0m	Onsite
RU2	Rural Landscape		Coffs Harbour Local Environmental Plan 2013	09/02/2018	09/02/2018	21/09/2018	Amendment No 9	0m	Onsite
R5	Large Lot Residential		Coffs Harbour Local Environmental Plan 2013	09/02/2018	09/02/2018	21/09/2018	Amendment No 9	0m	South West
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	09/02/2018	09/02/2018	21/09/2018	Amendment No 9	0m	South West
SP2	Infrastructure	Classified Road	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		0m	North
R2	Low Density Residential		Coffs Harbour Local Environmental Plan 2013	09/02/2018	09/02/2018	21/09/2018	Amendment No 9	5m	South
R5	Large Lot Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		28m	North West
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		77m	East
W2	Recreational Waterways		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		88m	South East
R2	Low Density Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		99m	North East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		130m	South East
RU2	Rural Landscape		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		153m	South East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		160m	North West
R5	Large Lot Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		284m	North West
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		298m	South East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		366m	South West
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		385m	South
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		398m	South East
E1	National Parks and Nature Reserves		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		405m	South West
RU3	Forestry		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		417m	South West
SP2	Infrastructure	Council Activities	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		417m	South East
SP2	Infrastructure	Classified Road	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		422m	South
E1	National Parks and Nature Reserves		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		449m	North East
W2	Recreational Waterways		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		453m	East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		501m	South East
W2	Recreational Waterways		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		529m	South
R2	Low Density Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		537m	South East
R2	Low Density Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		557m	South

Zone	Description	Purpose	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE2	Private Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		591m	North East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		593m	South
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		622m	North
SP2	Infrastructure	Cemetery	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		623m	East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		633m	South West
W2	Recreational Waterways		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		642m	North
R5	Large Lot Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		683m	South
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		725m	South East
B6	Enterprise Corridor		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		742m	South East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		746m	South East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		765m	South East
B6	Enterprise Corridor		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		766m	South East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		827m	South East
SP2	Infrastructure	Classified Road	Coffs Harbour Local Environmental Plan 2013	27/07/2018	27/07/2018	21/09/2018	Amendment No 8	829m	South
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		836m	East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		840m	North East
R2	Low Density Residential		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		846m	South East
W2	Recreational Waterways		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		860m	North East
E2	Environmental Conservation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		863m	North East
RE1	Public Recreation		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		940m	South
RU2	Rural Landscape		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		950m	West
RU2	Rural Landscape		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		978m	North East
RU3	Forestry		Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		985m	South

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Environmental Planning Instrument

Bark Hut Road, Woolgoolga, NSW 2456

Minimum Lot Size

What are the onsite Environmental Planning Instrument Minimum Lot Sizes?

Symbol	Minimum Lot Size	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
AB	40 ha	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	21/09/2018		98.83

Maximum Height of Buildings

What are the onsite Environmental Planning Instrument Maximum Height of Buildings?

Symbol	Maximum Height of Building	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
9	8.50 m	Coffs Harbour Local Environmental Plan 2013	27/07/2018	27/07/2018	27/07/2018	Amendment No 8	100

Floor Space Ratio

What are the onsite Environmental Planning Instrument Floor Space Ratios?

Symbol	Floor Space Ratio	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
No Data							

Land Application

What are the onsite Environmental Planning Instrument Land Applications?

Application Type	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
Included	Coffs Harbour Local Environmental Plan 2013	27/07/2018	27/07/2018	27/07/2018	Amendment No 8	100

Land Reservation Acquisition

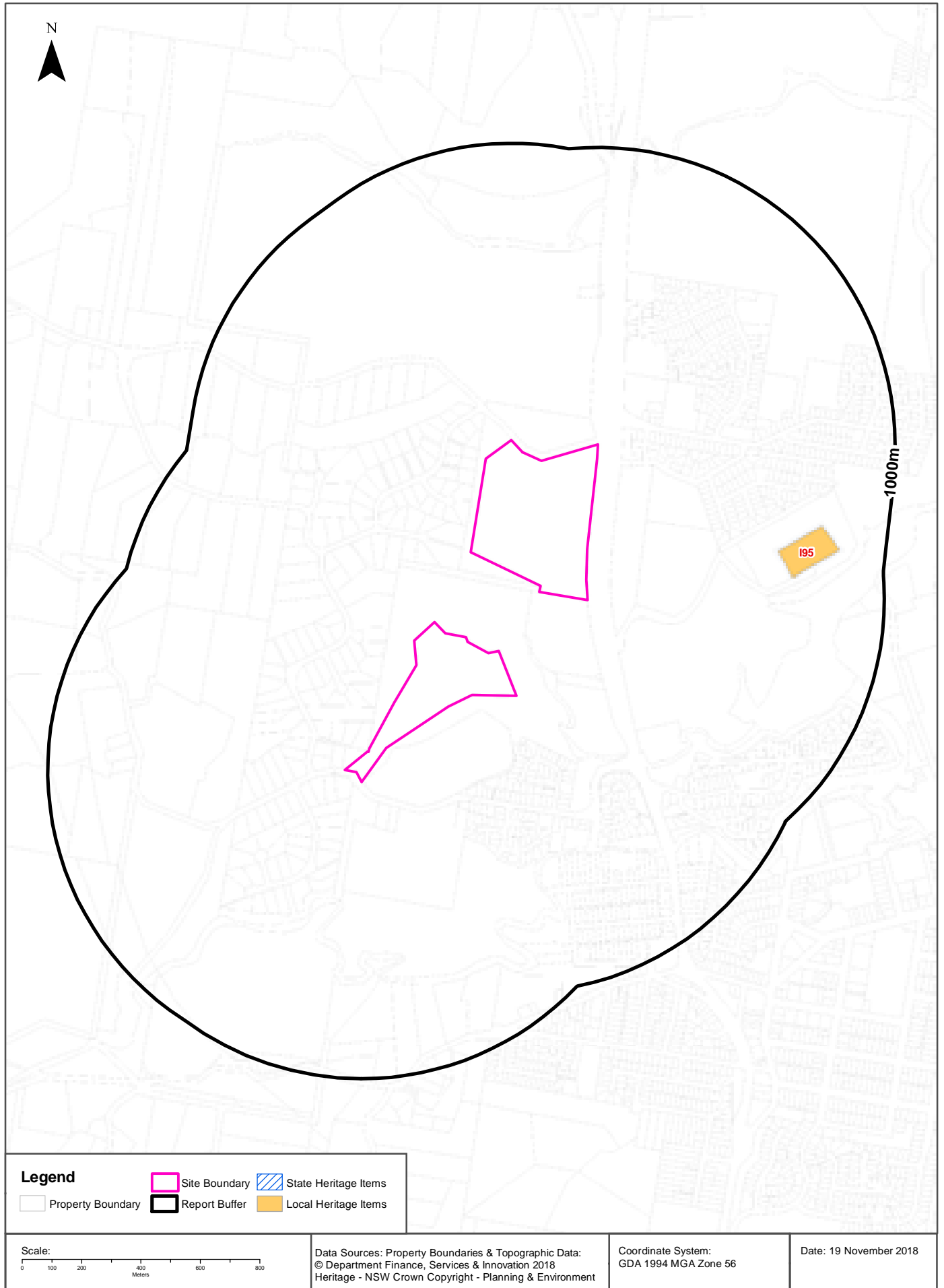
What are the onsite Environmental Planning Instrument Land Reservation Acquisitions?

Reservation	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Comments	Percentage of Site Area
No Data							

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Heritage Items

Bark Hut Road, Woolgoolga, NSW 2456



Heritage

Bark Hut Road, Woolgoolga, NSW 2456

State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

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Environmental Planning Instrument - Heritage

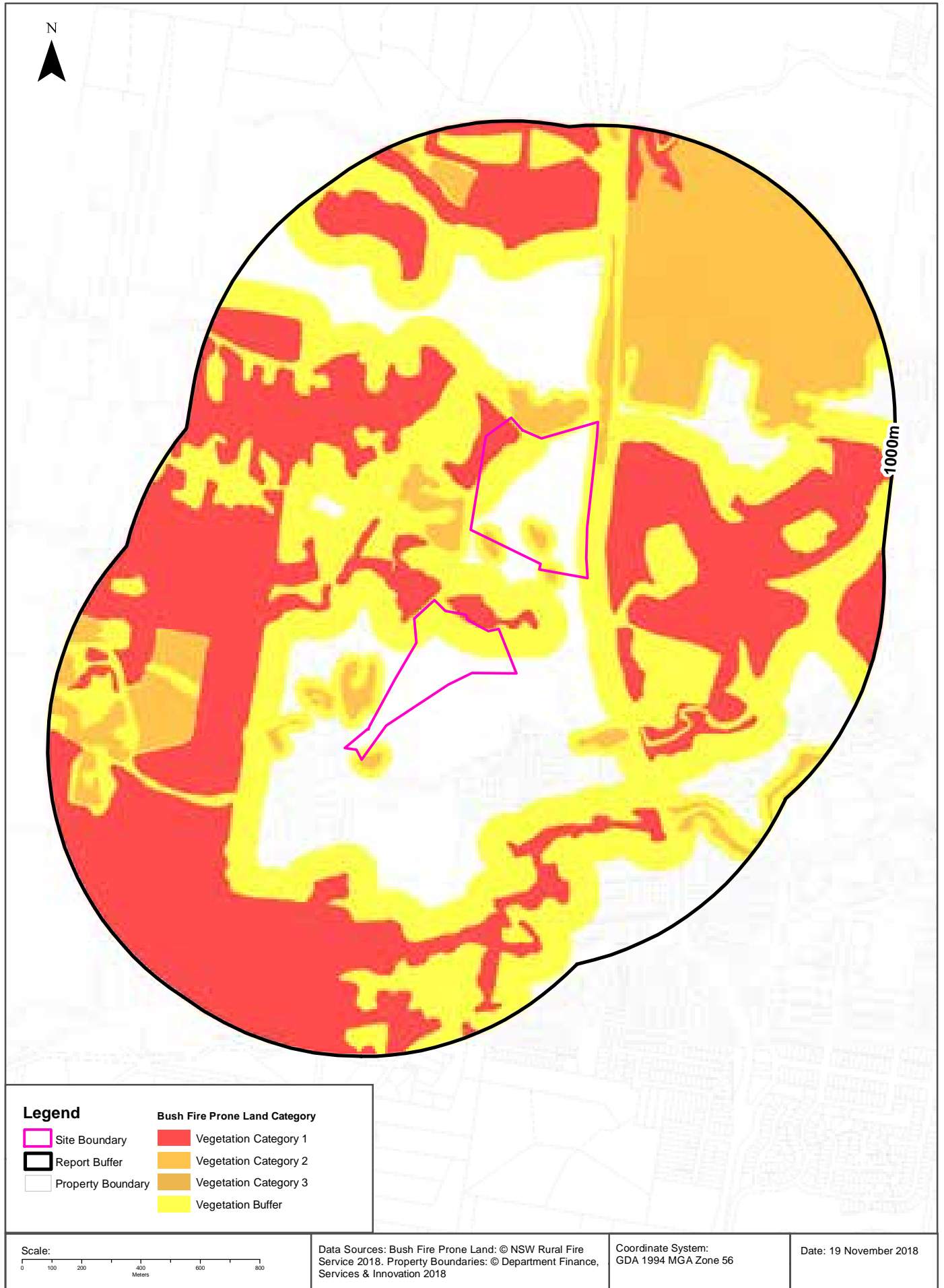
What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI	Published Date	Commenced Date	Currency Date	Distance	Direction
I95	Woolgoolga Cemetery	Item - General	Local	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	09/02/2013	637m	East

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Natural Hazards - Bush Fire Prone Land

Bark Hut Road, Woolgoolga, NSW 2456



Natural Hazards

Bark Hut Road, Woolgoolga, NSW 2456

Bush Fire Prone Land

What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	0m	Onsite
Vegetation Category 1	0m	Onsite
Vegetation Category 2	0m	Onsite

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Vegetation & RAMSAR Wetlands

Bark Hut Road, Woolgoolga, NSW 2456



Ecological Constraints

Bark Hut Road, Woolgoolga, NSW 2456

Vegetation of Coffs Harbour LGA

What Vegetation of Coffs Harbour LGA exists within the dataset buffer?

Vegetation Code	Vegetation Category	Species	Source	Distance	Direction
N11A	Tall Open Forest	Eucalyptus propinqua, E. microcorys.	Veg Mapping. Fisher 1996	0m	Onsite
N27	Tall Open Forest	Eucalyptus grandis	Veg Mapping. Fisher 1996	0m	Onsite
N2A	Open Forest	Eucalptus pilularis	Veg Mapping. Fisher 1996	0m	Onsite
ST	Scattered Trees		Veg Mapping. Fisher 1996	0m	Onsite
UNtyped	Untyped		Veg Mapping. Fisher 1996	0m	Onsite
N7	Tall Open Forest	Eucalyptus pilularis, E. microcorys	Veg Mapping. Fisher 1996	29m	South West
N44A	Open Forest	Eucalyptus pilularis, E. resinifera, Corymbia intermedia	Veg Mapping. Fisher 1996	60m	East
N67B	Open Forest	Eucalyptus siderophloia, E. propinqua	Veg Mapping. Fisher 1996	74m	North East
N67A	Tall Open Forest	Eucalyptus siderophloia, E. propinqua	Veg Mapping. Fisher 1996	275m	North West
N11A/ST	Tall Open Forest	Eucalyptus propinqua, E. microcorys.	Veg Mapping. Fisher 1996	339m	South West
N20	Swamp Forest	Melaleuca quinquenervia	Veg Mapping. Fisher 1996	371m	South East
N67C/ST	Open Forest	Eucalyptus propinqua, E. siderophloia, Corymbia maculata	Veg Mapping. Fisher 1996	386m	South West
N67C	Open Forest	Eucalyptus propinqua, E. siderophloia, Corymbia maculata	Veg Mapping. Fisher 1996	453m	South West
N50	Swamp Forest	Melaleuca sp., Casuarina glauca, Eucalyptus robusta	Veg Mapping. Fisher 1996	478m	East
N44A/ST	Open Forest	Eucalyptus pilularis, E. resinifera, Corymbia intermedia	Veg Mapping. Fisher 1996	637m	North East
N1B	Open Forest	Eucalyptus tereticornis, Angophora subvelutina, E. robusta, Lophostemon suaveolens	Veg Mapping. Fisher 1996	683m	North East
R	Regrowth		Veg Mapping. Fisher 1996	841m	North
N75A	Foredune Complex	Banksia integrifolia, Acacia sophorae,*Chrysanthemoides moniiifera*.	Veg Mapping. Fisher 1996	877m	East
N26A	Swamp Forest	Casuarina glauca.	Veg Mapping. Fisher 1996	931m	South East

Native Vegetation of Coffs Harbour : NSW Office of Environment and Heritage
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RAMSAR Wetlands

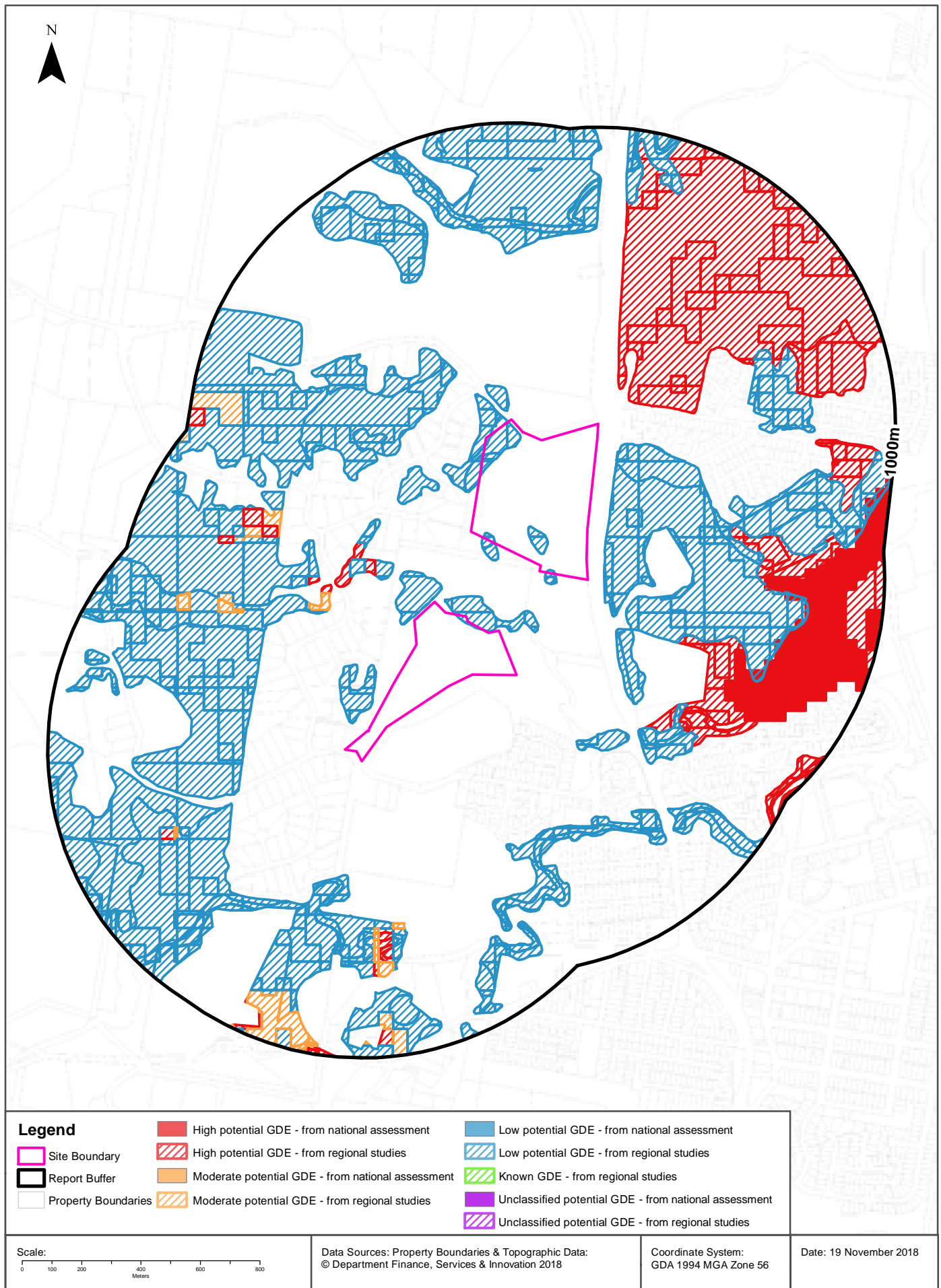
What RAMSAR Wetland areas exist within the dataset buffer?

Map Id	RAMSAR Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

RAMSAR Wetlands Data Source: © Commonwealth of Australia - Department of Environment

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Bark Hut Road, Woolgoolga, NSW 2456



Ecological Constraints

Bark Hut Road, Woolgoolga, NSW 2456

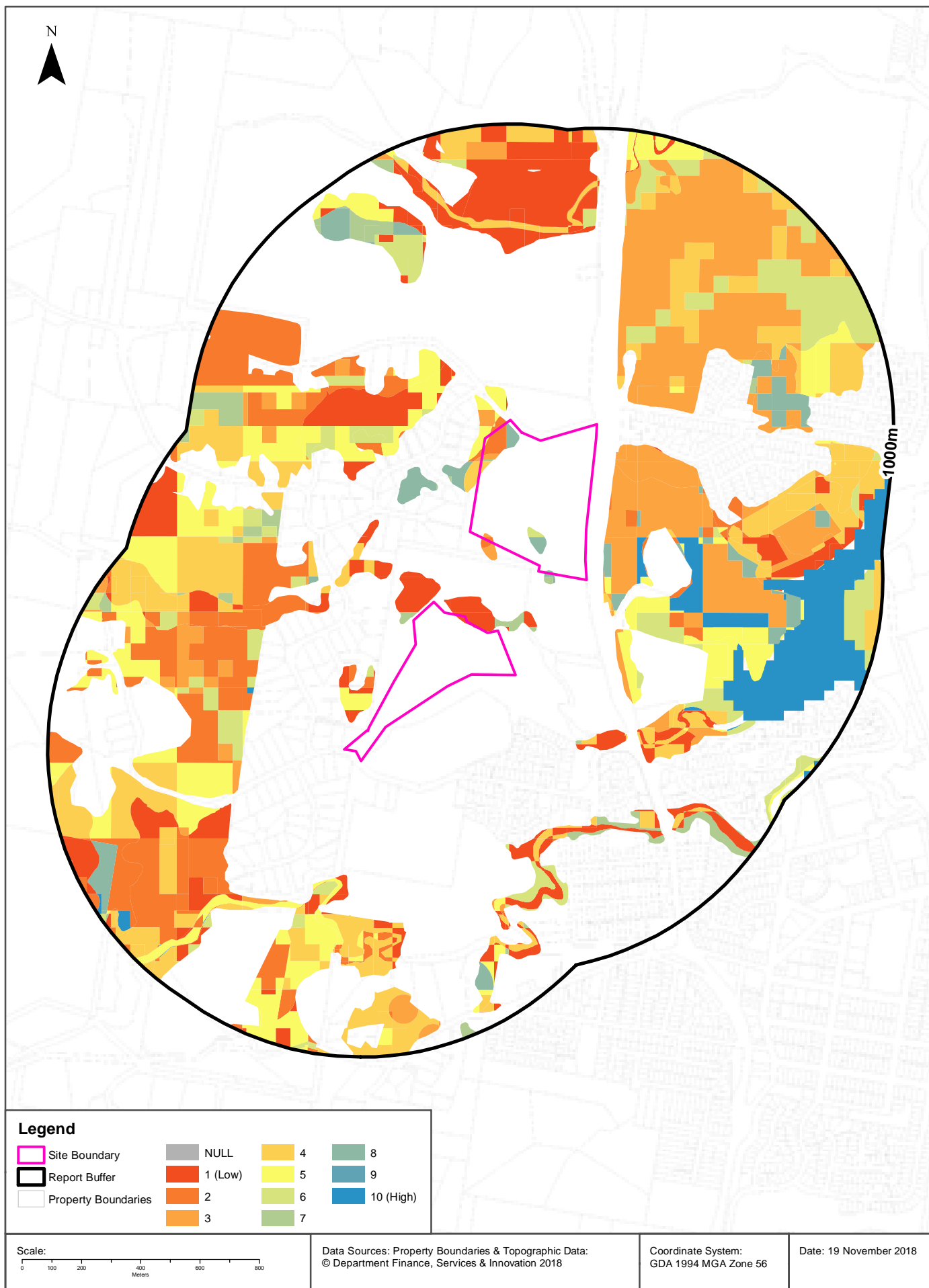
Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	Low potential GDE - from regional studies	Coastal lowlands on weak sedimentary rocks, with littoral and alluvial plains.	Vegetation		0m
Terrestrial	Low potential GDE - from regional studies	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	High potential GDE - from regional studies	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		129m
Terrestrial	Moderate potential GDE - from regional studies	Dissected plateau margin on granite and metamorphic rocks.	Vegetation		287m
Aquatic	High potential GDE - from national assessment	Dissected plateau margin on granite and metamorphic rocks.	Wetland		549m

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology
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Ecological Constraints - Inflow Dependent Ecosystems Likelihood

Bark Hut Road, Woolgoolga, NSW 2456



Ecological Constraints

Bark Hut Road, Woolgoolga, NSW 2456

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	1	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	2	Coastal lowlands on weak sedimentary rocks, with littoral and alluvial plains.	Vegetation		0m
Terrestrial	2	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	3	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	4	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	5	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	6	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	7	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	8	Plateau flank dissected into narrow strike ridges and valleys.	Vegetation		0m
Terrestrial	10	Coastal lowlands on weak sedimentary rocks, with littoral and alluvial plains.	Vegetation		170m
Aquatic	10	Dissected plateau margin on granite and metamorphic rocks.	Wetland		549m
Aquatic	4	Dissected plateau margin on granite and metamorphic rocks.	Wetland		943m

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology
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Ecological Constraints

Bark Hut Road, Woolgoolga, NSW 2456

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Crinia tinnula	Wallum Froglet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Amphibia	Mixophyes iteratus	Giant Barred Frog	Endangered	Category 2	Endangered	
Animalia	Aves	Anous stolidus	Common Noddy	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardea ibis	Cattle Egret	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Ardenna carneipes	Flesh-footed Shearwater	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Ardenna pacificus	Wedge-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardenna tenuirostris	Short-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Arenaria interpres	Ruddy Turnstone	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris ferruginea	Curllew Sandpiper	Endangered	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris tenuirostris	Great Knot	Vulnerable	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calyptorhynchus lathamii	Glossy Black-Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Coracina lineata	Barred Cuckoo-shrike	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Dromaius novaehollandiae	Emu	Endangered Population	Not Sensitive	Not Listed	
Animalia	Aves	Egretta sacra	Eastern Reef Egret	Not Listed	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Ephippiorhynchus asiaticus	Black-necked Stork	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Gelochelidon nilotica	Gull-billed Tern	Not Listed	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Grantiella picta	Painted Honeyeater	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Grus rubicunda	Brolga	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Hydroprogne caspia	Caspian Tern	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Irediparra gallinacea	Comb-crested Jacana	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Category 3	Critically Endangered	
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Limosa limosa	Black-tailed Godwit	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Macronectes giganteus	Southern Giant Petrel	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Merops ornatus	Rainbow Bee-eater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Neophema pulchella	Turquoise Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Oceanites oceanicus	Wilson's Storm-Petrel	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Pandion cristatus	Eastern Osprey	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pezoporus wallicus wallicus	Eastern Ground Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Phaethon lepturus	White-tailed Tropicbird	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Plegadis falcinellus	Glossy Ibis	Not Listed	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Pluvialis fulva	Pacific Golden Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus magnificus	Wompoo Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus regina	Rose-crowned Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Sterna hirundo	Common Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sternula albifrons	Little Tern	Endangered	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Todiramphus chloris	Collared Kingfisher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Tringa brevipes	Grey-tailed Tattler	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	<i>Tringa incana</i>	Wandering Tattler	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	<i>Tyto tenebricosa</i>	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Mammalia	<i>Aepyprymnus rufescens</i>	Rufous Bettong	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	<i>Dugong dugon</i>	Dugong	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Kerivoula papuensis</i>	Golden-tipped Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Megaptera novaeangliae</i>	Humpback Whale	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Miniopterus australis</i>	Little Bentwing-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Petauroides volans</i>	Greater Glider	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Petaurus australis</i>	Yellow-bellied Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Planigale maculata</i>	Common Planigale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Potorous tridactylus</i>	Long-nosed Potoroo	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Syconycteris australis</i>	Common Blossom-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Not Listed	Not Sensitive	Vulnerable	
Animalia	Reptilia	<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Acronychia littoralis</i>	Scented Acronychia	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Angophora robur</i>	Sandstone Rough-barked Apple	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Belvisia mucronata</i>	Needle-leaf Fern	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Boronia umbellata</i>	Orara Boronia	Vulnerable	Not Sensitive	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	Chamaesyce psammogeton	Sand Spurge	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Eleocharis tetraquetra	Square-stemmed Spike-rush	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Hicksbeachia pinnatifolia	Red Boppel Nut	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Lindernia alsinoides	Noah's False Chickweed	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Lindsaea incisa	Slender Screw Fern	Endangered	Category 3	Not Listed	
Plantae	Flora	Macadamia tetraphylla	Rough-shelled Bush Nut	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Marsdenia longiloba	Slender Marsdenia	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	Maundia triglochinoides		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Niemeyera whitei	Rusty Plum, Plum Boxwood	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Parsonia dorrigoensis	Milky Silkpod	Vulnerable	Not Sensitive	Endangered	
Plantae	Flora	Phaius australis	Southern Swamp Orchid	Endangered	Category 2	Endangered	
Plantae	Flora	Pultenaea maritima	Coast Headland Pea	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Quassia sp. Moonee Creek	Moonee Quassia	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Senna acclinis	Rainforest Cassia	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Sophora tomentosa	Silverbush	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Thesium australe	Austral Toadflax	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Typhonium sp. aff. brownii	Stinky Lily	Endangered	Category 3	Not Listed	
Plantae	Flora	Zieria prostrata	Headland Zieria	Endangered	Not Sensitive	Endangered	

Data does not include NSW category 1 sensitive species.

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Data obtained 16/11/2018

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Appendix D Laboratory summary tables

Appendix D

30012537 Preliminary Site Investigation, Site off Bark Hut Road, Woolgoolga NSW

Soil Analytical Results Table



Unit of Measurement	Asbestos Identification - Presence/absence	BTEX							Phenols	Halogenated Benzenes	Herbicides									
		Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX			Picloram	Hexachlorobenzene	2,4,5-Trichlorophenoxy Acetic Acid	2,4,5-TP (Silvex)	Hedonal	2,4-dichlorophenoxybutanoic acid	2,4-Dichloroprop	4-Chlorophenoxy acetic acid	Clopyralid	Dicamba
	NA	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.1g/kg	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)		100	14,000	4,500				12,000												
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)		140	21,000	5,900				17,000												
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m		77	NL	NL				NL												
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																				
NSW 2014 General Solid Waste CT1 (No Leaching)		10	288	600				1,000	60				200							40
NSW 2014 General Solid Waste SCC1 (with leached)		18	518	1,080				1,800	110				10							75
NSW 2014 General Solid Waste TCLP1 (leached)																				
NSW 2014 Restricted Solid Waste CT2 (No Leaching)		40	1,152	2,400				4,000	240				800							160
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m		0.5	160	55				40												
1-2m		0.5	220					60												
2-4m		0.5	310					95												
>=4m		0.5	540					170												
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																				
NEPM 2013 Table 1A(1) HILs Res A Soil									4,500	10	600		900							

Field ID	Date	Asbestos	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Phenols	Hexachlorobenzene	2,4,5-Trichlorophenoxy Acetic Acid	2,4,5-TP (Silvex)	Hedonal	2,4-dichlorophenoxybutanoic acid	2,4-Dichloroprop	4-Chlorophenoxy acetic acid	Clopyralid	Dicamba	Fluroxypyr
TP01-0.1m	6/12/2018	Not Detected	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP01 - 0.5m	6/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP02-1.0m	6/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP02_0.1m	6/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP02_1.0M DUP	6/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP03-0.1m	6/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP04-0.1m	6/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP05-0.1m	6/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP06-0.1m	6/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP07-0.1m	7/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP07-0.6m	7/12/2018	-	-	-	-	-	-	-	-	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TP08-0.1m	7/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	Not Detected	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TP09-0.5m	7/12/2018	Not Detected	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP09-0.5m DUP	7/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP09-1.1m	7/12/2018	Not Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	-	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP11-0.2m	7/12/2018	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
TP11-0.2m	7/12/2018	Not Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	Not Detected	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04

Statistics	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Phenols	Hexachlorobenzene	2,4,5-Trichlorophenoxy Acetic Acid	2,4,5-TP (Silvex)	Hedonal	2,4-dichlorophenoxybutanoic acid	2,4-Dichloroprop	4-Chlorophenoxy acetic acid	Clopyralid	Dicamba	Fluroxypyr
Number of Results	6	6	8	8	8	8	8	13	13	13	13	13	13	13	13	13	13	13
Number of Detects	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	1	1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Minimum Detect	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	1	1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Maximum Detect	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	1	1	0.1	0.25	0.25	0.25	0.25	0.1	0.018	0.025	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Median Concentration *	1	1	0.1	0.25	0.25	0.25	0.25	0.1	0.02	0.025	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Standard Deviation *	0	0	0	0	0	0	0	0	0.0038	0	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038
95% UCL (Student's-t) *	1	1	0.1	0.25	0.25	0.25	0.25	0.1	0.0203	0.025	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203

* A Non Detect Multiplier of 0.5 has been applied.

Appendix D

30012537



Unit of Measurement	2-Methyl-4-chlorophenoxyacetic acid	2-Methyl-4-Chlorophenoxy Butanoic Acid	Mecoprop	Triclopyr	Lead	Metals						4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.02	0.02	0.02	0.02	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)																				
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)																				
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m																				
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																				
NSW 2014 General Solid Waste CT1 (No Leaching)				40	100	100	20			4	40									
NSW 2014 General Solid Waste SCC1 (with leached)				75	1,500	500	100			50	1,050									
NSW 2014 General Solid Waste TCLP1 (leached)																				
NSW 2014 Restricted Solid Waste CT2 (No Leaching)				160	400	400	80			16	160									
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m																				
1-2m																				
2-4m																				
>=4m																				
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space						100														
NEPM 2013 Table 1A(1) HILs Res A Soil	600	600	600		300	100	20		6,000	40	400	7,400				6		50		

Field ID	Date	2-Methyl-4-chlorophenoxyacetic acid	2-Methyl-4-Chlorophenoxy Butanoic Acid	Mecoprop	Triclopyr	Lead	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)
TP01-0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	15	<5	<1	6	<5	<0.1	<2	14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP01 - 0.5m	6/12/2018	-	-	-	-	11	<5	<1	10	<5	<0.1	2	8	-	-	-	-	-	-	-	-
TP02-1.0m	6/12/2018	-	-	-	-	8	<5	<1	11	<5	<0.1	2	27	-	-	-	-	-	-	-	-
TP02_0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	9	<5	<1	5	<5	<0.1	<2	<5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP02_1.0M DUP	6/12/2018					8	<5	<1	10	<5	<0.1	<2	22	-	-	-	-	-	-	-	-
TP03-0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	8	<5	<1	7	<5	<0.1	2	18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP04-0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	10	<5	<1	5	<5	<0.1	<2	6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP05-0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	26	8	<1	13	<5	<0.1	4	11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP06-0.1m	6/12/2018	<0.04	<0.04	<0.04	<0.04	18	<5	<1	8	<5	<0.1	3	8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP07-0.1m	7/12/2018	<0.04	<0.04	<0.04	<0.04	13	<5	<1	10	<5	<0.1	<2	9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP07-0.6m	7/12/2018	<0.02	<0.02	<0.02	<0.02	15	7	<1	16	<5	<0.1	4	14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP08-0.1m	7/12/2018	<0.04	<0.04	<0.04	<0.04	14	<5	<1	7	<5	<0.1	2	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	<0.02	<0.02	<0.02	<0.02	13	<5	<1	13	<5	<0.1	<2	12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP09-0.5m	7/12/2018	-	-	-	-	13	<5	<1	12	<5	<0.1	<2	13	-	-	-	-	-	-	-	-
TP09-0.5m DUP	7/12/2018	-	-	-	-	15	8	<1	13	<5	<0.1	2	13	-	-	-	-	-	-	-	-
TP09-1.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	<0.04	<0.04	<0.04	<0.04	14	7	<1	11	<5	<0.1	2	14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP11-0.2m	7/12/2018	<0.04	<0.04	<0.04	<0.04	15	6	<1	12	<5	<0.1	2	12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP11-0.2m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	<0.04	<0.04	<0.04	<0.04	15	6	<1	12	<5	<0.1	2	6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Statistics																					
Number of Results	13	13	13	13	18	18	18	18	18	18	18	18	18	13	13	13	13	13	13	13	13
Number of Detects	0	0	0	0	18	6	0	18	0	0	11	17	17	0	0	0	0	0	0	0	0
Minimum Concentration	<0.02	<0.02	<0.02	<0.02	8	<5	<1	5	<5	<0.1	2	<5	<5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Minimum Detect	ND	ND	ND	ND	8	6	ND	5	ND	ND	2	6	6	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.04	<0.04	<0.04	<0.04	26	8	<1	16	<5	<0.1	4	27	27	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Maximum Detect	ND	ND	ND	ND	26	8	ND	16	ND	ND	4	27	27	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.018	0.018	0.018	0.018	13	4	0.5	10	2.5	0.05	1.9	12	12	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Median Concentration *	0.02	0.02	0.02	0.02	13.5	2.5	0.5	10.5	2.5	0.05	2	12	12	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Standard Deviation *	0.0038	0.0038	0.0038	0.0038	4.3	2.2	0	3.1	0	0	0.96	5.9	5.9	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.0203	0.0203	0.0203	0.0203	15.11	4.917	0.5	11.38	2.5	0.05	2.284	14.59	14.59	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

* A Non Detect Multiplier of 0.5 has been applied.

Appendix D

30012537



Unit of Measurement	Organochlorine Pesticides																Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	
	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	γ-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor					
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)																					
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)																					
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m																					
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																					
NSW 2014 General Solid Waste CT1 (No Leaching)						60															
NSW 2014 General Solid Waste SCC1 (with leached)						3															
NSW 2014 General Solid Waste TCLP1 (leached)																					
NSW 2014 Restricted Solid Waste CT2 (No Leaching)						240															
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m																					
1-2m																					
2-4m																					
>=4m																					
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space			180																		
NEPM 2013 Table 1A(1) HILs Res A Soil				240		270				10					6		300				

Field ID	Date	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	γ-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos
TP01-0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP01 - 0.5m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02-1.0m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP02_1.0M DUP	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03-0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP04-0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP05-0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP06-0.1m	6/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP07-0.1m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP07-0.6m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP08-0.1m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP09-0.5m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.5m DUP	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-1.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP11-0.2m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
TP11-0.2m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05

Statistics																					
Number of Results	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.025	0.025	0.1	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.025	0.025	0.025	0.025
Median Concentration *	0.025	0.025	0.1	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.025	0.025	0.025	0.025
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.025	0.025	0.1	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.025	0.025	0.025	0.025

* A Non Detect Multiplier of 0.5 has been applied.

Appendix D

30012537



Unit of Measurement	Organophosphorous Pesticides											Polycyclic Aromatic Hydrocarbons (PAHs)							
	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (LOR)	Benzo(b,f)fluoranthene	Benzo(g,h,i)perylene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)																			
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)																			
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m																			
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																			
NSW 2014 General Solid Waste CT1 (No Leaching)	4															0.8			
NSW 2014 General Solid Waste SCC1 (with leached)	7.5															10			
NSW 2014 General Solid Waste TCLP1 (leached)																			
NSW 2014 Restricted Solid Waste CT2 (No Leaching)	16															3.2			
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m																	40		
1-2m																			
2-4m																			
>=4m																			
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																			
NEPM 2013 Table 1A(1) HILs Res A Soil	160																		

Field ID	Date	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (LOR)	Benzo(b,f)fluoranthene	Benzo(g,h,i)perylene
TP01-0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP01 - 0.5m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP02-1.0m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP02_0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP02_1.0M DUP	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP03-0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP04-0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP05-0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP06-0.1m	6/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP07-0.1m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP07-0.6m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP08-0.1m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP09-0.5m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP09-0.5m DUP	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
TP09-1.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-
TP11-0.2m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
TP11-0.2m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	-	-	-	-	-	-	-	-

Statistics	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (LOR)	Benzo(b,f)fluoranthene	Benzo(g,h,i)perylene
Number of Results	13	13	13	13	13	13	13	13	13	13	13	8	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.1	0.025	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Median Concentration *	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.1	0.025	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.1	0.025	0.25	0.25	0.25	0.25	0.25	0.25	0.25

* A Non Detect Multiplier of 0.5 has been applied.

Appendix D

30012537



Unit of Measurement

	PAH										PCBs (Sum of total)	Organophosphorus Pesticides				C6-C9	C10-C14	C15-C28	C29-C36
	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)		Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl				
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.05	0.05	0.2	0.05	10	50	100	100
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)							1,400												
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)							2,200												
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m																			
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																			
NSW 2014 General Solid Waste CT1 (No Leaching)										200	50					650			
NSW 2014 General Solid Waste SCC1 (with leached)										200	50					6,500			
NSW 2014 General Solid Waste TCLP1 (leached)																			
NSW 2014 Restricted Solid Waste CT2 (No Leaching)										800	50					2,600			
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m							3												
1-2m																			
2-4m																			
>=4m																			
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space							170												
NEPM 2013 Table 1A(1) HILs Res A Soil										300	1								

Field ID	Date	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	PCBs (Sum of total)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	C6-C9	C10-C14	C15-C28	C29-C36
TP01-0.1m	6/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
TP01 - 0.5m	6/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	-	-	-	-	<10	<50	<100	<100
TP02-1.0m	6/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	-	-	-	-	<10	<50	<100	<100
TP02_0.1m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP02_1.0M DUP	6/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	-	-	-	-	<10	<50	<100	<100
TP03-0.1m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP04-0.1m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP05-0.1m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP06-0.1m	6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP07-0.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP07-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP08-0.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
TP09-0.5m	7/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	-	-	-	-	<10	<50	<100	<100
TP09-0.5m DUP	7/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	-	-	-	-	<10	<50	<100	<100
TP09-1.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-
TP11-0.2m	7/12/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
TP11-0.2m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-

Statistics	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	PCBs (Sum of total)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	C6-C9	C10-C14	C15-C28	C29-C36
Number of Results	8	8	8	8	8	8	8	8	8	8	8	13	13	13	13	8	8	8	8
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.025	0.025	0.1	0.025	5	25	50	50
Median Concentration *	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.025	0.025	0.1	0.025	5	25	50	50
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.025	0.025	0.1	0.025	5	25	50	50

* A Non Detect Multiplier of 0.5 has been applied.

Appendix D

30012537




Unit of Measurement	Total Recoverable Hydrocarbons							
	C6-C10 mg/kg	C10-C16 mg/kg	C16-C34 mg/kg	+C10-C36 (Sum of total) mg/kg	C10-C40 (Sum of total) mg/kg	C34-C40 mg/kg	F1 minus BTEX mg/kg	F2 minus Naphthalene mg/kg
EQL	10	50	100	50	50	100	10	50
CRC Care Table 4 HSL-A Residential Direct Contact (Low Density)	4,400	3,300	4,500			6,300		
CRC Care Table B4 HSL-B Residential Direct Contact (High Density)	5,600	4,200	5,800			8,100		
CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance Worker) Sand 0m to <2m								
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	700	1,000	2,500			10,000		
NSW 2014 General Solid Waste CT1 (No Leaching)				10,000				
NSW 2014 General Solid Waste SCC1 (with leached)				10,000				
NSW 2014 General Solid Waste TCLP1 (leached)								
NSW 2014 Restricted Solid Waste CT2 (No Leaching)				40,000				
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand 0-1m							45	110
1-2m							70	240
2-4m							110	440
>=4m							200	
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space								
NEPM 2013 Table 1A(1) HILs Res A Soil								

Field ID	Date	C6-C10	C10-C16	C16-C34	+C10-C36	C10-C40	C34-C40	F1 minus BTEX	F2 minus Naphthalene
TP01-0.1m	6/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP01 - 0.5m	6/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP02-1.0m	6/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP02_0.1m	6/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP02_1.0M DUP	6/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP03-0.1m	6/12/2018	-	-	-	-	-	-	-	-
TP04-0.1m	6/12/2018	-	-	-	-	-	-	-	-
TP05-0.1m	6/12/2018	-	-	-	-	-	-	-	-
TP06-0.1m	6/12/2018	-	-	-	-	-	-	-	-
TP07-0.1m	7/12/2018	-	-	-	-	-	-	-	-
TP07 -0.6m	7/12/2018	-	-	-	-	-	-	-	-
TP08-0.1m	7/12/2018	-	-	-	-	-	-	-	-
TP08-0.6m	7/12/2018	-	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	-	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP09-0.5m	7/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP09-0.5m DUP	7/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP09-1.1m	7/12/2018	-	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018	-	-	-	-	-	-	-	-
TP11-0.2m	7/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP11-0.2m	7/12/2018	-	-	-	-	-	-	-	-
TP12-0.1m	7/12/2018	-	-	-	-	-	-	-	-

Statistics	C6-C10	C10-C16	C16-C34	+C10-C36	C10-C40	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Number of Results	8	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	0	0	0	0
Minimum Concentration	<10	<50	<100	<50	<50	<100	<10	<50
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<10	<50	<100	<50	<50	<100	<10	<50
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	5	25	50	25	25	50	5	25
Median Concentration *	5	25	50	25	25	50	5	25
Standard Deviation *	0	0	0	0	0	0	0	0
95% UCL (Student's-t) *	5	25	50	25	25	50	5	25

* A Non Detect Multiplier of 0.5 has been applied.

 Member of the Sellen Group					Metals								BTEX							TRH				PAH		PCB	
					Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10	C6-C10 less BTEX (F1)	C>10-C16 less naphthalene (F2)	C16-C34 (F3)	C34-C40 (F4)	PAH B(a)P TEQ	Total PAHs	Total PCB
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR (ALS Laboratory)					5	1	2	5	5	0.1	2	5	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10	10	50	100	100	0.6	0.5	0.1
Sample ID	Depth (m)	Lab report	Date*	Matrix																							
Intra-laboratory duplicates																											
TP02_1.0M	1.0	ES1837559	7/12/2018	SOIL	<5	<1	11	<5	8	<0.1	2	27	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<100	<100	1.2	<0.5	<0.1
QC-01	1	ES1837559	7/12/2018	SOIL	<5	<1	10	<5	8	<0.1	<2	22	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<100	<100	1.2	<0.5	<0.1
RPD%					N/A	N/A	10	N/A	0	N/A	N/A	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
TP09-0.5M	0.5	ES1837559	7/12/2018	SOIL	<5	<1	12	<5	13	<0.1	<2	13	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<100	<100	1.2	<0.5	<0.1
QC-02	0.5	ES1837559	7/12/2018	SOIL	8	<1	13	<5	15	<0.1	2	13	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<100	<100	1.2	<0.5	<0.1
RPD%					N/A	N/A	8	N/A	14	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
Inter-laboratory duplicates																											
Results still to be provided																											

Notes:
 *Sample dates have been corrected as per the field logs. Some differences with laboratory reports are noted.

BOLD Indicates RPD is outside of control limits if:
 -If result less than 10 times the LOR, then no limit.
 -If result greater than 10 times the LOR, then control limit of 50%.

Appendix E Laboratory reports



CERTIFICATE OF ANALYSIS

Work Order : ES1837559
Client : SMEC AUSTRALIA PTY LTD
Contact : SAM VAUGHAN
Address : PO BOX 1052
NORTH SYDNEY NSW, AUSTRALIA 2060
Telephone : ----
Project : 30012537
Order number : 30012537
C-O-C number : ----
Sampler : MM
Site : ----
Quote number : EN/025/18 - Primary work
No. of samples received : 40
No. of samples analysed : 25

Page : 1 of 24
Laboratory : Environmental Division Sydney
Contact : Larissa Burns
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +6138549 9644
Date Samples Received : 13-Dec-2018 11:00
Date Analysis Commenced : 14-Dec-2018
Issue Date : 19-Dec-2018 10:50



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
Analytical Results
Descriptive Results
Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Table with 3 columns: Signatories, Position, Accreditation Category. Rows include Christopher Owler (Team Leader - Asbestos), Edwandy Fadjar (Organic Coordinator), Franco Lentini (Analyst), Kim McCabe (Senior Inorganic Chemist), and Satishkumar Trivedi (Senior Acid Sulfate Soil Chemist).



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP202: Particular samples required dilution due to sample matrix. LOR values have been adjusted accordingly.
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): 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'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.
Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-001	ES1837559-002	ES1837559-004	ES1837559-005	ES1837559-006	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	16.0	19.2	16.1	14.1	5.8	
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	----	----	----	----
Asbestos Type	1332-21-4	-	--	-	----	----	----	----	----
Sample weight (dry)	----	0.01	g	25.4	----	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	C.OWLER	----	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	10	5	11	7	
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg	15	11	9	8	8	
Nickel	7440-02-0	2	mg/kg	<2	2	<2	2	2	
Zinc	7440-66-6	5	mg/kg	14	8	<5	27	18	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	<0.1	----	
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m
Client sampling date / time					06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837559-001	ES1837559-002	ES1837559-004	ES1837559-005	ES1837559-006	
				Result	Result	Result	Result	Result	
EP068A: Organochlorine Pesticides (OC) - Continued									
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
Malathion	121-75-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Parathion	56-38-2	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Ethion	563-12-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-001	ES1837559-002	ES1837559-004	ES1837559-005	ES1837559-006	
				Result	Result	Result	Result	Result	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	0.6	----	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	1.2	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	----	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	----	
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	<100	----	
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	<100	----	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	<50	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	----	
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	----	
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	<100	----	
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	<100	----	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	<50	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	<50	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-001	ES1837559-002	ES1837559-004	ES1837559-005	ES1837559-006	
				Result	Result	Result	Result	Result	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	----	
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	<1	----	
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
2,4-DB	94-82-6	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Dicamba	1918-00-9	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Mecoprop	93-65-2	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
MCPA	94-74-6	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
2,4-DP	120-36-5	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
2,4-D	94-75-7	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Triclopyr	55335-06-3	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
2,4,5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
2,4,5-T	93-76-5	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
MCPB	94-81-5	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Picloram	1918-02-1	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Clopyralid	1702-17-6	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	----	<0.04	----	<0.04	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	111	119	----	112	----	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%	98.9	----	91.9	----	140	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	72.4	----	60.8	----	91.2	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%	72.9	73.8	----	74.8	----	
2-Chlorophenol-D4	93951-73-6	0.5	%	75.1	72.2	----	71.2	----	
2,4,6-Tribromophenol	118-79-6	0.5	%	67.8	54.7	----	52.8	----	
EP075(SIM)T: PAH Surrogates									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-001	ES1837559-002	ES1837559-004	ES1837559-005	ES1837559-006	
				Result	Result	Result	Result	Result	
EP075(SIM)T: PAH Surrogates - Continued									
2-Fluorobiphenyl	321-60-8	0.5	%	86.6	84.8	----	83.6	----	
Anthracene-d10	1719-06-8	0.5	%	84.4	83.5	----	82.1	----	
4-Terphenyl-d14	1718-51-0	0.5	%	80.5	79.9	----	80.2	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	110	109	----	116	----	
Toluene-D8	2037-26-5	0.2	%	96.4	94.5	----	90.8	----	
4-Bromofluorobenzene	460-00-4	0.2	%	99.1	102	----	90.3	----	
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2,4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%	56.4	----	55.4	----	54.3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04-0.1m	TP05-0.1m	TP06-0.1m	TP07-0.1m	TP07 -0.6m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-008	ES1837559-010	ES1837559-012	ES1837559-014	ES1837559-016	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	13.6	18.2	21.2	18.4	19.8	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	8	<5	<5	7	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	5	13	8	10	16	
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	<5	
Lead	7439-92-1	5	mg/kg	10	26	18	13	15	
Nickel	7440-02-0	2	mg/kg	<2	4	3	<2	4	
Zinc	7440-66-6	5	mg/kg	6	11	8	9	14	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04-0.1m	TP05-0.1m	TP06-0.1m	TP07-0.1m	TP07 -0.6m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-008	ES1837559-010	ES1837559-012	ES1837559-014	ES1837559-016	
				Result	Result	Result	Result	Result	
EP068A: Organochlorine Pesticides (OC) - Continued									
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
2,4-DB	94-82-6	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Dicamba	1918-00-9	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Mecoprop	93-65-2	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
MCPA	94-74-6	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
2,4-DP	120-36-5	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
2,4-D	94-75-7	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Triclopyr	55335-06-3	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
2,4,5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
2,4,5-T	93-76-5	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04-0.1m	TP05-0.1m	TP06-0.1m	TP07-0.1m	TP07 -0.6m
Client sampling date / time				06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-008	ES1837559-010	ES1837559-012	ES1837559-014	ES1837559-016	
				Result	Result	Result	Result	Result	
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued									
MCPB	94-81-5	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Picloram	1918-02-1	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Clopyralid	1702-17-6	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	<0.04	<0.04	<0.04	<0.02	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%	101	112	94.8	94.7	89.5	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	66.7	76.5	70.4	64.2	62.7	
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2,4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%	58.1	51.9	53.0	53.3	56.6	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP08-0.1m	TP08-0.6m	TP08-2.0m	TP08-2.4m	TP09-0.1m
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-017	ES1837559-020	ES1837559-021	ES1837559-022	ES1837559-023	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	----	5.9	5.7	5.7	----	
Titration Actual Acidity (23F)	----	2	mole H+ / t	----	4	2	3	----	
sulfidic - Titration Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	<0.02	<0.02	----	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.015	0.006	0.006	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	<10	<10	<10	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	----	1.5	1.5	1.5	----	
Net Acidity (sulfur units)	----	0.02	% S	----	0.02	<0.02	<0.02	----	
Net Acidity (acidity units)	----	10	mole H+ / t	----	13	<10	<10	----	
Liming Rate	----	1	kg CaCO3/t	----	<1	<1	<1	----	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.02	<0.02	<0.02	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	13	<10	<10	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	<1	<1	<1	----	
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	----	7.1	7.6	7.4	----	
ø pH (Fox)	----	0.1	pH Unit	----	5.3	5.6	5.7	----	
ø Reaction Rate	----	1	-	----	2	2	2	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	44.4	----	----	----	18.6	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	<5	
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	<1	
Chromium	7440-47-3	2	mg/kg	7	----	----	----	13	
Copper	7440-50-8	5	mg/kg	<5	----	----	----	<5	
Lead	7439-92-1	5	mg/kg	14	----	----	----	13	
Nickel	7440-02-0	2	mg/kg	2	----	----	----	<2	
Zinc	7440-66-6	5	mg/kg	10	----	----	----	12	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	<0.1	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	----	<0.1	
EP068A: Organochlorine Pesticides (OC)									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP08-0.1m	TP08-0.6m	TP08-2.0m	TP08-2.4m	TP09-0.1m
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-017	ES1837559-020	ES1837559-021	ES1837559-022	ES1837559-023	
				Result	Result	Result	Result	Result	
EP068A: Organochlorine Pesticides (OC) - Continued									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	<0.05	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	<0.05	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	<0.05	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	<0.05	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	<0.05	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	<0.05	
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	<0.05	
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	<0.05	
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	<0.05	
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	<0.05	
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	<0.05	
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	<0.05	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	----	----	<0.05	
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	<0.05	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	<0.2	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	<0.05	
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	<0.2	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	<0.05	
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	----	----	----	<0.05	
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	<0.05	
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	<0.05	
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	<0.2	
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	<0.05	
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	<0.05	
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	<0.05	
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	<0.2	
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	<0.05	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP08-0.1m	TP08-0.6m	TP08-2.0m	TP08-2.4m	TP09-0.1m
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-017	ES1837559-020	ES1837559-021	ES1837559-022	ES1837559-023	
				Result	Result	Result	Result	Result	
EP068B: Organophosphorus Pesticides (OP) - Continued									
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	<0.05	
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	<0.05	
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	<0.2	
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	<0.05	
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	<0.05	
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	<0.05	
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	<0.05	
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	<0.05	
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	<0.05	
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	<0.05	
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	<0.05	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5	
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	<0.5	
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	<0.5	
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	<0.5	
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	<0.5	
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	<0.5	
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	----	----	----	----	<0.5	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	----	----	----	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	----	----	----	<0.5	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	----	----	----	0.6	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	----	----	----	1.2	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	----	----	----	----	<10	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP08-0.1m	TP08-0.6m	TP08-2.0m	TP08-2.4m	TP09-0.1m
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-017	ES1837559-020	ES1837559-021	ES1837559-022	ES1837559-023	
				Result	Result	Result	Result	Result	
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg	----	----	----	----	<50	
C15 - C28 Fraction	----	100	mg/kg	----	----	----	----	<100	
C29 - C36 Fraction	----	100	mg/kg	----	----	----	----	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	----	----	----	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	----	----	<10	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	----	----	----	<10	
>C10 - C16 Fraction	----	50	mg/kg	----	----	----	----	<50	
>C16 - C34 Fraction	----	100	mg/kg	----	----	----	----	<100	
>C34 - C40 Fraction	----	100	mg/kg	----	----	----	----	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	----	----	----	<50	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	----	----	----	<50	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	----	----	----	----	<0.2	
Toluene	108-88-3	0.5	mg/kg	----	----	----	----	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	----	----	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	----	----	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	----	----	<0.5	
^ Sum of BTEX	----	0.2	mg/kg	----	----	----	----	<0.2	
^ Total Xylenes	----	0.5	mg/kg	----	----	----	----	<0.5	
Naphthalene	91-20-3	1	mg/kg	----	----	----	----	<1	
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	----	----	----	<0.02	
2,4-DB	94-82-6	0.02	mg/kg	<0.04	----	----	----	<0.02	
Dicamba	1918-00-9	0.02	mg/kg	<0.04	----	----	----	<0.02	
Mecoprop	93-65-2	0.02	mg/kg	<0.04	----	----	----	<0.02	
MCPA	94-74-6	0.02	mg/kg	<0.04	----	----	----	<0.02	
2,4-DP	120-36-5	0.02	mg/kg	<0.04	----	----	----	<0.02	
2,4-D	94-75-7	0.02	mg/kg	<0.04	----	----	----	<0.02	
Triclopyr	55335-06-3	0.02	mg/kg	<0.04	----	----	----	<0.02	
2,4,5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	----	----	----	<0.02	
2,4,5-T	93-76-5	0.02	mg/kg	<0.04	----	----	----	<0.02	
MCPB	94-81-5	0.02	mg/kg	<0.04	----	----	----	<0.02	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP08-0.1m	TP08-0.6m	TP08-2.0m	TP08-2.4m	TP09-0.1m
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-017	ES1837559-020	ES1837559-021	ES1837559-022	ES1837559-023	
				Result	Result	Result	Result	Result	
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued									
Picloram	1918-02-1	0.02	mg/kg	<0.04	----	----	----	<0.02	
Clopyralid	1702-17-6	0.02	mg/kg	<0.04	----	----	----	<0.02	
Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	----	----	----	<0.02	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	----	----	108	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%	106	----	----	----	111	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	77.0	----	----	----	82.8	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%	----	----	----	----	74.9	
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	----	----	72.0	
2,4,6-Tribromophenol	118-79-6	0.5	%	----	----	----	----	54.5	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	----	----	85.1	
Anthracene-d10	1719-06-8	0.5	%	----	----	----	----	83.2	
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	----	----	81.3	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	----	----	107	
Toluene-D8	2037-26-5	0.2	%	----	----	----	----	84.8	
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	----	----	91.8	
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2,4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%	51.4	----	----	----	62.3	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP09-0.1m	TP09-0.5m	TP09-0.5m	TP09-1.1m	TP09-0.5m DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-024	ES1837559-025	ES1837559-026	ES1837559-028	ES1837559-029	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	----	20.1	----	----	28.5	
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	No	No	----	
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	No	No	----	
Asbestos Type	1332-21-4	-	--	-	----	-	-	----	
Sample weight (dry)	----	0.01	g	281	----	454	450	----	
APPROVED IDENTIFIER:	----	-	--	C.OWLER	----	C.OWLER	C.OWLER	----	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	----	<5	----	----	8	
Cadmium	7440-43-9	1	mg/kg	----	<1	----	----	<1	
Chromium	7440-47-3	2	mg/kg	----	12	----	----	13	
Copper	7440-50-8	5	mg/kg	----	<5	----	----	<5	
Lead	7439-92-1	5	mg/kg	----	13	----	----	15	
Nickel	7440-02-0	2	mg/kg	----	<2	----	----	2	
Zinc	7440-66-6	5	mg/kg	----	13	----	----	13	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	----	----	<0.1	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	----	<0.1	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	<0.5	
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	<0.5	
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP09-0.1m	TP09-0.5m	TP09-0.5m	TP09-1.1m	TP09-0.5m DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-024	ES1837559-025	ES1837559-026	ES1837559-028	ES1837559-029	
				Result	Result	Result	Result	Result	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	0.6	----	----	0.6	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	1.2	----	----	1.2	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	----	<10	
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	----	<50	
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	----	<100	
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	----	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	----	----	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	----	<10	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	----	----	<10	
>C10 - C16 Fraction	----	50	mg/kg	----	<50	----	----	<50	
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	----	<100	
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	----	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	----	----	<50	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	----	----	<50	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	----	<0.2	
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	----	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	----	----	<0.2	
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
Naphthalene	91-20-3	1	mg/kg	----	<1	----	----	<1	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	122	----	----	120	
EP075(SIM)S: Phenolic Compound Surrogates									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP09-0.1m	TP09-0.5m	TP09-0.5m	TP09-1.1m	TP09-0.5m DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-024	ES1837559-025	ES1837559-026	ES1837559-028	ES1837559-029	
				Result	Result	Result	Result	Result	
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
Phenol-d6	13127-88-3	0.5	%	----	76.6	----	----	66.4	
2-Chlorophenol-D4	93951-73-6	0.5	%	----	80.1	----	----	75.2	
2,4,6-Tribromophenol	118-79-6	0.5	%	----	53.9	----	----	54.3	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	----	87.3	----	----	88.9	
Anthracene-d10	1719-06-8	0.5	%	----	85.1	----	----	85.8	
4-Terphenyl-d14	1718-51-0	0.5	%	----	83.9	----	----	83.6	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	----	102	----	----	108	
Toluene-D8	2037-26-5	0.2	%	----	85.7	----	----	89.3	
4-Bromofluorobenzene	460-00-4	0.2	%	----	92.2	----	----	94.2	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
Client sampling date / time				TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
Compound				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00
CAS Number	LOR	Unit		ES1837559-030	ES1837559-034	ES1837559-035	ES1837559-036	ES1837559-039
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	10.1	12.3	----	18.7	22.2
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	No	No	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	----	No	No	----
Asbestos Type	1332-21-4	-	--	----	----	-	-	----
Sample weight (dry)	----	0.01	g	----	----	366	17.2	----
APPROVED IDENTIFIER:	----	-	--	----	----	C.OWLER	C.OWLER	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	6	----	6	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg	11	12	----	12	10
Copper	7440-50-8	5	mg/kg	<5	<5	----	<5	<5
Lead	7439-92-1	5	mg/kg	14	15	----	15	8
Nickel	7440-02-0	2	mg/kg	2	2	----	2	<2
Zinc	7440-66-6	5	mg/kg	14	12	----	6	22
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-030	ES1837559-034	ES1837559-035	ES1837559-036	ES1837559-039	
				Result	Result	Result	Result	Result	
EP068A: Organochlorine Pesticides (OC) - Continued									
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	<0.2	----	
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	<0.05	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-030	ES1837559-034	ES1837559-035	ES1837559-036	ES1837559-039	
				Result	Result	Result	Result	Result	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	<0.5	
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	<0.5	
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	0.6	----	----	0.6	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	1.2	----	----	1.2	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	----	<10	
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	----	<50	
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	----	<100	
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	----	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	----	----	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	----	<10	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	----	----	<10	
>C10 - C16 Fraction	----	50	mg/kg	----	<50	----	----	<50	
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	----	<100	
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	----	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	----	----	<50	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	----	----	<50	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
Client sampling date / time				07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	
Compound	CAS Number	LOR	Unit	ES1837559-030	ES1837559-034	ES1837559-035	ES1837559-036	ES1837559-039	
				Result	Result	Result	Result	Result	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	----	<0.2	
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	----	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	----	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	----	<0.5	
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	----	----	<0.2	
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	----	----	<0.5	
Naphthalene	91-20-3	1	mg/kg	----	<1	----	----	<1	
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
2,4-DB	94-82-6	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Dicamba	1918-00-9	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Mecoprop	93-65-2	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
MCPA	94-74-6	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
2,4-DP	120-36-5	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
2,4-D	94-75-7	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Triclopyr	55335-06-3	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
2,4,5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
2,4,5-T	93-76-5	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
MCPB	94-81-5	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Picloram	1918-02-1	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Clopyralid	1702-17-6	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	<0.04	----	<0.04	----	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	108	----	----	104	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%	87.0	95.8	----	124	----	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	102	63.0	----	89.1	----	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%	----	76.2	----	----	74.4	
2-Chlorophenol-D4	93951-73-6	0.5	%	----	73.2	----	----	72.7	
2,4,6-Tribromophenol	118-79-6	0.5	%	----	56.5	----	----	50.9	
EP075(SIM)T: PAH Surrogates									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
Client sampling date / time					07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837559-030	ES1837559-034	ES1837559-035	ES1837559-036	ES1837559-039	
				Result	Result	Result	Result	Result	
EP075(SIM)T: PAH Surrogates - Continued									
2-Fluorobiphenyl	321-60-8	0.5	%	----	86.2	----	----	85.8	
Anthracene-d10	1719-06-8	0.5	%	----	83.5	----	----	84.0	
4-Terphenyl-d14	1718-51-0	0.5	%	----	81.8	----	----	84.7	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	----	113	----	----	120	
Toluene-D8	2037-26-5	0.2	%	----	86.7	----	----	95.0	
4-Bromofluorobenzene	460-00-4	0.2	%	----	87.8	----	----	102	
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2,4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%	59.4	53.8	----	59.1	----	

Analytical Results

Descriptive Results

Sub-Matrix: SOIL

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	TP01-0.1m - 06-Dec-2018 00:00	Mid brown clay soil
EA200: Description	TP09-0.1m - 07-Dec-2018 00:00	Mid brown clay soil
EA200: Description	TP09-0.5m - 07-Dec-2018 00:00	Mid brown clay soil
EA200: Description	TP09-1.1m - 07-Dec-2018 00:00	Mid brown clay soil
EA200: Description	TP11-0.2m - 07-Dec-2018 00:00	Mid brown clay soil
EA200: Description	TP12-0.1m - 07-Dec-2018 00:00	Mid brown clay soil



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2,4-Dichlorophenyl Acetic Acid	19719-28-9	45	139



QUALITY CONTROL REPORT

Work Order : ES1837559
Client : SMEC AUSTRALIA PTY LTD
Contact : SAM VAUGHAN
Address : PO BOX 1052
NORTH SYDNEY NSW, AUSTRALIA 2060
Telephone : ----
Project : 30012537
Order number : 30012537
C-O-C number : ----
Sampler : MM
Site : ----
Quote number : EN/025/18 - Primary work
No. of samples received : 40
No. of samples analysed : 25

Page : 1 of 12
Laboratory : Environmental Division Sydney
Contact : Larissa Burns
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +6138549 9644
Date Samples Received : 13-Dec-2018
Date Analysis Commenced : 14-Dec-2018
Issue Date : 19-Dec-2018



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Table with 3 columns: Signatories, Position, Accreditation Category. Rows include Christopher Owler, Edwandy Fadjar, Franco Lentini, Ivan Taylor, Kim McCabe, and Satishkumar Trivedi.



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA033-A: Actual Acidity (QC Lot: 2097917)									
EM1819703-005	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.00	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.7	6.7	0.00	0% - 20%
ES1837559-020	TP08-0.6m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.00	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	3	0.00	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	5.9	6.1	3.33	0% - 20%
EA033-B: Potential Acidity (QC Lot: 2097917)									
EM1819703-005	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.618	0.618	0.00	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	385	386	0.00	0% - 20%
ES1837559-020	TP08-0.6m	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.015	0.016	7.79	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.00	No Limit
EA037: Ass Field Screening Analysis (QC Lot: 2096702)									
EM1819815-075	Anonymous	EA037: pH (F)	----	0.1	pH Unit	5.5	5.4	1.84	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	3.2	3.3	0.00	0% - 20%
EW1805228-002	Anonymous	EA037: pH (F)	----	0.1	pH Unit	5.4	5.4	0.00	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	3.0	3.0	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2097500)									
ES1837528-003	Anonymous	EA055: Moisture Content	----	0.1	%	19.5	17.2	12.8	0% - 50%
ES1837559-006	TP03-0.1m	EA055: Moisture Content	----	0.1	%	5.8	6.3	7.18	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2097501)									
ES1837559-029	TP09-0.5m DUP	EA055: Moisture Content	----	0.1	%	28.5	25.6	10.8	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 2098367)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 2098367) - continued									
ES1837494-019	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	50	53	6.72	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	53	57	6.27	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	26	28	7.78	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	6	6	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	104	109	4.10	0% - 20%
ES1837559-014	TP07-0.1m	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	14	40.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	13	14	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	8	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2098368)									
ES1837494-019	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1837559-014	TP07-0.1m	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 2093508)									
ES1837559-001	TP01-0.1m	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2093509)									
ES1837559-030	TP10-0.1m	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2093509) - continued									
ES1837559-030	TP10-0.1m	EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1837559-001	TP01-0.1m	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2093509)									
ES1837559-030	TP10-0.1m	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit



Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2093509) - continued									
ES1837559-030	TP10-0.1m	EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1837559-001	TP01-0.1m	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2093506)									
ES1837559-001	TP01-0.1m	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2093506) - continued									
ES1837559-001	TP01-0.1m	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2093507)									
ES1837559-001	TP01-0.1m	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2094792)									
ES1836902-008	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1836909-027	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2093507)									
ES1837559-001	TP01-0.1m	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 2094792)									
ES1836902-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1836909-027	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 2094792)									
ES1836902-008	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1836909-027	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 2099300)									
ES1837559-001	TP01-0.1m	EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2,4-DB	94-82-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: MCPA	94-74-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2,4-DP	120-36-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit



Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 2099300) - continued									
ES1837559-001	TP01-0.1m	EP202: 2.4-D	94-75-7	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4.5-T	93-76-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: MCPB	94-81-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Picloram	1918-02-1	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
ES1837559-030	TP10-0.1m	EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4-DB	94-82-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: MCPA	94-74-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4-DP	120-36-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4-D	94-75-7	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: 2.4.5-T	93-76-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: MCPB	94-81-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Picloram	1918-02-1	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.04	<0.04	0.00	No Limit
		EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.04	<0.04	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EA033-A: Actual Acidity (QCLot: 2097917)									
EA033: pH KCl (23A)	----	----	pH Unit	----	4.5 pH Unit	97.8	70	130	
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	24.6 mole H+ / t	99.8	70	130	
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----	
EA033-B: Potential Acidity (QCLot: 2097917)									
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.23483 % S	94.4	70	130	
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----	
EG005T: Total Metals by ICP-AES (QCLot: 2098367)									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	107	86	126	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	108	76	128	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	107	86	120	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	110	80	114	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	116	87	123	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	112	80	122	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2098368)									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	70.8	70	105	
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2093508)									
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	88.0	62	126	
EP068A: Organochlorine Pesticides (OC) (QCLot: 2093509)									
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	100	69	113	
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	96.9	65	117	
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	75.9	67	119	
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	86.0	68	116	
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.6	65	117	
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.0	67	115	
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.1	69	115	
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	62	118	
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	87.2	63	117	
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	66	116	
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.2	64	116	
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	105	66	116	
EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	98.6	67	115	
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	103	67	123	
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.2	69	115	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EP068A: Organochlorine Pesticides (OC) (QCLot: 2093509) - continued									
EP068: 4.4'-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	103	69	121	
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	56	120	
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	108	62	124	
EP068: 4.4'-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	102	66	120	
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	102	64	122	
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	95.1	54	130	
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2093509)									
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	59	119	
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	62	128	
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	96.6	54	126	
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	96.8	67	119	
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	80.0	70	120	
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	83.1	72	120	
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	83.5	68	120	
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	68	122	
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.1	69	117	
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	92.6	76	118	
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	86.1	64	122	
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	85.9	70	116	
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	83.7	69	121	
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	92.2	66	118	
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	76.6	68	124	
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	97.9	62	112	
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	90.8	68	120	
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	97.7	65	127	
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	70.1	41	123	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2093506)									
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	116	77	125	
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	119	72	124	
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	107	73	127	
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	121	72	126	
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	118	75	127	
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	102	77	127	
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	124	73	127	
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	121	74	128	
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	113	69	123	
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	112	75	127	
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	6 mg/kg	102	68	116	
	205-82-3								



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike	Spike Recovery (%)		Recovery Limits (%)	
					Concentration	LCS	Low	High	
EP075(SIM): Polynuclear Aromatic Hydrocarbons (QCLot: 2093506) - continued									
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	104	74	126	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	116	70	126	
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	66.8	61	121	
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	68.4	62	118	
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	64.2	63	121	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2093507)									
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	105	75	129	
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	110	77	131	
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	112	71	129	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2094792)									
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	85.2	68	128	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2093507)									
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	94.4	77	125	
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	104	74	138	
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	103	63	131	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2094792)									
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	80.0	68	128	
EP080: BTEXN (QCLot: 2094792)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	98.0	62	116	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	96.1	67	121	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	92.3	65	117	
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	96.6	66	118	
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	95.7	68	120	
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	98.1	63	119	
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 2099300)									
EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.02	0.1 mg/kg	73.2	54	128	
EP202: 2,4-DB	94-82-6	0.02	mg/kg	<0.02	0.1 mg/kg	79.9	46	130	
EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.02	0.1 mg/kg	83.4	52	135	
EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.02	0.1 mg/kg	75.5	60	130	
EP202: MCPA	94-74-6	0.02	mg/kg	<0.02	0.1 mg/kg	74.1	57	131	
EP202: 2,4-DP	120-36-5	0.02	mg/kg	<0.02	0.1 mg/kg	113	50	141	
EP202: 2,4-D	94-75-7	0.02	mg/kg	<0.02	0.1 mg/kg	84.3	69	131	
EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.02	0.1 mg/kg	97.2	51	141	
EP202: 2,4,5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.02	0.1 mg/kg	73.3	41	126	
EP202: 2,4,5-T	93-76-5	0.02	mg/kg	<0.02	0.1 mg/kg	84.7	57	139	
EP202: MCPB	94-81-5	0.02	mg/kg	<0.02	0.1 mg/kg	72.2	39	137	
EP202: Picloram	1918-02-1	0.02	mg/kg	<0.02	0.1 mg/kg	64.0	49	129	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 2099300) - continued								
EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.02	0.1 mg/kg	57.6	49	106
EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.02	0.1 mg/kg	81.8	53	128

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report		
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low High
EG005T: Total Metals by ICP-AES (QCLot: 2098367)						
ES1837494-019	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	92.3	70 130
		EG005T: Cadmium	7440-43-9	50 mg/kg	100.0	70 130
		EG005T: Chromium	7440-47-3	50 mg/kg	101	70 130
		EG005T: Copper	7440-50-8	250 mg/kg	101	70 130
		EG005T: Lead	7439-92-1	250 mg/kg	99.3	70 130
		EG005T: Nickel	7440-02-0	50 mg/kg	103	70 130
		EG005T: Zinc	7440-66-6	250 mg/kg	104	70 130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2098368)						
ES1837494-019	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	82.9	70 130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2093508)						
ES1837559-001	TP01-0.1m	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	91.0	70 130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2093509)						
ES1837559-001	TP01-0.1m	EP068: gamma-BHC	58-89-9	0.5 mg/kg	80.2	70 130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	85.0	70 130
		EP068: Aldrin	309-00-2	0.5 mg/kg	96.6	70 130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	82.4	70 130
		EP068: Endrin	72-20-8	2 mg/kg	108	70 130
		EP068: 4,4'-DDT	50-29-3	2 mg/kg	93.8	70 130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2093509)						
ES1837559-001	TP01-0.1m	EP068: Diazinon	333-41-5	0.5 mg/kg	99.0	70 130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	79.7	70 130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	96.0	70 130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	91.3	70 130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	75.8	70 130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2093506)						
ES1837559-001	TP01-0.1m	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	91.3	70 130



Sub-Matrix: SOIL

				Matrix Spike (MS) Report				
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2093506) - continued								
ES1837559-001	TP01-0.1m	EP075(SIM): Pyrene	129-00-0	10 mg/kg	107	70	130	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2093507)								
ES1837559-001	TP01-0.1m	EP071: C10 - C14 Fraction	----	523 mg/kg	94.4	73	137	
		EP071: C15 - C28 Fraction	----	2319 mg/kg	102	53	131	
		EP071: C29 - C36 Fraction	----	1714 mg/kg	112	52	132	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2094792)								
ES1836902-008	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	79.1	70	130	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2093507)								
ES1837559-001	TP01-0.1m	EP071: >C10 - C16 Fraction	----	860 mg/kg	103	73	137	
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	115	53	131	
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	98.7	52	132	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 2094792)								
ES1836902-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.5	70	130	
EP080: BTEXN (QCLot: 2094792)								
ES1836902-008	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	88.2	70	130	
		EP080: Toluene	108-88-3	2.5 mg/kg	86.0	70	130	
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.5	70	130	
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	82.8	70	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.5	70	130	
	EP080: Naphthalene	91-20-3	2.5 mg/kg	104	70	130		
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 2099300)								
ES1837559-001	TP01-0.1m	EP202: Mecoprop	93-65-2	0.1 mg/kg	65.4	60	140	
		EP202: MCPA	94-74-6	0.1 mg/kg	68.3	57	143	
		EP202: 2,4-D	94-75-7	0.1 mg/kg	81.3	68	139	
		EP202: Triclopyr	55335-06-3	0.1 mg/kg	75.3	51	145	
		EP202: 2,4,5-T	93-76-5	0.1 mg/kg	88.7	57	142	
		EP202: Picloram	1918-02-1	0.1 mg/kg	62.6	49	138	
		EP202: Clopyralid	1702-17-6	0.1 mg/kg	72.1	49	149	



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1837559	Page	: 1 of 10
Client	: SMEC AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: SAM VAUGHAN	Telephone	: +6138549 9644
Project	: 30012537	Date Samples Received	: 13-Dec-2018
Site	: ----	Issue Date	: 19-Dec-2018
Sampler	: MM	No. of samples received	: 40
Order number	: 30012537	No. of samples analysed	: 25

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA033-A: Actual Acidity								
Snap Lock Bag - frozen (EA033) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	18-Dec-2018	07-Dec-2019	✓	18-Dec-2018	18-Mar-2019	✓
EA033-B: Potential Acidity								
Snap Lock Bag - frozen (EA033) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	18-Dec-2018	07-Dec-2019	✓	18-Dec-2018	18-Mar-2019	✓
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen (EA033) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	18-Dec-2018	07-Dec-2019	✓	18-Dec-2018	18-Mar-2019	✓
EA033-D: Retained Acidity								
Snap Lock Bag - frozen (EA033) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	18-Dec-2018	07-Dec-2019	✓	18-Dec-2018	18-Mar-2019	✓
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen (EA033) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	18-Dec-2018	07-Dec-2019	✓	18-Dec-2018	18-Mar-2019	✓
EA037: Ass Field Screening Analysis								
Snap Lock Bag - frozen (EA037) TP08-0.6m, TP08-2.4m	TP08-2.0m,	07-Dec-2018	17-Dec-2018	05-Jun-2019	✓	17-Dec-2018	05-Jun-2019	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) TP01-0.1m, TP02. 0.1m, TP03-0.1m, TP05-0.1m, TP01 - 0.5m, TP02-1.0m, TP04-0.1m, TP06-0.1m	06-Dec-2018	----	----	----	15-Dec-2018	20-Dec-2018	✓	
Soil Glass Jar - Unpreserved (EA055) TP07-0.1m, TP08-0.1m, TP09-0.5m, TP10-0.1m, TP12-0.1m, TP07 -0.6m, TP09-0.1m, TP09-0.5m DUP, TP11-0.2m, TP02_1.0M DUP	07-Dec-2018	----	----	----	15-Dec-2018	21-Dec-2018	✓	
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag (EA200) TP09-0.1m, TP09-1.1m, TP09-0.5m, TP11-0.2m	07-Dec-2018	----	----	----	17-Dec-2018	05-Jun-2019	✓	
Snap Lock Bag - Subsampled by ALS (EA200) TP01-0.1m	06-Dec-2018	----	----	----	17-Dec-2018	04-Jun-2019	✓	
Snap Lock Bag - Subsampled by ALS (EA200) TP12-0.1m	07-Dec-2018	----	----	----	17-Dec-2018	05-Jun-2019	✓	
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) TP01-0.1m, TP02. 0.1m, TP03-0.1m, TP05-0.1m, TP01 - 0.5m, TP02-1.0m, TP04-0.1m, TP06-0.1m	06-Dec-2018	17-Dec-2018	04-Jun-2019	✓	17-Dec-2018	04-Jun-2019	✓	
Soil Glass Jar - Unpreserved (EG005T) TP07-0.1m, TP08-0.1m, TP09-0.5m, TP10-0.1m, TP12-0.1m, TP07 -0.6m, TP09-0.1m, TP09-0.5m DUP, TP11-0.2m, TP02_1.0M DUP	07-Dec-2018	17-Dec-2018	05-Jun-2019	✓	17-Dec-2018	05-Jun-2019	✓	



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) TP01-0.1m, TP02-0.1m, TP03-0.1m, TP05-0.1m,	TP01 - 0.5m, TP02-1.0m, TP04-0.1m, TP06-0.1m	06-Dec-2018	17-Dec-2018	03-Jan-2019	✓	17-Dec-2018	03-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG035T) TP07-0.1m, TP08-0.1m, TP09-0.5m, TP10-0.1m, TP12-0.1m,	TP07 -0.6m, TP09-0.1m, TP09-0.5m DUP, TP11-0.2m, TP02_1.0M DUP	07-Dec-2018	17-Dec-2018	04-Jan-2019	✓	17-Dec-2018	04-Jan-2019	✓
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP066) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068) TP01-0.1m, TP03-0.1m, TP05-0.1m,	TP02-0.1m, TP04-0.1m, TP06-0.1m	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP068) TP07-0.1m, TP08-0.1m, TP10-0.1m, TP12-0.1m	TP07 -0.6m, TP09-0.1m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
EP068B: Organophosphorus Pesticides (OP)								
Soil Glass Jar - Unpreserved (EP068) TP01-0.1m, TP03-0.1m, TP05-0.1m,	TP02-0.1m, TP04-0.1m, TP06-0.1m	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP068) TP07-0.1m, TP08-0.1m, TP10-0.1m, TP12-0.1m	TP07 -0.6m, TP09-0.1m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓



Matrix: SOIL

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP080) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	15-Dec-2018	20-Dec-2018	✓	16-Dec-2018	20-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP080) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	15-Dec-2018	21-Dec-2018	✓	16-Dec-2018	21-Dec-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP080) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	15-Dec-2018	20-Dec-2018	✓	16-Dec-2018	20-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP080) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	15-Dec-2018	21-Dec-2018	✓	16-Dec-2018	21-Dec-2018	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) TP01-0.1m, TP02-1.0m	TP01 - 0.5m,	06-Dec-2018	15-Dec-2018	20-Dec-2018	✓	16-Dec-2018	20-Dec-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP09-0.1m, TP09-0.5m DUP, TP02_1.0M DUP	TP09-0.5m, TP11-0.2m,	07-Dec-2018	15-Dec-2018	21-Dec-2018	✓	16-Dec-2018	21-Dec-2018	✓
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
Soil Glass Jar - Unpreserved (EP202) TP01-0.1m, TP03-0.1m, TP05-0.1m,	TP02. 0.1m, TP04-0.1m, TP06-0.1m	06-Dec-2018	17-Dec-2018	20-Dec-2018	✓	17-Dec-2018	26-Jan-2019	✓
Soil Glass Jar - Unpreserved (EP202) TP07-0.1m, TP08-0.1m, TP10-0.1m, TP12-0.1m	TP07 -0.6m, TP09-0.1m, TP11-0.2m,	07-Dec-2018	17-Dec-2018	21-Dec-2018	✓	17-Dec-2018	26-Jan-2019	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaural	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	27	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **SOIL** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines, version 2.1 June 2004. As received samples are tested for pH field and pH fox and assessed for a reaction rating.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	SOIL	In house: LCMS (Electrospray in negative mode). Residues of acid herbicides are extracted from soil samples under the alkaline condition. An aliquot of the alkaline aqueous phase is taken and acidified before a SPE cleanup. After eluting off from the SPE cartridge, residues of acid herbicides are dissolved in HPLC mobile phase prior to instrument analysis.

<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Extraction for Phenoxy Acid Herbicides in Soils.	EP202-PR	SOIL	In-House: Alkaline extract followed by SPE clean up of acidified portion of the sample extract.
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1837559**

Client	: SMEC AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: SAM VAUGHAN	Contact	: Larissa Burns
Address	: PO BOX 1052 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sam.vaughan@smec.com	E-mail	: Larissa.burns@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9644
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 30012537	Page	: 1 of 4
Order number	: 30012537	Quote number	: EB2017SMEAUS0004 (EN/025/18 - Primary work)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: MM		

Dates

Date Samples Received	: 13-Dec-2018 11:00	Issue Date	: 14-Dec-2018
Client Requested Due Date	: 18-Dec-2018	Scheduled Reporting Date	: 18-Dec-2018

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 13.9°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 40 / 25

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- This is an updated SRN which indicates a change in report recipients.
- **PH fox and Chromium suit analysis will be conducted by ALS Brisbane.**
- **Sample TP02_0.5 received extra and place on hold, please confirm.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- **EA200: As only one sample container was submitted for multiple tests, sample 1 and 36 sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly and NATA accreditation does not apply to analysis on these samples.**
- Sample TP09_0.5m have been forwarded to ENVIROLAB.
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Asbestos Identification in Soils : EA200		
TP01-0.1m	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP12-0.1m	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - EP066 (solids) Polychlorinated Biphenyls by GCMS	SOIL - EP202(solids) Phenoxyacetic acids	SOIL - S-13 OC/OP/PCB	SOIL - S-26 8 metals/TRH/BTEX/PAH
ES1837559-001	06-Dec-2018 00:00	TP01-0.1m		✓	✓		✓	✓	✓
ES1837559-002	06-Dec-2018 00:00	TP01 - 0.5m		✓		✓			✓
ES1837559-003	06-Dec-2018 00:00	TP01 -1.0m	✓						
ES1837559-004	06-Dec-2018 00:00	TP02. 0.1m		✓			✓		
ES1837559-005	06-Dec-2018 00:00	TP02-1.0m		✓		✓			✓
ES1837559-006	06-Dec-2018 00:00	TP03-0.1m		✓			✓		
ES1837559-007	06-Dec-2018 00:00	TP03-0.5m	✓						
ES1837559-008	06-Dec-2018 00:00	TP04-0.1m		✓			✓		
ES1837559-009	06-Dec-2018 00:00	TP04 - 0.3m	✓						
ES1837559-010	06-Dec-2018 00:00	TP05-0.1m		✓			✓		
ES1837559-011	06-Dec-2018 00:00	TP05- 0.2m	✓						
ES1837559-012	06-Dec-2018 00:00	TP06-0.1m		✓			✓		
ES1837559-013	06-Dec-2018 00:00	TP06 -0.3m	✓						
ES1837559-014	07-Dec-2018 00:00	TP07-0.1m		✓			✓		
ES1837559-015	07-Dec-2018 00:00	TP07 -0.3m	✓						
ES1837559-016	07-Dec-2018 00:00	TP07 -0.6m		✓			✓		
ES1837559-017	07-Dec-2018 00:00	TP08-0.1m		✓			✓		
ES1837559-018	07-Dec-2018 00:00	TP08-0.3m	✓						
ES1837559-019	07-Dec-2018 00:00	TP08-0.6m	✓						
ES1837559-023	07-Dec-2018 00:00	TP09-0.1m		✓		✓	✓		✓
ES1837559-024	07-Dec-2018 00:00	TP09-0.1m			✓				
ES1837559-025	07-Dec-2018 00:00	TP09-0.5m		✓		✓			✓
ES1837559-026	07-Dec-2018 00:00	TP09-0.5m			✓				
ES1837559-027	07-Dec-2018 00:00	TP09-1.1m	✓						
ES1837559-028	07-Dec-2018 00:00	TP09-1.1m			✓				
ES1837559-029	07-Dec-2018 00:00	TP09-0.5m DUP		✓		✓			✓
ES1837559-030	07-Dec-2018 00:00	TP10-0.1m		✓			✓		
ES1837559-031	07-Dec-2018 00:00	TP10-0.1m	✓						
ES1837559-032	07-Dec-2018 00:00	TP10-0.4m	✓						
ES1837559-033	07-Dec-2018 00:00	TP10-0.4m	✓						
ES1837559-034	07-Dec-2018 00:00	TP11-0.2m		✓		✓	✓		✓



			(On Hold) SOIL	No analysis requested	SOIL - EA055-103	Moisture Content	SOIL - EA200	Asbestos Identification in Soils -	SOIL - EP066 (solids)	Polychlorinated Biphenyls by GCMS	SOIL - EP202(solids)	Phenoxyacetic acids	SOIL - S-13	OC/OP/PCB	SOIL - S-26	8 metals/TRH/BTEX/NPAH
ES1837559-035	07-Dec-2018 00:00	TP11-0.2m					✓									
ES1837559-036	07-Dec-2018 00:00	TP12-0.1m			✓		✓				✓					
ES1837559-037	07-Dec-2018 00:00	TP12-0.5	✓													
ES1837559-038	07-Dec-2018 00:00	TP02_0.5	✓													
ES1837559-039	07-Dec-2018 00:00	TP02_1.0M DUP			✓				✓							✓
ES1837559-040	07-Dec-2018 00:00	TP04_0.3m DUP	✓													

Matrix: **SOIL**

Laboratory sample ID Client sampling date / time Client sample ID

			SOIL - EA033	Chromium Suite for Acid Sulphate Soils	SOIL - EA037	ASS Field Screening Analysis	SOIL - S-02	8 Metals (incl. Digestion)	SOIL - S-12	OC/OP Pesticides
ES1837559-004	06-Dec-2018 00:00	TP02. 0.1m					✓		✓	✓
ES1837559-006	06-Dec-2018 00:00	TP03-0.1m					✓		✓	✓
ES1837559-008	06-Dec-2018 00:00	TP04-0.1m					✓		✓	✓
ES1837559-010	06-Dec-2018 00:00	TP05-0.1m					✓		✓	✓
ES1837559-012	06-Dec-2018 00:00	TP06-0.1m					✓		✓	✓
ES1837559-014	07-Dec-2018 00:00	TP07-0.1m					✓		✓	✓
ES1837559-016	07-Dec-2018 00:00	TP07 -0.6m					✓		✓	✓
ES1837559-017	07-Dec-2018 00:00	TP08-0.1m					✓		✓	✓
ES1837559-020	07-Dec-2018 00:00	TP08-0.6m	✓		✓					
ES1837559-021	07-Dec-2018 00:00	TP08-2.0m	✓		✓					
ES1837559-022	07-Dec-2018 00:00	TP08-2.4m	✓		✓					
ES1837559-023	07-Dec-2018 00:00	TP09-0.1m					✓		✓	✓
ES1837559-030	07-Dec-2018 00:00	TP10-0.1m					✓		✓	✓
ES1837559-034	07-Dec-2018 00:00	TP11-0.2m					✓		✓	✓
ES1837559-036	07-Dec-2018 00:00	TP12-0.1m					✓		✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



Requested Deliverables

ACCOUNTS INVOICES

- A4 - AU Tax Invoice (INV) Email accounts.payable@smec.com

ADAM XANTHIS

- *AU Certificate of Analysis - NATA (COA) Email Adam.xanthis@smec.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email Adam.xanthis@smec.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email Adam.xanthis@smec.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email Adam.xanthis@smec.com
- Chain of Custody (CoC) (COC) Email Adam.xanthis@smec.com
- EDI Format - ESDAT (ESDAT) Email Adam.xanthis@smec.com
- EDI Format - XTab (XTAB) Email Adam.xanthis@smec.com

MARK MAHARAJ

- *AU Certificate of Analysis - NATA (COA) Email mark.maharaj@smec.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email mark.maharaj@smec.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email mark.maharaj@smec.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email mark.maharaj@smec.com
- A4 - AU Tax Invoice (INV) Email mark.maharaj@smec.com
- Chain of Custody (CoC) (COC) Email mark.maharaj@smec.com
- EDI Format - ESDAT (ESDAT) Email mark.maharaj@smec.com
- EDI Format - XTab (XTAB) Email mark.maharaj@smec.com

SAM VAUGHAN

- *AU Certificate of Analysis - NATA (COA) Email sam.vaughan@smec.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email sam.vaughan@smec.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email sam.vaughan@smec.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email sam.vaughan@smec.com
- Chain of Custody (CoC) (COC) Email sam.vaughan@smec.com
- EDI Format - ESDAT (ESDAT) Email sam.vaughan@smec.com
- EDI Format - XTab (XTAB) Email sam.vaughan@smec.com



CHAIN OF CUSTODY

OFFICE: []
 PROJECT: []
 DATE: []

RECEIVED BY: []
 RECEIVED ON: []

FOR LABORATORY USE ONLY (DO NOT WRITE)

LABORATORY: []
 ANALYST: []
 DATE: []

APPROVED BY: []
 DATE: []

LINE NO.	SAMPLE DETAILS			CONTAINER INFORMATION		ANALYSIS	LABORATORY USE ONLY	ANALYSIS
	SAMPLE ID	DATE / TIME	DEPTH	VOLUME / PRESERVATIVE	DATE & TIME			
1	TP01-0.10	01/12/2018	0			X		
2	TP01-0.20	01/12/2018	0			X		
3	TP01-0.30	01/12/2018	0			X		
4	TP01-0.40	01/12/2018	0			X		
5	TP01-0.50	01/12/2018	0			X		
6	TP01-0.60	01/12/2018	0			X		
7	TP01-0.70	01/12/2018	0			X		
8	TP01-0.80	01/12/2018	0			X		
9	TP01-0.90	01/12/2018	0			X		
10	TP01-1.00	01/12/2018	0			X		
11	TP01-1.10	01/12/2018	0			X		
12	TP01-1.20	01/12/2018	0			X		
13	TP01-1.30	01/12/2018	0			X		
14	TP01-1.40	01/12/2018	0			X		
15	TP01-1.50	01/12/2018	0			X		
16	TP01-1.60	01/12/2018	0			X		
17	TP01-1.70	01/12/2018	0			X		
18	TP01-1.80	01/12/2018	0			X		
19	TP01-1.90	01/12/2018	0			X		
20	TP01-2.00	01/12/2018	0			X		
21	TP01-2.10	01/12/2018	0			X		
22	TP01-2.20	01/12/2018	0			X		
23	TP01-2.30	01/12/2018	0			X		
24	TP01-2.40	01/12/2018	0			X		
25	TP01-2.50	01/12/2018	0			X		
26	TP01-2.60	01/12/2018	0			X		
27	TP01-2.70	01/12/2018	0			X		
28	TP01-2.80	01/12/2018	0			X		
29	TP01-2.90	01/12/2018	0			X		
30	TP01-3.00	01/12/2018	0			X		
31	TP01-3.10	01/12/2018	0			X		
32	TP01-3.20	01/12/2018	0			X		
33	TP01-3.30	01/12/2018	0			X		
34	TP01-3.40	01/12/2018	0			X		
35	TP01-3.50	01/12/2018	0			X		
36	TP01-3.60	01/12/2018	0			X		
37	TP01-3.70	01/12/2018	0			X		
38	TP01-3.80	01/12/2018	0			X		
39	TP01-3.90	01/12/2018	0			X		
40	TP01-4.00	01/12/2018	0			X		

1-3
4-5
6-7
8-9
10-11
12-13
14-15
16-17
18-19
20-21
22-23
24-25
26-27
28-29
30-31
32-33
34-35
36-37
38-39
40

TP02-10m Dup

TP01-0.5m Dup

TP01-0.5 Dup

TP02-0.5 column

TP01-0.5m Dup

TP01-0.5m Dup

TP01-0.5m Dup

TP01-0.5m Dup

Environmental Division
 Sydney
 Work Order Reference
ES1837559



Appendix F Test pit logs

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP01
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 3 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 518016.0, N: 6670368.0 () **SURFACE ELEVATION :**

EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm bucket

DATE EXCAVATED : 06/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 4.00 m LONG 0.60 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETROMETER (kPa)	STRUCTURE & Other Observations
			ES	0.0 - 0.10m		OL	Sandy SILT: low plasticity, brown, trace clay, with trace roots/rootlets	D	Fr		TOPSOIL
				0.10 - 0.20m		ML	Clayey SILT: low plasticity, mottled red brown, trace fine grained sand, with trace roots/rootlets				RESIDUAL SOIL
			ES, DS	0.20 - 0.50m			Silty CLAY: medium - high plasticity, mottled red brown		H		>> 0.30: PP In-situ >600 kPa
			DS	0.50 - 0.60m							* 0.50: PP In-situ =400 - 600 kPa
				0.60 - 1.00m							0.60: PID = 0.0ppm
			B	1.00 - 1.50m		CH		W < PL	VSt - H		* 0.80: PP In-situ =360 - 600 kPa
				1.50 - 2.20m							1.00: PID = 0.1ppm
				2.20 - 2.50m			Silty CLAY: medium plasticity, mottled pale grey, red-orange		H		>> 2.30: PP In-situ >600 kPa
			DS	2.50 - 2.60m							
			DS	2.60 - 2.70m							
				2.70 - 3.00m		GC	Clayey GRAVEL: fine to coarse, angular, blue-grey, mottled orange	D	VD		EXTREMELY WEATHERED MATERIAL / HIGHLY WEATHERED ROCK
				3.00 - 3.50m			Hole Terminated at 3.00 m Target Depth				

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION WATER 10 Oct., 73 Water Level on Date shown water inflow water outflow	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP02
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 1.6 m

CLIENT : RDM
PROJECT : Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517892.0, N: 6670388.0 () **SURFACE ELEVATION :**

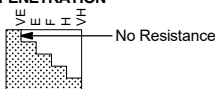
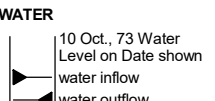
EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

DATE EXCAVATED : 06/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 4.00 m LONG 0.60 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETRO- METER 100 200 300 400	STRUCTURE & Other Observations
				0.0		OL	Clayey SILT: low plasticity, brown, trace fine sand, roots/rootlets	D	F		TOPSOIL
			ES	0.10m			Silty CLAY: medium plasticity, orange brown mottled red, trace rootlets		H		RESIDUAL SOIL
				0.50m		CH		W <PL			0.20: PP In-situ =600 kPa 0.20: HP = 600 Kpa 0.30: PP In-situ =350 - 450 kPa 0.30: HP = 350-450 Kpa
			ES	0.80m					VSt - H		0.50: PID = 0.0 ppm
			DS	1.00m			Clayey SAND: fine grained, white mottled orange, with ironstone gravel, with silt				EXTREMELY WEATHERED MATERIAL
			B ES	1.30m		SC		M	MD		0.90: PP In-situ =300 - 600 kPa 0.90: HP = 300-600 Kpa 0.91: PID = 0.0ppm 1.10: 300mm toothed bucket below 1.3m
			B	1.50m			ARGILLITE: fine grained, pale grey, distinct foliations, low to medium strength, orange staining		D		HIGHLY WEATHERED ROCK
				1.60m			Hole Terminated at 1.60 m Material Refusal				1.30: Closely Fractured 50-100mm, planar jointing/bedding
				2.0							
				2.5							
				3.0							
				3.5							

PHOTOGRAPHS
NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  WATER 10 Oct., 73 Water Level on Date shown 	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP03
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 0.9 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517721.0, N: 6670396.0 () **SURFACE ELEVATION :**

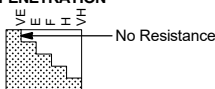
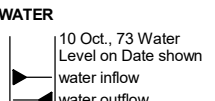
EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

DATE EXCAVATED : 06/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 3.50 m LONG 0.45 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETROMETER (kPa)	STRUCTURE & Other Observations
E F H			ES-1	0.0	GM	0.07m	Silty GRAVEL: fine to coarse, angular, roots/rootlets	D	Fr		TOPSOIL
			DS-1 ES-1	0.5	GM	0.60m	Sandy Silty GRAVEL: fine to coarse, angular, pale brown, roots/rootlets	D			EXTREMELY WEATHERED ROCK
			DS-1 ES-1	0.5		0.60m	ARGILLITE: fine grained, grey, highly to moderately weathered, low to medium strength, orange staining	D			WEATHERED ROCK
				0.90			Hole Terminated at 0.90 m Material Refusal				0.50: 300mm toothed bucket below 0.5m 0.75: numerous subhorizontal and subvertical defects
				1.0							
				1.5							
				2.0							
				2.5							
				3.0							
				3.5							

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  WATER  10 Oct., 73 Water Level on Date shown	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP04
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 2.1 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517774.0, N: 6670305.0 () **SURFACE ELEVATION :**

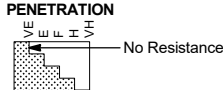
EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

DATE EXCAVATED : 06/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 3.50 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL			
VE PENETRATION	SUPPORT	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY
E F H		ES	0.0	X	Clayey SILT: low plasticity, brown, roots/rootlets	D	Fr
			0.10m		Silty CLAY: medium plasticity, red brown		H
		B	0.30m			W < PL	>> X
			0.60m	CH			X
			0.90m		Silty CLAY: medium plasticity, pale grey mottled red, with fine to medium grained, angular gravel	VSt - H	
			1.50m	CH		W = PL	
			2.10m		ARGILLITE: fine grained, pale grey, distinct fabric, foliations and planar bedding, low to medium strength, orange staining		
			2.10m		Hole Terminated at 2.10 m Material Refusal		
			2.5				
			3.0				
			3.5				

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  WATER 10 Oct., 73 Water Level on Date shown water inflow water outflow	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



Log_SMEC TEST PIT WITH PP_30012537 PRELIMINARY INVESTIGATION.GPJ | Lib: SMEC_1_06.5 | Job: SMEC_1_06.0

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP05
 PROJECT NUMBER : 30012537
 SHEET : 1 OF 1
 FINAL DEPTH : 3 m

CLIENT : RDM PROJECT : Preliminary Geotechnical and Environmental Investigation
 LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517833.0, N: 6670238.0 () SURFACE ELEVATION :

EQUIPMENT TYPE : 5t CAT305E Excavator METHOD : EX - 450mm buckets

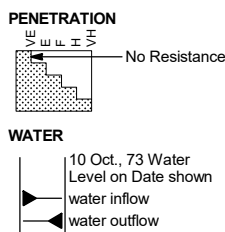
DATE EXCAVATED : 06/12/2018 LOGGED BY : MM CHECKED BY :

EXCAVATION DIMENSIONS : 4.00 m LONG 0.60 m WIDE

EXCAVATION				MATERIAL			
VE PENETRATION	SUPPORT	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	STRUCTURE & Other Observations
E F H		ES ES	0.0 0.10m 0.15m	OL	OL	Clayey SILT: low plasticity, dark brown, trace fine sand, trace roots/rootlets 0.15m Clayey SILT: low plasticity, red-brown, rootlets	TOPSOIL 0.10: PID = 0.0 ppm RESIDUAL SOIL
			0.50m	ML	ML	Silty CLAY: medium to high plasticity, red-brown, some carbonaceous charcoal inclusions (black), trace fine sand	0.30: PP In-situ =500 kPa 0.30: PID = 0.0 ppm 0.50: PP In-situ =350 kPa
		DS	0.70m	CH	CH	Silty CLAY: high plasticity, mottled red-grey, trace ironstone gravel	0.70: PID = 0.0 ppm 0.80: PP In-situ =350 kPa
			1.10m	CH	CH	Silty CLAY: high plasticity, mottled red-grey, with fine to coarse grained gravel, remant rock fabric	1.10: PP In-situ =350 - 400 kPa
			2.20m	CH	CH	Silty CLAY: high plasticity, mottled red-grey, with fine to coarse grained gravel, remant rock fabric	EXTREMELY WEATHERED MATERIAL 2.40: minor water seepage below 2.4m
		DS	2.40m	CH	CH		
			3.00m	CH	CH	Hole Terminated at 3.00 m Target Depth	

PHOTOGRAPHS YES NO
 NOTES

- METHOD**
- N Natural Exposure
 - X Existing Excavation
 - BH Backhoe Bucket
 - B Bulldozer Blade
 - R Ripper
 - EX Hydraulic Excavator
 - EH Excavator with Hammer
- SUPPORT**
- T Timbering



- SAMPLES & FIELD TESTS**
- ES Environmental Sample
 - DS Disturbed Sample
 - B Bulk Disturbed Sample
 - MC Moisture Content
 - HP Hand Penetrometer (kPa) Vane
 - VS Shear; P-Peak, R-Remoulded (uncorrected kPa)
 - PBT Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE

- D Dry
- M Moist
- W Wet

CONSISTENCY/ RELATIVE DENSITY

- VS Very Soft
- S Soft
- F Firm
- St Stiff
- VSt Very Stiff
- H Hard
- VL Very Loose
- L Loose
- MD Medium Dense
- D Dense
- VD Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP06
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 3 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517938.0, N: 6670256.0 () **SURFACE ELEVATION :**

EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

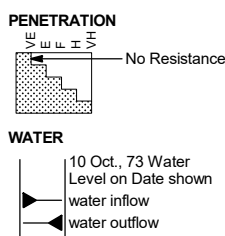
DATE EXCAVATED : 06/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 4.00 m LONG 0.60 m WIDE

EXCAVATION				MATERIAL			
VE PENETRATION	SUPPORT	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION	STRUCTURE & Other Observations
E F H			0.0	/ / / / /	OL	Clayey SILT: low plasticity, dark brown, roots/rootlets	TOPSOIL
		0.10m ES	0.10	- - - - -	ML	Clayey SILT: medium plasticity, brown, rootlets	RESIDUAL SOIL 0.10: PID = 0.0 ppm
		0.30m ES	0.30		CH	Silty CLAY: medium to high plasticity, brown-orange	0.30: PP In-situ =200 kPa 0.30: PID = 0.0 ppm
		0.50m DS	0.50		CH	Silty CLAY: high plasticity, grey mottled orange, trace carbonaceous inclusions As above, becomes mottled red-grey	0.50: PP In-situ =150 - 200 kPa 0.50: PID = 0.0 ppm 0.60: 300mm toothed bucket used below 0.5m depth
		1.00m DS	1.00		CH		0.80: PP In-situ =200 kPa 1.00: PP In-situ =200 - 300 kPa
		2.00m DS	2.00		CH	Sandy CLAY: high plasticity, mottled pale grey-orange, with some clayey sand lenses	2.00: PP In-situ =150 - 200 kPa 2.00: Moderate water seepage into pit between 2.0m and 2.2m
		2.90m DS	2.90		CH		1.50: PP In-situ =200 kPa
			3.00		CH	Hole Terminated at 3.00 m Target Depth	

PHOTOGRAPHS NOTES YES NO

METHOD
 N Natural Exposure
 X Existing Excavation
 BH Backhoe Bucket
 B Bulldozer Blade
 R Ripper
 EX Hydraulic Excavator
 EH Excavator with Hammer
SUPPORT
 T Timbering



SAMPLES & FIELD TESTS

ES Environmental Sample
 DS Disturbed Sample
 B Bulk Disturbed Sample
 MC Moisture Content
 HP Hand Penetrometer (kPa) Vane
 VS Shear; P-Peak, R-Remoulded (uncorrected kPa)
 PBT Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
 Based on Unified Classification System

MOISTURE

D Dry
 M Moist
 W Wet

CONSISTENCY/ RELATIVE DENSITY

VS Very Soft
 S Soft
 F Firm
 St Stiff
 VSt Very Stiff
 H Hard
 VL Very Loose
 L Loose
 MD Medium Dense
 D Dense
 VD Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.



Log_SMEC TEST PIT WITH PP_30012537 PRELIMINARY INVESTIGATION.GPJ | Lib: SMEC_1_06.5 | Job Pjt: SMEC_1_06.0

EXCAVATION - GEOLOGICAL LOG

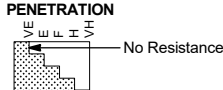
PIT NO : TP07
 PROJECT NUMBER : 30012537
 SHEET : 1 OF 1
 FINAL DEPTH : 1.6 m

CLIENT : RDM PROJECT : Preliminary Geotechnical and Environmental Investigation
 LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517954.0, N: 6670159.0 () SURFACE ELEVATION :
 EQUIPMENT TYPE : 5t CAT305E Excavator METHOD : EX - 450mm/300mm buckets
 DATE EXCAVATED : 07/12/2018 LOGGED BY : MM CHECKED BY :
 EXCAVATION DIMENSIONS : 3.50 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETROMETER	STRUCTURE & Other Observations
E F H				0.0	/ / / /	OL	Clayey SILT : low plasticity, dark brown, trace fine sand, roots/rootlets	D	Fr		TOPSOIL
			ES	0.10m	/ / / /						0.10: PID = 0.0ppm
			ES	0.30m	/ / / /	ML	Clayey SILT : low to medium plasticity, orange-brown, trace rootlets	W < PL	Fr		RESIDUAL SOIL
			ES	0.50m	/ / / /						0.30: PID = 0.0 ppm
			DS	0.60m	/ / / /	CH	Silty CLAY : medium plasticity, mottled orange-grey	W = PL	VSt		0.40: PP In-situ = 400 kPa
			ES	0.85m	/ / / /						0.50: PP In-situ = 350 kPa
			DS	1.05m	/ / / /	CH	CLAY : high plasticity, pale grey with orange, trace rootlets	W > PL	St		0.60: PP In-situ = 300 kPa
				1.10m	/ / / /	GP	Clayey GRAVEL : medium to coarse, angular, blue grey ARGILLITE : blue grey, highly fractured, fracture spacing typically less than 50mm, moderately weathered, high strength, stained red		MD		0.80: PP In-situ = 180 kPa
				1.60m	/ / / /			W			EXTREMELY WEATHERED MATERIAL WEATHERED ROCK 1.10: Switched to 300mm toothed bucket below 1.1m
							Hole Terminated at 1.60 m Material Refusal				

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  No Resistance WATER 10 Oct., 73 Water Level on Date shown water inflow water outflow	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP08
 PROJECT NUMBER : 30012537
 SHEET : 1 OF 1
 FINAL DEPTH : 2.5 m

CLIENT : RDM PROJECT : Preliminary Geotechnical and Environmental Investigation
 LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517946.0, N: 6670016.0 () SURFACE ELEVATION :

EQUIPMENT TYPE : 5t CAT305E Excavator METHOD : EX - 450mm bucket

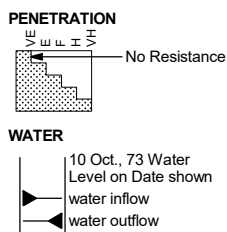
DATE EXCAVATED : 07/12/2018 LOGGED BY : MM CHECKED BY :

EXCAVATION DIMENSIONS : 3.50 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETRO- METER 100 200 300 400	STRUCTURE & Other Observations
E F H				0.0	OH		Silty CLAY: high plasticity, dark brown, roots/rootlets				TOPSOIL 0.05: Reeds on surface. Low lying poorly drained land. 0.10: PID = 0.0 ppm
			0.10m ES	0.20m			Silty CLAY: high plasticity, orange-brown, trace rootlets and occasional ironstone gravels		F to St	X	ALLUVIUM 0.30: PP In-situ =90 kPa 0.30: PID = 0.0 ppm 0.40: PP In-situ =110 kPa 0.40: PID = 0.0 ppm
			0.30m DS ES	0.5			As above, orange and grey streaks			X	0.60: PP In-situ =120 kPa 0.60: PID = 0.0 ppm
			0.60m B DS ES	1.0		CH			St	*	0.80: PP In-situ =100 - 120 kPa
		Not Observed		1.5				W > PL		X	1.30: PP In-situ =180 kPa
			2.00m DS	2.0					F to St	X X	2.00: PP In-situ =100 - 180 kPa
			2.40m DS	2.30m		CH	Gravelly CLAY: high plasticity, blue-grey mottled orange, medium to coarse grained, angular gravel, remnant rock fabric				EXTREMELY WEATHERED MATERIAL
				2.50m			Hole Terminated at 2.50 m Target Depth				
				3.0							
				3.5							

PHOTOGRAPHS NOTES YES NO

METHOD
N Natural Exposure
X Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper
EX Hydraulic Excavator
EH Excavator with Hammer
SUPPORT
T Timbering



SAMPLES & FIELD TESTS
ES Environmental Sample
DS Disturbed Sample
B Bulk Disturbed Sample
MC Moisture Content
HP Hand Penetrometer (kPa) Vane
VS Shear; P-Peak, R-Remoulded (uncorrected kPa)
PBT Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System
MOISTURE
D Dry
M Moist
W Wet

CONSISTENCY/ RELATIVE DENSITY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP09
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 1.5 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517946.0, N: 6670009.0 () **SURFACE ELEVATION :**

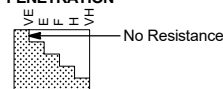
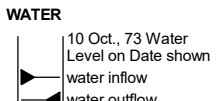
EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm bucket

DATE EXCAVATED : 07/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 2.00 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL			
VE PENETRATION F H	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY
Net Observed				0.0	[Cross-hatch pattern]	FILL: Silty CLAY: medium to high plasticity, mottled red-grey, trace siltstone gravel and cobble, angular, fine to coarse grained	
			ES	0.10m			
			ES	0.50m			
			ES	1.10m			
				1.0	[Vertical lines]	Silty CLAY: high plasticity, dark brown-black, trace rootlets	W < PL
				1.10m			H
				1.30m	[Vertical lines]	Silty CLAY: high plasticity, mottled orange-brown-grey	W > PL
				1.50m		Hole Terminated at 1.50 m Target Depth	
				1.5			
				2.0			
				2.5			
				3.0			
				3.5			

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  WATER 	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



Log_SMEC TEST PIT WITH PP_30012537 PRELIMINARY INVESTIGATION.GPJ | Lib: SMEC_1.06.5 | Job Pj: SMEC_1.06.0

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP10
 PROJECT NUMBER : 30012537
 SHEET : 1 OF 1
 FINAL DEPTH : 1.6 m

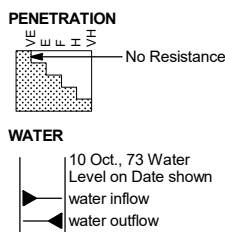
CLIENT : RDM PROJECT : Preliminary Geotechnical and Environmental Investigation
 LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517734.0, N: 6670091.0 () SURFACE ELEVATION :
 EQUIPMENT TYPE : 5t CAT305E Excavator METHOD : EX - 450mm/300mm buckets
 DATE EXCAVATED : 07/12/2018 LOGGED BY : MM CHECKED BY :
 EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL							
VE PENETRATION F H	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETRO- METER 100 200 300 400	STRUCTURE & Other Observations
				0.0		OL	0.05m Clayey SILT : low plasticity, brown, roots/rootlets	D	Fr		TOPSOIL
			ES	0.10m			Gravelly CLAY : medium plasticity, mottled red-grey-orange	D	Fr		EXTREMELY WEATHERED MATERIAL 0.10: PID = 0.0 ppm
				0.40m		CH					
			ES	0.40m			Clayey GRAVEL : coarse, angular, pale grey with orange staining				EXTREMELY WEATHERED MATERIAL to HIGHLY WEATHERED MATERIAL 0.40: PID = 0.0 ppm
				0.5		GP			D to VD		0.60: Switch to 300mm toothed bucket below 0.6m
				0.80m			ARGILLITE : pale grey, highly to moderately weathered, low to medium strength, highly fractured intersecting subvertical joint sets; planar, smooth, orange staining				WEATHERED ROCK
				1.0			recovered angular cobbles up to 150mm nominal size		D		0.90: recovered as angular cobble typically 65mm to 150mm
				1.5							
				1.60m			Hole Terminated at 1.60 m Material Refusal				
				2.0							
				2.5							
				3.0							
				3.5							

PHOTOGRAPHS YES NO

- METHOD**
- N Natural Exposure
 - X Existing Excavation
 - BH Backhoe Bucket
 - B Bulldozer Blade
 - R Ripper
 - EX Hydraulic Excavator
 - EH Excavator with Hammer
- SUPPORT**
- T Timbering



- SAMPLES & FIELD TESTS**
- ES Environmental Sample
 - DS Disturbed Sample
 - B Bulk Disturbed Sample
 - MC Moisture Content
 - HP Hand Penetrometer (kPa) Vane
 - VS Shear; P-Peak, R-Remoulded (uncorrected kPa)
 - PBT Plate Bearing Test

- CLASSIFICATION SYMBOLS & SOIL DESCRIPTION**
Based on Unified Classification System
- MOISTURE**
- D Dry
 - M Moist
 - W Wet

- CONSISTENCY/ RELATIVE DENSITY**
- VS Very Soft
 - S Soft
 - F Firm
 - St Stiff
 - VSt Very Stiff
 - H Hard
 - VL Very Loose
 - L Loose
 - MD Medium Dense
 - D Dense
 - VD Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP11
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 0.75 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517748.0, N: 6670118.0 () **SURFACE ELEVATION :**

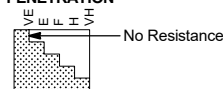
EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

DATE EXCAVATED : 07/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL					
VE PENETRATION	SUPPORT	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETRO- METER 100 200 300 400	STRUCTURE & Other Observations
Not Observed	Not Observed	ES 0.20m	0.0	[Cross-hatch pattern]	0.07m FILL: Clayey SILT: low plasticity, brown, roots/rootlets	W < PL	Fr		FILL / TOPSOIL
			0.20		FILL: MIXTURE OF CLAY AND SILT: medium to high plasticity, mottled red, brown, orange, trace rootlets	W < PL	Fr		FILL 0.10: Argillite boulder buried in topsoil; 300mm, angular, slightly weathered, high strength 0.20: PID = 0.0 ppm
			0.5	GP	Clayey GRAVEL: medium to coarse, angular, pale grey with red and orange staining, with angular cobble	W	MD to D		HIGHLY WEATHERED MATERIAL
			0.70		ARGILLITE: pale grey, moderately weathered, medium to high strength	D			WEATHERED ROCK
			0.75		Hole Terminated at 0.75 m Material Refusal				0.75: Refusal on rock with 300mm toothed bucket
			1.0						
			1.5						
			2.0						
			2.5						
			3.0						
			3.5						

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION  No Resistance WATER 10 Oct., 73 Water Level on Date shown water inflow water outflow	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



EXCAVATION - GEOLOGICAL LOG

PIT NO : TP12
PROJECT NUMBER : 30012537
SHEET : 1 OF 1
FINAL DEPTH : 2.2 m

CLIENT : RDM **PROJECT :** Preliminary Geotechnical and Environmental Investigation
LOCATION : Lot 202 DP874273; Woolgoolga; NSW

POSITION : E: 517810.0, N: 6670051.0 () **SURFACE ELEVATION :**

EQUIPMENT TYPE : 5t CAT305E Excavator **METHOD :** EX - 450mm/300mm buckets

DATE EXCAVATED : 07/12/2018 **LOGGED BY :** MM **CHECKED BY :**

EXCAVATION DIMENSIONS : 3.00 m LONG 0.50 m WIDE

EXCAVATION				MATERIAL							
VE E F H	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components ROCK NAME : grain size, colour, texture and fabric, features, inclusion and minor components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	POCKET PENETROMETER	STRUCTURE & Other Observations
			0.10m ES	0.0		OL	Clayey SILT: low plasticity, brown, roots/rootlets	W < PL	Fr	100	TOPSOIL
				0.10			Silty CLAY: high plasticity, mottled red-grey, trace rootlets and trace gravel			200	RESIDUAL SOIL 0.10: PID = 0.0 ppm
				0.40		CH			H	300	* * * 0.20: PP In-situ = 400 - 600 kPa
			0.50m ES	0.5		CH	Silty CLAY: high plasticity, mottled red-brown, some siltstone gravel			400	EXTREMELY WEATHERED MATERIAL 0.45: remnant rock fabric 0.50: PID = 0.0 ppm
				0.60		GW	Clayey GRAVEL: fine to coarse, angular, pale grey with red staining		MD		
				0.80			ARGILLITE: pale grey, highly weathered, low to medium strength, highly fractured, stained orange and red				0.75: switched to 300mm toothed bucket at 0.8m HIGHLY WEATHERED MATERIAL
		Not Observed	1.00m B	1.0			recovered as angular gravel and cobble up to 150mm, some gravelly clay seams		D		
				1.5							
				2.0							
				2.20			Hole Terminated at 2.20 m Material Refusal				
				2.5							
				3.0							
				3.5							

PHOTOGRAPHS NOTES YES NO

METHOD N Natural Exposure X Existing Excavation BH Backhoe Bucket B Bulldozer Blade R Ripper EX Hydraulic Excavator EH Excavator with Hammer SUPPORT T Timbering	PENETRATION WATER 10 Oct., 73 Water Level on Date shown 	SAMPLES & FIELD TESTS ES Environmental Sample DS Disturbed Sample B Bulk Disturbed Sample MC Moisture Content HP Hand Penetrometer (kPa) Vane VS Shear; P-Peak, R-Remoulded (uncorrected kPa) PBT Plate Bearing Test	CLASSIFICATION SYMBOLS & SOIL DESCRIPTION Based on Unified Classification System MOISTURE D Dry M Moist W Wet	CONSISTENCY/ RELATIVE DENSITY VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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See Explanatory Notes for details of abbreviations & basis of descriptions.



Log_SMEC TEST PIT WITH PP_30012537 PRELIMINARY INVESTIGATION.GPJ | Lib: SMEC_1_06.5 | Job: SMC_1_06.0

local people global experience

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