

PLANNING PROPOSAL COFFS HARBOUR CITY COUNCIL

Planning Proposal PP-2021-5577 Rezone land at Bark Hut Road, Woolgoolga Lot 2 DP 1277984

PLANNING PROPOSAL STATUS (FOR THIS COPY)

Stage	Version / Date (blank until achieved)
Reported to Council – Initiate s3.33	Version 1 – Pre-Exhibition
Version 1 – Pre-Exhibition	October 2021
Referred to DPIE s3.34(1)	Version 1 – Pre-Exhibition
Version 1 – Pre-Exhibition	18 October 2021
Gateway Determination s3.34(2)	Gateway Determination received on
Version 1 – Pre-Exhibition	1 November 2021
Amendments Required:	Yes
Public Exhibition – Schedule 1 Clause 4	Version 2 – Pre-Exhibition
Version 2 - Exhibition	November 2021
Reported to Council – Initiate Revised PP s3-33	
Version 3 – Re-Exhibition	
Reported to Council – Endorsement (or Making of LEP if delegated) s3.36	
Version x - Post Exhibition	
Endorsed by Council for Submission to Minister for Notification (or Making where not delegated) s3.36(2) Version x – Post Exhibition	

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EXECUTIVE SUMMARY & EXHIBITION INFORMATION

What is a Planning Proposal?

A planning proposal is a document that explains the intended effect of a proposed local environmental plan (LEP) and sets out the justification for making that plan. Essentially, the preparation of a planning proposal is the first step in making an amendment to *Coffs Harbour Local Environmental Plan 2013* ('Coffs Harbour LEP 2013').

A planning proposal assists those who are responsible for deciding whether an LEP amendment should proceed and is required to be prepared by a relevant planning authority. Council, as a relevant planning authority, is responsible for ensuring that the information contained within a planning proposal is accurate and accords 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.

What is the Intent of this Planning Proposal?

The intent of Planning Proposal PP-2021-5577 (the planning proposal) is to amend LEP 2013 to allow low density residential development on Lot 2 DP 1277984. The planning proposal will:

- rezone the subject land from Zone RU2 Rural Landscape to part Zone R2 Low Density Residential, part Zone E2 Environmental Conservation and part Zone E3 Environmental Management,
- amend the relevant lot size map accordingly,
- modify clause 7.19 (Development on certain land at Newmans Road, Woolgoolga) within LEP
 2013 and create a new key sites map accordingly, and
- enable the development of the land for low density residential purposes, having regard to the
 environmental attributes affecting the land and 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.

BACKGROUND

Proposal	Rezoning for Low Density Residential and
	Environmental Conservation / Environmental
	Management purposes
Property Details	Lot 2 DP 1277984, Bark Hut Road Woolgoolga
Current Land Use Zone(s)	Zone RU2 Rural Landscape
Proponent	Keiley Hunter
Landowner	Vadejil Pty Ltd
Location	A location map is included in Figure 1 below

This planning proposal has been prepared in accordance with the Environmental Planning and Assessment Act 1979 and A guide to preparing planning proposals (NSW Department of Planning and Environment 2018) and A guide to preparing local environmental plans (NSW Department of Planning and Environment 2018).

This planning proposal explains the intended effects of a proposed amendment to Coffs Harbour Local Environmental Plan 2013 ('LEP 2013') to enable low density residential development on land at Bark Hut Road Woolgoolga (the subject land), having regard to the environmental attributes affecting the land.

A previous planning proposal (PP_2019_COFFS_003_00) applied to the same parcel of land and was publicly exhibited in accordance with a Gateway Determination issued by NSW Department of Planning, Industry and Environment on 11 October 2019. PP_2019_COFFS_003_00 included the subject land entirely within an R2 Low Density Residential zone. As a result of the public exhibition process for PP_2019_COFFS_003_00, Council received three public submissions and six Government agency/stakeholder submissions.

One of the public submissions and a submission from NSW Department of Planning, Industry and Environment (Biodiversity and Conservation Division) raised a number of issues in relation to biodiversity. 'BCD' noted that they do not support the rezoning of the entire site to R2 Low Density Residential and that vegetated parts on the western side of the planning area that adjoin the Council reserve should be zoned for conservation. Following a lengthy delay, the proponents revised the planning proposal to include an amended zone layout that better reflected the environmental attributes of the land.

Upon enquiry, Department of Planning, Industry and Environment staff indicated that it would be unlikely that an extension to the planning proposal timeframe (Alteration to Gateway Determination) beyond October 2021 would be issued due to the length of time since the issue of the Gateway Determination in October 2019. The Department's preferred approach was for Council to seek a simultaneous termination of PP_2019_COFFS_003_00 and a Gateway determination for a new planning proposal incorporating the amended zone layout. This current planning proposal (PP-2021-5577) has been submitted as a result of this advice.

This planning proposal includes the subject land within a combination of Zone R2 Low Density Residential, Zone E2 Environmental Conservation and Zone E3 Environmental Management (see Figure 3 below).

The Site

This planning proposal applies to Lot 2 DP 1277984 as shown in Figure 1, which is accessed from Bark Hut Road Woolgoolga. The subject land has an area of 16.4 hectares and is located approximately 23 km north of Coffs Harbour and 2.4 km northwest of Woolgoolga. It is located immediately west of Solitary Islands Way (the former Pacific Highway), in close proximity to the established residential areas of Woolgoolga and Safety Beach and R5 Large Lot Residential zoned land is located to the west. The land is currently zoned RU2 Rural Landscape under LEP 2013 as shown in Figure 2. Land use zones proposed in this planning proposal are shown in Figure 3.



Figure 1: Locality Map: Part Lot 202 DP 874273

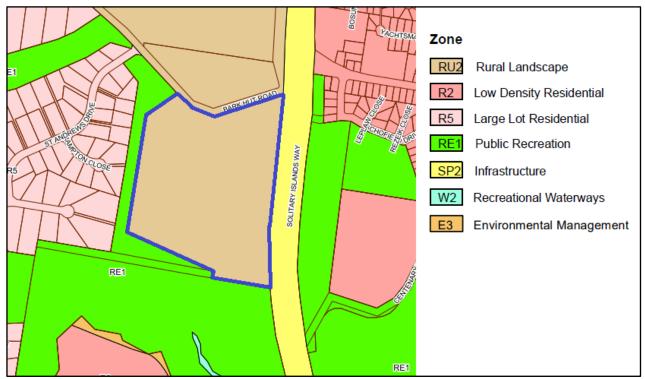


Figure 2: Current Land Use Zones – Coffs Harbour LEP 2013

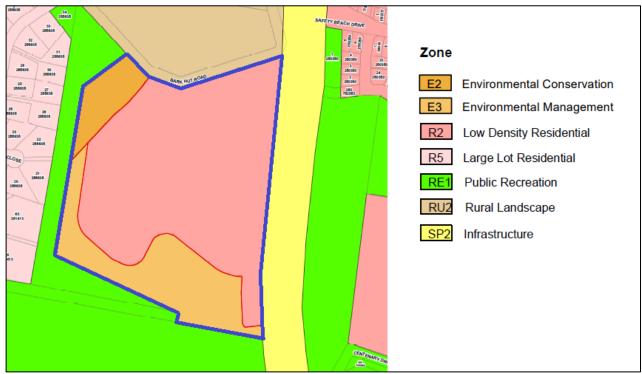


Figure 3: Proposed land use zones

PART 1 – OBJECTIVES OR INTENDED OUTCOMES

The objectives of this Planning Proposal are to:

- Amend LEP 2013 to permit low density residential development on the subject land, having regard
 to the environmental attributes affecting the land and 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 2020.

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 Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to change land currently zoned RU2 Rural Landscape to Zone R2 Low Density Residential, Zone E2 Environmental Conservation and Zone E3 Environmental Management;
- Amend the Coffs Harbour Minimum Lot Size Map (Sheet LSZ_005F) over Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to change land currently subject to minimum lot size provision AB – 40ha to part AB – 40ha and part F – 400 sqm;
- Amend the Coffs Harbour Terrestrial Biodiversity Map (Sheet CL2_005F) over Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to include areas proposed to be zoned E2 Environmental Conservation and E3 Environmental Management as terrestrial biodiversity on the map; and
- Amend the Coffs Harbour Key Sites Map (KYS_005F) to include Lot 2 DP 1277984, Bark Hut Road, Woolgoolga.

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

The zone layout includes the application of an R2 Low Density Residential zone, as well as an E2 Environmental Conservation zone and an E3 Environmental Management zone that reflect the environmental attributes of the land. In this situation, the E3 zone is a suitable 'transitional' zone between RE1 Public Recreation zoned land surrounding the site that is partially cleared and partially inclusive of remnant vegetation. The E2 zone has been applied to a patch of remnant native vegetation that exists in the north-western area of the subject land.

This planning proposal also seeks to modify clause 7.19 of Coffs Harbour LEP 2013. As further outlined in Part 3 of this planning proposal, the land is included within Council's Local Growth Management Strategy 2020, Chapter 4 - Compact City Program as an "Investigation Area – Urban Land" and has been given a high priority (1-4 years). The land is also within the growth area boundary for Woolgoolga, mapped in the North Coast Regional Plan 2036. Due to the high priority given to the land release program 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 Contributions Plan for Woolgoolga North West. Clause 7.19 of Coffs Harbour LEP 2013 is proposed to be modified to include the following:

Development on certain land at Newmans Road and Bark Hut Road, Woolgoolga

- 1. The objectives of this clause are
 - a) to ensure West Woolgoolga and Woolgoolga North West are 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 of West Woolgoolga and Woolgoolga North West, and surrounding land uses.
- 2. This clause applies to Lot 202 DP 874273, Newmans Road and Bark Hut Road, Woolgoolga, identified as "West Woolgoolga" and "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) the appropriate use of land for residential development and infrastructure construction, including the supply of water and the provision of sewerage services, having regard to the following
 - i) environmental and other constraints of West Woolgoolga and Woolgoolga North West and, for example, bush fire, water quality and Aboriginal heritage,
 - ii) surrounding land uses, particularly agricultural activities, by proposing appropriate measures to minimise or mitigate the impacts of the surrounding land uses, for example, dust, noise and spray drift,
 - (e) subdivision layout,
 - (f) pedestrian and cycleway connectivity, including to adjoining public reserves,
 - (g) an integrated traffic management strategy to ensure the safe and efficient movement of
 - (h) the management, protection and, where appropriate, rehabilitation of high conservation value land.
- 5. Subclause (3) does not apply to the following development-
 - (a) a subdivision for the purpose of a realignment of boundaries that does not create additional lots.
 - (b) a subdivision of land if a lot proposed to be created is to be reserved or dedicated for public open space, public roads or a public or environment protection or management purpose,
 - (c) a subdivision of land in a zone in which the erection of structures is prohibited,
 - (d) development that is of a minor nature only, if the consent authority is of the opinion the development is consistent with the objectives of the zone in which the development is to be carried out.

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 land is included within Council's Local Growth Management Strategy 2020, Chapter 4 - Compact City Program as an "Investigation Area – Urban Land" and has been given a high priority (1-4 years). The land is within the growth area boundary for Woolgoolga, as mapped in the North Coast Regional Plan 2036 and the planning proposal is also consistent with the objectives of LGMS 2020 Chapter 3 - Strategic Approach, particularly:

- The subject site is identified within the Woolgoolga North West Growth Area in the LGMS as a high priority 1-4 year 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 4).
- 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.

A detailed Residential Land Demand Analysis accompanies the planning proposal (refer Appendix 4), 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.

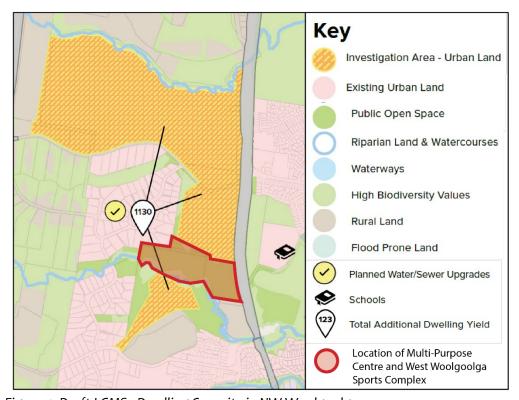


Figure 4: Draft LGMS - Dwelling Capacity in NW Woolgoolga

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 chapter within Coffs Harbour Development Control Plan 2015 and an associated Contributions Plan.

3. Is there a net community benefit?

The revised rezoning of the subject land enables the development of approximately 124 low density residential lots within a 11.5 ha portion of the site proposed to be zoned R2 Low Density Residential. The remainder of the site is intended to be zoned E2 Environmental Conservation and E3 Environmental Management.

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 124 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 are proposed to be implemented and it is noted that the amendment to clause 7.19 of LEP 2013 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 generally 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 5.



Figure 5: 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

- Action 1.1 Focus future urban development to mapped urban growth areas.
- Action 1.2 Review areas identified as 'under investigation' within urban growth areas to identify and map sites of potentially high environmental value.
- Comment 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 amendment to clause 7.19 of LEP 2013 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

- Action 2.1 Focus development to areas of least biodiversity sensitivity in the region and implement the 'avoid, minimise, offset' hierarchy to biodiversity, including areas of high environmental value.
- Action 2.2 Ensure local environmental plans manage marine environments, water catchment areas and groundwater sources to avoid potential development impacts.
- Comment A Biodiversity Impact Assessment (BIA) is included with this Planning Proposal (Appendix 8). 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, as well as other native vegetation has moderate conservation value and are proposed to be contained in an E2 Environmental Conservation and an E3 Environmental Management zone.

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

- Action 3.1 Reduce the risk from natural hazards, including the projected effects of climate change, by identifying, avoiding and managing vulnerable areas and hazards.
- Action 3.2 Review and update floodplain risk, bushfire and coastal management mapping to manage risk, particularly where urban growth is being investigated.
- Action 3.3 Incorporate new knowledge on regional climate projections and related cumulative impacts in local plans for new urban development.
- Comment A conceptual subdivision layout (Appendix 3) 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 conceptual subdivision layout and the management actions described in the Bushfire Risk Assessment report (Appendix 5) will be an important part of bushfire hazard protection. The bushfire assessment and concept subdivision layout have been prepared to accord with the NSW Rural Fire Service's Planning Bush Fire Protection 2019.

Direction 4: Promote renewable energy opportunities

- Action 4.1 Diversify the energy sector by identifying renewable energy resource precincts and infrastructure corridors with access to the electricity network.
- Action 4.2 Enable appropriate smaller-scale renewable energy projects using bio-waste, solar, wind, small-scale hydro, geothermal or other innovative storage technologies.
- Action 4.3 Promote appropriate smaller and community-scale renewable energy projects.
- Comment Although the subject land slopes such that it 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

- Action 5.1 Collaborate on regional and intra-regional housing and employment land delivery and industry development.
- Comment The proposed residential area will have good access to local employment opportunities as well as the Pacific Highway for broader regional opportunities.

Direction 8 - Promote the growth of tourism

- Action 8.2 Facilitate tourism and visitor accommodation and supporting land uses in coastal and rural hinterland locations through local growth management strategies and local environmental plans.
- Action 8.5 Preserve the region's existing tourist and visitor accommodation by directing permanent residential accommodation away from tourism developments, except where it is ancillary to existing tourism developments or part of an area otherwise identified for urban expansion in an endorsed local growth management strategy.
- Comment The proposed residential area will indirectly provide for tourism by providing land for housing, which may cater for tourism workers.

Direction 11: Protect and enhance productive agricultural lands

- Action 11.1 Enable the growth of the agricultural sector by directing urban and more residential development away from important farmland and identifying locations to support existing and small-lot primary production, such as horticulture in Coffs Harbour.
- Action 11.3 Identify and protect intensive agriculture clusters in local plans to avoid land use conflicts, particularly with residential and rural residential expansion.
- Action 11.4 Encourage niche commercial, tourist and recreation activities that complement and promote a stronger agricultural sector, and build the sector's capacity to adapt to changing circumstances.
- Action 11.5 Address sector-specific considerations for agricultural industries through local plans.

Comment - The subject land does not contain highly productive agricultural lands and is not identified as Regionally Significant Farmland. Agricultural land uses exist to the north of the subject land and accordingly, a Land Use Conflict Risk Assessment (LUCRA, refer to Appendix 6) 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. This will be further investigated as part of the preparation of a masterplan for the subject site.

The rural land to the 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 amendment to clause 7.19 of LEP 2013 contained within this Planning Proposal includes reference to the establishment of appropriate buffer requirements within subsequent Development Control Plan provisions.

Direction 13 - Sustainably manage natural resources

- Action 13.1 Enable the development of the region's natural, mineral and forestry resources by directing to suitable locations land uses such as residential development that are sensitive to impacts from noise, dust and light interference.
- Action 13.2 Plan for the ongoing productive use of lands with regionally significant construction material resources in locations with established infrastructure and resource accessibility.
- Comment 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

- Action 14.1 Prepare precinct plans in growth areas, such as Kingscliff, or centres bypassed by the Pacific Highway, such as Woodburn and Grafton, to guide development and establish appropriate land use zoning, development standards and developer contributions.
- Action 14.2 Deliver precinct plans that are consistent with the Precinct Plan Guidelines (Appendix C).
- Comment The amendment to clause 7.19 of LEP 2013 and key sites 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

- Action 15.2 Facilitate more recreational walking and cycling paths and expanded inter-regional and intra-regional walking and cycling links, including the NSW Coastline Cycleway.
- Action 15.4 -Create socially inclusive communities by establishing social infrastructure benchmarks, minimum standards and social impact assessment frameworks within local planning.
- Action 15.5 Deliver crime prevention through environmental design outcomes through urban design processes.

Comment - There are opportunities for links between the subject land and the Woolgoolga Sporting Fields, 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

- Action 16.2 Ensure Aboriginal communities are engaged throughout the preparation of local growth management strategies and local environmental plans.
- Comment The Aboriginal Cultural Heritage Assessment Report (Appendix 7) outlines a consultation process undertaken with the local Aboriginal community in accordance with the (former) OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010).

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

- Action 18.1 Ensure Aboriginal objects and places are protected, managed and respected in accordance with legislative requirements and the wishes of local Aboriginal communities.
- Action 18.2 Undertake Aboriginal cultural heritage assessments to inform the design of planning and development proposals so that impacts to Aboriginal cultural heritage are minimised and appropriate heritage management mechanisms are identified.
- Action 18.3 Develop local heritage studies in consultation with the local Aboriginal community, and adopt appropriate measures in planning strategies and local plans to protect Aboriginal heritage.
- Comment The Aboriginal Cultural Heritage Assessment Report (Appendix 7) submitted with the Application to Amend LEP 2013 identified two artefacts located near to, but not on the subject land.

An onsite AHIP consultation meeting was held on 18th January 2018 with the applicant's Aboriginal cultural heritage consultant, local Aboriginal cultural knowledge holders and the Coffs Harbour and District Local Aboriginal Land Council. According to the report, those present agreed that the progression of a rezoning of the land would be acceptable.

The Aboriginal Cultural Heritage Assessment Report (Appendix 7) outlines a series of management recommendations, designed to address the eventual development of the land. Should the rezoning progress to completion, it would be appropriate that all of the management recommendations set out in the Aboriginal Cultural Heritage Assessment Report be implemented as part of the future development of the land. To ensure that this occurs, an attribute can be placed on the subject land within Council's property information system to alert development assessment staff of the need to contact the Coffs Harbour and District Local Aboriginal Land Council during the development assessment process.

Direction 19 - Protect historic heritage

- Action 19.1 Ensure best-practice guidelines are considered such as the Australia ICOMOS Charter for Places of Cultural Significance and the NSW Heritage Manual when assessing heritage significance.
- Action 19.2 Prepare, review and update heritage studies in consultation with the wider community to identify and protect historic heritage items, and include appropriate local planning controls.
- Action 19.3 Deliver the adaptive or sympathetic use of heritage items and assets.
- Comment No historic heritage is identified within the Planning Proposal area.

Direction 20 - Maintain the region's distinctive built character

- Action 20.1 Deliver new high-quality development that protects the distinct character of the North Coast, consistent with the North Coast Urban Design Guidelines (2009).
- Comment Existing Coffs Harbour DCP 2015 controls will assist in preserving the distinctive North Coast built character.

Direction 21: Coordinate local infrastructure delivery

- Action 21.1 Undertake detailed infrastructure service planning to support proposals for new major release areas.
- Action 21.2 Maximise the cost-effective and efficient use of infrastructure by directing development towards existing infrastructure or promoting the co-location of new infrastructure.
- Comment 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

- Action 22.2 Facilitate housing and accommodation options for temporary residents by: preparing planning guidelines for seasonal and itinerant workers accommodation to inform the location and design of future facilities; and working with councils to consider opportunities to permit such facilities through local environmental plans.
- Comment The proposed rezoning will result in an estimated 124 additional low density residential allotments within the subject land.

Direction 23: Increase housing diversity and choice

- Action 23.1 Encourage housing diversity by delivering 40 per cent of new housing in the form of duel occupancies, apartments, townhouses, villas or dwellings on lots less than 400 square metres, by 2036.
- Comment The land is proposed to include an R2 Low Density Residential zone which provides for a range of residential accommodation land uses.

Direction 25: Deliver more opportunities for affordable housing

- Action 25.1 Deliver more opportunities for affordable housing by incorporating policies and tools into local growth management strategies and local planning controls that will enable a greater variety of housing types and incentivise private investment in affordable housing.
- Comment The minimum lot size for the proposed development is one lot/dwelling per 400 m² which is the standard minimum 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. Will the planning proposal give effect to a Council's endorsed local strategic planning statement, or another endorsed local strategy or strategic plan?

Coffs Harbour City Council adopted its Local Strategic Planning Statement (LSPS) on 25 June 2020. The LSPS was prepared in accordance with the *Environmental Planning and Assessment Act* 1979 and Regulations and provides a 20-year land use planning vision for the Coffs Harbour LGA. It identifies 16 Planning Priorities to be delivered in four themes to 2040: connected, sustainable, thriving and leadership. This planning proposal is consistent with the following relevant planning priority and associated action within the adopted LSPS:

Planning Priority	Action
5. Deliver greater housing supply, choice and diversity	A5.1 - Review and amend Council's local planning controls relating to housing supply, choice and diversity as outlined in the Local Growth Management Strategy
	A5.5 - Implement remaining actions from the Local Growth Management Strategy as funding allows

Coffs Harbour Regional City Action Plan 2036

The NSW Government developed the Coffs Harbour Regional City Action Plan (the Plan) to provide a framework to manage and shape the city's future growth so it conforms with the requirements of the North Coast Regional Plan 2036. The Plan was finalised in March 2021 and it identifies 5 overarching goals which incorporate objectives and related actions. This planning proposal is consistent with the following relevant goals, objectives and associated actions within the Plan:

Goal	Objective	Actions	
Live	17. Deliver a city that responds to Coffs Harbour's unique green cradle setting	17.1	Promote a sustainable growth footprint and enhance place-specific character and design outcomes.
	and offer housing choice.	17.4	Support a greater variety and supply of affordable housing.

6. Is the Planning Proposal consistent with the local council's Community Strategic Plan and Local Growth Management Strategy?

MyCoffs Community Strategic Plan

Council's Community Strategic Plan is based on four key themes: Community Wellbeing; Community Prosperity; A Place for Community; and Sustainable Community Leadership. Within each theme there are a number of objectives and for each objective there are a number of strategies to assist in achieving the objectives. The planning proposal is generally consistent with the following relevant objectives and strategies within the Plan:

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.

Coffs Harbour Local Growth Management Strategy 2020

This planning proposal is consistent with the strategic approach taken by the Coffs Harbour Local Growth Management Strategy (LGMS) 2020, particularly:

- The subject land is identified within the Woolgoolga North West Growth Area in Chapter 4 (Compact City Program) of LGMS 2020 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.
- LGMS 2020 also identifies that greenfield developments should carefully consider environmental constraints, water sensitive design and walkability and maintain important heritage values.

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

The table provided in Appendix 1 provides an assessment of consistency against each State Environmental Planning Policy relevant to the Planning Proposal.

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

The table provided in Appendix 2 provides an assessment of consistency against Ministerial Planning Directions relevant to the Planning Proposal.

Section C – Environmental, social and economic impact

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

An Ecological Assessment (refer to Appendix 8) suggests that he most important ecological attributes of the subject land are associated with the remnant native vegetation in the northwest corner which provides an important habitat linkage with adjoining vegetation. This narrow strip of vegetation connects to Poundyard Creek which is an important mapped 'urban link' corridor. Further, that there are opportunities to establish environmental zone/s across the subject land, which will protect and link vegetation across the local landscape and provide suitable movement corridors for wildlife. These areas are confined to the western and southern boundaries of the lot, particularly the northwest sector.

The Ecological Assessment recommends the following actions for the future development of the site:

- Retain as much remnant native vegetation on-site as possible, including all mapped koala habitat and ensure that proposed APZs do not impinge on these areas where possible.
- Consider the development proposal's impact on eastern grey kangaroos, particularly within the context of the Council sports fields being developed between the two development precincts which will increase the availability of food resources.
- Where possible, link remnant vegetation of the site to other extant vegetation across the landscape to provide suitable movement pathways for wildlife. For the subject land this should include a network of E zoned areas in appropriate locations.
- Prepare a Vegetation Management Plan (VMP) (see Appendix 10) in accordance with CHCC's requirements to increase habitat value. The VMP should give specific consideration to:
- wetland species for the proposed bio-retention basin and other low lying areas
- enhancement of proposed E zoned areas under CHCC's LEP
- linking areas of remnant vegetation by identifying habitat linkages and 'gap filling' as required.
- Conduct a detailed impact assessment that shows the extent of vegetation that will be removed / retained when the final concept design is developed.
- Given the proximity of the proposed development to Woolgoolga Lake and the Solitary Islands Marine Park, effective sediment and erosion controls should be employed during any future construction works.
- Implement the key objectives of the Coffs Harbour Kangaroo Management Plan to establish a strategic approach to maintain wild populations of eastern grey kangaroo while managing the social, economic and ecological impacts and ensuring their welfare.
- Implement a Storm Water Management Plan (including artificial wetlands) to reduce nutrients and sediments from reaching the surrounding areas. This is also recommended in the Woolgoolga Lake Estuary Coastal Zone Management Plan.
- Limit the impact of APZs on remnant vegetation ensuring only Outer Protection Areas (OPA) impinge in to the proposed E zoned areas
- Utilise local native landscaping for future developments (including any revegetation works), sourcing seed where possible from surrounding vegetation.

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 PNo9-002 (Environment Protection Zones), E2 Environmental Conservation and E3 Environmental Management Zones have been applied where relevant across the subject land.

10. 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 6). However, given that no residential development is likely in this location, there would be no likely adverse impact by any inundation.

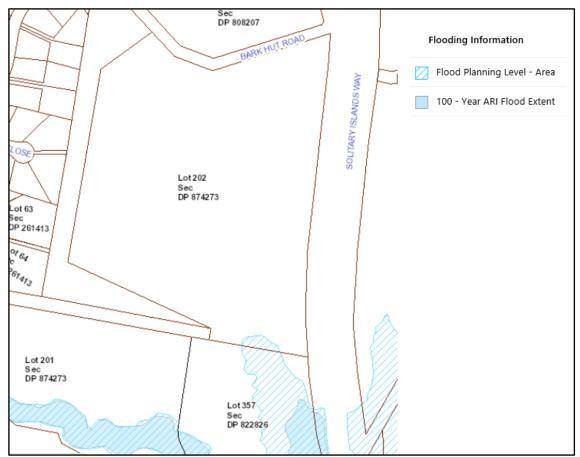


Figure 6: Flood Prone Land

Bushfire Risk

The NSW Rural Fire Service raised no objection to the initial LEP amendment, subject to future residential development complying with *Planning for Bushfire Protection* 2019 and associated documents.

A revised Bushfire Risk Assessment (refer to Appendix 5) has been prepared to assess the suitability of the site for low density residential development in the context of the amended zone layout. The Bushfire Risk Assessment concluded that the planning proposal can comply with s.9.1(2) Direction 4.4 Planning for Bushfire Protection and with the specific objectives for the development type and the performance criteria for the various proposed Bushfire Protection Measures in accordance with PBP 2019.

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 11) 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.

Aboriginal Cultural Heritage

The Archaeological Assessment submitted with the Application to Amend LEP 2013 identified two artefacts located near to, but not on the subject land.

An onsite AHIP consultation meeting was held on 18th January 2018 with the applicant's Aboriginal cultural heritage consultant, local Aboriginal cultural knowledge holders and the Coffs Harbour and District Local Aboriginal Land Council. According to the Aboriginal Cultural Heritage Assessment Report (Appendix 7), those present agreed that the progression of a rezoning of the land would be acceptable.

The Aboriginal Cultural Heritage Assessment Report (Appendix 7) outlines a series of management recommendations, designed to address the eventual development of the land. Should the rezoning progress to completion, it would be appropriate that all of the management recommendations set out in the Aboriginal Cultural Heritage Assessment Report be implemented as part of the future development of the land. To ensure that this occurs, an attribute can be placed on the subject land within Council's property information system to alert development assessment staff of the need to contact the Coffs Harbour and District Local Aboriginal Land Council during the development assessment process.

The 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.

European Heritage

The subject land does not contain any Heritage Items listed in Schedule 5 of Coffs Harbour Local Environmental Plan 2013 or on the State Heritage Register. There are no Post-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 generally positive in terms of the provision of land for new housing close to public open space, 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, E2 Environmental Conservation and E3 Environmental Management 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 (124 lots x 2.3 people) is estimated to be 285 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 4 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,
 - o Improved employment prospects and labour markets within the Coffs Harbour region,
 - o Affordable housing options relative to other major markets along Australia's east coast; and
 - o 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?

Following the preparation of a masterplan for the area and resolution of development servicing plan issues, reticulated services will be able to be extended to service future development. Electricity and telecommunications infrastructure are available in the locality and capacity is considered adequate for future development.

The Traffic Impact Assessment (refer to Appendix 12) 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 near to the common property boundary of the subject land and the West Woolgoolga Sports Complex will provide the opportunity to incorporate pedestrian refuge facilities on Solitary Islands Way to service both the sporting complex and the proposed residential development.

Council is currently undertaking 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. The broader traffic assessment considers:

- Existing and future base road network traffic conditions, with specific consideration of the key roads providing future access for WNW, including Solitary Islands Way, Newmans Road and Bark Hut Road;
- Future peak vehicular trip generation, and the potential impact of those trips on the road network;

- Existing and future public and active transport services and infrastructure, including 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; and
- 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?

There are no matters of interest to Commonwealth authorities in relation to the planning proposal.

A Gateway determination was issued by NSW Planning, Industry and Environment on 1 November 2021 (see Appendix 13). The Gateway determination required consultation on the planning proposal with a number of Government Agencies, including:

- NSW Rural Fire Service
- NSW Environment, Energy and Science Group (Biodiversity and Conservation Division)
- NSW Department of Premier and Cabinet (Heritage NSW)
- Coffs Harbour and District Local Aboriginal Land Council (CH&DLALC)
- NSW Department of Primary Industries (Agriculture)
- Transport for NSW
- NSW Department of Natural Resources Access Regulator
- Department of Primary Industries Mining, Exploration and Geoscience

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 Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to change land currently zoned RU2 Rural Landscape to Zone R2 Low Density Residential, Zone E2 Environmental Conservation and Zone E3 Environmental Management;
- Amend the Coffs Harbour Minimum Lot Size Map (Sheet LSZ_005F) over Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to change land currently subject to minimum lot size provision AB – 40ha to part AB – 40ha and part F – 400 sqm;
- Amend the Coffs Harbour Terrestrial Biodiversity Map (Sheet CL2_005F) over Lot 2 DP 1277984, Bark Hut Road, Woolgoolga to include areas proposed to be zoned E2 Environmental Conservation and E3 Environmental Conservation as terrestrial biodiversity on the map; and
- Amend the Coffs Harbour Key Sites Map (KYS_005F) to include Lot 2 DP 1277984, Bark Hut Road, Woolgoolga.

Existing mapping and proposed LEP mapping amendments are shown in Figures 7-14.

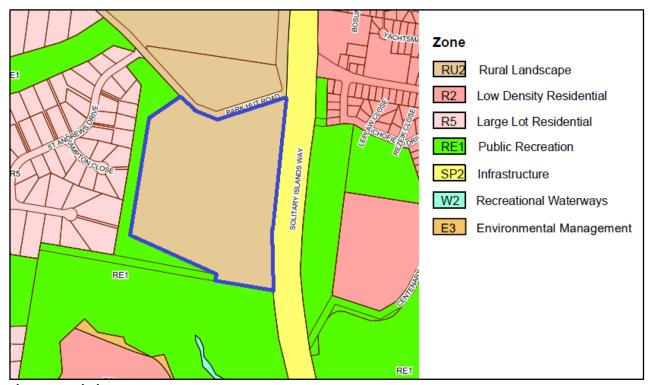


Figure 7: Existing LEP 2013 Zones

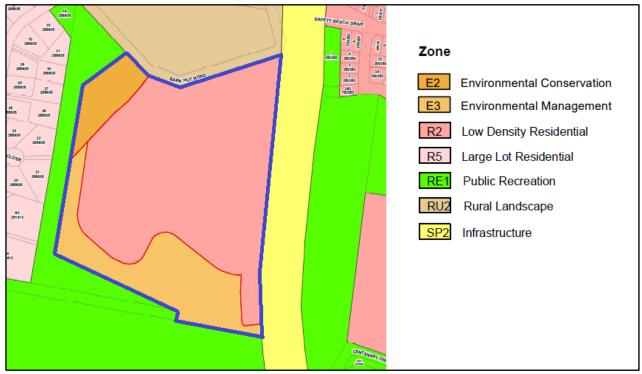


Figure 8: Proposed LEP 2013 Zones - initial and revised layout

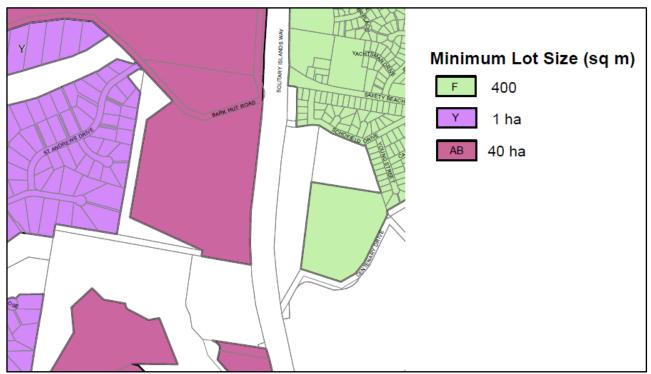


Figure 9: Existing LEP 2013 Minimum Lot Sizes

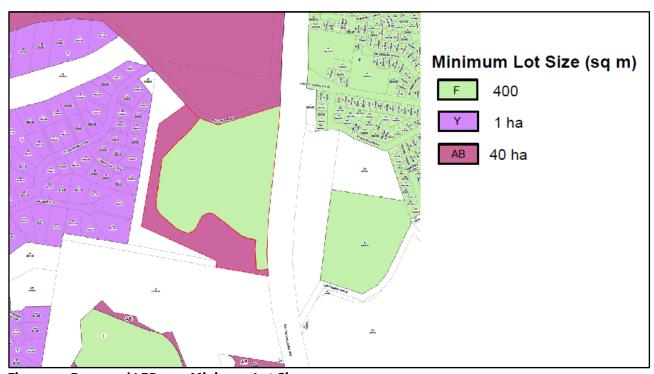


Figure 10: Proposed LEP 2013 Minimum Lot Sizes

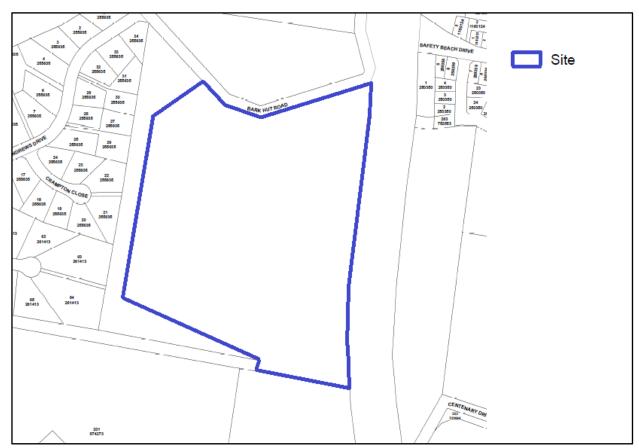


Figure 11: Current Key Sites Map (subject land not identified as a key site)

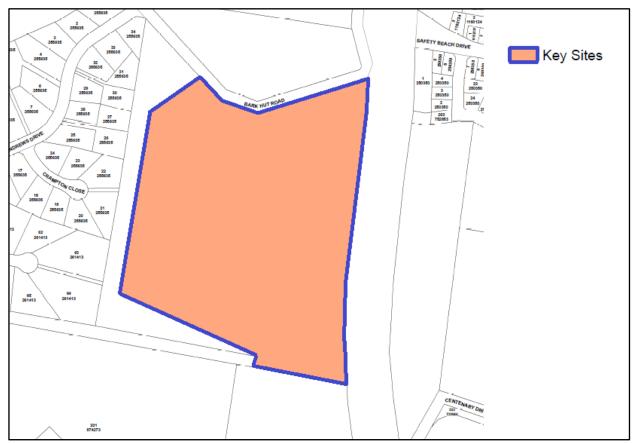


Figure 12: Proposed Key Sites Map

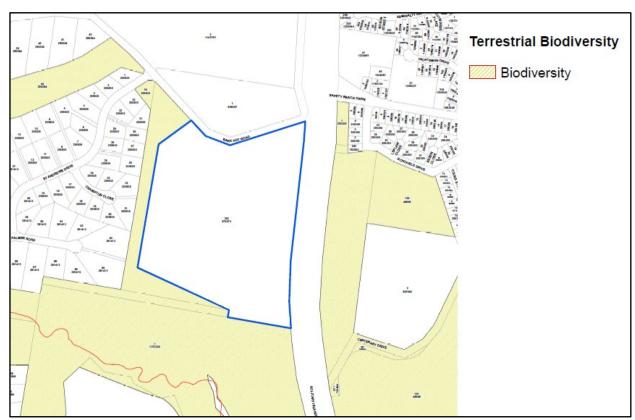


Figure 13: Existing Terrestrial Biodiversity Map

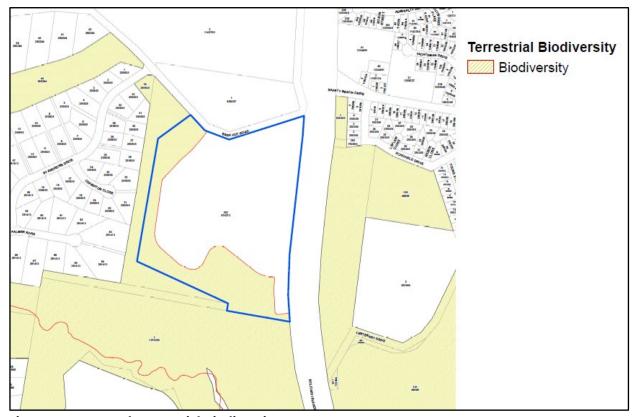


Figure 14: Proposed Terrestrial Biodiversity Map

PART 5 – COMMUNITY CONSULTATION

The Gateway determination issued by the Department of Planning, Industry and Environment on 1 November 2021 has specified the community consultation requirements that must be undertaken for the planning proposal. In accordance with the Gateway determination, the planning proposal will be exhibited for 28 days.

Public Exhibition of the planning proposal will include the following:

Advertisement

Placement of an online advertisement in the Coffs Newsroom.

Consultation with affected owners and adjoining landowners

Written notification of the public exhibition to the proponent, the landowner and adjoining landowners.

Website

The planning proposal will be made publicly available on Council's Have Your Say Website at: https://haveyoursay.coffsharbour.nsw.gov.au/

PART 6 – PROJECT TIMELINE

A project timeline is provided below in Table 1.

Table 1: Project timeline

Task	Estimated timeframe
Decision by Council to initiate the planning proposal	October 2021
Commencement (date of Gateway determination)	November 2021
State Government agency consultation	November 2021
Public exhibition	February 2022 – March 2022
Consideration of submissions	March 2022
Reporting to Council for consideration	April 2022
Submission to Minister to make the plan (if not delegated)	May 2022

State Environmental Planning Policy	Applicable	Consistent	Comment
SEPP No 19 – Bushland in Urban Areas	No	N/A	Coffs Harbour City Council is not listed in Schedule 1 of this policy and thus the policy does not apply to this planning proposal.
SEPP No 21 – Caravan Parks	Yes	Yes	Caravan parks are permitted with consent in the R2 zone. Although unlikely, this may become relevant for future development applications and is not a consideration at this stage.
SEPP No 33 – Hazardous and Offensive Development	No	N/A	This policy does not apply. This planning proposal does not contain specific provisions that reference hazardous and offensive development.
SEPP No 36 – Manufactured Home Estates	Yes	Yes	Caravan parks are permitted with consent in the R2 zone. Although unlikely, this may become relevant for future development applications and is not a consideration at this stage.
SEPP No 50 – Canal Estate Development	No	N/A	This policy does not apply. This planning proposal does not contain specific provisions that reference or propose canal estate development.
SEPP No 55 – Remediation of Land		Consistent.	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.
			A preliminary site contamination investigation is included with this Planning Proposal (see Appendix 11) 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.
SEPP No 64 – Advertising and Signage	Yes	Yes	This may become relevant for future development applications but is not a consideration at this stage.
SEPP No 65 – Design Quality of Residential Flat Development	No	N/A	This policy does not apply. This planning proposal will not result in buildings that are three or more storeys in height.
SEPP No 70 – Affordable Housing (Revised Schemes)	Yes	Yes	This may become relevant for future development applications but is not a consideration at this stage.

SEPP (Aboriginal Land) 2019	No	N/A	This policy does not apply. This policy presently only applies to the Central Coast Local Government Area.
SEPP (Affordable Rental Housing) 2009	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. Future development may incorporate housing delivered under this SEPP and relevant provisions will be given detailed consideration during the assessment of a development application.
SEPP (Building Sustainability Index: BASIX) 2004	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. Future development incorporating BASIX affected buildings will be subject to the provisions of this SEPP.
SEPP (Coastal Management) 2018	Yes	Yes	The aim of this Policy is to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area by establishing a framework for land use planning to guide decision-making in the coastal zone. As shown in Figure 13 below, the south eastern corner of the site is located within the coastal environment area. Supplementaria (2018) Comment: The south-eastern corner of the subject land is affected by the provisions of the 'coastal environmental area' component of SEPP (Coastal Management) 2018. This SEPP states as follows: 1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

			 (a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment, (b) coastal environmental values and natural coastal processes, (c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1, (d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, (e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability, (f) Aboriginal cultural heritage, practices and places, (g) the use of the surf zone. 2) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that: (a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact. Woolgoolga Lake is listed as a sensitive coastal lake identified in Schedule 1 of the SEPP. The conceptual subdivision masterplan for the site (Appendix 3) 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.
SEPP (Concurrences and Consents) 2018	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. Future development requiring concurrence will be subject to the provisions of this SEPP.
SEPP (Educational Establishments and	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. Any future development

Child Care Facilities) 2017			incorporating a child care centre or the like would be subject to the provisions of this SEPP.
SEPP (Exempt and Complying Development Codes) 2008	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. This SEPP is not specifically relevant in the context of the planning proposal.
SEPP (Housing for Seniors or People with a Disability) 2004	Yes	Yes	Seniors housing is permitted with consent in the R2 Low Density Residential Zone under Coffs Harbour Local Environmental Plan 2013.
SEPP (Infrastructure) 2007	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. This planning proposal does not contain provisions that contradict or hinder the application of this SEPP.
SEPP (Koala Habitat Protection) 2020	Yes	Yes	Council has an adopted <i>Koala Plan of Management</i> 1999 (KPoM) which includes local provisions that apply to identified koala habitat. The KPoM identifies both secondary and tertiary koala habitat within the subject land. 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 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 Biodiversity Impact Assessment is provided as an appendix to this Planning Proposal (see Appendix 8).
			To ameliorate the potential impacts of development on koala habitat, the zoning layout of the site includes the location of Secondary and Tertiary Koala Habitat within E2 Environmental Conservation and E3 Environmental Management zones.
			The Planning Proposal is consistent with the KPoM in that new areas of land zoned E2 and E3 will provide additional protection for biodiversity connections and habitat links for Koalas and other threatened species.
SEPP (Koala Habitat Protection) 2021	Yes	Yes	Refer to discussion above.
SEPP (Mining, Petroleum Production and Extractive Industries) 2007	Yes	Yes	The planning proposal is consistent with the aims or provisions of this SEPP. This planning proposal does not contain provisions that contradict or hinder the application of this SEPP.

SEPP (State and Regional Development) 2019	Yes	Yes	This Planning Proposal does not contain provisions that contradict or hinder the application of this SEPP.
SEPP (State Significant Precincts) 2005	No	N/A	This planning proposal does not relate to a state significant precinct.
SEPP (Urban Renewal) 2010	No	N/A	This planning proposal does not relate to an urban renewal precinct.
SEPP (Vegetation in Non-Rural Areas) 2017	Yes	Yes	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.

Ministerial Direction	Applicable	Consistent	Comment
1. Employ	ment and Resources		
1.1 Business and Industrial Zones	Applies when a relevant planning authority prepares a planning proposal that will affect land within an existing or proposed business or industrial zone (including the alteration of any existing business or industrial zone boundary).	N/A	This planning proposal does not affect land within an existing or proposed business or industrial zone.
1.2 Rural Zones	Applies when a relevant planning authority prepares a planning proposal that will affect land within an existing or proposed rural zone (including the alteration of any existing rural zone boundary). Under this direction a planning proposal must: (a) not rezone land from a rural zone to a residential, business, industrial, village or tourist zone.	inconsistent for reasons	This Planning Proposal seeks to rezone land from an existing rural zone to a residential zone and environmental zone/s. However, this inconsistency is considered to be justified for the following reasons: • 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. • Upon referral of a previous planning proposal (PP_2019_COFFS_003_00) that proposed to rezone the same parcel of land, the NSW Department of Primary Industries (Agriculture) supported the strategic justification for the proposed rezoning and notes that the subject land is not important farmland. At that time, DPI also acknowledged that the intention to amend clause 7.19 (and the Key Sites Map) of Coffs Harbour LEP 2013 will ensure that adequate DCP controls will be prepared for the land in relation to any potential land use conflict with surrounding agricultural activities. • The land is small in area and is inappropriately located for sustainable agriculture, given its proximity to adjacent residential land

Ministerial Direction	Applicable	Consistent	Comment
			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.
			For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be "of minor significance".
			It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.
1.3 Mini ng, Petroleum Production	Applies when a relevant planning authority prepares a planning proposal that would have the effect of: (a) prohibiting the mining of coal or other minerals, production of		This planning proposal does not: (a) prohibit the mining of coal or other minerals, production of petroleum, or winning or obtaining of extractive materials, or
and Extractive Industries	petroleum, or winning or obtaining of extractive materials, or		(b) restrict the potential development of resources of coal, other minerals, petroleum or extractive materials which are of State or regional significance.
	other minerals, petroleum or extractive materials which are of State or regional significance by permitting a land use that is likely to be incompatible with such development.	SII CCCIOIII	The terms of the Gateway Determination from NSW Planning Industry and Environment issued on 1 November 2021 require Council to consult with the NSW Department of Primary Industries – Mining, Exploration and Geoscience.
			This agency will therefore need to supply comments relevant to 59.1 Direction 1.3, in order to demonstrate compliance with the requirements of that direction.
1.5 Rural Lands	Applies when a relevant planning authority prepares a planning proposal that: (a) will affect land within an existing	inconsistent for reasons	This direction applies as the Planning Proposal includes changes in existing rural zone boundaries and minimum lot sizes of rural zoned land.
	or proposed rural or environment protection zone (including the alteration of any existing rural or environment protection zone boundary), or		Land which is currently zoned RU2 Rural Landscape is proposed to be amended to Zone R2 Low Density Residential, Zone E2 Environmental Conservation and Zone E3 Environmental Management.

Ministerial Direction	Applicable	Consistent	Comment
	(b) changes the existing minimum lot size on land within a rural or environment protection zone.		The land is identified in the North Coast Regional Plan 2036 and Council's Local Growth Management Strategy 2020 as within the urban growth area boundary and as an urban investigation area respectively.
			Upon referral of a previous planning proposal (PP_2019_COFFS_003_00) that proposed to rezone the same parcel of land, the NSW Department of Primary Industries (Agriculture) supported the strategic justification for the proposed rezoning and notes that the subject land is not important farmland. At that time, DPI also acknowledged that the intention to amend clause 7.19 (and the Key Sites Map) of Coffs Harbour LEP 2013 will ensure that adequate DCP controls will be prepared for the land in relation to any potential land use conflict with surrounding agricultural activities. For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be "of minor
			significance". It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.
2 Environ	ment and Heritage		
2.1 Enviro nment Protection Zones	A planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas. 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	Consistent	An Ecological Assessment (refer to Appendix 8) suggests that he most important ecological attributes of the subject land are associated with the remnant native vegetation in the northwest corner which provides an important habitat linkage with adjoining vegetation. This narrow strip of vegetation connects to Poundyard Creek which is an important mapped 'urban link' corridor. Further, that there are

APPENDIX 2 – CONSIDERATION OF MINISTERIAL PLANNING DIRECTIONS

Ministerial Direction	Applicable	Consistent	Comment
	modifying development standards that apply to the land). This requirement does not apply to a change to a development standard for minimum lot size for a dwelling in accordance with clause (5) of Direction 1.5 "Rural Lands".		opportunities to establish e nvironmental zone/s across the subject land, which will protect and link vegetation across the local landscape and provide suitable movement corridors for wildlife. These areas are confined to the western and southern boundaries of the lot, particularly the northwest sector.
			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 PNo9-002 (Environment Protection Zones) E2 Environmental Conservation and E3 Environmental Management Zones have been applied where relevant across those parts of the site containing worthy environmental attributes.
2.2 Coastal Protection	Applies to land that is within the coastal zone, as defined under the Coastal Management Act 2016 – comprising the coastal wetlands and littoral rainforests area, coastal vulnerability area, coastal environment area and coastal use area – as identified in State Environmental Planning Policy (Coastal Management) 2018.		The south-eastern corner of the subject land is affected by the Coastal Environment Area which is one of four coastal management areas as defined under the SEPP (Coastal Management) 2018. The Coastal Environment Area identifies the environmental features of the coastal zone, such as state waters, estuaries, coastal lakes and coastal lagoons.
	A planning proposal must include provisions that give effect to and are consistent with: (a) the objects of the Coastal Management Act 2016 and objectives of the relevant coastal management areas, (b) the NSW Coastal Management Manual and associated Toolkit; and (c) the NSW Coastal Design Guidelines		Overall, the Planning Proposal is consistent with the aims and objectives of the Coastal Management Act 2016. 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
	2003, and (c) any relevant Coastal Management Program that has been certified by the Minister, or any Coastal Zone Management Plan under the Coastal Protection Act 1979 that		relevance or effect the Coastal Design Guidelines 2003. At the development application stage, mitigation measures will be incorporated into the storm-water drainage design to ensure all runoff will have a nil or

Ministerial Direction	Applicable	Consistent	Comment
	continues to have effect under the Coastal Management Act 2016.		beneficial impact downstream. There is sufficient area within the subject land to accommodate this outcome.
			For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be "of minor significance".
			It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.
2.3 Heritage Conservatio n	A planning proposal must contain provisions that facilitate the conservation of: (a) items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance to an area, in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, area, object or place, identified in a study of the environmental heritage of the area, (b) Aboriginal objects or Aboriginal places that are protected under the National Parks and Wildlife Act 1974, and Aboriginal areas, Aboriginal objects, Aboriginal places or landscapes identified by an Aboriginal heritage survey prepared by or on behalf of an Aboriginal Land Council, Aboriginal body or public authority and provided to the relevant planning authority, which identifies the area, object, place or landscape as being of heritage significance to Aboriginal culture and people.		The Archaeological Assessment report (Appendix 7) submitted with the Application to Amend LEP 2013 identified two artefacts located near to, but not on the subject land. An onsite AHIP consultation meeting was held on 18th January 2018 with the applicant's Aboriginal cultural heritage consultant, local Aboriginal cultural knowledge holders and the Coffs Harbour and District Local Aboriginal Land Council (CHDLALC). According to the report those present agreed that the progression of a rezoning of the land would be acceptable. The 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. A previous planning proposal (PP_2019_COFFS_003_00) that proposed to rezone the same parcel of land was referred to the CHDLALC. The CHDLALC replied with a request that all of the management recommendations set out in the Aboriginal Cultural Heritage Assessment Report be implemented as

Ministerial Direction	Applicable	Consistent	Comment
			land. Should the rezoning progress to completion, to ensure that this occurs, an attribute will be placed on the subject land within Council's property information system to alert development assessment staff of the need to contact the CHDLALC during the development assessment process. Given the above, it is also considered appropriate that a Gateway Determination should require further consultation with the CHDLALC.
2.4 Recrea tion Vehicle Areas	A planning proposal must not enable land to be developed for the purpose of a recreation vehicle area (within the meaning of the Recreation Vehicles Act 1983): (a) where the land is within an environment protection zone, (b) where the land comprises a beach or a dune adjacent to or adjoining a beach, (c) where the land is not within an area or zone referred to in paragraphs (a) or (b) unless the relevant planning authority has taken into consideration: (i) the provisions of the guidelines entitled Guidelines for Selection, Establishment and Maintenance of Recreation Vehicle Areas, Soil Conservation Service of New South Wales, September, 1985, and (ii) the provisions of the guidelines entitled Recreation Vehicles Act, 1983, Guidelines for Selection, Design, and Operation of Recreation Vehicle Areas, State Pollution Control Commission, September 1985.		This planning proposal does not enable land to be developed for the purpose of a recreation vehicle area.
2.6 Remediatio n of	A planning proposal authority must not include in a particular zone (within the meaning of the local environmental plan) any land, if the	Consistent	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

Ministerial Direction	Applicable	Consistent	Comment
Contaminat ed Land	inclusion of the land in that zone would permit a change of use of the land, unless: (a) the planning proposal authority has considered whether the land is contaminated, and (b) if the land is contaminated, the planning proposal authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes for which land in the zone concerned is permitted to be used, and (c) if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning proposal authority is satisfied that the land will be so remediated before the land is used for that purpose. In order to satisfy itself as to paragraph (c), the planning proposal authority may need to include certain provisions in the local environmental plan. Before including any land in a particular zone, the planning proposal authority is to obtain and have regard to a report specifying the findings of a preliminary investigation of the land carried out in accordance with the contaminated land planning guidelines.		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. A preliminary site contamination investigation is included with this Planning Proposal (see Appendix 11) 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.
3. Housing	g, Infrastructure and Urban Developme	nt	
3.1 Reside ntial Zones	This direction applies when a relevant planning authority prepares a planning proposal that will affect land within: (a) an existing or proposed residential zone (including the alteration of any existing residential zone boundary), (b) any other zone in which significant residential development is permitted or proposed to be permitted.	Consistent	The Planning Proposal provides for an additional 11.5 hectares of R2 Low Density Residential zoned land under Coffs Harbour LEP 2013. The provision of additional Low Density Residential land will broaden lifestyle choices in a suitable location. 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

Ministerial Direction	Applicable	Consistent	Comment
	A planning proposal must include provisions that encourage the provision of housing that will: (a) broaden the choice of building types and locations available in the housing market, and (b) make more efficient use of existing infrastructure and services, and (c) reduce the consumption of land for housing and associated urban development on the urban fringe, and (d) be of good design. A planning proposal must, in relation to land to which this direction applies: (a) contain a requirement that residential development is not permitted until land is adequately serviced (or arrangements satisfactory to the council, or other appropriate authority, have been made to service it), and (b) not contain provisions which will reduce the permissible residential density of land.		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. The proposal will increase the supply of residential land adjoining other residential land, as well as land earmarked for public recreation. Appropriate planning controls are also contained within <i>Coffs Harbour DCP</i> 2015 to ensure that development within R2 Low Density Residential zoned land is of good design.
	Applies when a relevant planning authority prepares a planning proposal. In identifying suitable zones, locations and provisions for caravan parks in a planning proposal, the relevant planning authority must: (a) retain provisions that permit development for the purposes of a caravan park to be carried out on land, and (b) retain the zonings of existing caravan parks, or in the case of a new principal LEP zone the land in accordance with an appropriate zone under the Standard Instrument (Local Environmental Plans) Order 2006 that would facilitate the retention of the existing caravan park.		This Planning Proposal is consistent with this direction. Caravan parks are permitted with consent in the R2 Low Density Residential zone under Coffs Harbour LEP 2013. There are no existing caravan parks located on the subject lands.

Ministerial Direction	Applicable	Consistent	Comment
	In identifying suitable zones, locations and provisions for manufactured home estates (MHEs) in a planning proposal, the relevant planning authority must: (a) take into account the categories of land set out in Schedule 2 of SEPP 36 as to where MHEs should not be located, (b) take into account the principles listed in clause 9 of SEPP 36 (which relevant planning authorities are required to consider when assessing and determining the development and subdivision proposals), and (c) include provisions that the subdivision of MHEs by long term lease of up to 20 years or under the Community Land Development Act 1989 be permissible with consent.		
3.3 Home Occupations	Planning proposals must permit home occupations to be carried out in dwelling houses without the need for development consent.	Consistent	Home occupations are permitted without consent in both the R2 and E3 zone under Coffs Harbour LEP 2013. This Planning Proposal does not seek to alter those LEP provisions.
_	Applies when a relevant planning authority prepares a planning proposal that will create, alter or remove a zone or a provision relating to urban land, including land zoned for residential, business, industrial, village or tourist purposes. A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of: (a) Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and (b) The Right Place for Business and Services – Planning Policy (DUAP 2001).	Consistent	This Planning Proposal is consistent with the objectives of this direction. The amendment to clause 7.19 of LEP 2013 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.

Ministerial Direction	Applicable	Consistent	Comment
3.5 Developme nt Near Regulated Airports and Defence Airfields	Applies when a relevant planning authority prepares a planning proposal that will create, alter or remove a zone or a provision relating to land in the vicinity of a licensed aerodrome.	Consistent	This planning proposal does not affect land within the vicinity of a regulated airport or defence airfield.
3.6 Shooting Ranges	Applies when a relevant planning authority prepares a planning proposal that will affect, create, alter or remove a zone or a provision relating to land adjacent to and/or adjoining an existing shooting range.	Consistent	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.
4. Hazard	and Risk		
4.1 Acid Sulfate Soils	Applies when a relevant planning authority prepares a planning proposal that will apply to land having a probability of containing acid sulfate soils as shown on the Acid Sulfate Soils Planning Maps.	Justifiably inconsistent for reasons listed.	The subject site has a low risk of containing acid sulphate soils as the site includes land within Class 5 as shown on the acid sulphate soils risk maps. 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). For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be "of minor significance". It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.
4.2 Mine Subsidence and Unstable Land	Applies when a relevant planning authority prepares a planning proposal that permits development on land that:		This planning proposal does not apply to land that: (a) is within a mine subsidence district, or

Ministerial Direction	Applicable	Consistent	Comment
	 (a) is within a mine subsidence district, or (b) has been identified as unstable in a study, strategy or other assessment undertaken: (i) by or on behalf of the relevant planning authority, or (ii) by or on behalf of a public authority and provided to the relevant planning authority. 		 (b) has been identified as unstable in a study, strategy or other assessment undertaken: (i) by or on behalf of the relevant planning authority, or (ii) by or on behalf of a public authority and provided to the relevant planning authority.
4.3 Flood Prone Land	Applies when a planning proposal authority prepares a planning proposal that creates, removes or alters a zone or a provision that affects flood prone land. A planning proposal must include provisions that give effect to and are consistent with: a) the NSW Flood Prone Land Policy, b) the principles of the Floodplain Development Manual 2005, c) the Considering flooding in land use planning guideline 2021, and d) any adopted flood study and/or floodplain risk management plan prepared in accordance with the principles of the Floodplain Development Manual 2005 and adopted by the relevant council. A planning proposal must not rezone land within the flood planning area from Recreation, Rural, Special Purpose or Environmental Protection Zones to a Residential, Business, Industrial or Special Purpose Zones. A planning proposal must not contain provisions that apply to the flood planning area which: a) permit development in floodway areas, b) permit development that will result in significant flood impacts to other properties,	Justifiably inconsistent for reasons listed.	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 3), there would be no adverse impact by any inundation. Any future residential development would have conditions attached to control the developed volumetric storm-water discharge flow and water quality with regard to that from the undeveloped properties. Further, the planning proposal: • will not permit development in floodway areas • will not permit development in floodway areas • will not generate additional spending on flood mitigation measures, infrastructure or services; and • is not proposing to include additional development without consent. For these reasons the provisions of the Planning Proposal that are inconsistent are considered to be "of minor significance".

Ministerial Direction	Applicable	Consistent	Comment
	c) permit development for the purposes of residential accommodation in high hazard areas, d) permit a significant increase in the development and/or dwelling density of that land, e) permit development for the purpose of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate, f) permit development to be carried out without development consent except for the purposes of exempt development or agriculture. Dams, drainage canals, levees, still require development consent, g) are likely to result in a significantly increased requirement for government spending on emergency management services, flood mitigation and emergency response measures, which can include but are not limited to the provision of road infrastructure, flood mitigation infrastructure and utilities, or h) permit hazardous industries or hazardous storage establishments where hazardous materials cannot be effectively contained during the occurrence of a flood event. A planning proposal must not contain provisions that apply to areas between the flood planning area and probable maximum flood to which Special Flood Considerations apply which: a) permit development in floodway areas, b) permit development that will result in significant flood impacts to other		It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.

Ministerial Direction	Applicable	Consistent	Comment
	c) permit a significant increase in the dwelling density of that land, d) permit the development of centrebased childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate, e) are likely to affect the safe occupation of and efficient evacuation of the lot, or f) are likely to result in a significantly increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures, which can include but not limited to road infrastructure, flood mitigation infrastructure and utilities.		
	For the purposes of preparing a planning proposal, the flood planning area must be consistent with the principles of the Floodplain Development Manual 2005 or as otherwise determined by a Floodplain Risk Management Study or Plan adopted by the relevant council.		
	A planning proposal may be inconsistent with the terms of this direction only if the planning proposal authority can satisfy the Secretary of the Department of Planning, Industry and Environment (or their nominee) that:		
	a) the planning proposal is in accordance with a floodplain risk management study or plan adopted by the relevant Council in accordance with the principles and guidelines of the Floodplain Development Manual 2005, or		
	b)where there is no council adopted floodplain risk management study or plan, the planning proposal is		

Ministerial Direction	Applicable	Consistent	Comment
	consistent with the flood study adopted by the council prepared in accordance with the principles of the Floodplain Development Manual 2005; or c) the planning proposal is supported by a flood and risk impact assessment accepted by the relevant planning authority and is prepared in accordance with the principles of the Floodplain Development Manual 2005 and consistent with the relevant planning authorities' requirements, or d) the provisions of the planning proposal that are inconsistent are of minor significance as determined by the relevant planning authority.		
Planni ng for Bushfire Protection	Applies when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to land mapped as bushfire prone land. 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 undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made. A planning proposal must: (a) have regard to Planning for Bushfire Protection 2006, (b) introduce controls that avoid placing inappropriate developments in hazardous areas, and (c) ensure that bushfire hazard reduction is not prohibited within the APZ.	NSW Rural Fire Service is required prior to confirmatio n of consistency with this	The land is mapped as bushfire prone. As such, future development applications for all development involving bush fire prone lands will be required to comply with either \$4.14 of the EP&A Act 1979 or \$100B of the Rural Fires Act 1997, depending on the nature of the proposed development and the relevant provisions of Planning for Bush Fire Protection 2019. A Bushfire Risk Assessment (refer to Appendix 5) 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. In this situation, it is considered appropriate that the Gateway Determination issued on 1 November 2021 requires consultation with the NSW Rural Fire Service.

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 APZ cannot be achieved, provide for an appropriate 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 roads which link 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

Ministerial Direction	Applicable	Consistent	Comment
Comm ercial and Retail Developme nt along the Pacific Highway, North Coast	for land in the vicinity of the existing and/or proposed alignment of the Pacific Highway. A planning proposal that applies to land located on "within town" segments of the Pacific Highway must	Consistent	This proposal will not affect commercial and retail land along the Pacific Highway, North Coast.

Ministerial Direction	Applicable	Consistent	Comment	
	"residential", "tourist", "commercial", "industrial", etc.) or are in areas where the Pacific Highway speed limit is 80 km/hour or greater. The establishment of highway service centres may be permitted at the localities listed in Table 1 of the SEPP, provided that the Roads and Traffic Authority is satisfied that the highway service centre(s) can be safely and efficiently integrated into the highway interchange(s) at those localities.			
5.10 Implementa tion of Regional Plans	Planning proposals must be consistent with a Regional Plan released by the Minister for Planning.	Consistent	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. 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 and it is considered that the Planning Proposal will result in development that generally supports the intent of the above actions.	
5.11 Develo pment of Aboriginal Land Council Land	This direction applies when a planning authority prepares a planning proposal for land shown on the Land Application Map of State Environmental Planning Policy (Aboriginal Land) 2019; or an interim development delivery plan published on the Department's website on the making of this direction.	N/A	This direction is not applicable to the Coffs Harbour LGA.	
6. Local P	Local Plan Making			
6.1 App roval and Referral Requiremen ts	A planning proposal must: (a) minimise the inclusion of provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority, and	Consistent	The Planning Proposal does not include provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority. It does not identify development as designated development.	

Ministerial Direction	Applicable	Consistent	Comment
	(b) not contain provisions requiring concurrence, consultation or referral of a Minister or public authority unless the relevant planning authority has obtained the approval of: (i) the appropriate Minister or public authority, and (ii) the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), prior to undertaking community consultation in satisfaction of section 57 of the Act, and (c) not identify development as designated development unless the relevant planning authority: (i) can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the class of development is likely to have a significant impact on the environment, and (ii) has obtained the approval of the Director-General of the Department nominated by the Director-General of the Department nominated by the Director-General) prior to undertaking community consultation in satisfaction of section 57 of the Act.		
Res erving Land for Public Purposes	A planning proposal must not create, alter or reduce existing zonings or reservations of land for public purposes without the approval of the relevant public authority and the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General).	Consistent	The Planning Proposal does not create, alter or reduce land reserved for a public purpose.

Ministerial Direction	Applicable	Consistent	Comment
6.3 Site Specific Provisions	Applies when a relevant planning authority prepares a planning proposal that will allow a particular development to be carried out. A planning proposal that will amend another environmental planning instrument in order to allow a particular development proposal to be carried out must either: (a) allow that land use to be carried out in the zone the land is situated on, or (b) rezone the site to an existing zone already applying in the environmental planning instrument that allows that land use without imposing any development standards or requirements in addition to those already contained in that zone, or (c) allow that land use on the relevant land without imposing any development standards or requirements in addition to those already contained in the principal environmental planning instrument being amended. A planning proposal must not contain or refer to drawings that show details of the development proposal.	•	The Planning Proposal includes an amendment to clause 7.19 of LEP 2013 and an associated key sites map, Land Zone Map and Lot Size Map to amend Coffs Harbour LEP 2013. 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. Therefore, the provisions of the Planning Proposal that are inconsistent are considered to be "of minor significance". It is noted that the Department correspondence accompanying the Gateway Determination dated 1 November 2021 states that any inconsistency with this Direction has been justified in accordance with the terms of the Direction.





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:

Kerrianne Meulman Managing Director

> Joshua Binkley Consultant

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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:
 - o Low interest rates and the availability of finance,
 - o Improved employment prospects and labour markets within the Coffs Harbour region,
 - o 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.



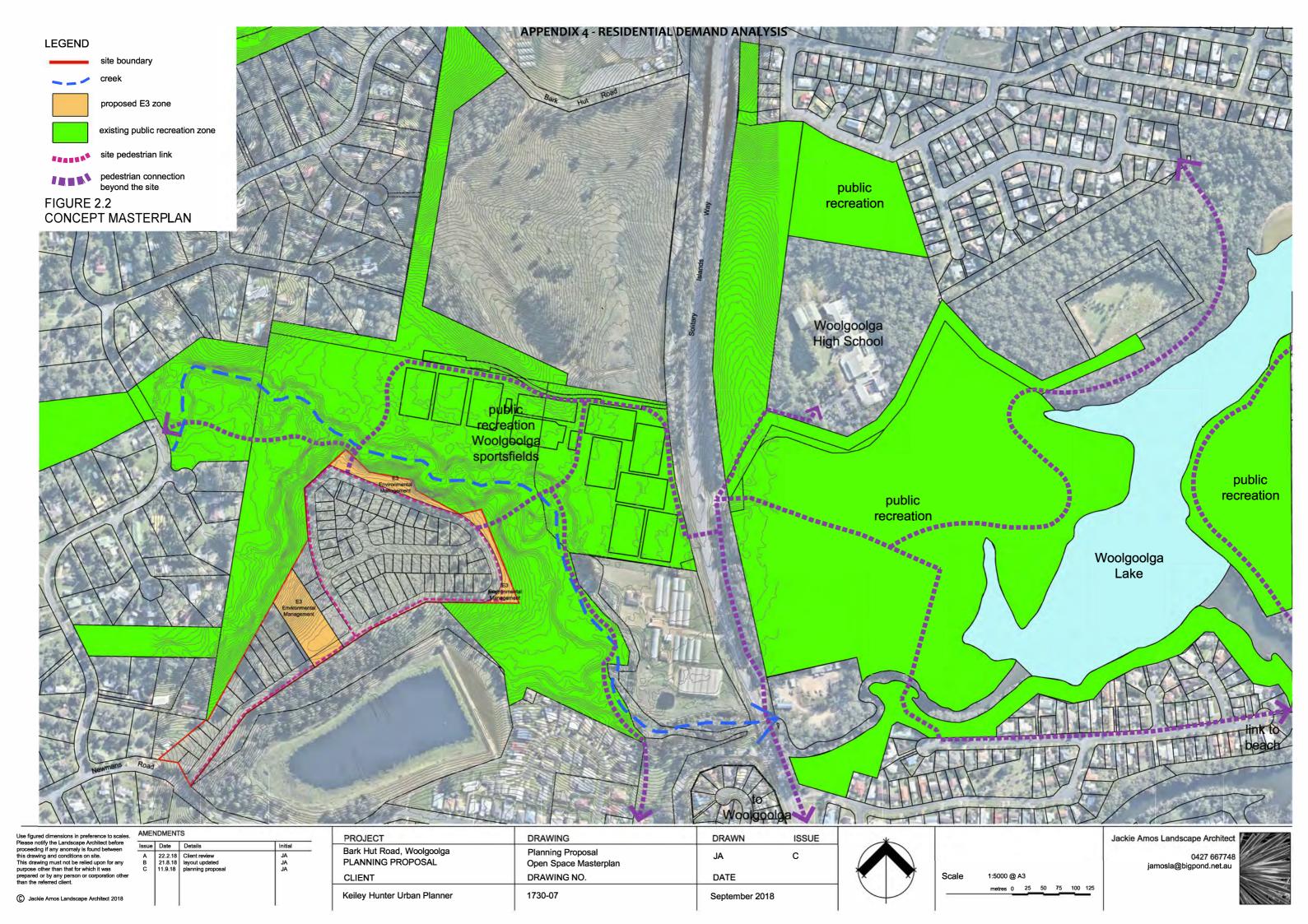


Source: Nearmap showing May 5th 2016

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.

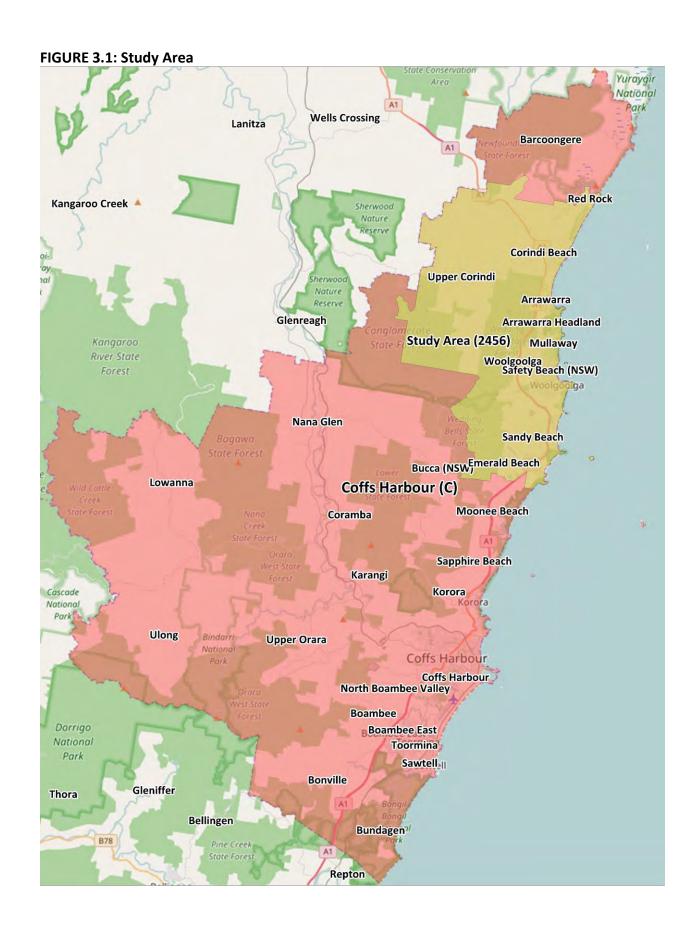


3.0 RESIDENTIAL SUPPLY ANALYSIS

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).



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.

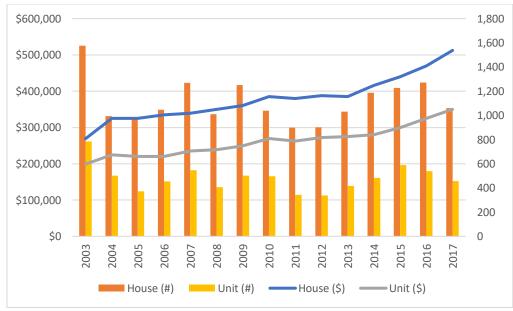


FIGURE 3.2: House and Unit Sales - Coffs Harbour

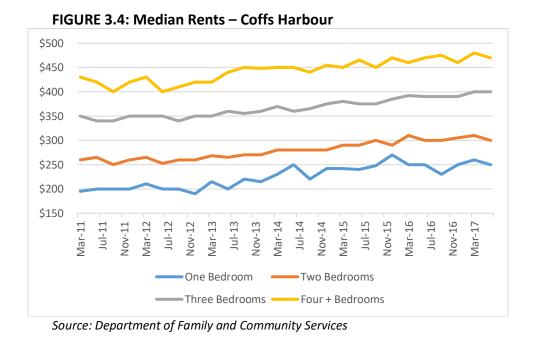
Source: Pricefinder

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 \$300,000 900 800 \$250,000 700 \$200,000 600 500 \$150,000 400 \$100,000 300 200 \$50,000 100 \$0 2015 2003 2012 ■ Vacant Land (#) Vacant Land (\$)

Source: Pricefinder

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.



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 Hearnes 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

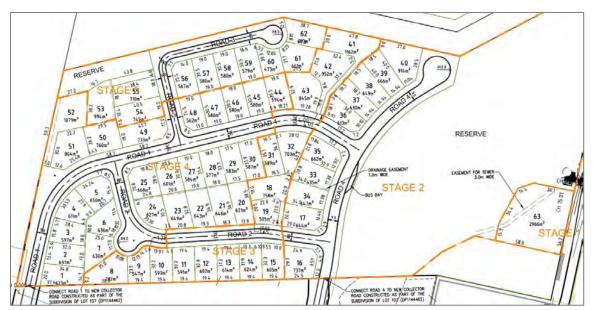
Seacrest at Sandy Beach adjoins North Sandy Beach estate and is masterplanned to include 166 residential lots. Stages 1 and 2 (43 lots) are completed and sold whilst 123 lots within stages 3 to 5 are predominantly presold with civil works continuing.

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 Hearnes 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 Hearnes 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:

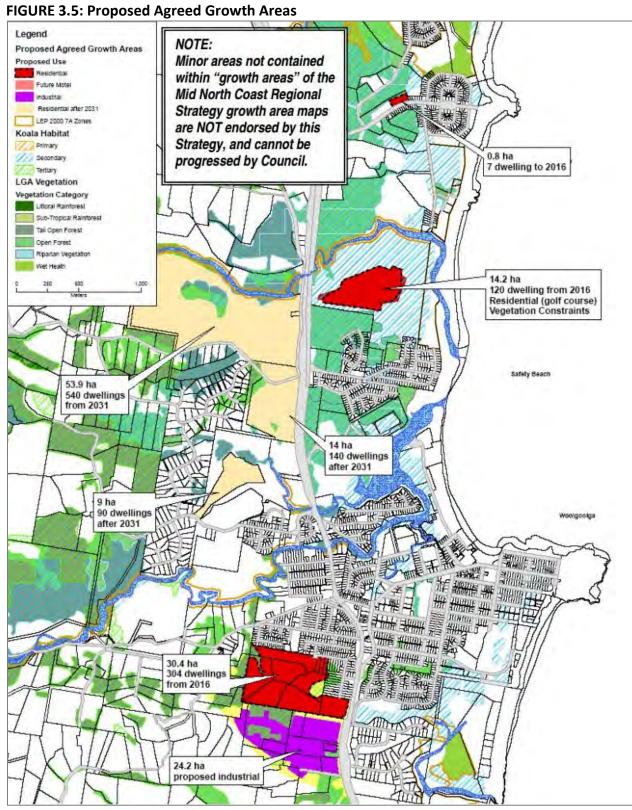
15.8hectares over 12 large lots at Corindi Beach

- 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 Hearnes 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.



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.

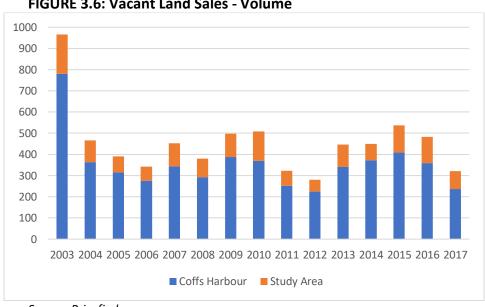
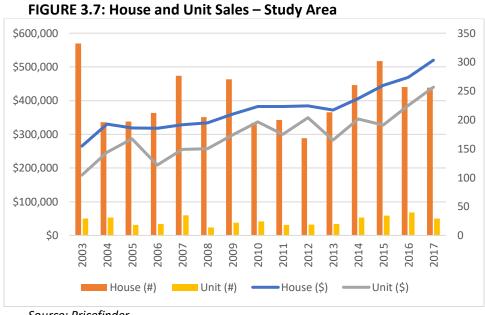


FIGURE 3.6: Vacant Land Sales - Volume

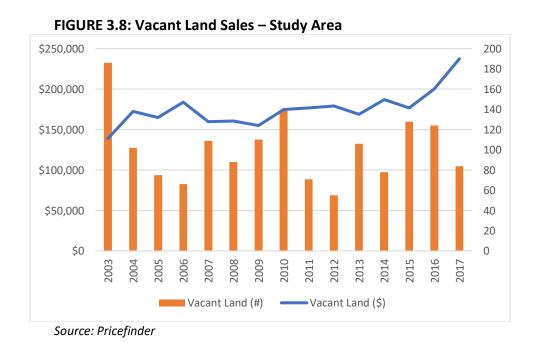
Source: Pricefinder

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.



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.



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, Hearnes 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.



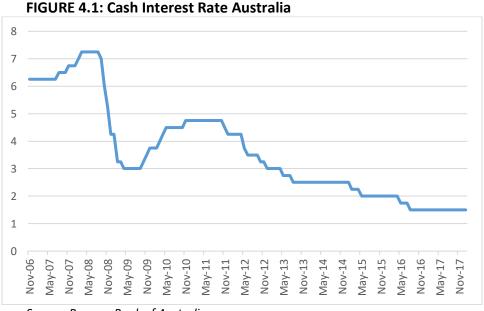
Woopi Beach Estate lot plan, Woolgoolga

4.0 DEMAND ANALYSIS

4.1 DEMAND DRIVERS

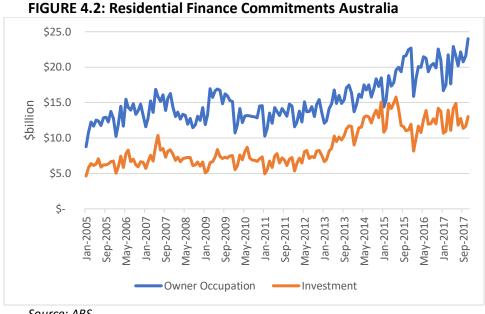
Economic conditions in Australia have in more recent times been defined by the existence of a "two speed economy" - the resources and energy sector, which has experienced strong levels of activity, fuelled by demand particularly from China and India, and the remainder of the economy, which is much more 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.



Source: Reserve Bank of Australia

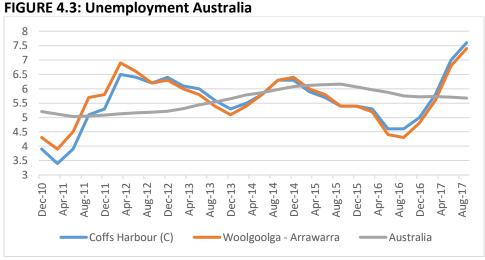
It is interesting to note that the value of housing finance commitments continued to rise to record highs for investors in 2014/15 and owner occupation at the end of 2015. Tighter lending conditions imposed by banks has moderated lending activity somewhat; particularly from investors however there has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



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.

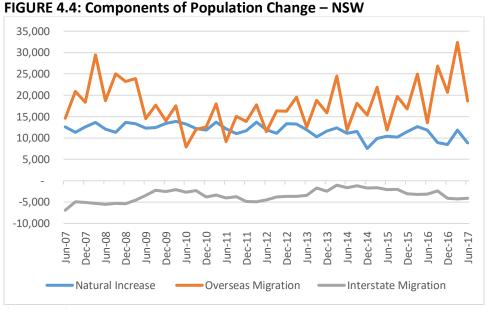
FIGURE 4.3 illustrates the unemployment rates of Coffs Harbour and the Woolgoolga-Arrawarra SA2 to the Australian average; highlighting the declining employment rate in the region.



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.

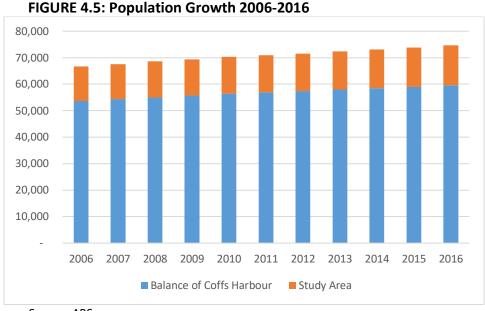


Source: ABS

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.



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

Not Stated	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, Arrawarra	?	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 5 - BUSHFIRE RISK ASSESSMENT



Land & Fire Assessments Pty Ltd

PO BOX 104 Wardell NSW 2477 ACN 160 897 343

Web: landandfireassessments.com.au

BUSHFIRE ASSESSMENT S.100B RURAL FIRES ACT

For Planning Proposal Part Lot 202 DP 874273 Bark Hut Road Planning Area, Woolgoolga, NSW





Prepared By: Paola Rickard BPAD – Level 3 Accredited Practitioner – BPAD-21855

Land & Fire Assessments Pty Ltd

For: Keiley Hunter Report No: LFA20043 Date: 5 May 2021

Disclaimer

Land & Fire Assessments Pty Ltd (LFA) have conducted work concerning the environmental status of the site, which is the subject of this report, and has prepared this report on the basis of that assessment. The work was conducted, and the report has been prepared, in response to specific instructions from the client or a representative of the client and in reliance on certain data and information made available to LFA. The analysis, evaluations, opinions and conclusions presented in this report are based on that information, and they could change if the information is in fact inaccurate or incomplete.

Due consideration has been given to site conditions and to appropriate legislation and documentation available at the time of preparation of the report. As these elements are liable to change over time, the report should be considered current at the time of preparation only. Should further information become available regarding the conditions at the site, LFA reserves the right to review the report in the context of the additional information. LFA has made no allowance to update this report and has not taken into account events occurring after the time its assessment was conducted.

This report is intended for the sole use of the client and only for the purpose for which it was prepared. Any representation contained in the report is made only to the client unless otherwise noted in the report. Any third party who relies on this report or on any representation contained in it does so at his or her own risk

Revision List

Revision No.	Revision Date	Report Title	Report Author	Field Survey By	Status
00	7.12.20	Bushfire Assessment_s.100B Rural Fires Act_For	Main Author: Paola Rickard (LFA - Senior Environmental	Paola Rickard	Draft
01	05.05.21	Planning Proposal, Part Lot 202 DP 874273, Bark Hut Road Planning Area, Woolgoolga, NSW	Planner & BPAD – Level 3 Accredited Practitioner –no. BPAD 21855)	undertaken on the 18.11.20	Final

Paola Rickard contact detail: 0427 809 352

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Summary Compliance Table

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Site Details	Part of Lot 202 DP 874273, Bark Hut Road, Woolgoolga, NSW; Coffs Harbour City Council LGA
Proposal	Rezone the subject land (Bark Hut Road Planning Area) from Zone RU2 Rural Landscape to Zone R2 Low Density Residential
Bushfire Prone Land Map	Vegetation Category 1, Category 2 & Category 3 - see Fig. 1
Planning context	s. 4.46 of the Environmental Planning and Assessment Act 1979 and s. 100B of the Rural Fires Act 1997; section 9.1(2) of the Environmental Planning and Assessment Act 1979 - Directions (specifically Direction 4.4 Planning for Bushfire Protection)
Bushfire planning	Planning for Bushfire Protection 2019 (PBP)
guideline and	Chapter 5 - Residential and Rural Subdivision; s. 4.4.1 Consideration of bush fire
relevant chapter	issues; Appendix 1
Application complies with 'Deemed - to Satisfy' (DtS) provisions	Yes, all DtS provisions met
Consultation with	Required under s.9.1(2) Directions of the <i>Environmental Planning and Assessment</i>
RFS Commissioner	Act 1979; specifically, Direction 4.4 Planning for Bushfire Protection
Compliance statement	This Assessment has duly considered the bushfire issues identified in s 4.4.1 of PBP 2019. Accordingly, it has found that the proposed Planning Proposal to amend LEP 2013 to allow low density residential development on part of Lot 202 DP 874273 can comply with the s.9.1(2) Directions (specifically Direction 4.4 Planning for Bushfire Protection), and with the specific objectives for the development type and the performance criteria for the various proposed Bushfire Protection Measures in accordance with PBP 2019.
Full Name of Accredited Practitioner	Paola Rickard - Land & Fire Assessments Pty Ltd
Qualification	BPAD – Level 3 Accredited Practitioner - Accreditation no. BPAD-21855, valid to 2/08/2021
Date	5 May 2021
Signature	Ricky



1. Introduction

1.1 Background & Planning Context

This Bushfire Assessment report has been prepared by Land & Fire Assessments Pty Ltd (LFA) in accordance with the relevant provisions of Planning for Bushfire Protection (PBP) 2019 in its entirety and future residential development can comply with all relevant Acceptable Solutions in this version of PBP. This assessment has been prepared to support the **Planning Proposal of Part Lot 202 DP 874273, Bark Hut Road, Woolgoolga, NSW**. The site is shown on Figs. 1 & 2. Woolgoolga is located in the Coffs Harbour City Council (CHCC) Local Government Area approximately 23 km north of Coffs Harbour and 1.4 km northwest of Woolgoolga.

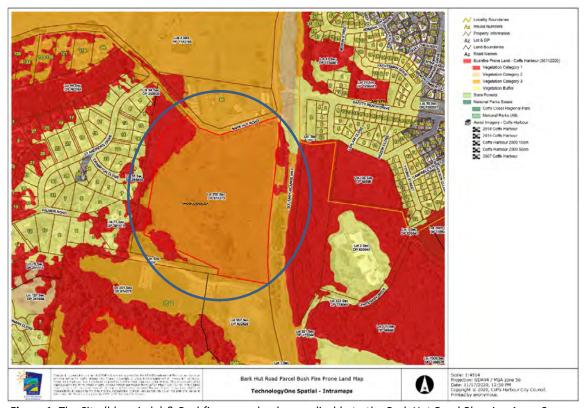


Figure 1. The Site (blue circle) & Bushfire prone land as applicable to the Bark Hut Road Planning Area. Source: CHCC Intramaps

The 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 (see Figs. 2 & 3) as the 'Bark Hut Road Planning Area' and a southern portion (the 'Newmans Road Planning Area').

This Planning Proposal applies to the Bark Hut Road Planning Area (the Site) only, which is zoned RU2 Rural Landscape under the Coffs Harbour Local Environmental Plan (LEP) 2013 (refer to Fig. 4). 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 proposal area is wholly affected by the Bush Fire Prone Land mapping, as shown on Fig. 1. Accordingly, the proposal triggers the need to address the bushfire planning provisions.

Section 4.4.1 of PBP 2019 requires consideration of bushfire issues when preparing a draft LEP or planning proposal. The emphasis is on early consultation and inclusion of a bushfire assessment that demonstrate compliance with the s.9.1(2) Directions (specifically Direction 4.4 Planning for Bushfire



Protection) and PBP. A prior bushfire assessment was submitted to the Rural Fire Service (RFS) on the 5/11/19 with the Pre – Exhibition version of the Planning Proposal, dated September 2019 (CHCC 2019). The pre-exhibition Bushfire Risk Assessment, which was undertaken by Resource Design & Management Pty Ltd in March 2019 (CHCC 2019), assessed the proposal against the provisions of the draft *Planning for Bushfire Protection 2018*. The RFS response, which was received on the 30 January 2020 stated that 'Future residential subdivisions are to comply with the requirements of Planning for Bush Fire Protection 2019 and associated documents.' This assessment will review the proposal against the provisions of PBP 2019.

The Minister for Planning, under section 9.1(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) issues directions that relevant planning authorities (such as local councils) must follow when preparing planning proposals for new Local Environmental Plans (LEP) and amending LEPs. Direction 4.4 Planning for Bushfire Protection identifies matters for consideration for rezoning that will affect, or are in proximity to land mapped as bush fire prone.

The key principle is to ensure that future development is capable of complying with PBP. To achieve this, it is necessary to undertake a constraint assessment of the Site to identify potential bush fire risks to the individual site and proposed forms of development. The assessment requirements are detailed in s. 4.4.1 of PBP 2019. These measures, summarised below, will be evaluated for compliance in this assessment:

- 1. Assessment of the suitability of the land for the proposed development given the bush fire risk and existing land uses
- 2. The proposal must demonstrate that the required APZs can be met on the development site and that the road network can support evacuation demands numbers in the event of an emergency.
- 3. It is important that new development does not increase the level of bush fire risk to the existing community. A traffic report prepared by a suitably qualified traffic consultant may be required in circumstances where issues relating to access/egress are identified.
- 4. In addition to the review of any layout designs, consideration must also be given to the LEP provisions relating to minimum lot sizes to ensure appropriate APZs can be accommodated within future subdivisions.

Under s. 4.46 of the *Environmental Planning and Assessment Act 1979* and s. 100B of the *Rural Fires Act 1997* a Bushfire Safety Authority (BFSA) will be required from the Commissioner of the NSW Rural Fire Service (RFS) for the future subdivision of the land. Clause 44 of the *Rural Fires Regulation 2013* specifies the points to be considered in preparing an application for a Bush Fire Safety Authority (BFSA). In addition, PBP 2019 states that it must be demonstrated that the proposal satisfies the broad aim and objective of PBP, the specific objectives for the development type and the performance criteria for the various proposed Bushfire Protection Measures (BPMs).

Chapter 5 of PBP sets out the specific objectives, and the specifications and requirements for Bushfire Protection Measures for Residential and Rural Subdivision Development. These measures, summarised below, will be assessed for compliance in this assessment:

- Asset Protection Zones/Bushfire Attack Level;
- Access;
- o Services; and
- Landscaping and Maintenance

Furthermore, address of Direction 4.4 Planning for Bushfire Protection is undertaken in s.3 of this report.



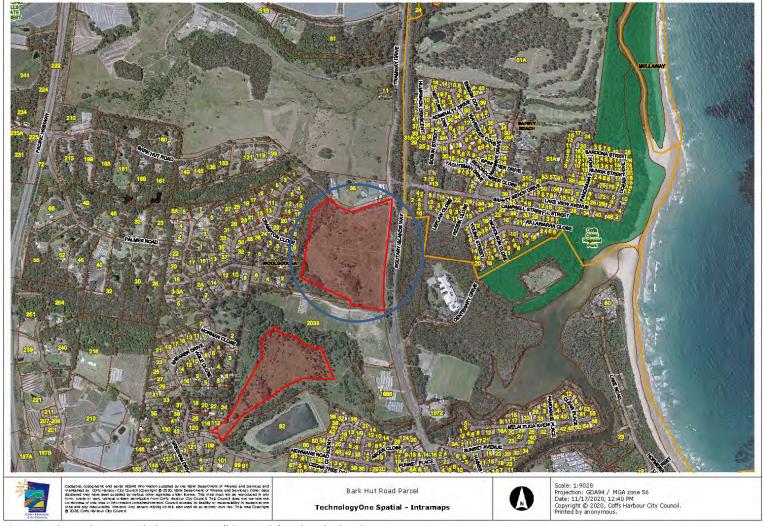


Figure 2. The Bark Hut Road Planning Area (blue circle) within the locality context. Source: CHCC Intramaps





Figure 3. The Bark Hut Road Planning Area and surrounding landuse. Source: CHCC Intramaps



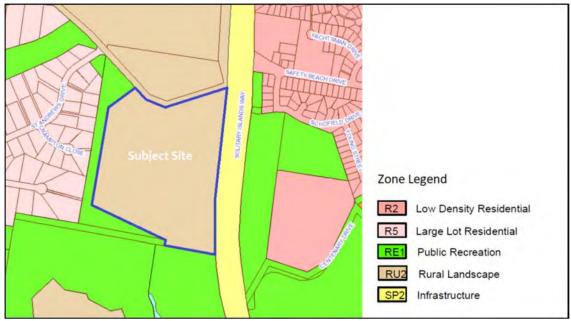


Figure 4. Land zoning applicable to the Site (blue boundary). Source CHCC (2019)

1.2 The Subject Site

The land, which is 16.4 ha in size, is directly accessed from Bark Hut Road. The land in context with the locality is shown on Fig. 2. It entails a vacant property bounded by Bark Hut Road to the north, Solitary Islands Way to the east, residential development (known as the Country Club Estate) to the west, the Woolgoolga Sporting Fields (under construction) to the south, and rural and intensive horticulture (blueberry farm) to the north.

The Subject Site is 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. Furthermore, the Site is close to urban services including schools and a shopping centre (CHCC 2019). Whilst rural land is found to the north, it is identified as 'possible future urban investigation' land and, in any case, the Site is not located near any significant farmland or sensitive ecosystems (CHCC 2019).



Plate 1. Looking south - south east from corner of Bark Hut Road across the Planning Proposal area

The Site is predominantly cleared with scattered trees (Plates 1-7). Denser stands of predominantly Dry Sclerophyll Forest (i.e. Forest vegetation formation) are found along the western portion of the Site extending to the north west and south west, as shown on Figs. 3, 7 & 8 and Plates 1-12. This Forest vegetation spreads into the adjacent Council Reserve found to the west of the Site (Figs. 3 & 7). A stand of Forest (~0.7 ha in size) on a knoll is found to south of the Site (Plates 3, 4 & 6). A marshy swamp area is found to the south east (Plate 12). Disturbed Dry Sclerophyll Forest and Grassland is also found to the west of the Site along the Solitary Islands Way road reserve (Plates 8-10). A wide spaced windbreak is found along the northern boundary (Plate 7). Exiting overhead transmission



powerline runs along the eastern boundary (Plates 8-10) and the Woolgoolga Sporting Fields are found to the south (Plates 13 & 14).



Plate 2. Looking north west across Site to the Forest vegetation found along the western portion of the land



Plate 3. Looking south towards the Woolgoolga Sports Fields. The Forest vegetation along the western boundary to the right and the Forest stand on a knoll to left



Plate 4. Looking east across the small Forest stand on a knoll found to the south east of the Site



Plate 5. Looking north west to the Forest vegetation along western boundary and adjoining residential development





Plate 6. Looking east, south east and south west across the Site



Plate 7. Looking NE at entry to Site from Bark Hut Road, planted single row and wide spaced windbreak along the northern boundary and beyond it a blueberry farm



Plate 8. Looking south along the Solitary Islands Way road reserve, which entails a corridor of open Forest between the Solitary Islands Way (to the left) and the open Grassland area within the Site (to right)



Plate 9. Looking north along the Solitary Islands Way road reserve. The Site is to the left. Note the overhead transmission powerline running along the eastern boundary of the Site





Plate 10. Looking south along the Solitary Islands Way road reserve. The Site is to the right. Note the overhead transmission powerline running along the eastern boundary of the Site



Plate 11. Looking west across Site from the Solitary Islands Way road reserve



Plate 12. Looking north east from southern Site boundary across marshy swamp land to the SE of the Site



the Site earmarked for the Woolgoolga Sporting Fields (under construction)



1.3 Proposed Development & Agencies Feedback

According to CHCC (2019), 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.

A Biodiversity Impact Assessment (BIA) was included in Pre — Exhibition version of Planning Proposal (CHCC 2019). The BIA found that the Site contains small areas of low and moderate conservation value, although it was found to be 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. However, secondary and tertiary koala habitat is present on the subject land. The BIA further found that the secondary and tertiary koala habitat that occur on the Site has moderate conservation value and will need further environmental assessment at the development application stage. Based on the BIA findings a conceptual master plan layout was formulated, which did not include retention of the vegetation occurring to the north west, west and south west of the Site as an intact Forest structure. In fact, an Asset Protection Zone (APZ) was overlayed over the current Forest vegetation. Furthermore, the road reserve adjacent to the eastern boundary of the Site was also earmarked as an APZ.

However, the feedback received from Biodiversity Conservation Department (BCD) did not support the aforementioned conceptual master plan layout. Specifically, the BCD recommendations are summarised as follows:

- 1. Vegetated areas (PCT 1262) to the north west and south west adjoining Council reserve should:
 - a. Be zoned E2 or E3
 - b. Not have any development including APZ or infrastructure locate within them,
 - c. Be dedicated to council or if retained in private land be subject to planning agreement ensuring protection and management
- 2. All APZs are to be contained with the planning area in land zoned R2. There should be no requirement to clear roadside vegetation along Bark Hut Road or for vegetation along Solitary Islands Way to be managed as an outer protection area

Given the above, the Forest vegetation will be retained within an environmental protection zone and a new bushfire assessment has been undertaken to ensure all APZs are contained with the planning area in land zoned R2.

In addition, the Aboriginal Cultural Heritage Assessment (ACHA) Report undertaken as part of the Pre – Exhibition version of Planning Proposal (CHCC 2019) identified 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 (refer to Fig. 5). The ACHA further stated: '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.'





Figure 5. Location of identified two artefacts

Given the comments from BCD and the need to protect the two artefacts shown on Fig. 5, a new conceptual master plan layout has been devised as shown on Fig. 6. The new conceptual layout includes an environmental protection zone aimed at protecting the vegetated areas (PCT 1262) to the north west and south west adjoining Council reserve, as well as retaining the artefacts within the environmental protection zone. The conceptual layout further ensures the required APZ are wholly contained within the Site's residential zoned land and do not impact on the proposed environmental protection zone.

Concerning the BCD comments presented at point 2 (road reserve cannot be used as APZ) it should be noted that currently a cleared setback to powerlines within the roadside reserve is already in place. Thus, no additional clearing would be required and because of the required clearance around transmission power lines, the setback will be managed in perpetuity. Nevertheless, Council has indicated that it would also generally not support an APZ within the road reserve; although it may be able to look at it on a case by case basis.

At the subdivision level it is required to demonstrate that proposed dwellings can be accommodate so that potential building footprint is not exposed to radiant heat levels exceeding 29kW/m² for each proposed lot. In other words, the proposed dwellings need to be able to have sufficient separation from the classified vegetation to achieve a construction level of BAL-29. BAL = Bushfire Attack Level. Fig. 6 demonstrate that there is plenty of room available to meet such requirement. In addition, at least two entry points from the public road network to a future subdivision of the Site are catered for in the conceptual master plan layout.



Figure 6. Proposed conceptual masterplan layoutplease refer to Fig. 8 for correct APZ plan



1.4 Site & Surrounding Vegetation, Topography and Slope

As noted in s. 1.2 and shown on Figs. 7 & 8, the Planning Proposal area is predominantly cleared with scattered trees (Plates 1-7). Denser stands of predominantly Dry Sclerophyll Forest (i.e. Forest vegetation formation) are found along the western portion of the Site extending to the north west and south west. This Forest vegetation spreads into the adjacent Council Reserve found to the west of the Site (Figs. 3 & 7). A stand of Forest (~0.7 ha in size) on a knoll is found to south of the Site (Fig. 7). A marshy swamp area is found to the south east. Disturbed Dry Sclerophyll Forest and Grassland is also found to the west of the Site along the Solitary Islands Way road reserve. A wide spaced windbreak is found along the northern boundary.

A Biodiversity Impact Assessment (BIA) to evaluate the biodiversity values of the proposal has been undertaken by ERM Newcastle (CHCC 2019). The BIA 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 (CHCC 2019) 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 SEPP 44.
- 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.

The vegetation communities mapping undertaken by ERM Newcastle is reproduced as Fig. 9. The field vegetation assessment findings undertaken as part of this bushfire assessment are consistent with the mapping undertaken by ERM.

The potential bushfire hazard vegetation within the assessment area include the Dry Sclerophyll Forest (i.e. Forest vegetation formation) along the eastern, western and south western boundary. A small Forest remnant is found to the south, this remnant is less than 1 Ha in size as shown on Fig. 7, so in accordance with the PBP 2019 provisions specified in A1.11.1, remnant vegetation such as this are



Planning Proposal – Bark Hut Road Planning Area

considered low hazard, thus can be downgraded in term of potential bushfire risk and classified as Rainforest.

Accordingly, the Classified vegetation and the applicable slope, as shown on Figs. 7 & 8, are as detailed on Table 1.

Table 1. Classified vegetation and slope applicable to the Site

Aspect	ct Vegetation Slope Comments		
North west	Forest	downslope 5-10 ⁰	Large parcel of Forest predominantly occurring on flat or upslope in immediate proximity to Site then sloping downslope - beyond it is residential development
West	Forest	upslope	This portion is rather narrow and immediately abutting residential development; nevertheless, the vegetation is continuous with the Forest vegetation to the north and south
South west	Forest	downslope 5-10 ⁰	This vegetation is hemmed in by residential development and the sporting field
South beyond Site	Managed Land (sporting field)	flat	West Woolgoolga Sporting Field (under construction) abuts the Site to the south. This is considered managed land and thus it is regarded as low threat; therefore, is excluded from the determination of the Bushfire Attack Level (BAL)
South within Site	Rainforest (remnant)	upslope	Forest remnant less than 1 ha in size. In accordance with the PBP 2019 provisions specified in A1.11.1, remnant vegetation such as this are considered low hazard, thus can be downgraded in term of potential bushfire risk and classified as Rainforest.
East	Forest	upslope to downslope 0-5°, some steeper section, thus 0-5° downslope utilised	Road reserve, managed by Council, jammed between the Site and Solitary Islands Way. The Forest occurring here is disturbed and open and includes cleared area where the power transmission line runs along the eastern boundary. An access track and setback clearance to the powerline of approximately 10 m is currently implemented as required for the management of such asset
North	Managed Land (single row windbreak, Bark Hut Road & horticulture)		The planted single row and wide spaced windbreak along the northern boundary, and the managed land (horticulture) to the north of the Site beyond Bark Hut Rd are all considered to be vegetation regarded as low threat (A1.11.1 in PBP 2019); therefore, are excluded from the determination of the Bushfire Attack Level (BAL)





Figure 7. Bark Hut Road Parcel (Lot 202 DP874273) - Site assessment area, Vegetation, Slope analysis (arrows point up the slope) using 2m contours intervals (slopes also verified using Nikon Laser Rangefinder). Also showing Council Reserves (mustard shading) - site assessment 18/11/20 Source: CHCC Intramaps





Figure 8. Vegetation retention area (yellow dashed line) and Asset Protection Zone (APZ - yellow to red dashed lines) - APZs (not to scale) range from 31m wide to 11m wide. The APZ is measured from the tree base of the retained vegetation edge or the property boundary



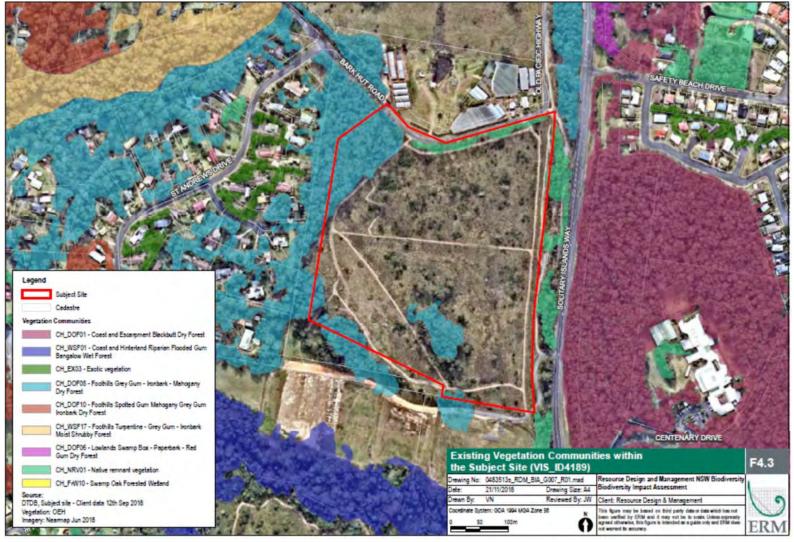


Figure 9. Vegetation communities mapping undertaken by ERM Newcastle. Source CHCC (2019)



1.5. Risk Assessment and Consultant Qualifications

The proposed development Site is surrounded by predominantly residential development, public roads, horticulture and sporting fields. However, Forest vegetation is found to west and east of the Site. Therefore, the potential bushfire hazard is considered to be a medium bushfire risk.

This report has been prepared by Paola Rickard.

The Fire Protection Association Australia (FPA) has in place the Bushfire Planning and Design Accreditation Scheme (BPAD), which is recognised by the NSW Rural Fires Services (RFS). Paola Rickard is a **BPAD - Level 3 Accredited Practitioner** (Accreditation no. BPAD 21855) and is listed on the FPA Australia web site register.

BPAD- Level 3 Accredited Practitioner can perform the following:

 BPAD- Level 3 Accredited Practitioner meet specific requirements in relation to identifying bushfire prone land, assessing potential bushfire impact, and submitting designs and plans, both deemed to satisfy and alternate solution, to meet the performance requirements of the Building Code of Australia and the specific state or territory legislation, for subdivisions, new buildings or modification to existing buildings aiming to minimise the risk to future developments, their occupants and responding emergency services from a bushfire event.

Paola holds a **Graduate Diploma in Design for Bush Fire Prone Areas with Distinction** from the University of Western Sydney and is a **bronze corporate member of the Fire Protection Association Australia (FPA Australia)**. She is a participating **member of the FPA Technical Advisory Committee (TAC) /20 Bushfire Safety**. The TAC provides a nationally focussed forum for discussion between practitioners, fire services and regulators on the design and construction of property in areas prone to bushfires.

From 2015 to 2019, Paola was appointed as a **BPAD member to the NSW Bushfire Working Group (NSWBWG)** set up by FPA Australia. The NSWBWG provide a forum to discuss the application, interpretation and periodic review of NSW Government-based bushfire related regulatory requirements governing land use planning and building construction in areas subject to bushfire impact.

Paola also holds a **Bachelor Degree in Applied Science**, a **Certificate in Bushland Regeneration**, and is a member of the **Australian Association Bush Regenerators**. She has over 18 years of experience in flora surveys and vegetation management issues, and **has been undertaking bushfire assessments since 2003.**

Paola has attended the "NSW Consulting Planners Bushfire Training Course" in Sydney in 2003 and has attended the "Planning for Bushfire Protection Short Course" held by the University of Technologies (UTS) Sydney in 2007. She has obtained certification for the short course. In November 2010, Paola attended the "One-day Planning for Bushfire Prone Areas Update Course" conducted by the Centre for Local Government UTS, Sydney. Additionally, Paola has a 'Basic Bush Fire Awareness' certificate and has experience in fire control and planning while living on a rural land sharing community.



2. Bushfire Protection Measures for Residential Subdivision

2.1 Introduction

Bushfire Protection Measures for Residential and Rural Subdivision are detailed in Chapter 5 of PBP 2019. The specific objectives for 'residential and rural residential subdivision development' are:

- Minimise perimeters of the subdivision exposed to the bush fire hazard (hourglass shapes, which maximise perimeters and create bottlenecks, should be avoided);
- Minimise vegetated corridors that permit the passage of bush fire towards buildings;
- Provide for the siting of future dwellings away from ridge-tops and steep slopes, within saddles and narrow ridge crests;
- Ensure that APZs between a bush fire hazard and future dwellings are effectively designed to address the relevant bushfire attack mechanism;
- Ensure the ongoing maintenance of APZs;
- o provide adequate access from all properties to the wider road network for residents and emergency services;
- provide access to hazard vegetation to facilitate bush fire mitigation works and fire suppression; and
- Ensure the provision of an adequate supply of water and other services to facilitate effective firefighting.

Additionally, PBP identifies the performance criteria and acceptable solutions for the various proposed Bushfire Protection Measures (BPMs). The relevant BPMs criteria and acceptable solutions with regard to residential and rural residential subdivision development are outlined in Sections 2.2 to 2.4 of this report.

2.2 Asset Protection Zones/Bushfire Attack Level

Asset Protection Zones (APZs) are buffer areas between development and a fire hazard, which aim to protect human life and property. The APZ comprises an Inner Protection Area (IPA) and an Outer Protection Area (OPA). These areas are to be managed to reduce the bushfire hazard. Appendix A provides guidance concerning the general requirements for APZs and appropriate landscaping and property maintenance.

Intent of measures: to provide sufficient space and maintain reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and prevent direct flame contact.

At the subdivision level it is required to demonstrate that proposed dwellings can be accommodated so that potential building footprint is not exposed to radiant heat levels exceeding 29kW/m² for each proposed lot.

Accordingly, the Classified vegetation is Forest on upslope, and downslope 0-5° & 5-10° ranges; and Rainforest on upslope as shown on Figs. 7 & 8. According to Table A1.12.3 of Planning for Bushfire Protection 2019 (PBP) for residential subdivisions the minimum APZ distances are calculated to achieve no more than 29kW/m² [i.e. Bushfire Attack Level (BAL)-29].

In this case the setbacks (APZs) requirements are:

- Forest vegetation to the north west & south west = 31m (Classified vegetation on 5-10⁰ downslope)
- Forest vegetation to the west = 20m (Classified vegetation on upslope)
- Forest vegetation on upslope to downslope 0-5°, some steeper section 0-5°utilised = 25 m (Classified vegetation on 5-10° downslope) *



 Forest Remnant to south, classified as 'Rainforest' on upslope = 11m (Classified vegetation on upslope)

*The land east of the Site, which is a road reserve managed by Council, is jammed between the Site and Solitary Islands Way. It was noted that a power transmission line runs along the eastern boundary and that an access track and setback clearance to the powerline of approximately 10 m is currently implemented as required for the management of such asset. According to feedback from BCD, it would not support using the road reserve as an APZ. However at least portion of the area in question is managed as an effective vegetation setback because of the required powerlines clearance. Thus, at least part of the required setback (APZ) to the vegetation occurring on the road reserve and beyond Solitary Islands Way, could take advantage of the powerline clearance already implemented. Feedback was sought from Council who is responsible for the management of this land. Council confirmed it manages the road reserve, but it was further noted that use of an unconstructed portion of road reserve as an APZ is generally not supported by Council, although Council may be able to look at it on a case by case basis. In summary, although it may be possible to achieve some reduction of the APZ at the subdivision level, at this point, the APZ is to be wholly contained within the Site (as shown on Figs. 6 & 8).

In summary, the proposed development is capable of complying with the APZ requirements set out in Appendix 4 of PBP 2019. Guidance concerning the general requirements for APZs and appropriate landscaping and property maintenance is provided in Appendix A of this report.

Consideration of specific construction standards applicable to the proposal are not required at the subdivision application stage. As noted, the key requirement is to ensure that future dwellings can be accommodated so that a potential building footprint is not exposed to radiant heat levels exceeding 29kW/m². This proposal can easily achieve such requirement.

2.3 Access

The provision of PBP 2019 specify the following criteria concerning access provisions, namely:

 Performance Criteria: to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area

The proposed rezoning will need to demonstrate that the future residential subdivision layouts can comply with the PBP access requirements.

According to CHCC (2019), '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.' In summary the Traffic Impact Assessment found that:

- 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 requirements.
- The proposed roads will be constructed to local road standard, being 7m wide carriageway within a 15m wide road reserve. In PBP 2019, these are considered non-perimeter roads and



are required to be a minimum 5.5m carriage way with parking provided to the outside, thus the proposal meets the PBP requirements.

- The perimeter roads will have 8m wide carriageway within a 16m wide road reserve as per PBP requirements.
- All roads will be two-way, 3% (less than 3 degrees) crossfall with roll kerb and gutter on each side of the road. These measures are consistent with PBP 2019 requirements.
- The proposed road network will have a minimum longitudinal gradient of 0.5% and will not exceed 16% (9 degrees). Access gradients to each lot will not exceed 14% (8 degrees). These measures are consistent with PBP 2019 requirements.
- The road network will be designed to ensure service vehicles can undertake all necessary turning movements within the site; thus, meeting PBP requirements.

In summary, as noted the proposed rezoning will need to demonstrate that the future residential subdivision layouts can comply with the PBP access requirements. The conceptual masterplan layout shown on Fig. 6 includes the required elements to satisfy the RFS subdivision provisions, including:

- perimeter road,
- more than one access in and out of the development
- no dead ends roads
- internal roads (i.e. non-perimeter roads) are through roads, etc

2.4 Water, Gas and Electricity Supply

Intent of measures: to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

According to CHCC (2019), the adjoining residential developments to the east and west 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, as shown on Fig. 10.

A 150mm diameter water main traverses the centre of the Site, from east to west (Plate 15 & Fig. 10). 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.

Therefore, CHCC (2019) concludes that preliminary investigations indicate that adequate water supply is available to the Site from the existing mains surrounding the Site.



Plate 15. A 150mm diameter water main traverses the centre of the Site, from east to west



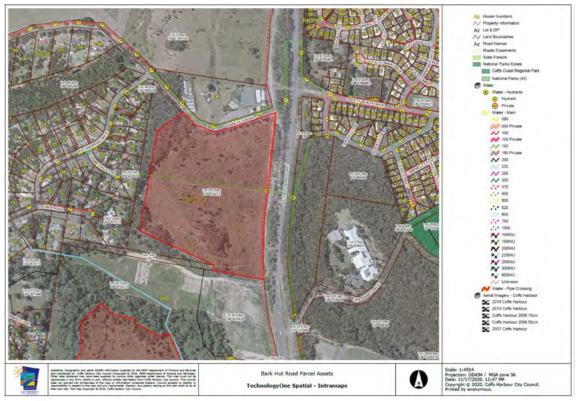


Plate 10. Existing reticulated water infrastructure in the locality. Source: CHCC Intramaps

As noted, Council has found that adequate water supply is available to the Site from the existing mains surrounding the Site. Nevertheless, provision of water supply for a proposed future subdivision will need to comply with the acceptable solution detailed on Table 2 applicable to reticulated developments. In terms of electrical transmission lines, existing supply is overhead, and if reticulated or bottled gas is provided it will comply with the relevant requirements stated in Table 2.

Table 2. Performance criteria and Acceptable Solutions for water, gas and electricity supply (as per Table 5.3c PBP 2019)

I DI	PBF 2019)			
Performance Criteria		Acceptable Solutions		
•	Adequate water supply is provided for firefighting	reticulated water is to be provided to the development where available. A total and a second budget available and a seco		
	purposes	 A static water and hydrant supply is provided for non- reticulated development or where reticulated water supply cannot be guaranteed; and 		
•	water supplies are	Static water supply shall comply with table 5.3d.		
	located at regular intervals	fire hydrant spacing, design and sizing comply with the relevant clauses of Australian Standard AS 2419.1:2005;		
•	the water supply is	 hydrants are not located within any road carriageway; 		
	accessible and reliable for firefighting operations	 reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. 		
•	flows and pressure are appropriate	• fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005		
•	the integrity of the water supply is maintained	all above-ground water service pipes are metal, including and up to any taps.		
Ele	ectricity Services	Where practicable, electrical transmission lines are underground.		
Loc	cation of electricity services	Where overhead electrical transmission lines are proposed:		
	its the possibility of	o lines are installed with short pole spacing (30 metres), unless		
ignition of surrounding		crossing gullies, gorges or riparian areas;		



APPENDIX 5 - BUSHFIRE RISK ASSESSMENT

LFA20043

Planning Proposal – Bark Hut Road Planning Area

Performance Criteria	Acceptable Solutions
bushland or the fabric of buildings.	o no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.
Gas Services Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	 Reticulated or bottled is installed and maintained in accordance with AS/NZS 1596:2014 -the storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used; All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side; connections to and from gas cylinders are metal; polymer-sheathed flexible gas supply lines are not used; and above-ground gas service pipes are metal, including and up to any outlets



MAY 2021

3. Address of Direction 4.4 Planning for Bushfire Protection

The RFS practice note '2/12 - Planning Instruments and Policies' requires that the following be addressed to support a Planning Proposal.

Part 1 – Objectives or Intended Outcomes relating to bush fire prone land that is: Protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and encourage sound management of bush fire prone areas.

Response: The Site is 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 Site is included in Council's Local Growth Management Strategy 2008 – Urban Lands Component as a "possible future urban investigation" area. 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*. The proposed rezoning is a compatible landuse on this land as the Site occurs in proximity to residential development, and it is serviced by capable road infrastructure and water and electricity services. The proposed development Site is surrounded by predominantly residential development, roads, sport fields and schools. The retained Forest vegetation is limited in extent and the potential bushfire risk can effectively be mitigated by the provisions of suitable APZ, perimeter roads and appropriate building construction standards.

Part 2 – Explanation of the Provisions - The identified objectives can be achieved by ensuring that new controls imposed on development will:

- not increase the risk to life from bush fire,
 Response: The proposal will not increase the risk to life from bushfire as adequate controls can be implemented in the future subdivision design to minimise such risk.
- not introduce controls that place inappropriate developments in areas exposed to unacceptable bush fire hazard,
 Response: As noted previously, the proposal is in close proximity to the established residential areas of Woolgoolga and Safety Beach and a Large Lot Residential precinct found to the west. It is surrounded by predominantly residential development, roads, sport fields and schools. The potential bushfire hazard is limited in extent and the Site is serviced by capable road infrastructure and water and electricity services. Accordingly, the development will not be exposed to unacceptable bush fire hazard.
- ensure that appropriate bush fire protection measures can be afforded to property at risk of bushfire,
 Response: Appropriate hushfire protection measures can be accommodated at the proposal
 - Response: Appropriate bushfire protection measures can be accommodated at the proposal Site as demonstrated in s. 2.
- minimise negative impacts on the surrounding environment,
 Response: According to the Biodiversity Impact Assessment (BIA), which was included in Pre Exhibition version of Planning Proposal (CHCC 2019), the proposed rezoning occurs on land containing small areas of low and moderate conservation value, although it was found to be 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. However, secondary and tertiary koala



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habitat is present on the subject land. The BIA further found that the secondary and tertiary koala habitat that occur on the Site has moderate conservation value and will need further environmental assessment at the development application stage. In addition, the *Aboriginal Cultural Heritage Assessment* (ACHA) Report (CHCC 2019) identified two artefacts on the access trail immediately south of the Bark Hut Road entrance to the Project Area (refer to Fig. 5). Accordingly, a new conceptual master plan layout has been devised as shown on Fig. 6. The new conceptual layout ensures the Forest vegetation occurring to northwest, west and south west of the Site as well as the artefacts are retained within an environmental protection zoning. Similarly, the required APZ are wholly contained within the Site's proposed residential zoned land without impacting on the proposed environmental protection zone.

- ensure that provision is made for adequate evacuation/shelter options for the community,
 Response: The Site occurs in proximity to residential development, and it is serviced by capable
 road infrastructure and water and electricity services. The proposed development Site is
 surrounded by predominantly residential development, roads, sport fields and schools. The
 retained Forest vegetation is limited in extent and the potential bushfire risk can effectively be
 mitigated by the provisions of suitable APZ, perimeter roads and building construction
 standards. Accordingly, the rezoning does not increase the potential bushfire risk and existing
 measures are already in place at the locality level.
- and ensure that development is capable of complying with Planning for Bush Fire Protection 2006 (PBP).

Response: The development is capable of complying with the relevant Residential and Rural Residential provisions detailed in Chapter 5 of PBP 2019 as demonstrated in s. 2. Notably, PBP 2019 is the currently legislated document, and it provides updated and more robust provisions than those detailed in PBP 2006.

Part 3 – Justification - The level of justification should be proportionate to the impact that the planning proposal will have.

Response: The proposed rezoning will not have an undue impact on the locality in terms of bushfire risk. This assessment has found that the proposal can comply with the Direction 4.4 Planning for Bushfire Protection and is capable of complying with PBP.



4. Recommendations & Compliance

This Bushfire Assessment report has been prepared by LFA in accordance with the relevant provisions of PBP 2019 to support the **Planning Proposal of Part Lot 202 DP 874273**, **Bark Hut Road, Woolgoolga, NSW**. The Planning Proposal applies to the Bark Hut Road Planning Area (the Site) only, which is zoned RU2 Rural Landscape under the Coffs Harbour Local Environmental Plan (LEP) 2013. 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 proposal area is wholly affected by the Bush Fire Prone Land mapping.

Specifically, this assessment reviewed suitability of the Site for landuse intensification. Direction 4.4 Planning for Bushfire Protection identifies matters for consideration for landuse intensification proposals that will affect, or are in proximity to land mapped as bush fire prone.

A key principle should be to ensure that future development is capable of complying with PBP. To achieve this, it is necessary to undertake a constraint assessment of the Site in respect to bushfire to identify potential bush fire risks to the proposed forms of development (i.e. amend LEP 2013 to allow low density residential development on part of Lot 202 DP 874273).

Thus, this bushfire assessment found that the proposal:

- will not increase the risk to life from bush fire;
- will not introduce controls that place inappropriate developments in areas exposed to unacceptable bush fire hazard;
- can provide for appropriate bush fire protection measures to properties at risk of bushfire;
- does not have adverse impacts on the surrounding environment;
- does not place additional burden to current evacuation/shelter options for the community;
 and
- the proposed development is capable of complying with Planning for Bush Fire Protection.

A prior bushfire assessment was submitted to the RFS on the 5/11/19 with the Pre – Exhibition version of the Planning Proposal, dated September 2019 (CHCC 2019). The pre-exhibition Bushfire Risk Assessment, which was undertaken by Resource Design & Management Pty Ltd in March 2019 (CHCC 2019), assessed the proposal against the provisions of the draft *Planning for Bushfire Protection 2018*. The RFS response, which was received on the 30 January 2020 stated that 'Future residential subdivisions are to comply with the requirements of Planning for Bush Fire Protection 2019 and associated documents.'

Accordingly, this bushfire assessment has been undertaken in accordance with the relevant provisions of Planning for Bushfire Protection (PBP) 2019 in its entirety and the future residential development can comply with all relevant Acceptable Solutions in this version of PBP.

The assessment found that the applicable bushfire protection measures and acceptable solutions as they would apply to future residential subdivision can be met and the following is noted:

- O According to Table A1.12.3 of PBP 2019 for residential subdivisions the minimum APZ distances are calculated to achieve a radiant heat of no more than 29kW/m² (i.e. BAL- 29). In this case the setbacks (APZs) requirements to achieve BAL 29 range from 31m to 11m. The proposed conceptual masterplan layout (see Fig. 6) details the identified APZs and demonstrate that there is room available to achieve BAL 29.
- Direct and multiple access to the public road is already provided. The Traffic Impact Assessment prepared by George Stulle (CHCC 2019), found that 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. The proposed road network will be fully compliant with the subdivision access provisions



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detailed in s. 5.3.2 of PBP 2019. The conceptual masterplan layout shown on Fig. 6 includes the required elements to satisfy the RFS subdivision provisions, including:

- perimeter road,
- more than one access in and out of the development
- no dead ends roads
- internal roads (i.e. non-perimeter roads) are through roads, etc.
- Concerning the provision of adequate reticulated water supply, preliminary investigations undertaken by CHCC (2019) indicate that adequate water supply is available to the Site from the existing mains surrounding the Site.
- o In terms of electrical transmission lines, existing supply is overhead, and if reticulated or bottled gas is provided it will comply with the relevant requirements stated in Table 2.

In conclusion, this Assessment has duly considered the bushfire issues identified in s. 4.4.1 of PBP 2019. Accordingly, it has found that the proposed Planning Proposal to amend LEP 2013 to allow low density residential development on part of Lot 202 DP 874273 can comply with the s.9.1(2) Directions (specifically Direction 4.4 Planning for Bushfire Protection), and with the specific objectives for the development type and the performance criteria for the various proposed Bushfire Protection Measures in accordance with PBP 2019.



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Appendices

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Appendix A - APZs Requirements and Landscaping

A.1 General Requirement for Asset Protection Zones

Asset Protection Zones (APZs) are buffer areas between development and a fire hazard, which aim to protect human life and property. The APZ comprises an Inner Protection Area (IPA) and an Outer Protection Area (OPA). These areas are to be managed to reduce the bushfire hazard. The general requirements for APZs are described in Tables 1A and 2A.

Table 1A. Inner Protection Area (IPA) General Requirements

Specifications and Management		
Location	The IPA extends from the edge of the OPA to the development.	
Purpose	Ensures that the presence of fuel, which could become involved in fire, is minimised.	
Depth	Varies from 10 to 100 metres.	
Fuel Loading	Minimum fine fuel at ground level, which could be set alight by bushfire.	
Vegetation Requirements	Do not touch or overhang the building; Are well spread out and do not form a continuous canopy; Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period; and Are located far enough away from the house so that they will not ignite the house by direct flame contact or radiated heat emissions.	
Uses Within the Area	Tennis courts, swimming pools and gardens are permitted. Woodpiles, wooden sheds, combustive material storage areas, large quantities of garden mulch, stacked flammable building materials are not permitted.	
Maintenance	This Area should be regularly mowed and all fuel removed e.g. fallen branches, leaf build-up.	

Table 2A. Outer Protection Area (OPA) General Requirements

Specifications and Management		
Location	Located adjacent to the hazard. Originally the OPA would have formed part of the bushfire hazard but becomes an area where the fuel loadings are reduced.	
Purpose Reduction of fuel in this area substantially decreases the intensity of an approach fire and restricts the pathway of crown fuels; reducing the level of direct fla radiant heat and ember attack on the IPA.		
Depth	Varies from 0 to 25 metres.	
Fuel Loading	Fine fuel loads should be kept to a level where the fire intensity expected will not impact on adjacent developments. In the absence of any policy to the contrary, 8 tonnes per hectare of fuel is commonly used. In grasslands, fuel height should be maintained below 10 centimetres.	
Vegetation	getation Any trees and shrubs should be maintained in such a manner that the vegetation is	
Requirements	not continuous.	
Maintenance	This Area should be regularly mowed and all excess fuels should be removed e.g. fallen branches, leaf build-up.	

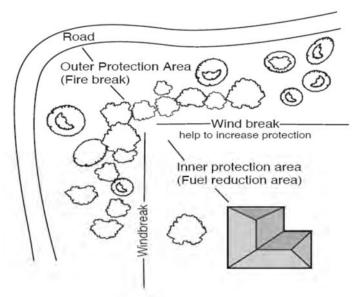
The RFS has also developed "Standards for Asset Protection Zones" which should be consulted for APZ specifications. Standards for Asset Protection Zones can be downloaded from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf



A.2 Landscaping and Property Maintenance

A.2.1 Landscaping Features & Principles

Bushland vegetation provides the fuel which feeds wildfires; however, by providing adequate



separation distance between the bush and buildings will effectively prevent the spread of bushfire. Still vegetation is not always the foe when it comes to bushfires and it is possible to use managed vegetation as a tool to reduce fire risk. According to many practitioners and researchers (Ramsay & Rudolph 2006; CFA 2004; RFS 2006; Queensland Government 2000; RFS undated), a well-designed garden can reduce bushfire hazard near buildings. In summary, homes and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time.

Figure 1A. Example of landscaped design

aimed at minimising the impact of fire. Source RFS (undated)

According to the RFS (undated), this can be achieved by providing an effective Asset Protection Zone (APZ), which incorporates features such as fire-resistant plants, radiant heat barriers and windbreaks in the landscape layout as shown on Fig. 1A. The key features required when using landscaping as tool to reduce bushfire risk are summarised as follows (Ramsay & Rudolph 2006; RFS undated; RFS 2006):

- Plants with low flammability are selected (eg. broad leaves with high moisture and mineral content, smooth-trunk species with high branches, etc.)
- Vegetation does not provide a continuous path to the house
- Vegetation is located far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission
- Planted (or cleared) vegetation is into clumps rather than continuous rows
- Planted or retained species possesses attributes which makes them a good barrier against bushfire and wind attack
- Low branches are pruned two metres from the ground to prevent a ground fire from spreading into trees
- Lawn is planted and maintained around the future dwellings as this will slow the fire and reduce fire intensity. Alternatively, non-flammable pathways directly around the dwelling are provided
- Shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non-flammable ground cover such as pebbles and crush tile
- Brush type fencing and planting "pencil pine" type trees next to buildings are avoided, as these are highly flammable.

Therefore, the features noted above and the principles listed in the following section should be applied to the landscaping and property maintenance for future dwellings.



A.2.2 Vegetation Management

Vegetation management is the responsibility of individual landowners and should, as per PBP, include:

- Maintaining a low cut lawn;
- Keeping areas around the garden free of fuel;
- Utilising non-combustible fencing materials;
- Breaking up tree and shrub canopies by defining garden beds;
- Using non-flammable mulch;
- Ensuring tree branches do not overhang roofs;
- Ensuring tree canopies are not continuous; and
- Installing windbreaks in the direction from which fires are likely to approach.

A.2.3 Property Maintenance

Property maintenance should, as per PBP, include:

- Removal of material such as litter from the roof and gutters;
- Ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- Check pumps and water supplies are available and in working order;
- Driveways are in good condition with trees not being too close and forming an obstacle during smoky conditions;
- Check tiles and roof lines for broken tiles or dislodged roofing materials;
- Screens on windows and doors are in good condition without breaks or holes in flyscreen material and frames are well fitting into sills and window frames;
- Drenching or spray systems are regularly tested before the commencement of the fire season;
- Hoses and hose reels are not perished and fittings are tight and in good order;
- Doors are fitted with draught seals and well maintained;
- Mats are of non-combustible material or in areas of low potential exposure; Woodpiles, garden sheds and other combustible materials are located downslope and well away from the house; and
- Trees and other vegetation in the vicinity of power lines and tower lines should be managed and trimmed in accordance with the specifications in "Vegetation Safety Clearances" issued by Energy Australia (NS179 April 2002).



Land Use Conflict Risk Assessment

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



HEALTH SCIENCE ENVIROMENTAL 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

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 runoff.

APPENDIX 6 - LAND USE CONFLICT RISK ASSESSMENT

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	 Farming equipment, pumps, spray machines, transport. Ancillary equipment associated with on-farm processing.
Odour	Fertilisers and chemicals.
Health concerns	Chemicals.Spray drift.
Water	Access.Pumping.Quantity.Runoff, sedimentation
Smoke and ash	 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



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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:
 - o 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

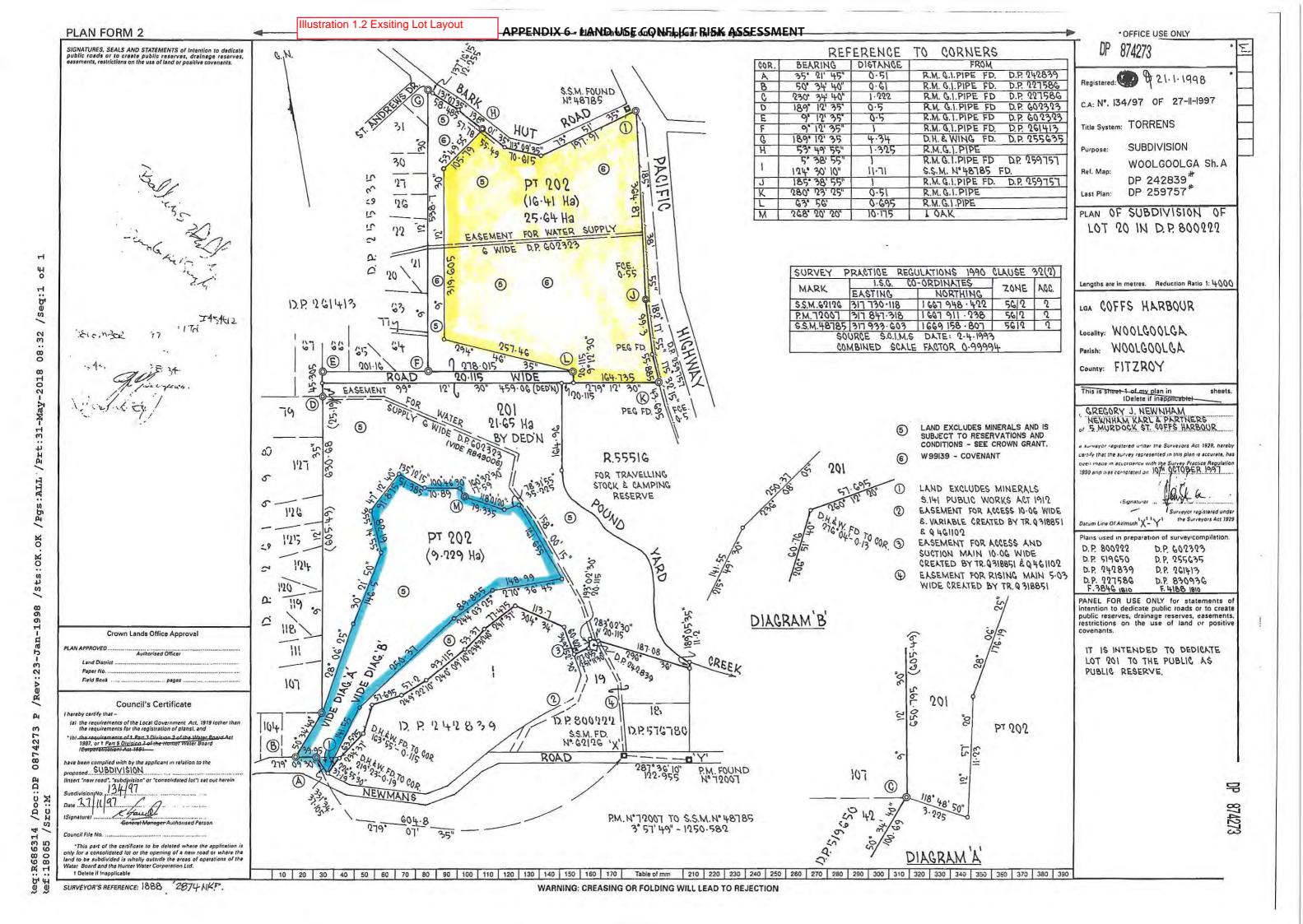
• Record each activity on the risk assessment matrix, and identify the level of risk of a land use conflict arising from the activity.

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



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).

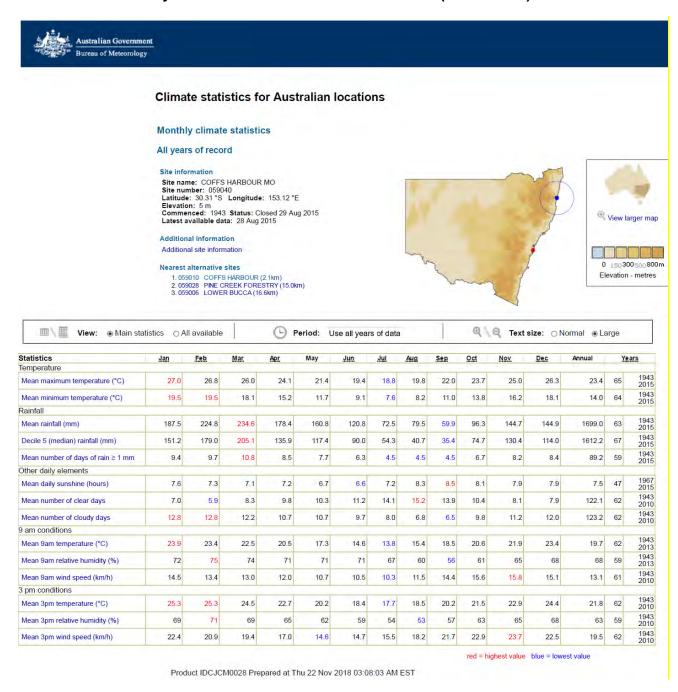
Rainfall is mainly distributed throughout November to May with 1,121 mm (72%) of the mean annual rainfall of 1563 mm falling during this period. The highest monthly rainfall occurs in February/March while the months July-October are much drier, generally receiving less than 100 mm each.

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)



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.

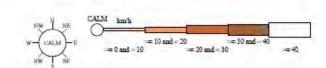
Rose of Wind direction versus Wind speed in km/h (01 Feb 1943 to 24 Aug 2015)

Custom times selected, refer to attached note for details

COFFS HARBOUR MO

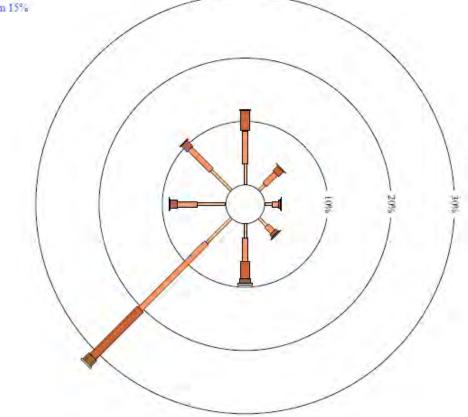
Site No: 059040 • Opened Jan 1943 • Closed Aug 2015 • Latitude: -30.3107* • Longitude: 153.1187* • Elevation 5m

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%





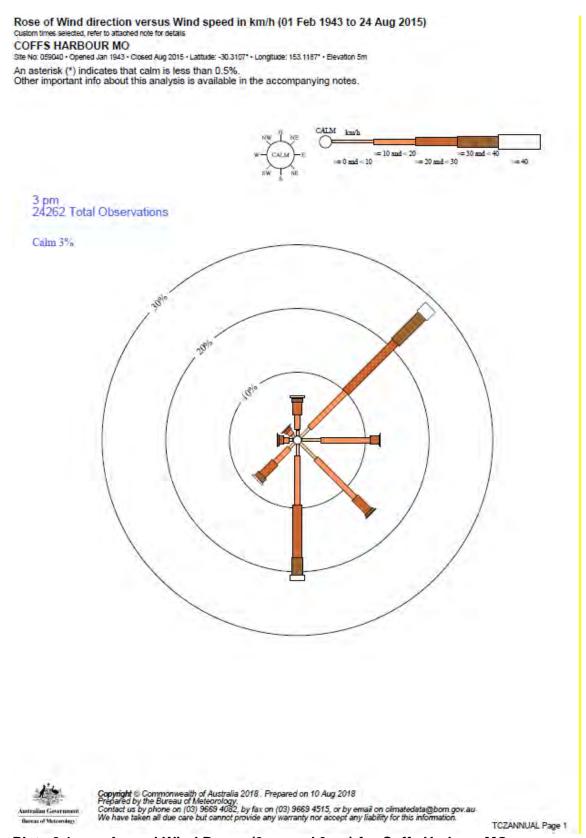


Plate 2.1 Annual Wind Roses (9am and 3pm) for Coffs Harbour MO

Source: Bureau of Meteorology

Illustration 2.1



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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 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.

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 singe 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.

- 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.
- 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 Cyprodinil + Fludioxonil Switch) PER13630 OR Boscalid + Pyroclostrobin (Pristine) PER82986 OR Copper PER14132 Qld only (under direction of permit holder)	M4 9,12 7,11	1 7 (Aust. only) 3	Botrytis control sprays will also control Anthracnose. If rain is forecast and fruit is present apply additional sprays. Captan is preferable close to harvest due to its short WHP. 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. Apply at the first sign of rust to leaves, flowers or fruit, beginning in December.
Blueberry rust	Chlorothalonil PER14309 OR Propiconazole (Tilt) PER14740 OR Mancozeb PER13958 OR Boscalid + Pyroclostrobin (Pristine) PER82986 OR Dithianon PER82601	M5 3 M3 7,11 M9	28 3 7 3 21	Use preventatively when conditions favour the disease. If sending fruit with ICA31, apply Pristine or Propiconazole or Dithane every 14 days from fruit set to harvest. 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			Do not spray more than two consecutive sprays from the same
	PER13955			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.
	Spinetoram OR			
Budworms (Heliothis,	Methomyl PER14134 (Methomyl is registered on label for blueberries in NSW and WA but a permit is required for QLD) OR	G5 A1	1 5	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.
Helicoverpa)	Helicoverpa NPV OR	NA 28	3	DO NOT apply more than three (3)
	Chloranthraniliprole			applications per crop, with a minimum re-treatment interval of 7 days between sprays
	PER84178			
Downy mildew	Mancozeb PER13958 OR Chlorothalonill 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.
	Spinetoram OR			Isomate mating disruption lures are used in the orchard at 500/ha to confuse LBAM males. Delta traps can
	Methoxyfenozide (Prodigy)			be used to monitor numbers. The insect is present when young leaves show
Light brown apple moth	OR Indoxacarb PER13289 OR	G5 G18	1 7	folding and webbing is observed around terminal clusters.
(LBAM)	Bacillus thuringiensis OR	22A 11 28	1 Nil 3	Do not apply Indoxacarb if bees are foraging.
	Chloranthraniliprole			DO NOT apply more than three (3)
	PER84178			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) Painted apple moth larvae	Methomyl PER14134 (Methomyl is registered on label for blueberries in NSW and WA but a permit is required for QLD) OR Pyrethrin PER80070 Yates Nature's Way Caterpillar Killer Bacillus thuringiensis var. kurstaki is the only control registered in	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 retreatment interval of 1-2 days. Apply when chewing damage is first observed. Controls caterpillars on herbs, fruits,
Phytophthora root rot	Australia Phosphonic acid (Agrifos, Phospot) PER13958 OR Metalaxyl (Ridomil) PER13958	33 4	Not required when used as directed	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 acetoxyphenyl-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

	Chlorpyrifos PER82002 OR Chloranthraniliprole		Not required when used as	maximum of three cover sprays/season. Can be used as a cover spray with a maximum of four applications/ season. No more than 12 applications in a season. A grid system of 16 Amulet® PER13785 fly lures/hectare gives good control in conjunction with monitoring traps, baiting and good crop hygiene.
Scarab beetles	PER81063 (NSW and TAS only) OR Clothianidin (Sumitomo Samurai) PER81063 (NSW and TAS only) OR Imidacloprid PER12534	1B 28 4A 4A	14 Not required when used as directed	and move into mounds from the grassed inter row. Place pellets in bottom of planting hole and mix in well. Retreat if necessary in autumn and spring.
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	Diazinon OR Paraffinic oil OR Petroleum oil OR Spirotetramat	1B 23	14 7	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. Do not spray petroleum spray oil (PSO) if leaf temperatures are over 26 °C. Make a maximum of three (3) applications per season, at a minimum 14-day retreatment interval.

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	0ct	Nov	Dec	Jan	Feb	Mar
African black beetle												
Anthracnose												
Aphids												
Botrytis flower blight												
Budworms (Helicoverpa previously Heliothis)												
Caterpillars												
Common garden snail												
Corn earworm (Helicoverpa previously Heliothis)												
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						1						
Plague thrips												
Painted apple moth (hairy)												
Queensland fruit fly												
Rust						-					1	
Scale (wax) insects												
Scarab beetle												
Septoria leaf spot					-							
Slugs												
Spider (red) mites												
Spur blight												
Thrips												
Western flower thrip	l'											

(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	6	Imidacloprid (Confidor®)	contact and stomach insecticide applied through drippers		
Anthracnose	0	Captan	protectant fungicide		
	0	Cyprodinil + fludioxonil (Switch®)	fungicide with protectant and some curative action		
	0	Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action		
	0	Copper oxychloride	protectant fungicide		
Aphids	0	Pirimicarb	stomach action		
	0	Horticultural mineral oil	insecticide and miticide		
Botrytis flower blight	0	Chlorothalonil	protectant fungicide		
	0	Pyrimethanil (Scala®)	fungicide with protectant and some curative action		
	0	Captan	protectant fungicide		
	0	Cyprodinil + fludioxonil (Switch*)	fungicide with protectant and some curative action		
	0	Iprodione	fungicide with protectant and some curative action		
	0	Sulfur dioxide			
	0	Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action		
Budworms	0	Spinetoram	insecticide with contact and stomach action		
(Heliothis, Helicoverpa)		Methomyl	systemic insecticide with contact and stomach action		
Caterpillars	6	Methomyl	systemic insecticide with contact and stomach action		
	0	Bacillus thuringiensis	biological control-stomach poison		
Common garden snail	0	Methiocarb snail bait	molluscicide acts as a physical barrier		
Corn earworm	0	Spinetoram	insecticide with contact action		
(Heliothis, Helicoverpa)	8	Methornyl	systemic insecticide with contact and stomach action		
Downy mildew	0	Chlorothalonil	protectant fungicide		
	0	Mancozeb	protectant fungicide		
Dried fruit beetles	0	Carpophilus lure and trap system	used as lure to attract insects to trap.		
(Carpophilus)	0	Mancozeb	protectant fungicide		
Elephant weevil	6	Indoxacarb (Avatar®)	insecticide with both contact and stomach action on larvae		
	0	Bifenthrin	contact insecticide		
European wasp	0	Permethrin (bait only)	contact insecticide for use on dusted baits		
Grey mould (Botrytis)	0	Chlorothalonil	protectant fungicide		
	0	Pyrimethanil (Scala®)	fungicide with protectant and some curative action		
	0	Captan	protectant fungicide		
	0	Cyprodinil + fludioxonil (Switch®)	fungicide with protectant and some curative action		
	0	Iprodione	fungicide with protectant and some curative action		
	0	Sulfur dioxide infruta pads	fungicide with vapour action		
	0	Boscalid+ Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action		

For managing		Pesticide common name (trade name) ²	Comment ³
Lesser Queensland fruit fly	6	Dimethoate	contact insecticide with larvicidal and ovicidal activity
	6	Maldison	contact insecticide with stomach and respiratory action
	6	Trichlorfon	insecticide and acaricide with contact and stomach action
	2	Spinetoram	insecticide with contact action
	6	Abamectin	acaricide with stomach action and translaminar movement
Light brown apple moth	2	Spinetoram	insecticide with contact action
(LBAM)	0	Methoxyfenozide (Prodigy®)	insecticide with contact action
	2	Indoxacarb(Avatar®)	insecticide with both contact and stomach action on larvae
	6	Azinphos methyl	insecticide with contact and stomach action, moderate persistence
	0	Bacillus thuringiensis	biological control-stomach poison
Mites	0	Bifenazate Acramite®	acaricide with contact and residual activity
Monolepta beetle	0	Methomyl	systemic insecticide with contact and stomach action
	0	Pyrethrin Pyganic®	contact insecticide
Phytophthora root rot	0	Metalaxyl (Ridomil®)	protectant fungicide with slow release activity
	0	Phosphonic acid	protectant fungicide
Plague thrips	6	Methomyl	systemic insecticide with contact and stomach action
Painted apple moth (hairy)	0	Bacillus thuringiensis	biological control-stomach poison
Queensland fruit fly	6	Dimethoate	contact insecticide with larvicidal and ovicidal activity
	6	Maldison	contact insecticide with stomach and respiratory action
	6	Trichlorfon	insecticide and acaricide with contact and stomach action
	0	Spinetoram	insecticide with contact action
	0	Abamectin used in conjunction with protein yeast attractant	contact insecticide with stomach and respiratory action
	0	Acetoxy-phenyl-butanone Amulet lures	contact insecticide impregnated into baits
	0	Fipronil (Amulet cue lure®)	contact insecticide impregnated into baits and gel powder in yeast mixture
Rust	0	Mancozeb	protectant fungicide
	6	Propiconazole (Tilt®)	systemic fungicide with protectant and curative action
	0	Boscalid + Pyroclostrobin (Pristine®)	fungicide with protectant and some curative action
	2	Chlorothalonil	protectant fungicide
Scale (wax)	6	Diazinon	insecticide with contact, stomach and respiratory action
	0	Horticultural mineral oil	insecticide and miticide
Scarab beetles	6	Imidacloprid	systemic insecticide applied by dripper to plant root systems
	0	Chlorpyrifos	contact insecticide with stomach and respiratory action
	0	Chloranthraniliprole	insecticide interrupts normal muscle contraction
Septoria leaf spot	0	Chlorothalonil	protectant fungicide
Slugs	6	Copper as complex Kendon Escar-Go®	protectant molluscicide
Spider (red) mites	6	Bifenazate	acaricide with contact and residual activity
Spur blight	6	Captan	protectant fungicide
Thrips	6	Methomyl	systemic insecticide with contact and stomach action
	6	Bifenthrin	contact insecticide
Western flower thrip (WFT)	0	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.

- 💶 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 tyro 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	 Severe and/or permanent damage to the environment Irreversible with management 	 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	 Serious and/or long-term impact to the environment Long-term management implications 	 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	 Moderate and/or medium-term impact to the environment Some ongoing management implications 	 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	 Minor and/or short- term impact to the environment Can be effectively managed as part of normal operations 	 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	 Very minor impact to the environment Can be effectively managed as part of normal operations 	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
Α	Almost certain	Common or repeating occurrence
В	Likely	Known to occur, or 'it has happened'
С	Possible	Could occur, or 'I've heard of it happening'
D	Unlikely	Could occur in some circumstances, but not likely to occur
Е	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	Α	В	С	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	 The closest point of the subject site is approximately 12m to the blueberry farm on Lot 1 DP808207 to the north Default Buffer distances to Residential development: 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

·	T	T
Exposure	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)	Low - Moderate
	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. 	
Run-on and Upslope Seepage Site Drainage and Water pollution	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.	Negligible
•	The catchments are separated by Bart Hart Road.	
	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.	
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.	Major
Odour	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.	Major
Noise	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.	Low to negligible
Dust	The main sources of dust from a blueberry farm include cultivation prior to planting, tractor and transport movements.	Low to Moderate
	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	

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
Use of Agricultural/ Horticultural Sprays	Health and Safety Spray drift from an application of agricultural chemicals has the potential to adversely affect the health and safety of persons in nontargeted areas.	C3 = 13 Unacceptable	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. 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.	C4 = 8 Acceptable

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 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.

- 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*.

1- Myso

Tim FitzroyEnvironmental Health Scientist
Environmental Auditor



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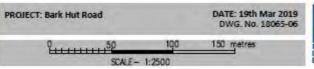
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A Concept Masterplan











CONCEPTUAL MASTER PLAN INDICATIVE ONLY

PT.LOT 201 DP 874273

A

B Photographs



Photo A Subject Site Looking South



Photo B Blue Berry Farm looking East

APPENDIX 6 - LAND USE CONFLICT RISK ASSESSMENT



Photo C Blueberry Farm Looking North west



Photo D Subject Site Looing East

February 2018

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: <u>info@everick.com.au</u>

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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 Are 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 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.
- 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 entre 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). 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 Are 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 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.

- 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 entre 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 <u>Aboriginal</u> 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 <u>Aboriginal remains</u>.

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.

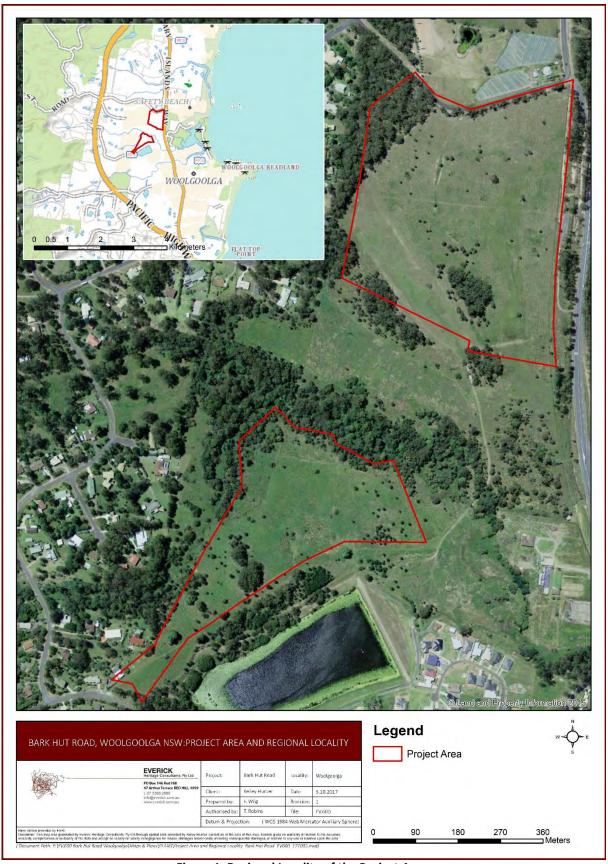


Figure 1: Regional Locality of the Project Area.



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 OEH. Approval from the OEH 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, costeaning 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-girrwaa 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

Site Number	Name	Easting	Northing	Site 'Features'
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.

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.

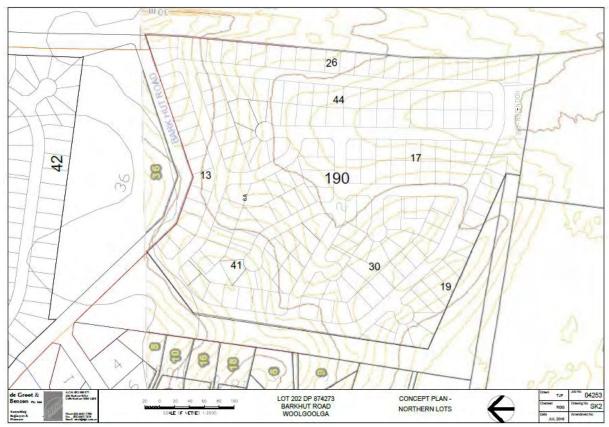


Figure 6: Lot Layout and contour map- Northern section.

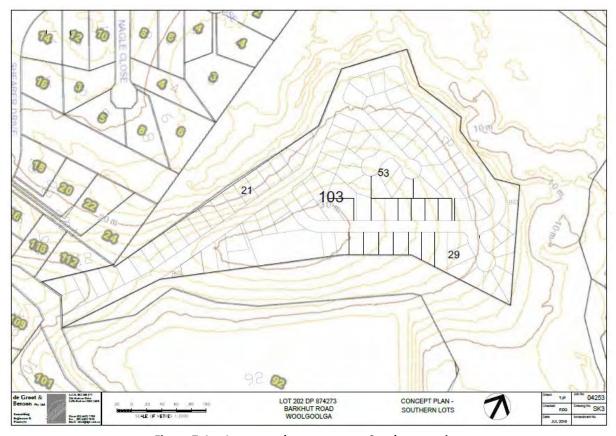


Figure 7: Lot Layout and contour map- Southern section.

6. ARCHAEOLOGICAL SYNTHESIS AND PREDICTIONS

6.1 European History of the Coffs Harbour Area.

The first historical documents relating to the Woolgoogla 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 Maclaey) 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 ethnohistorical 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 Hearnes 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-Hearnes RD Lot 21 Ridge Site) which is immediately adjacent to the coastline/ Hearnes Lake entrance.

Two archaeological assessments were undertaken for the 'Woopi Beach Estate' residential development which comprised the area of the Hearnes Lake 1 site (Hill et al 2015a, 2015b). These studies confirmed the extent of the Hearnes Lake 1 site as being the ridge crest as originally mapped by Collins (2004). Artefacts identified at Hearnes 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 (Hearnes 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 subcoastal 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 schlerophyll 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 podozolic 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 though 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 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.

Survey Unit	Environmental Description	Ground Disturbance Summary
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 (m²)	Visibility (%)	Exposure (%)	Effective Coverage Area (m²)	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 (m²)	Area Effectively surveyed (m²)	% 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 Are 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 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.
- 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 entre 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

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

Site Name	Type of Harm	Degree of Harm	Consequence of Harm
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

NSW	Office of Environment & AHIMS Web Services (AWS) Extensive search - Site list report									Cale State	Your Ref/PO Number : Bark Hut Road Client Service ID : 261963	
SiteID 22-1-0152	SiteName C1_Poundyard Ck		AGD Recorders	Zone 56	Easting 517710	6669940	Context Open site	Site Status Valld	SiteFeatures Aboriginal Resource and Gathering:-, Artefact:3 Permits	SiteTypes	Reports 102143,10241 9	
22-1-0408	West Woolgoelga Spor	rts Field	GDA Recorders	56	THE RESERVE AND ADDRESS OF THE PARTY OF THE	6669964	Open site	Valid	Artefact: 2	3613		

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

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

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Yours faithfully,

Tim Robins

Director/Archaeologist

02 November 2017 Our Ref: EV.600

Garlambirla Guuyu-girrwaa 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

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Yours faithfully,

Tim Robins

Director/Archaeologist

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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forward to hearing from you.

Yours faithfully,

Tim Robins

Director/Archaeologist

02 November 2017 Our Ref: EV.600

Bagawa Birra Murri Aboriginal Corporation Susan Hoskins 31 Soren Larson Crescent

Dear Susan,

BOAMBEE EAST NSW 2452

RE: ABORIGINAL CULTURAL HERITAGE ASSESSMENT/ABORIGINAL HERITAGE IMPACT PERMIT

LOT 202 DP874273, WOOLGOOLGA, NSW

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Yours faithfully,

Tim Robins

Director/Archaeologist

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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forward to hearing from you.

Yours faithfully,

Tim Robins

Director/Archaeologist

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

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Yours faithfully,

Tim Robins

Director/Archaeologist

02 November 2017 Our Ref: EV.600

Muurrbay 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

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Yours faithfully,

Tim Robins

Director/Archaeologist

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

02 November 2017 Our Ref: EV.600

Cultural Heritage Officer Gumbaynggirr Elders PO Box 400 NAMBUCCA HEADS NSW2448

To the nominated Cultural Heritage Officer,

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Yours faithfully,

Tim Robins

Director/Archaeologist

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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Director/Archaeologist Everick Heritage Consultants

02 November 2017 Our Ref: EV.600

Norm Archibald 17 Flobern Ave WAUCHOPE NSW 2446

Dear Norm,

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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

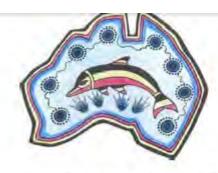
Project Officer Culture & Heritage CH&D LALC 2-3 Wongala Drive, Wongala Estate PO Box 6150

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 cortext 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.

lan 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.

lan 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

lan 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.

lan 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.

lan 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.

lan 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.

In 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 Hearnes 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.)

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: <u>simone@jagunagedcare.com.au</u>
Website: <u>www.jagunagedcare.com.au</u>



Bark Hut Road Ecological Assessment

Final Report August 2018

Keiley Hunter Urban Planner





Glossary, acronyms and abbreviations

BC Act Biodiversity Conservation Act 2016

APZ Asset Protection Zone

BC Act Biodiversity Conservation Act 2016

CHCC Coffs Harbour City Council

CHLC Coffs Harbour Landscape Corridors

CKPoM Comprehensive Koala Plan of Management

CZMP Coastal Zone Management Plan

DCP Development Control Plan

EEC Endangered ecological community

EPBC Act Environment Protection and Biodiversity Conservation Act 1999

HVH High valued habitat

LEP Local Environment Plan

OEH Office of Environment and Heritage

PCT Plant community type

SAT Spot assessment technique

TEC Threatened Ecological Community

TSC Act Threatened Species Conservation Act 1995

VMP Vegetation Management Plan



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1 Introduction

1.1 Overview

Keiley Hunter Urban Planner engaged Ecosure Pty Ltd (Ecosure) to conduct an ecological assessment of Lot 202 DP874273 (the site), being two parcels of land in Woolgoolga, west of the Pacific Highway, 30 km north of Coffs Harbour, New South Wales. The northern precinct of the land borders Bark Hut Road (16.41 ha) while the southern precinct borders Newmans Road (9.23 ha) (Figure 1). The assessment is necessary in order to meet state and local government requirements for a re-zoning application for the subject land. The concept design for the preliminary proposal for re-zoning is provided as Appendix 1.

The Biodiversity Conservation Act 2016 (BC Act) commenced on 25 August 2017 with transitional provisions until 25 November 2017. Under Part 7 of the BC Act (Savings and Transitional) Regulation 2017, Council can assess DAs under the former planning provisions. Accordingly, this report has been prepared in accordance with the threatened species impact assessment requirements under Section 94 of the Threatened Species Conservation Act 1995 (TSC Act).

The project scope included:

- a literature review which included findings from the constraints analysis (Ecosure 2016a), recommendations from the Northern Councils Review of Environmental Zonings (DPE 2015), and relevant Coffs Harbour City Council (CHCC) Local Environment Plan (LEP), Development Control Plan (DCP), policies and guidelines
- an assessment of fauna habitat particularly for threatened fauna species likely to occur based on findings from the constraints analysis (including identification of landscape features such as dry slopes and wet areas, features that could provide habitat including dead wood and dead trees, identification of hollow-bearing trees, searches for distinctive scats and scratches on trees, and identification of nests and assessment of culverts and drainage lines)
- a modified koala Spot Assessment Technique (SAT) survey targeting primary koala feed trees if they occur on-site and a review of mapped koala habitat including the consideration of Council's Comprehensive Koala Plan of Management (CKPoM)
- a flora assessment that ground-truthed vegetation communities in accordance with NSW Plant Community Types (PCTs) and Council's fine scale vegetation mapping (OEH 2012a).
- a targeted search for threatened flora species identified as potentially occurring on the site
- detailed mapping identifying potential E3 Environmental Management zoned land



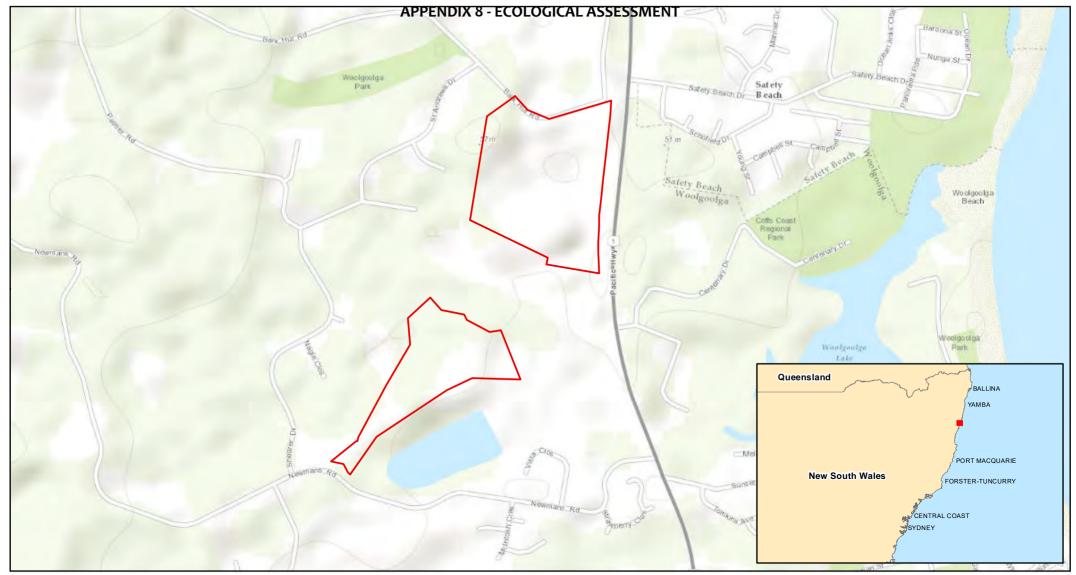
an assessment of potential habitat linkages associated with the subject area

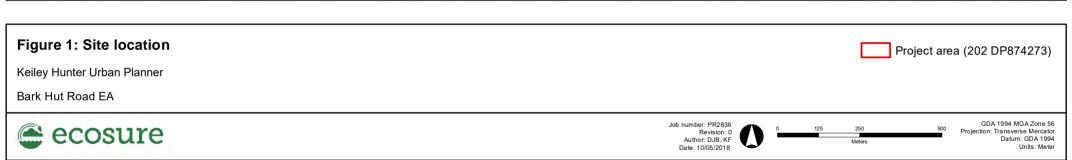
1.2 Site description

The subject area falls within the North Coast Bioregion and the Coffs Coast and Escarpment Interim Biogeographic Regionalisation of Australia sub-region. The eastern boundary is located approximately 1 km from the eastern seaboard and would be influenced by the maritime environment depending on wind direction and speed. The land is gently sloping, rarely exceeding 10 degrees. There are no major landscape features associated with the site, such as karst, caves, crevices, cliffs and areas of geological significance.

The project area is mostly cleared with scattered patches of vegetation. Small patches of dry sclerophyll forest are present in both the northern and southern precincts with wet sclerophyll forest only present in the southern precinct. Poundyard Creek flows just to the north of the southern precinct (Figure 1) although the stream and its banks fall outside the lot boundaries of the subject area.

Throughout the remainder of this report the two study areas are referred to as the southern and northern precincts. They are geographically separated by Poundyard Creek and council owned land currently being developed for the purposes of a community sports field. The western boundary of the northern precinct is bounded by Solitary Islands Way (old Pacific Highway) while the entry to the southern precinct adjoins Newmans Road as part of west Woolgoolga.







2 Methods

Literature review 2.1

The following information was reviewed:

- previous reports including Bark Hut Road Planning Proposal-Environmental Investigation Report (Ecosure 2016a) and Bark Hut Road Lesser Swamp-orchid (Ecosure 2016b)
- relevant biodiversity databases (i.e. NSW BioNet and the EPBC Act Protected Matters Search) for flora and fauna records
- vegetation community mapping data (OEH 2012a)
- plant community types (OEH 2017) and fine-scale vegetation mapping (OEH 2012b)
- preliminary layout design plan (Appendix 1)
- review of relevant legislation, plans and policies including relevant sections of the CHCC LEP (CHCC 2013) and the Coffs Harbour Comprehensive Koala Plan of Management (CHCC 1999).
- review of Landscape Corridors of the Coffs Harbour Local Government Area (CHCC 2015)
- Northern beaches kangaroo management plan (CHCC 2017)
- Woolgoolga Lake Estuary Coastal Zone Management Plan (GeoLink 2013).

2.2 Flora assessment

Flora surveys were undertaken in the northern precinct on the 25th September 2017 and 9th October and in the southern precinct on 3rd November 2017. Sampling of the site involved the "random meander" transect method (Cropper 1993) and targeted sampling within each mapped vegetation community area. Mapped vegetation communities were ground truthed and dominant species within each vegetation patch were assessed and matched to NSW Office of Environment and Heritage (OEH) PCTs. Vegetation was also matched against vegetation community profiles within the Development of a Fine-scale vegetation map for the Coffs Harbour local government area volume 2: vegetation community profiles (OEH 2012b).

A GPS enabled digital tablet was used to compare the location of existing mapped ecosystems to the communities occurring in the field. Where differences between mapped and actual ecosystems were observed, the ground truthed communities were mapped and used to produce an updated vegetation communities map. Targeted searches for threatened flora species within each vegetation community were undertaken.

The areas that did not contain native vegetation (i.e. land not included in native vegetation extent) required no further assessment.



2.3 Fauna habitat assessment including modified SAT

Fauna habitat and opportunistic fauna sightings were recorded within and adjacent to the site as follows:

- Opportunistic fauna sightings were recorded throughout the day.
- Targeted assessments for threatened fauna and associated fauna habitat were undertaken with a particular focus on koala feed tree species and hollow-bearing trees.
- Modified SAT surveys were conducted in areas of remnant vegetation in the northern and southern precincts. For each area, 25 trees were surveyed for a period of two minutes per tree to determine presence/absence of koala scat.
- Populations of the eastern kangaroo (Macropus giganteus) were estimated in the southern and northern precincts.

2.4 Bushfire threat analysis

The proposed design layout (Appendix 1) was reviewed to determine potential location of infrastructure including roads and building envelopes. Vegetation and slope were inspected on 25th September to make a preliminary determination of bushfire threat associated with the proposed layout design.

The vegetation assessment associated with this report will be used to inform a comprehensive bushfire report being prepared by Holiday Coast Bushfire Solutions.



3 Results

3.1 Literature review

Various reports, databases, and maps were reviewed to gain an understanding of the characteristics of the site and potential environmental constraints.

Previous reports

Findings from the desktop constraints analysis (Ecosure 2016a) and the targeted survey for the southern swamp-orchid (*Phaius australis*) (Ecosure 2016b) identified the following:

- the majority of the site is considered to be of low ecological value. An area in the north and northwestern part of the southern precinct is considered of high ecological value
- patches of vegetation scattered throughout both parcels are considered of medium ecological value
- secondary and tertiary koala habitat is mapped on the site
- riparian areas and areas of high ecological value should be retained.

A summary of potential environmental constraints was provided and indicated that no high valued habitats have been mapped on the site (Ecosure 2016a) (Table 1).

Table 1 Potential environmental constraints (only those applicable to the site have been included)

Operational Layer	Result		Details	
Coffs Harbour City LEP 2013	Natural resource waterways	n/a	Drainage line associated with Poundyard Creek flows to the north of the southern precinct of Lot 20 2DP874273	
	Land zoning	RU2	Rural landscape	
	Potential Acid Sulphate Soils	Class 4 Class 3	Northern precinct - south east corner Southern precinct - northern tip Southern precinct – along northern border	
Constraints	Acid Sulphate Soils	Class 5 Class 4	Northern and southern precincts Southern precinct - north western tip	
	Koala Habitat	Secondary	Northern and southern precincts contain some patches	
		Tertiary	Northern precinct – a patch in the north west and in the southern end	
	SEPP71 Coastal Policy	yes	Relevant to both northern and southern precincts	
Bushfire prone Fire Prone Vegetation Categories		Category 1	Northern precinct Tip of southern precinct	
		Category 2	Northern precinct	
	Fire Prone Vegetation	30m buffer	Northern precinct	
	Buffers	100m buffer	Northern and southern precincts	



Operational Layer	Result		Details	
Flooding information	Flood planning area	Yes	Northern precinct – south east Southern precinct – northern tip	
	AEP flood extents	Yes	Southern precinct – along northern border	
Scale Vegetation	Dry sclerophyll forests	Yes	Northern precinct (CH_DOF05)	
Mapping	Remnant native vegetation	Yes	Northern precinct (CH_NRV01) Southern precinct (CH_NRV01)	
	Wet sclerophyll forests	Yes	Southern precinct (CH_WSF01)	
High Valued Habitats (HVH)	Endangered ecological communities (EECs)	n/a	Likely EECs are mapped to occur within one (1) km of project area however no EEC are mapped to occur within the project area	

A targeted survey for the southern swamp-orchid, determined to potentially occur on the site, did not locate the species nor was any potential habitat for the species identified on the site (Ecosure 2016b). Vegetation mapping by OEH identifies four communities within the site (Figure 2).



NSW BioNet and EPBC Act Protected Matters Searches 3.2

A search of NSW BioNet records within 5 km of the site returned 47 species listed as threatened under the Biodiversity Conservation Act 2016 (BC Act), (Appendix 2). A 5 km Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters search returned 73 threatened species and 51 migratory species Appendix 3).

The EPBC search also returned three threatened ecological communities (TECs).

As the NSW BioNet search returns actual records of threatened species (while the EPBC Act Protected Matters Search returns all species possibly occurring), only the BioNet records have been included and discussed in relation to their likelihood of occurrence (Table 2 and Table 3). It should be noted that this analysis excludes species found in the ocean (e.g. whale, turtle, etc.) and marine dependent birds. Locations of threatened species records are mapped in Figure 3.

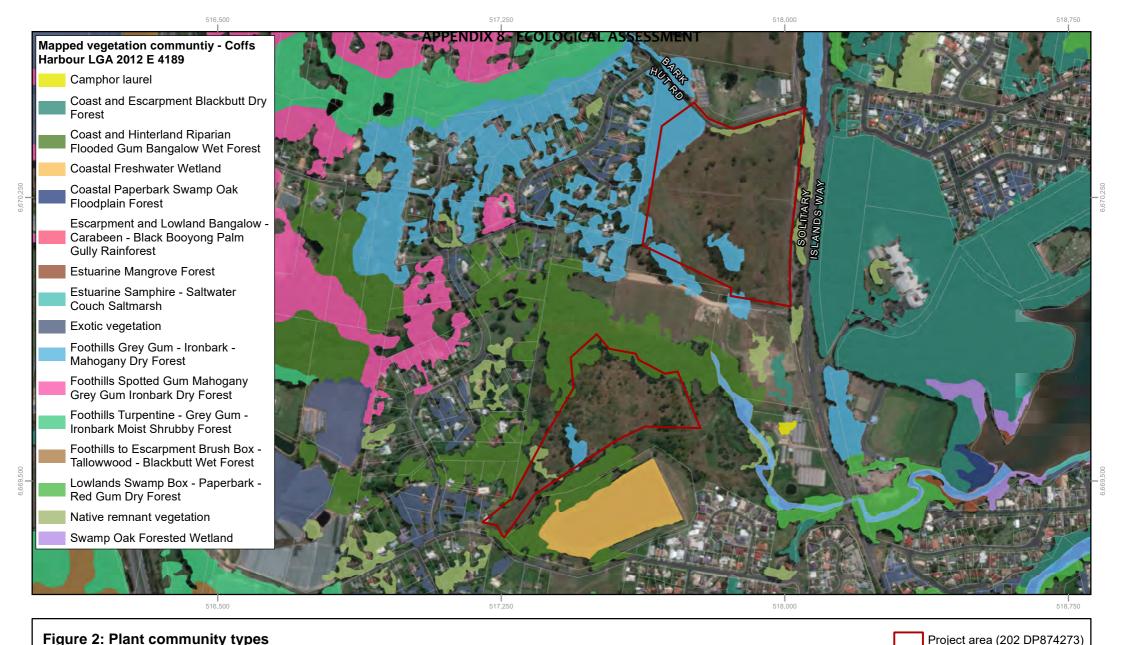


Figure 2: Plant community types

Keiley Hunter Urban Planner Bark Hut Rd EA





Property boundary

GDA 1994 MGA Zone 56 on: Transverse Mercator Datum: GDA 1994



Table 2 Likelihood of occurrence of threatened flora species recorded within 5 km of the site

Scientific name	Common name	EPBC Act status	BC Act status	Likelihood of occurrence	Potential site impacts
Hicksbeachia pinnatifolia	red boppel nut	V	V	Unlikely. Occurs in rainforest habitat which is not mapped within the site.	Very minimal, unlikely to occur within development footprint
Macadamia tetraphylla	rough-shelled bush nut	V	V	Unlikely. Occurs in rainforest habitat which is not mapped within the site.	Very minimal, unlikely to occur within development footprint
Marsdenia longiloba	slender marsdenia	V	E	Possible. Associated with vegetation community CH_WSF01 which is mapped to occur within the project area.	Minimal, species likely to occur outside the development footprint
Niemeyera whitei	rusty plum, plum boxwood		V	Possible. Associated with vegetation community CH_WSF01 which is mapped to occur within the project area. Despite a record in the northern precinct, targeted searches did not record this species.	
Phaius australis	southern swamp orchid	Е	E	Possible, but only in flood prone areas of Poundyard Creek. This species has been heavily impacted by illegal collection.	

Key: BC Act: E1 Endangered, P Protected, V Vulnerable

EPBC: E Endangered, V Vulnerable



Table 3 Likelihood of occurrence of threatened fauna species recorded within 5 km of the site

Class	Scientific name	Common name	EPBC Act status	BC Act status	Likelihood of occurrence	Potential site impacts
Amphibia	Mixophyes iteratus	giant barred frog	E	E1	Unlikely Found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Generally associated with deep leaf litter for shelter and foraging.	There are no permanent streams or creeks associated with either the southern or northern precincts so the proposal is very unlikely to have any impact on this frog. Surveys may locate this species in Poundyard Creek but appropriate sediment and erosion control measures will mitigate any impacts on the creek.
Birds	Ephippiorhynchus asiaticus	black-necked stork		E1	Unlikely. More likely associated with estuarine areas further to the east and large dam to the east of the southern precinct. There is a single record east of the southern precinct near the large council dam.	Negligible, there is no suitable habitat available for the black-necked stork.
Birds	Ardea ibis	cattle egret	C,J (migratory)		Possible. Occurs in tropical and temperate grasslands and woodlands which is mapped to occur within project area.	Negligible, there is no suitable habitat available for the cattle egret.
Birds	Hirundapus caudacutus	white-throated needletail	C,J,K		Possible. High flying species occurring in Australia only between late spring and early autumn. The species is unlikely to be recorded perching but may be seen above the subject site.	exclusively aerial in Australia over a wide
Birds	Stictonetta naevosa	freckled duck		V	estuarine areas further to the east and	Negligible, there is no suitable habitat available for the duck in either the northern or southern precinct although suitable waterbodies occur to the east of the site.
Birds	Ptilinopus magnificus	wompoo fruit-dove		V		Negligible, this dove generally prefers high quality habitat including rainforest, neither of which occurs on site.
Birds	Ixobrychus flavicollis	black bittern		V	estuarine areas further to the east and	Negligible, there is no suitable habitat available for the bittern in either the northern or southern precinct. Adjoining council land associated with Poundyard Creek may have some suitable habitat.



Class	Scientific name	Common name	EPBC Act status	BC Act status	Likelihood of occurrence	Potential site impacts
Birds	Haliaeetus leucogaster	white-bellied sea-eagle		V	Likely. Found in coastal habitats and may be flying over the project area.	The sea-eagle may be an itinerant visitor to the subject site as there are known nesting pairs further to the east along the coast, however, there are no large water bodies associated with the site which would provide suitable foraging habitat. Similarly, there are no large tree stags for nesting.
Birds	Lathamus discolor	swift parrot	CE	E	Possible. Occurs on the coast and inhabits dry sclerophyll eucalypt forest which is mapped to occur within project area.	
Birds	Grus rubicunda	brolga		V	Unlikely. Occurs in open grassland habitat including pasture which is mapped to occur within the project area.	Negligible, there is no suitable habitat available for the brolga in either the northern or southern precinct although suitable waterbodies occur to the east of the site.
Birds	Irediparra gallinacea	comb-crested jacana		V	estuarine areas further to the east and	Negligible, there is no suitable habitat available for the jacana in either the northern or southern precinct although suitable waterbodies occur to the east of the site.
Birds	Daphoenositta chrysoptera	varied sittella		V		All consolidated areas of remnant vegetation will be retained within both precincts, limiting any impact on the foraging resources of the sittella.
Birds	Calyptorhynchus lathami	glossy black-cockatoo		V	the coastline and is highly dependent on vegetation where <i>Allocasuarina</i> sp is	There are scattered <i>Allocasuarina sp.</i> throughout the north west sector of the northern precinct. No consolidated areas of habitat are proposed for removal as part of the development proposal. Additionally all remnant vegetation is proposed to be protected under an E3 zone.



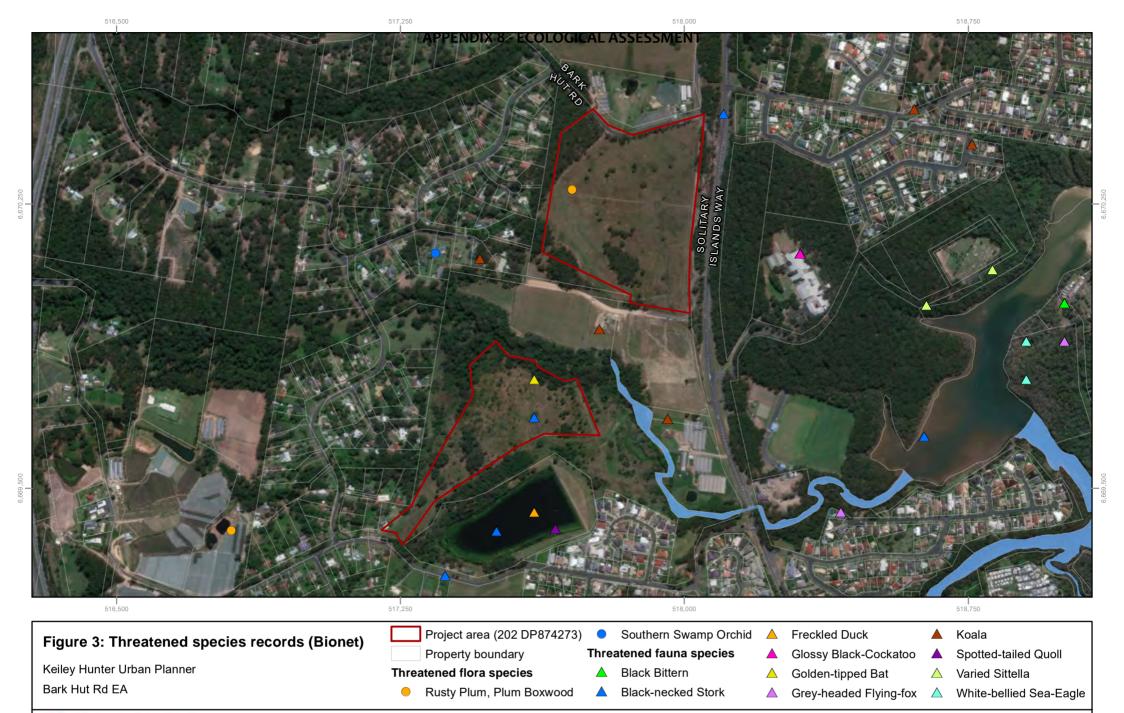
Class	Scientific name	Common name	EPBC Act status	BC Act status	Likelihood of occurrence	Potential site impacts
Birds	Pandion cristatus	eastern osprey		V	estuarine areas further to the east and	The osprey may be an itinerant visitor to the subject site as there are known nesting pairs further to the east along the coast, however, there are no large water bodies associated with the site which would provide suitable foraging habitat. Similarly, there are no large tree stags for nesting.
Birds	Ninox strenua	powerful owl		V	types including woodland and open sclerophyll forest to tall open wet forest	The powerful owl may utilise the site for foraging but there are no hollow-bearing trees suitable for breeding. All consolidated areas of remnant vegetation on the site are proposed to be protected under environmental zoning.
Mammals	Dasyurus maculatus	spotted-tailed quoll	E	V	species the quoll could find suitable foraging habitat in the remnant forest	Negligible, no consolidated areas of remnant vegetation are being removed as part of the proposal, however the species is wide ranging and falls in to the landscape species management stream. Quolls are likely to benefit from movement habitat linkages across the local area.
Mammals	Phascolarctos cinereus	koala	V	V	tertiary koala habitat mapped across the	There are three BioNet records associated with Poundyard Creek, this land is not part of the development footprint and is likely to continue to act as a movement corridor for koalas. All consolidated remnants of native vegetation, including primary koala food trees, are proposed to be protected on the development site under environmental zoning. The planting of primary koala food trees within the indicative habitat linkages, as part of the proposed VMP, will consolidate habitat resources for the koala.



Class	Scientific name	Common name	EPBC Act status	BC Act status	Likelihood of occurrence	Potential site impacts
Mammals	Pteropus poliocephalus	grey-headed flying-fox	V	V	forages in flowering trees of rainforests, eucalypts, paperbarks and banksias which	May utilise flowering eucalypts and paperbarks on a seasonal basis, A large flying fox camp located further east may increase the chances that habitat in the area is utilised by the grey headed flying fox. All consolidated areas of remnant vegetation on the site are proposed to be retained under environmental zoning.
Mammals	Kerivoula papuensis	golden-tipped bat		V	in dry eucalypt forest and wet sclerophyll	This bat may utilise the site for foraging but all consolidated areas of remnant vegetation on the site are proposed to be retained under environmental zoning.

Key: BC Act: E1 Endangered, V Vulnerable

EPBC: CE Critically endangered, E Endangered, V Vulnerable,



Transverse Mercator Datum: GDA 1994



3.3 Flora assessment

Appendix 4 lists flora species identified during field surveys. No threatened species were recorded. Ground-truthing of the PCT boundaries was confirmed to be correct and the PCTs matched the NSW BioNet Vegetation Classification, see Figure 2. These vegetation communities are also confirmed against the equivalent LGA fine-scale vegetation mapping (OEH 2012a).

3.3.1 Threatened flora

The desktop assessment identified five threatened flora species within 5 km of the site. A site survey targeting the southern swamp-orchid (Phaius australis), listed as endangered under both the EPBC Act and the 2016 BC Act, did not locate this species (Ecosure 2016b).

There is a single rusty plum record along the western boundary of the northern precinct, although this appears to be erroneous as the coordinates place the record in the middle of long since cleared land. Targeted searches did not locate this species in nearby remnant vegetation or anywhere else across the subject site.

Similarly, targeted searches did not detect the other three threatened flora species captured by the 5km BioNet search (slender marsdenia, red boppel nut and rough-shelled bush nut).



Plate 1. Remnant vegetation north west corner

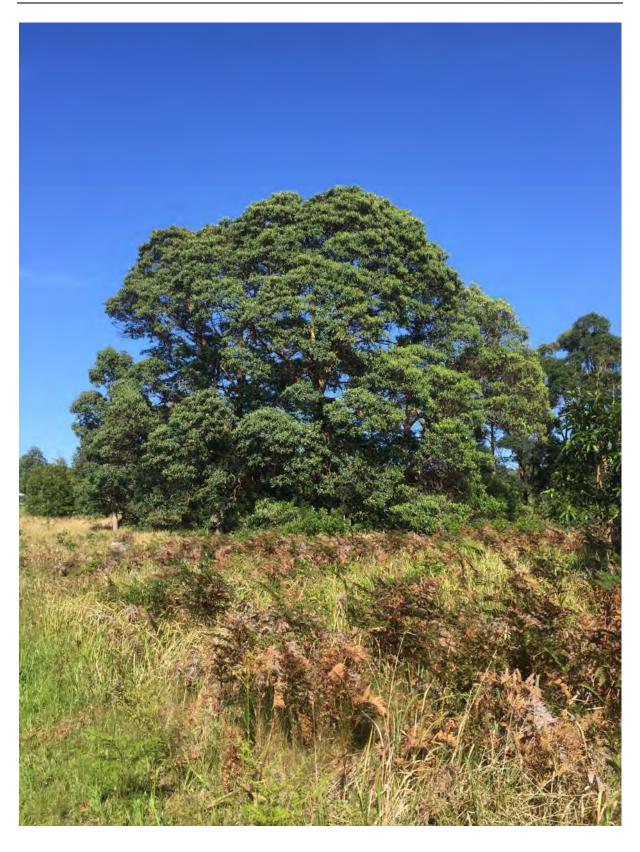


Plate 2. Isolated paddock tree (Brushbox)



3.3.1 Endangered ecological communities

The EPBC Act Protected Matters Search identified three listed TECs as likely to occur within the area. These are:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC listed as critically endangered under the EBPC Act. This community is analogous to Littoral Rainforest in the South East Corner, Sydney Basin and NSW North Coast Bioregions which is listed as a TEC under the BC Act.
- Lowland Rainforest of Subtropical Australia TEC listed as critically endangered under the EBPC Act. This community is analogous to Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions which is listed as a TEC under the BC Act.
- Subtropical and Temperate Coastal Saltmarsh TEC listed as vulnerable under the EPBC Act. This community is analogous to Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions which is listed as a TEC under the BC Act.

Ground truthing did not detect any of the EPBC Act listed TECs.

3.4 Fauna habitat assessment and modified SAT

Appendix 5 lists fauna species identified by timed bird surveys and opportunistic sightings. Forty-seven species of bird and one mammal (Eastern grey kangaroo) were observed. No threatened species were recorded.

Northern precinct

The northern precinct contains a linear drainage basin which terminates at a dam. The dam overflow leads to a culvert and eventually to the Council sports fields. This drainage has created an artificial wetland environment at its southern terminus before the water continues further south passing under a cement culvert.

In terms of fauna habitat the vegetation communities within the site boundaries are generally degraded as a result of either frequent slashing of the understorey or dense weedy undergrowth. Reduced slashing and/or grazing in the last few years has resulted in the regrowth of slash pine (Pinus elliotti) and groundsel bush (Baccharis halimifolia). There are good patches of remnant vegetation in the northwest and southern central areas although little deadwood remains on the ground.

There is minimal habitat for threatened arboreal wildlife and large forest owls with no significant large diameter hollow-bearing trees across the site. There are some isolated young eucalypt trees located in the lower level of the drainage line on the eastern side. A significant amount of branch decay from regular water inundation has resulted in some trees with small diameter hollows.



The site does provide marginal habitat as part of a larger connected network of linear vegetated strips across the local landscape. Given the site's proximity to urban development and that the majority of the site is cleared, the fauna habitat present is low to medium.

Southern precinct

There are some isolated patches of brushbox (Lophostemon confertus) and tallowwood (Eucalyptus microcorys) in the southern end of the southern precinct which are less than 80 years old. There are two much larger brushbox that may exceed 150 years old but neither is currently hollow-bearing. Portions of the northern end of this lot are being invaded by wildling slash pine (Plate 3). There are no large diameter hollow-bearing trees associated with this precinct. The remainder of the site is dominated by exotic grasses and perennial weeds perpetuated by regular slashing of the site.



Plate 3. Young slash pine forest associated with the southern precinct



Comprehensive Koala Plan of Management (CKPoM)

The northern precinct contains a centrally located patch of blackbutt (Eucalyptus pilularis) of approximately 1 hectare and roughly circular in shape containing trees approximately 50 - 60 years old. This area is mapped as tertiary koala habitat under Council's CKPoM. Blackbutt is considered a secondary koala feed tree species, see Figure 4. There is minimal midstorey and some scattered native species in the understorey. Remnant vegetation associated with the north west corner is also mapped as tertiary koala habitat.

The southern precinct contains secondary koala habitat along the northern boundary which is associated with riparian vegetation along Poundyard Creek. There is no other koala habitat mapping associated with the southern precinct, see Figure 4.

Primary and secondary koala feed trees were surveyed including areas mapped as secondary and tertiary koala habitat under Councils CKPoM (Lunney et al. 1999). No koalas were sighted or distinctive scats found on the site based on the modified SAT assessment of 25 trees within each precinct.

While there are no koala records associated with the subject area, there are three NSW BioNet records located close to Poundyard Creek (Figure 4) where council owned land bisects the two subject precincts. It is reasonable to assume that koalas use this riparian corridor to move across the landscape, but also because there are primary koala food trees, including Eucalyptus tereticornis and Eucalyptus grandis, located within this area.

The proposed development will not remove any secondary or tertiary koala habitat or remove any of the primary koala food tree species including tallowwood (Eucalyptus microcorys), swamp mahogany (E. robusta), flooded gum (E. grandis), forest red gum (E. tereticornis), or small-fruited grey gum (E. propingua).

Retention of all the large remnant areas of native vegetation will ensure the development will not destroy, damage or compromise the values of the land as koala habitat.

The proposal will not result in significant barriers being established to koala movement by ensuring habitat linkages are enhanced through implementation of a VMP to improve the habitat availability for koalas where appropriate. Additionally, boundary fencing will not prevent the free movement of koalas, although it may be necessary to erect exclusion fencing to prevent koalas from entering areas where there is high usage by people, vehicles and dogs.

New local roads will be designed to reduce traffic speed to 40 kph where roads cross identified wildlife corridor areas. It may be necessary to exclude all dogs from areas set aside for wildlife corridor management.

Kangaroo assessment

Eastern grey kangaroo counts across the southern and northern precinct returned numbers of 45 and 120 respectively. Council owned land between the two precincts, and the subject of ongoing construction for the purposes of sporting fields, also retains a large resident population of approximately 145 kangaroos. This large mob is currently taking advantage of



the new growth associated with the fields. Based on diurnal and evening surveys kangaroos are resting in the peripheral shaded areas during the hottest part of the day and browsing on the more open areas during the morning, late afternoon and evening. A number of kangaroo carcasses were located during the survey suggesting wild dogs or dingoes are having some impact on the local population.

Subdivision design will need to incorporate a number of the key objectives of the Coffs Harbour Kangaroo Management Plan to ensure the welfare of both kangaroos and future residents (CHCC 2017).





ecosure

ection: Transverse Mercator Datum: GDA 1994



3.5 Bushfire threat analysis

It is anticipated that an Asset Protection Zone (APZ) will be required where proposed dwellings adjoin areas of consolidated dry sclerophyll forest, particularly along the western boundary of the northern precinct. Holiday Coast Bushfire Solutions will determine the requisite distances based on the plant community type, structure and slope and target Bushfire Attack Level (BAL).

APZs will generally be excluded from extending in to remnant native vegetation. However, there may be circumstances where the Outer Protection Area (OPA) of an APZ will impinge in to proposed E3 zones.

Woolgoolga Lake Estuary Coastal Zone Management 3.6 Plan

The Coastal Zone Management Plan (CZMP) recognises that new developments have the potential to reduce the quality of catchment runoff during and after the construction phase. It is important that controls are placed on this new development to ensure no negative net impact upon water quality. This includes stormwater management (treatment and detention) of a standard that will not impact on Poundyard Creek or the Woolgoolga Lake Estuary. Stormwater management and pollutant inputs from the catchment was the second highest ranked issue identified in the CZMP.

Water quality also has the potential to impact on a range of terrestrial and aquatic threatened fauna including some of the threatened entities identified in Table 3.



4 Discussion

Figure 5 identifies areas of ecological value that are proposed to be retained as E3 – Environmental Management. Indicative wildlife linkages are also shown to demonstrate the major pathways for wildlife through the landscape.

Northern precinct

The most important ecological attributes of the northern precinct are associated with the remnant native vegetation in the northwest corner which provides an important habitat linkage with adjoining vegetation. This narrow strip of vegetation connects to Poundyard Creek which is an important mapped 'urban link' corridor (CHCC 2015).

The desktop review identified five threatened flora species that have been recorded within 5 km of the site. No threatened flora species were observed during the site assessment.

The desktop review identified 19 terrestrial fauna species that have been recorded within 5 km of the site. The likelihood of occurrence table (refer to Table 3) identified numerous bird, bat and frog species that could potentially utilise the site, particularly the vegetated areas. It is possible frogs could utilise the dam, gullies and other areas of low elevation at the southern end of the northern precinct.

No threatened fauna species were observed on-site. The Rainbow bee-eater was observed offsite to the northeast of the survey area. This bird is listed as a migratory species under the EPBC Act. Further assessment should be undertaken to consider the potential impacts on this species.

APZs will be proposed along the northwestern, northern, western and southwestern boundaries and the patch of blackbutt forest located more centrally in the northern precinct. The APZ requirement is expected to be approximately 21 m in width for all of these areas. The fire assessment report will make recommendations on the APZ requirements for the northern boundary of the southern precinct which contains wet sclerophyll forest on gently sloping land.

The pond and stormwater treatment areas and other low lying areas should be planted with sedges and wetland plants to improve their ecological value. It is intended that there will be no net increase of pollutants from the site. The design of the pond and treatment systems will be outlined in a final Stormwater Management Plan as part of a Development Application to Council.

There are opportunities to establish E3 – Environmental Management zone across the northern precinct, which will protect and link vegetation across the local landscape and provide suitable movement corridors for wildlife. These areas are confined to the western and southern boundaries of the lot, particularly the northwest sector.



Southern precinct

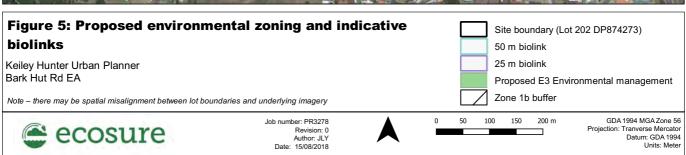
The natural values of the southern precinct include scattered brushbox, turpentine and a few large diameter tallowwoods. There are no large diameter hollow-bearing trees associated with the site. There are some fringes of wet sclerophyll forest mapped as secondary koala habitat along the northern boundary that link with riparian vegetation associated with Poundyard Creek. Some infill planting of this area would further consolidate this vegetation and enhance ecological buffering of Poundyard Creek.

A large council owned water storage south-east of the southern precinct has a number of NSW BioNet threatened species records of wetland fauna.

The rest of the site is dominated by exotic grassland and invasive shrubs and trees including large areas of establishing wildling slash pine. There are opportunities to retain individual eucalypts and a larger patch of remnant vegetation (approximately 500 m²) of eucalypts located across the central portion of the site. This patch of remnant vegetation could become a more passive community based area for the benefit of the local residents.

The thin area of mapped secondary koala habitat along the northern boundary will be retained and enhanced to better consolidate riparian vegetation associated with Poundyard Creek. Protection of this area of council land is important given there are two koala records in the NSW BioNet. This riparian area is likely to act as a movement corridor for koalas across the landscape.







5 Recommendations

The following actions are recommended for the future development of the site:

- 1. Retain as much remnant native vegetation on-site as possible, including all mapped koala habitat and ensure that proposed APZs do not impinge on these areas where possible (see Figure 5).
- 2. Conduct additional flora and fauna surveys to account for seasonal variations (and investigate presence of frogs), targeting species that have been determined to possibly occur on the site (Table 3).
- 3. Consider the development proposal's impact on eastern grey kangaroos, particularly within the context of the Council sports fields being developed between the two development precincts which will increase the availability of food resources.
- 4. Where possible, link remnant vegetation of the site to other extant vegetation across the landscape to provide suitable movement pathways for wildlife. For the subject area this should include a network of E3 zoned areas in appropriate locations (Figure 5).
- 5. Retain individual eucalypts and a larger patch of remnant vegetation (approximately 500m²) of eucalypts located across the central portion of the southern precinct either as remnant bushland or a more passive community based area for the benefit of the local residents.
- 6. Prepare a Comprehensive Vegetation Management Plan (VMP) in accordance with CHCC's requirements to increase habitat value. The comprehensive VMP should give specific consideration to:
 - wetland species for the proposed bio-retention basin and other low lying areas
 - enhancement of proposed E3 zoned areas under CHCC's LEP
 - linking areas of remnant vegetation by identifying habitat linkages and 'gap filling' as required (including the northern boundary of the southern precinct).
- 7. Conduct a detailed impact assessment that shows the extent of vegetation that will be removed / retained when the final concept design is developed.
- 8. Given the proximity of the proposed development to Woolgoolga Lake and the Solitary Islands Marine Park, effective sediment and erosion controls should be employed during any future construction works. A management plan is recommended to prevent, mitigate and ameliorate the impacts of sediment runoff.
- 9. Implement the key objectives of the Coffs Harbour Kangaroo Management Plan to establish a strategic approach to maintain wild populations of eastern grey kangaroo while managing the social, economic and ecological impacts and ensuring their welfare.



- 10. Implement a Storm Water Management Plan (including artificial wetlands) to reduce nutrients and sediments from reaching the surrounding areas. This is also recommended in the Woolgoolga Lake Estuary Coastal Zone Management Plan.
- 11. Limit the impact of APZs on remnant vegetation ensuring only Outer Protection Areas (OPA) impinge in to the proposed E3 zoned areas
- 12. Utilise local native landscaping for future developments (including any revegetation works), sourcing seed where possible from surrounding vegetation.



6 Conclusion

The two precincts associated with the development have a long history of agricultural use including extensive grazing. More recently these areas have been maintained as grassland, predominately exotic, by slashing. The southern precinct, if left undisturbed, would eventually revert to a mature slash pine forest as there are many wildings dominating the site.

No large diameter hollow-bearing trees were located during the field assessment, suggesting that the site has been successively logged over the last 150 years. The majority of remnant vegetation is young eucalypt forest dominated by blackbutt and interspersed with other eucalypt species. This has limited the habitat value of the vegetation for a range of arboreal wildlife such as microbats, gliders, quolls, phascogales and large forest owls.

The current field assessment did not detect any threatened flora or fauna species on the site at the time of the survey. The individual threatened flora records from the northern precinct remain incongruous as none of the threatened plants previously identified at the site were located. The author is unsure whether the spatial records are inaccurate or whether the individual plants have been collected (i.e. Southern swamp orchid), or perished as a result of grazing, slashing, clearing, fungal attack or drought.

The NSW Bionet records indicate that the site, and its surrounds, are utilised by a range of threatened fauna species on a seasonal basis. Further seasonal surveys for some fauna species are required.

The re-zoning proposal will need to give consideration to the very large population of eastern grey kangaroos currently inhabiting the subject area and surrounds (including the proposed council sports fields). Based on estimates, the population currently numbers approximately 300 individuals which will be severely compromised by a large lot subdivision and formal sports fields.

This report recommends a network of biolinks to connect linear remnants of vegetation across the fringes of the two precincts, using riparian vegetation along Poundyard Creek as a focal point (Figure 5). The proposed re-zoning of the best consolidated patches of remnant vegetation under E3 – Environmental Management is important to consolidate the long term protection of habitat. This is one of the objectives under CHCC's Development Control Plan 2015 (E1.2 compensatory requirements) 'to protect and maintain important linkages between habitats'.



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Appendix 1 Preliminary concept design



Appendix 2 BioNet search

Class name	Family name	Scientific name	Common name	NSW Status	Comm Status
Amphibia	Myobatrachida e	Mixophyes iteratus	Giant Barred Frog	E1,2	E
Aves	Ephippiorhynchus Ciconiidae asiaticus		Black-necked Stork	E1	not listed
	Psittacidae	Lathamus discolor	Swift Parrot	E1,P,3	CE
	Ardeidae	Ardea ibis	Cattle Egret	not listed	C,J
	Apodidae	Hirundapus caudacutus	White-throated Needletail	not listed	C,J,K
	Anatidae	Stictonetta naevosa	Freckled Duck	V	not listed
	Columbidae	Ptilinopus magnificus	Wompoo Fruit-Dove	V	not listed
	Ardeidae	Ixobrychus flavicollis	Black Bittern	V	not listed
	Gruidae	Grus rubicunda	Brolga	V	not listed
	Jacanidae	Irediparra gallinacea	Comb-crested Jacana	V	not listed
	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	V	not listed
	Accipitridae	Haliaeetus leucogaster	White-bellied Sea-Eagle	V	С
	Cacatuidae	Calyptorhynchus lathami	Glossy Black-Cockatoo	V,2	not listed
	Accipitridae	Pandion cristatus	Eastern Osprey	V,3	not listed
	Strigidae	Ninox strenua	Powerful Owl	V,3	not listed
Mammalia	Dasyuridae	Dasyurus maculatus	Spotted-tailed Quoll	V	E
	Phascolarctida e	Phascolarctos cinereus	Koala	V	V
	Pteropodidae	Pteropus poliocephalus	Grey-headed Flying-fox	V	V
	Vespertilionida e	Kerivoula papuensis	Golden-tipped Bat	V	not listed
Flora	Apocynaceae	Marsdenia longiloba	Slender Marsdenia	E1	V
	Orchidaceae	Phaius australis	Southern Swamp Orchid	E1,2	E
	Sapotaceae	Niemeyera whitei	Rusty Plum, Plum Boxwood	V	not listed
	Proteaceae	Hicksbeachia pinnatifolia	Red Boppel Nut	V	V
	Proteaceae	Macadamia tetraphylla	Rough-shelled Bush Nut	V	V

TSA: E1 Endangered, P Protected, V Vulnerable, 2 Category 2 sensitive species, 3 Category 3 sensitive species

EPBC: CE Critically endangered, E Endangered, V Vulnerable



Appendix 3 EPBC protected matters search results

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 <u>Environment Assessments</u> and the EPBC Act including significance guidelines, forms and application process details.

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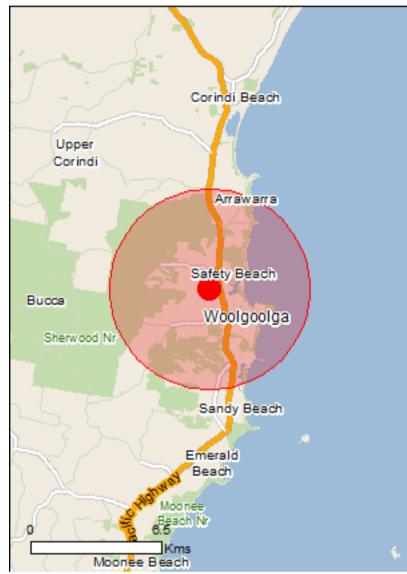
<u>Summary</u>

Details

Matters of NES
Other Matters Protected by the EPBC Act
Extra Information

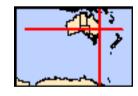
Caveat

<u>Acknowledgements</u>



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

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

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:	3
Listed Threatened Species:	73
Listed Migratory Species:	51

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 <u>permit</u> 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:	89
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	41
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

[Resource Information]

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

	hadia 2 U.			
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		
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		
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely		

Name APPENDIX 8 - ECOLO	Status	Type of Presence
APPENDIX 6 - ECOLO	GICAL ASSESSIMENT	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 likely to occur within area
<u>Limosa lapponica baueri</u> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
<u>Limosa lapponica menzbieri</u> 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
Phoebetria 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 [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
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area

Name Appendix 8 - ECOLO	Status OGICAL ASSESSMENT	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]		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 daemelii 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
<u>Litoria olongburensis</u> Wallum Sedge Frog [1821]	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 populat Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	i <mark>on)</mark> 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
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
APPENDIX 8 - ECO	Status LOGICAL ASSESSMENT	Type of Fresence
Phascolarctos cinereus (combined populations of Qlo Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] Potorous tridactylus tridactylus	Vulnerable	Species or species habitat known to occur within area
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may 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 defungens		
Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat
Boronia umbellata		may occur within area
Orara Boronia [56301]	Vulnerable	Species or species habitat likely 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] Macadamia integrifolia	Vulnerable	Species or species habitat known to occur within area
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 likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area

	Status IX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
Tylophora woollsii		
[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] Chelonia mydas	Endangered	Breeding known to occur within area
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<u>Dermochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [176	8] Endangered	Breeding likely to occur within area
Eretmochelys imbricata		William Greek
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257] Sharks	Vulnerable	Breeding likely to occur within area
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [687	751] Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark Great White Shark [64470]	Vulnerable	Species or species habitat
White Shark, Great White Shark [64470]	vuirierable	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 na		
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 Shear [82404]	rwater	Foraging, feeding or related behaviour likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea epomophora		_ , , ,
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea exulans</u> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related
Fregata ariel	vuillerable	behaviour likely to occur within area
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat
		likely to occur within area

Name Appendix 8 - ECOLO	Threatened OGICAL ASSESSMENT	Type of Presence
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
Phoebetria 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 melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may 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
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
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<u>Dermochelys coriacea</u> 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		Species or species

Name	Threatened	Type of Presence
Name APPENDIX 8 - ECOLOG Manta Ray, Prince Alfred's Ray, Resident Manta Ray	GICAL'ÀSSESSMENT	habitat known to occur
[84994]		within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta		Species or species habitat
Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		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 Whole, Orea [46]		Species or species habitat
Killer Whale, Orca [46]		Species or species habitat may occur within area
Division des transce		·
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat
Whale Ghark [00000]	Vulliciable	may occur within area
		·
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat
mao i acine riampoack bolprim [50]		likely to occur within area
Migratory Torrostrial Chasins		
Migratory Terrestrial Species <u>Cuculus optatus</u>		
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
Rhipidura rufifrons		within area
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	0 W W = -	
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
		may occar within area
Gallinago hardwickii		Conocina familia a constituti
Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may
		30arioar may

Threatened APPENDIX 8 - ECOLOGICAL ASSESSMENT Name Type of Presence 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 Iapponica

Bar-tailed Godwit [844] Species or species habitat

known to occur within area

Numenius madagascariensis

Eastern Curlew, Far Eastern Curlew [847] Species or species habitat Critically Endangered

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 nam	ne on the EPBC Act - Threate	ened Species list.
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Carrage and Carrage in an [50000]		On a since on a section habitat

Species or species habitat Common Sandpiper [59309]

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

Name	Threatened APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
	711 1 2 1 2 1 2 2 2 3 3 1 2 1 1 1 1 1 1 1	habitat known to occur within area
Calidris ferruginea		within area
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat
		likely to occur within area
<u>Calidris melanotos</u>		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
		may occar mami area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat
Otreaked Orical water [1011]		may occur within area
Catharacta skua		
Great Skua [59472]		Species or species habitat
		may occur within area
<u>Cuculus saturatus</u>		
Oriental Cuckoo, Himalayan Cuckoo [7	710]	Species or species habitat
		may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur
		within area
<u>Diomedea epomophora</u> Southern Royal Albatross [89221]	Vulnerable	Foraging fooding or related
Southern Royal Albatioss [09221]	Vullielable	Foraging, feeding or related behaviour likely to occur
Diamadaa ayulana		within area
<u>Diomedea exulans</u> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related
3		behaviour likely to occur
Diomedea gibsoni		within area
Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related
		behaviour likely to occur within area
Diomedea sanfordi		Within area
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur
		within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1	10121	Species or species habitat
Lesser i figatebira, Least i figatebira [i	1012]	likely to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [[1013]	Species or species habitat
		likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related
		behaviour may occur within area
Gallinago megala		
Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur
Calling and otherwise		within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related
		behaviour likely to occur
Haliaeetus leucogaster		within area
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
		MIOWIT TO OCCUT WITHIH AIRA
Lathamus discolor	Oritically Carles were 1	Charles ar anasias bakitat
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur
		-

Name ,	Threatened APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
	APPENDIX 0 - ECOLOGICAL ASSESSIMENT	within area
<u>Limosa lapponica</u> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant P	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] Numenius madagascariensis		Breeding known to occur within area
Eastern Curlew, Far Eastern Curlew [847	7] 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
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed [1043]	Shearwater	Foraging, feeding or related behaviour likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [644	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

Name	APPENDIX 8 - ECOLOG	.Threatened.	Type of Presence
	APPENDIX 8 - ECOLOG	JICAL ASSESSMENT	habitat may occur within
Thalassaraha impayida			area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-l [64459]	browed Albatross	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
		· a	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 [8	332]		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 [66199]	d Pipefish		Species or species habitat may occur within area
Corythoichthys ocellatus			
Orange-spotted Pipefish, Ocellated Pi	ipefish [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 area
Halicampus grayi			
Mud Pipefish, Gray's Pipefish [66221]			Species or species habitat may occur within area
Hippichthys cyanospilos	District Language		
Blue-speckled Pipefish, Blue-spotted	Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus			_
Madura Pipefish, Reticulated Freshwa [66229]	ater Pipefish		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	n [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

Name	Threatened APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
	AFFENDIA 6 - ECOLOGICAL ASSESSIVILINI	habitat may occur within
Hippocampus planifrons		area
Flat-face Seahorse [66238]		Species or species habitat
		may occur within area
Hippocampus trimaculatus Three spot Seaborse Low crowned	Sophoreo Flat	Species or species habitat
Three-spot Seahorse, Low-crowned faced Seahorse [66720]	Seanoise, Flat-	Species or species habitat may occur within area
		may cood. mam. area
Hippocampus whitei		
White's Seahorse, Crowned Seahors Seahorse [66240]	se, Sydney	Species or species habitat may occur within area
Seanoise [00240]		may occur within area
<u>Lissocampus runa</u>		
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 Pipe	efish [66253]	Species or species habitat
•		may occur within area
Micrognathus brovirostris		
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefi	ish [66254]	Species or species habitat
theman iponon, international ipon		may occur within area
		·
Microphis manadensis Manada Binafiah Manada Biyar Bin	ofich [66259]	Species or appaies habitat
Manado Pipefish, Manado River Pip	elisti [00230]	Species or species habitat may occur within area
		may cood. mam. area
Solegnathus dunckeri		
Duncker's Pipehorse [66271]		Species or species habitat
		may occur within area
Solegnathus hardwickii		
Pallid Pipehorse, Hardwick's Pipeho	rse [66272]	Species or species habitat
		may occur within area
Solegnathus spinosissimus		
Spiny Pipehorse, Australian Spiny P	ripehorse [66275]	Species or species habitat
		may occur within area
Solenostomus cyanopterus		
Robust Ghostpipefish, Blue-finned G	Shost Pipefish,	Species or species habitat
[66183]		may occur within area
Solenostomus paegnius		
Rough-snout Ghost Pipefish [68425]]	Species or species habitat
		may occur within area
Solenostomus paradoxus		
Ornate Ghostpipefish, Harlequin Gh	ost Pipefish,	Species or species habitat
Ornate Ghost Pipefish [66184]		may occur within area
Stigmatopora nigra		
Widebody Pipefish, Wide-bodied Pip	pefish. Black	Species or species habitat
Pipefish [66277]	,	may occur within area
Cynanothoidea biggylasty:		
Syngnathoides biaculeatus Double-end Pipehorse, Double-ende	ed Pinehorse	Species or species habitat
Alligator Pipefish [66279]		may occur within area
		-
Trachyrhamphus bicoarctatus Rentstick Pinefish Rend Stick Pinefi	ish Short-tailed	Species or species hebitet
Bentstick Pipefish, Bend Stick Pipefi Pipefish [66280]	ion, Onor-taileu	Species or species habitat may occur within area
Urocampus carinirostris		Oppoies an experience to the first
Hairy Pipefish [66282]		Species or species habitat may occur within
		a, ooda waami

Name APPENDIX 8 - ECOLO	Threatened GICAL ASSESSMENT	Type of Presence
Vanacampus margaritifer		area
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
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
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		·
•		may occur within area Species or species habitat
Common Dophin, Short-beaked Common Dolphin [60] <u>Eubalaena australis</u>		Species or species habitat may occur within area Species or species habitat
Common Dophin, Short-beaked Common Dolphin [60] Eubalaena australis Southern Right Whale [40] Grampus griseus		Species or species habitat may occur within area Species or species habitat likely to occur within area Species or species habitat likely to occur within area

Name	Status APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
Sousa chinensis		On a standard and a standard back to t
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
<u>Tursiops aduncus</u>		
Indian Ocean Bottlenose Dolphin, Spo Dolphin [68418]	otted Bottlenose	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]
Note that all areas with completed RFAs have been included.	
Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Landscape Health Project, National Land an	d vvater Resouces Audit, 200	1.
Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon	[803]	Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat

likely to occur within area

Name	Status APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
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 Blackbi	rd [596]	Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely 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	3]	Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Migi	nonette Vine,	Species or species

Name Status APPENDIX 8 - ECOLOGICAL ASSESSMENT	Type of Presence
Anredera, Gulf Madeiravine, Heartleaf Madeiravine,	habitat likely to occur within
Potato Vine [2643] Asparagus aethiopicus	area
Asparagus Fern, Ground Asparagus, Basket Fern,	Species or species habitat
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus	likely to occur within area
[62425] Asparagus plumosus	
Climbing Asparagus-fern [48993]	Species or species habitat
	likely to occur within area
Cabomba caroliniana	
Cabomba, Fanwort, Carolina Watershield, Fish Grass,	Species or species habitat
Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]	likely to occur within area
Chrysanthemoides monilifera	
Bitou Bush, Boneseed [18983]	Species or species habitat likely to occur within area
	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
vvater riyacintri, vvater Orchid, ivile Lily [13400]	likely to occur within area
Conjete en V Conjete mononcoulons	·
Genista sp. X Genista monspessulana Broom [67538]	Species or species habitat
	may occur within area
Lantana camara	
Lantana, Common Lantana, Kamara Lantana, Large-	Species or species habitat
leaf Lantana, Pink Flowered Lantana, Red Flowered	likely to occur within area
Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]	
Pinus radiata	
Radiata Pine Monterey Pine, Insignis Pine, Wilding	Species or species habitat
Pine [20780]	may occur within area
Protasparagus densiflorus	
Asparagus Fern, Plume Asparagus [5015]	Species or species habitat likely to occur within area
	intoly to occur within area
Protasparagus plumosus	Species or appoint habitat
Climbing Asparagus-fern, Ferny Asparagus [11747]	Species or species habitat likely to occur within area
Dubus frutissaus arena nata	·
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]	Species or species habitat
Diackberry, European Diackberry [ee ree]	likely to occur within area
Sagittaria platyphylla	
Delta Arrowhead, Arrowhead, Slender Arrowhead	Species or species habitat
[68483]	likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii	
Willows except Weeping Willow, Pussy Willow and	Species or species habitat
Sterile Pussy Willow [68497]	likely to occur within area
Salvinia molesta	
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba	Species or species habitat
Weed [13665]	likely to occur within area
Senecio madagascariensis	
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]	Species or species habitat likely to occur within area
	incry to occur within area
Reptiles Hemidaetylus fronatus	
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 gualifications 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

-30.1027 153.18391

Acknowledgements

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

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

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

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



Appendix 4 Flora survey results

Family name	Scientific name	Common name	Exotic	North east	North west	Wetland	South block
Apiaceae	Hydrocotyle bonariensis	Largeleaf Pennywork	*		*		
Apocynaceae	Araujia sericifera	Moth vine	*	*			
Apocynaceae	Asclepias curassavica	Milkweed	*	*			
Apocynaceae	Gomphocarpus physocarpus	Balloon Cotton Bush	*		*		*
Apocynaceae	Parsonsia straminea	Common Silkpod		*			
Araliaceae	Polyscias sambucifolia	Elderberry Panax		*			
Araliaceae	Schefflera actinophylla	Umbrella tree	*	*	*		
Asparagaceae	Asparagus aethiopicus	Asparagus Fern	*		*		*
Asteraceae	Ageratum conyzoides	Blue billygoat weed	*	*			*
Asteraceae	Ageratum houstonianum	Whiskey grass	*		*		
Asteraceae	Baccharis halimifolia	Groundsel Bush	*	*	*		*
Asteraceae	Bidens pilosa	Cobbler's Pegs	*	*	*		*
Asteraceae	Chrysanthemoides monilifera spp. Rotunda	Bitou bush	*	*			
Asteraceae	Chrysanthemoides monilifera subsp. rotundata	Bitou Bush	*		*		
Asteraceae	Cirsium vulgare	Spear Thistle	*		*		*
Asteraceae	Ozothamnus diosmifolius	White Dogwood			*		
Asteraceae	Senecio madagascariensis	Fireweed	*	*	*		
Asteraceae	Tagetes minuta	Stinking roger	*				*
Blechnaceae	Blechnum cartilagineum	Gristle Fern			*		
Casuarinaceae	Allocasuarina torulosa	Forest Oak		*			
Convolvulaceae	Convolvulus erubescens	Australian Bindweed			*	*	
Convolvulaceae	Ipomoea cairica	Mile-a-minute	*		*		*
Cupressaceae	Callitris rhomboidea	Port Jackson Pine			*		
Curcurbitaceae	Cucumis zeyheri	South African spiny cucumber	*	*			



Family name	Scientific name	Common name	Exotic	North east	North west	Wetland	South block
Cyatheaceae	Cyathea australis	Rough Treefern					*
Cyperaceae	Baumea juncea	Bare twigrush				*	
Cyperaceae	Baumea teretifolia	Common twig rush				*	
Dennstaedtiaceae	Pteridium esculentum	Bracken			*		*
Dilleniaceae	Hibbertia scandens	Climbing Guinea Flower			*		*
Ericaceae	Leucopogon pimeleoides	Beard heath		*	*		
Ericaceae	Trochocarpa laurina	Tree Heath			*		
Escalloniaceae	Cuttsia viburnea	Elderberry			*		
Fabaceae	Chorizema parviflorum	Eastern Flame Pea		*			
Fabaceae	Daviesia ulicifolia	Gorse Bitter Pea			*		
Fabaceae	Jacksonia scoparia	Dogwood			*		
Fabaceae	Kennedia rubicunda	Dusky Coral-pea					*
Fabaceae (Caesalpinioideae)	Senna pendula var. glabrata	Winter Senna	*	*			*
Fabaceae (Faboideae)	Pultenaea retusa	Notchedbush pea		*			
Fabaceae (Mimosoideae)	Acacia irrorata	Green Wattle					*
Fabaceae (Mimosoideae)	Acacia melanoxylon	Blackwood			*		*
Goodeniaceae	Goodenia rotundifolia	Round-leaved Goodenia		*			
Juncaceae	Juncus usitatus	Common rush				*	
Lauraceae	Cinnamomum camphora	Camphor Laurel	*	*	*		*
Lindsaeaceae	Lindsaea microphylla	Wedge fern			*		
Lomandraceae	Lomandra longifolia	Spiny-headed Mat- rush			*		*
Luzuriagaceae	Eustrephus latifolius	Wombat Berry			*		*
Luzuriagaceae	Geitonoplesium cymosum	Scrambling Lily			*		
Malvaceae	Sida rhombifolia	Paddy's Lucerne	*		*		
Menispermaceae	Stephania japonica var. discolor	Snake Vine			*		*



Family name	Scientific name	Common name	Exotic	North east	North west	Wetland	South block
Moraceae	Ficus watkinsiana	Strangling Fig					*
Myrtaceae	Corymbia intermedia	Pink Bloodwood					*
Myrtaceae	Eucalyptus eugonoides	Thin-leaved stringbark			*		
Myrtaceae	Eucalyptus microcorys	Tallowwood			*		*
Myrtaceae	Eucalyptus pilularis	Blackbutt			*		
Myrtaceae	Eucalyptus propinqua	Small-fruited Grey Gum			*		
Myrtaceae	Eucalyptus siderophloia	Grey Ironbark			*		*
Myrtaceae	Eucalyptus tereticornis	Forest Red Gum					*
Myrtaceae	Lophostemon confertus	Brush Box			*		*
Myrtaceae	Lophostemon suaveolens	Swamp Mahogany, Swamp Turpentine			*		
Myrtaceae	Melaleuca quinquenervia	Broad-leaved Paperbark			*		
Myrtaceae	Syncarpia glomulifera	Turpentine					*
Ochnaceae	Ochna serrulata	Mickey Mouse Plant	*		*		
Oleaceae	Notelaea longifolia	Large Mock-olive					*
Oleaceae	Notelaea venosa	Veined Mock-olive		*			
Orchidaceae	Dipodium punctatum	Blotched Hyacinth Orchid		*			
Orchidaceae	Spiranthus sinensis	Chinese sinensis		*			
Passifloraceae	Passiflora spp.		*		*		
Passifloraceae	Passiflora suberosa	Cork Passionfruit	*		*		*
Passifloraceae	Passiflora subpeltata	White Passionflower	*		*		*
Philydraceae	Philydrum lanuginosum	Woolly Frogmouth				*	
Phormiaceae	Dianella caerulea	Blue Flax-lily			*		
Phyllanthaceae	Breynia oblongifolia	Coffee Bush			*		*
Phyllanthaceae	Glochidion ferdinandi	Cheese Tree			*		*
Pinaceae	Pinus elliottii	Slash pine	*	*	*		*
Pittosporaceae	Billardiera scandens	Hairy Apple Berry		*			
Pittosporaceae	Pittosporum undulatum	Sweet Pittosporum			*		*



Family name	Scientific name	Common name	Exotic	North east	North west	Wetland	South block
Poaceae	Andropogon virginicus	Whisky Grass	*	*			
Poaceae	Axonopus fissifolius	Narrow-leafed Carpet Grass	*		*		
Poaceae	Chloris gayana	Rhodes Grass	*		*		
Poaceae	Cymbopogon refractus	Barbed wire grass			*		
Poaceae	Echinopogon caespitosus	Bushy Hedgehog- grass			*		
Poaceae	Imperata cylindrica	Blady Grass			*		*
Poaceae	Oplismenus aemulus	Basket grass		*			*
Poaceae	Paspalum mandiocanum	Broadleaf Paspalum	*		*		*
Poaceae	Paspalum urvillei	Vasey Grass	*		*		
Poaceae	Pennisetum clandestinum	Kikuyu Grass	*		*		
Poaceae	Setaria sphacelata	South African Pigeon Grass	*		*		*
Poaceae	Themeda triandra	Kangaroo grass			*		*
Polygonaceae	Persicaria spp.	Knotweed	*		*		
Proteaceae	Grevillea robusta	Silky Oak	*	*			
Proteaceae	Persoonia stradbrokensis	Geebung			*		
Rubiaceae	Psychotria loniceroides	Hairy Psychotria					*
Rutaceae	Citrus limon	Bush lemon	*				*
Sapindaceae	Cupaniopsis anacardioides	Tuckeroo					*
Sapindaceae	Jagera pseudorhus var. pseudorhus	Foambark Tree					*
Scrophulariaceae	Digitalis purpurea	Foxglove	*		*		
Solanaceae	Solanum mauritianum	Wild Tobacco Bush	*	*	*		*
Stackhousiaceae	Stackhousia viminea	Slender stachhousia		*			
Thymelaeaceae	Pimelia latifolia subsp. altior	Broad-leaved Riceflower		*			
Verbenaceae	Lantana camara	Lantana	*	*	*		*
Verbenaceae	Verbena bonariensis	Purpletop	*	*	*		*
Vitaceae	Cissus antarctica	Water Vine			*		

APPENDIX 8 - ECOLOGICAL ASSESSMENT



Family name	Scientific name	Common name	Exotic	North east	North west	Wetland	South block
Vitaceae	Cissus hypoglauca	Giant Water Vine			*		



Appendix 5 Fauna survey results

Class name	Scientific name	Common name	Exotic	North west corner	Wetland	Southern site
Amphibia	Litoria fallax	Eastern Dwarf Tree Frog		*		
Aves	Accipiter novaehollandiae	Grey Goshawk				*
	Acrocephalus australis	Australian Reed Warbler		*		*
	Calyptorhynchus funereus	Yellow-tailed Black- Cockatoo				*
	Coracina tenuirostris	Cicadabird		*		*
	Corvus tasmanicus	Forest Raven				*
	Dacelo novaeguineae	Laughing Kookaburra				*
	Eopsaltria australis	Eastern Yellow Robin				*
	Eudynamys orientalis	Eastern Koel				*
	Eurystomus orientalis	Dollarbird		*		*
	Haliastur sphenurus	Whistling Kite				*
	Hirundo neoxena	Welcome Swallow				*
	Lopholaimus antarctica	Topknot pigeon		*		
	Malurus cyaneus	Superb Fairy-wren		*		*
	Malurus melanocephalus	Red-backed Fairy-wren		*		
	Manorina melanocephala	Noisy Miner		*		
	Meliphaga lewinii	Lewin's Honeyeater		*		*
	Merops ornatus	Rainbow Bee-eater				*
	Neochmia temporalis	Red-browed Finch		*		*
	Philemon citreogularis	Little Friarbird				*
	Psophodes olivaceus	Eastern Whipbird				*
	Rhipidura albiscapa	Grey Fantail				*
	Strepera graculina	Pied Currawong				*
	Todiramphus sanctus	Sacred Kingfisher		*		*
	Trichoglossus haematodus	Rainbow Lorikeet		*		
	Zosterops lateralis	Silvereye		*		

APPENDIX 8 - ECOLOGICAL ASSESSMENT



Class name	Scientific name	Common name	Exotic	North west corner	Wetland	Southern site
Mammalia	Canis lupus	Dingo, domestic dog	х	*		
	Macropus giganteus	Eastern Grey Kangaroo		*	*	*
	Macropus rufogriseus	Red-necked Wallaby				*

APPENDIX 8 - ECOLOGICAL ASSESSMENT



Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	28/11/2017	Bark Hut Road Ecological Assessment – Draft Report	Nigel Cotsell Senior Ecologist	C. Lokkers Senior Environmental Scientist	Diane Lanyon General Manager
Final	16/08/2018	Bark Hut Road Ecological Assessment – Final report	Nigel Cotsell Senior Ecologist	Trudy Thompson Senior Environmental Scientist	Diane Lanyon General Manager

Distribution List

Copy#	Date	Туре	Issued to	Name
1	17/08/2018	Electronic	Keiley Hunter Urban Planner	Keiley Hunter
2	17/08/2018	Electronic	Ecosure	Administration

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Report compiled by Ecosure Pty Ltd

ABN: 63 106 067 976

admin@ecosure.com.au www.ecosure.com.au

PR2836-RE.Bark Hut Road EA.FI

Adelaide	Brisbane	Coffs Harbour
PO Box 145	PO Box 675	PO Box 4370

Pooraka SA 5095 Fortitude Valley QLD 4006 Coffs Harbour Jetty NSW 2450

P 1300 112 021 P 07 3606 1030 P 02 5621 8103

M 0407 295 766

Gold CoastRockhamptonSydneyPO Box 404PO Box 235PO Box 880West Burleigh QLD 4219Rockhampton QLD 4700Surry Hills N

West Burleigh QLD 4219 Rockhampton QLD 4700 Surry Hills NSW 2010 P 07 5508 2046 P 07 4994 1000 P 1300 112 021

F 07 5508 2544 F 07 4994 1012



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Bark Hut Road – Lesser Swamp-orchid

Targeted Survey Report (Draft) November 2016

Keiley Hunter Planning

Glossary, acronyms and abbreviations

CHCC Coffs Harbour City Council

ECA Ecological Constraints Analysis

EPBC Act Environment Protection and Biodiversity Conservation Act 1999

NSW New South Wales

TSC Act Threatened Species Conservation Act 1995

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1 Introduction

Keiley Hunter Planning engaged Ecosure Pty Ltd (Ecosure) in June 2016, to provide an Ecological Constraints Analysis (ECA) that identified ecological constraints for possible future rezoning of two (2) parcels of land (the site) in Woolgoolga, New South Wales (NSW).

The site is located at Lot 202 DP874273 (totalling 25.64 ha) and is bisected by Coffs Harbour City Council (CHCC) reserves. The northern portion of the site (bordering Bark Hut Road) is 16.41 ha and the southern portion is 9.23 ha (Figure 1).

The ECA report (Ecosure 2016) identified five threatened flora species with the potential to occur within the site. The Lesser Swamp-orchid (*Phaius australis*) was identified as likely to occur within flood prone areas of Poundyard Creek (between the two parcels of land). It is listed as endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Threatened Species Conservation Act 1995* (TSC Act).

At a pre-planning proposal lodgement meeting, CHCC requested a targeted survey to determine the presence of Lesser Swamp-orchid. The survey was to be conducted during the known flowering time for this species (i.e. September to November).

The scope of this project included:

1. Desktop assessment

- a. to identify potential habitat of the lesser swamp-orchid (the orchid) within and around the two parcels of land (Lot 202 DP874273; the site)
- b. search of Bionet records to identify known locations of the orchid
- c. liaison with relevant qualified personnel regarding known accessible locations of the orchid

2. Field survey

- a. confirmation of presence of orchid in the local area (off site survey at known reference sites)
- b. on site survey for the orchid in areas of potential habitat
- c. off site survey in and around Poundyard Creek in accessible areas of potential habitat, within a 100 m (approximate) buffer of the two sites
- 3. Mapping of areas surveyed and locations of any orchid observed
- 4. A brief report outlining methods, results, maps, and recommendations.

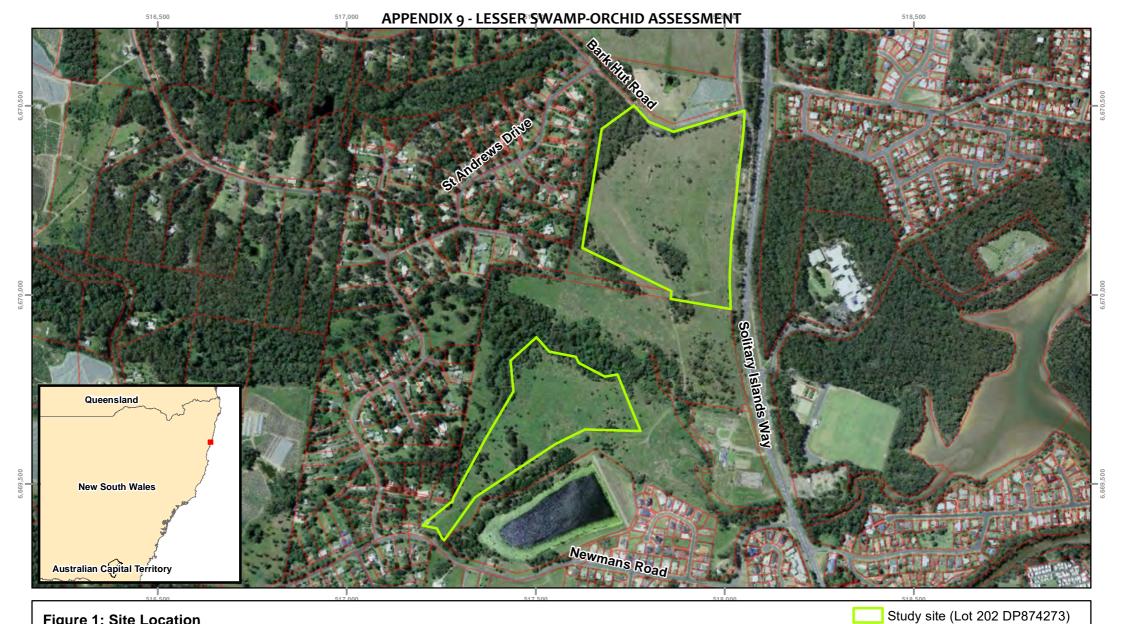
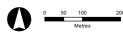


Figure 1: Site Location

Keiley Hunter Planning PR2152 - Bark Hut Road Planning Lesser Swamp-orchid





GDA 1994 MGA Zone 56 rojection: Transverse Mercator Datum: GDA 1994

2 Methods

2.1 Literature review

Key background information including database searches was reviewed and included:

- Bark Hut Road Planning Proposal Environmental Investigation Report (Ecosure 2016)
- relevant databases including the Department of Energy and Environment species profile and threats database
- CHCC fine scale vegetation mapping.

Discussions with suitably qualified personnel were also conducted to determine known locations of the orchid in the area and flowering times.

Digital maps were produced with the CHCC fine scale vegetation mapping and aerial imagery for use by the project team to provide information for this report.

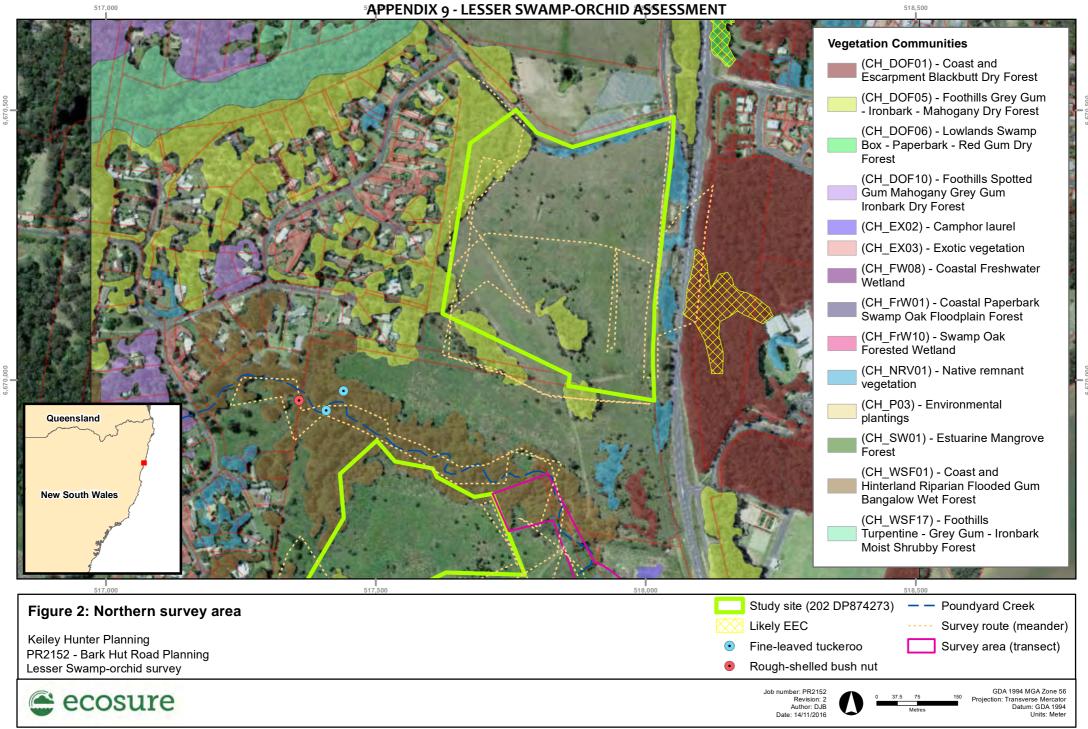
2.2 Off site survey – confirmation of presence in the area

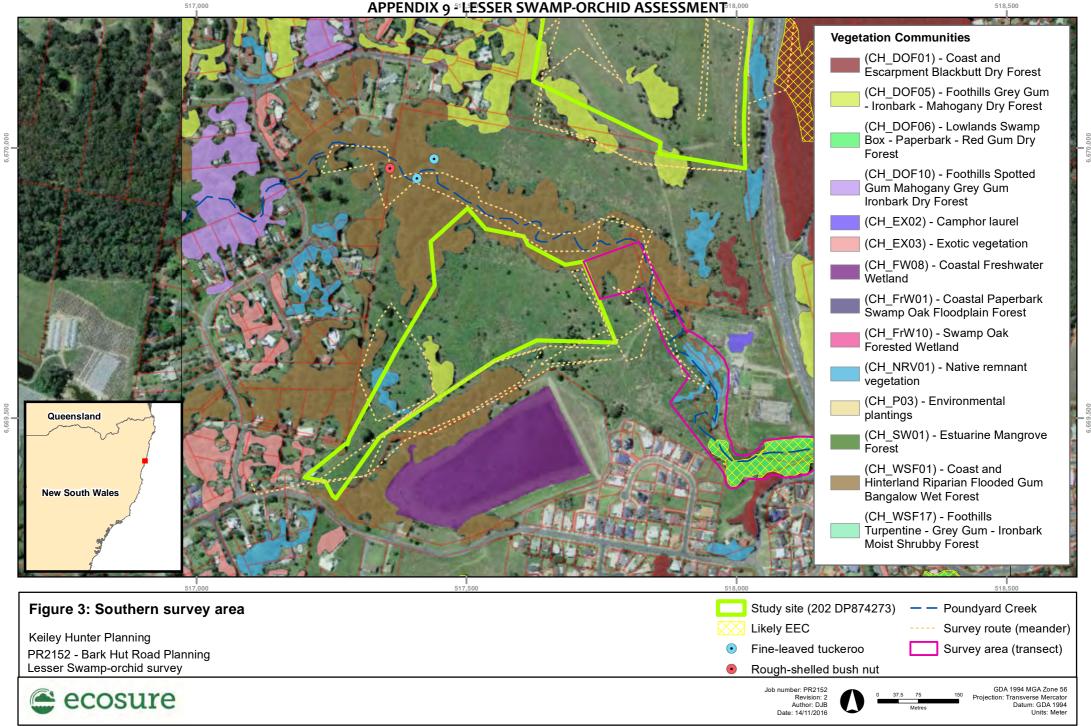
Discussions were held with relevant qualified personnel who identified three locations of the orchid in the local area. One of these sites was visited to confirm presence prior to conducting the field survey.

2.3 Field survey – on site and off site

A targeted search for the orchid was conducted on Wednesday 9 November 2016 by a qualified ecologist. The survey concentrated on likely habitat within the site and on community land surrounding the two parcels of land. A 100 m buffer around the lot boundaries was used as a basis for the off site survey. Suitable habitat on and off site (within a general 100 m buffer) was identified through the desktop assessment and assessed during the field survey.

Within areas confirmed as potential habitat, linear transects at 10 m - 15 m spacings were searched for the orchid. All other mapped native vegetation was searched using a meandering transect (Figure 2 and Figure 3). The 100 m buffer was chosen to include potential habitat in the vicinity of the site. Community land between the two sites outside the 100 m buffer to the east was identified during the field survey as potential habitat and also surveyed.





2.4 Limitations

This report did not include detailed flora and fauna assessments or detailed ground-truthing of vegetation communities as the purpose of the report was to identify the presence of the Lesser Swamp-orchid. Whilst flowering of a known Lesser Swamp-orchid within the local region was confirmed at the time of survey, it does not guarantee that any specimens on site were flowering concurrently. Due to the height and density of vegetation, it would have been difficult to detect non-flowering orchids if they did exist, however narrow transects were undertaken to improve detectability.

3 Results and discussion

3.1 Literature review

A review of relevant publications and databases identified that the orchid is generally found in and adjacent to inundated or periodically inundated vegetation communities including coastal wet heath, freshwater wetlands, swamp grasslands, swamp forest, swamp rainforest and swamp sclerophyll forest (Barry 2005; Benwell 1994b; Bishop 1996; Harden 1993; NSW DECCW 2005). It is usually found where Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Mahogany (*Eucalyptus robusta*) occur (Sparshott & Bostock 1993, NH NSW 2006), and where rainforest communities feature, including where Bangalow Palm (*Archontophoenix cunninghamiana*) or Cabbage Tree Palm (*Livistona australis*) are present (Benwell 1994b; Bishop 1996; Harden 1993).

The site consists mainly of cleared land with exotic grasses and patches of native vegetation. A review of CHCC's online mapping viewer (CHCC 2016) indicated the dominant mapped vegetation within the 100 m buffer surveyed was (CH_WSF01) - Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest. This community is predominately mapped around Poundyard Creek and enters the northern boundary of the southern land parcel (as well as a small section in this parcel's southern boundary. (CH_DOF05) - Foothills Grey Gum - Ironbark - Mahogany Dry Forest - occurs in patches on and off site in the 100 m buffer. There are also areas of (CH_DOF01) - Coast and Escarpment Blackbutt Dry Forest - to the east of the site, (CH_FW08) - Coastal Freshwater Wetland - adjoining the southern boundary and smaller patches of (CH_NRV01) - Native remnant vegetation (Figure 2 and Figure 3).

The desktop assessment identified the areas of CH_WSF01 around Poundyard Creek, CH_FW08 adjoining the southern boundary and smaller patches of CH_NRV01 in the south east corner as the most likely habitat for the orchid.

3.2 Off site survey

Discussions with local qualified personnel provided three known locations of the orchid in the area i.e. within a residential property in Sawtell, Coffs Harbour Botanic Gardens and a site near Coffs Harbour airport.

Of the three sites, one was confirmed as currently flowering (residential garden, Sawtell) (pers com Peter Richards, Senior Botanist). The orchids at the Botanic Gardens had completed flowering (pers com Alex Floyd, Curator) and an inspection of the specimen near the Coffs Harbour Airport indicated that it had not flowered this season and there was no evidence to indicate it would flower this season (pers com Peter Richards).

3.3 Field survey

Survey timing (9th November 2016) coincided with the usual flowering period (September to November) for the species (Benwell 1994b). No individuals or populations of the orchid were found during the site survey.

Areas identified as potential habitat adjacent to Poundyard Creek and mapped as (CH_WSF01) - Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest - were not swampy and did not contain species usually associated with the orchid. Lantana dominated the mid and understorey either side of Poundyard Creek. The heavy infestations of lantana made linear transects difficult to conduct and considerably reduced the potential habitat for the orchid in this area.

Riparian rainforest species occurred in a narrow strip both sides of Poundyard creek and transitioned up steep banks into sclerophyll communities dominated by Flooded Gum (*Eucalyptus grandis*), Tallowwood (*Eucalyptus microcorys*), Small Fruited Grey Gum (*Eucalyptus propinqua*), Grey Ironbark (*Eucalyptus siderophloia*) and Coastal Blackbutt (*Eucalyptus pilularis*). Despite the presence of rainforest species none of the (CH_WSF01) - Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest was swampy and no Broad-leaved Paperbark or Swamp Mahogany occurred.

Areas to the north of the creek did not contain suitable habitat. Areas under tree cover were mainly dominated by Coastal Blackbutt and were considered too dry for the species to exist. Parallel to the eastern boundary, a north south gully has been cleared and grazed. Although swampy in the bottom of this gully, previous management practices and the resulting vegetation makes this area unlikely to contain the orchid. To the south of the creek tall blady grass and bracken fern dominated the site. These areas were not considered likely habitat.

The survey identified that the areas of CH_NRV01 in the south east corner of the site, where Poundyard Creek widens into overflow channels and associated freshwater wetlands, were the most likely habitat for the orchid. This area (approximately 250 m from the eastern boundary of the southern portion of the site and therefore outside the 100 m buffer) contained fenced-off tree plantings, tall ferns, grasses and sedges. A search of this area revealed no orchids. If a non flowering orchid existed in this area it would have been difficult to detect due to the height and density of existing vegetation. Due to the distance of this area from the property boundary, if located, it would be expected that any impacts could be mitigated.

The CH_FW08 - Coastal Freshwater Wetland adjoining the southern boundary was a large dam. The adjoining mapped (CH_WSF01) - Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest was dominated by exotic pine with occasional Tallowwood trees. No suitable orchid habitat was recorded in this area.

3.3.1 Additional observations

Two species located on the site, with similar leaf formation to the orchid, were positively identified as Cocos Palm (*Syagrus romanzoffiana*) and Cabbage Tree Palm seedlings.

Two NSW threatened flora species were recorded in the western section of Poundyard Creek (Figure 3), approximately 135 m from the northwestern corner of the southern portion of the site. These were Fine-leaved Tuckeroo (*Lepiderema pulchella*) and Rough-shelled Bush Nut (*Macadamia tetraphylla*). Both of these species are listed as Vulnerable in NSW under the TSC Act; however the records of both these species at this site are considered to be outside their normal distribution.

Fine-leaved Tuckeroo normally occurs north of the Brunswick River and mainly in the Tweed Valley in north east NSW (OEH 2014). This species is commonly used in landscaping and is attractive to birds; its presence at the site may be due to seed dispersal by birds.

Rough-shelled Bush Nut usually occur north of the Clarence River (OEH 2014b). A database search conducted as part of the constraints report (Ecosure 2016) identified this species as potentially occurring within 5 km of the project area. It was considered unlikely to occur as there is no rainforest habitat mapped within the site. Although not likely to have been introduced by birds, it is possible this species was introduced to the site from nearby residential gardens during a previous flood event.

4 Conclusion

At the time of the survey, no lesser swamp orchid were located on the site or in the potential habitat surveyed on community land surrounding the site. No potential habitat for the orchid was identified on site. The most suitable potential habitat occurred to the south-east of the site where restoration works had occurred. No orchids were observed in this area, however it should be noted that the height and density of this vegetation made detection of any non-flowering orchids extremely difficult. This potential habitat was a considerable distance from the project site (approximately 250 m from the eastern corner of the southern site).

Two threatened flora species were located off site, approximately 135 m from the southern site's northwestern boundary, with their location shown on Figure 2. Whilst these specimens are considered to be outside their natural range and a considerable buffer is provided between the site boundaries and their location, it is recommended that their presence is considered in future developments to ensure that they are protected.

CHCC has requested this survey to determine the feasibility of future re-zoning of the site – Lot202 DP874273. More detailed flora and fauna assessments may be required to meet CHCC's Gateway requirements. No orchids were detected on or off site at the time of the survey, and no suitable habitat was observed on site. A precautionary approach is recommended to guide future management for areas off site as height and density of some vegetation may have prevented detection of non-flowering orchids. A substantial buffer exists between the boundary of the two sites and the potential orchid habitat to the east. To mitigate any potential adverse impacts to the potential habitat as a result of future development, it is recommended that appropriate erosion and sediment control during construction is implemented as well as appropriate hydrological and storm water management.

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Report compiled by Ecosure Pty Ltd

ABN: 63 106 067 976

admin@ecosure.com.au www.ecosure.com.au

PR2152-RE.Bark Hut Road Lesser Swamp-orchid

Adelaide	Brisbane	Coffs Harbour
PO Box 145	PO Box 675	PO Box 4370

Pooraka SA 5095 Fortitude Valley QLD 4006 Coffs Harbour Jetty NSW 2450

P 1300 112 021 P 07 3606 1030 P 02 562 8103

M 0407 295 766

Gold CoastRockhamptonSydneyPO Box 404PO Box 235PO Box 880

West Burleigh QLD 4219 Rockhampton QLD 4700 Surry Hills NSW 2010 P 07 5508 2046 P 07 4994 1000 P 1300 112 021

F 07 5508 2544 F 07 4994 1012



Preliminary Vegetation Management Plan Bark Hut Road Final Report July 2018

Vadejil Pty Ltd





Glossary, acronyms and abbreviations

APZ Asset Protection Zone

CHCC Coffs Harbour City Council

DBH Diameter at breast height

DCP Development Control Plan

IBRA Interim Biogeographical Regionalisation of Australia

KFT Koala feed tree

LGA Local Government Area

SERA Society for Ecological Restoration Australasia

TEC Threatened ecological community

TPZ Tree Protection Zone

VMP Vegetation management plan



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Introduction 1

This preliminary Vegetation Management Plan (VMP) is for Lot 202 DP874273 (the site), being two parcels of land in Woolgoolga, west of the Pacific Highway and 30 km north of Coffs Harbour New South Wales. The northern precinct of the land borders Bark Hut Road (16.41 ha) while the southern precinct borders Newmans Road (9.23 ha) (Figure 1). This preliminary VMP will contribute to a re-zoning application for the subject land. The concept design for the preliminary proposal for re-zoning is provided in Appendix 1.

The VMP draws upon information provided in Coffs Harbour City Council's (CHCC) Development Control Plan (DCP) 2015, Appendix 2 Guidelines for preparing vegetation management plans, as well as the Australian Standard AS4970-2009 Protection of trees on development sites. Restoration principles have been adopted in accordance with the National standards for the practice of ecological restoration in Australia (SERA). This report should be read in conjunction with the ecological assessment (Ecosure 2017).

Site description 1.1

There are two distinct study areas, (hereafter referred to as the southern and northern precincts) separated by Poundyard Creek and council owned land currently being developed for the purposes of a community sports field. The western boundary of the northern precinct is bounded by Solitary Islands Way (old Pacific Highway) while the entry to the southern precinct adjoins Newmans Road as part of west Woolgoolga.

The sites are mostly cleared with scattered patches of remnant vegetation. Small patches of dry sclerophyll forest are present in both the northern and southern precincts with wet sclerophyll forest only present in the southern precinct. Poundyard Creek flows just to the north of the southern precinct although the stream and its banks fall outside the lot boundaries of the subject area.

Northern precinct

Important ecological attributes of the northern precinct identified in an ecological assessment by Ecosure (2017) include remnant native vegetation in the northwest corner and southern boundary, both of which contain secondary and tertiary koala habitat. The vegetation in the northwest corner also provides a significant corridor with adjoining vegetation, and connects to Poundyard Creek which is an important mapped 'urban link' corridor (CHCC 2015). Although no threatened flora species were recorded during the site assessment, vegetated areas likely provide habitat for mammal, bird, bat, and frog species (Ecosure 2017).

Southern precinct

Ecological features of the southern precinct include an area of wet sclerophyll forest along the northern boundary which is mapped as secondary koala habitat (CHCC). This connects to Poundyard Creek and flows to Woolgoolga Lake (Ecosure 2017). Connecting Poundyard Creek and the large freshwater wetland located outside the southern boundary is a patch



(approximately 500 m²) of brushbox (Lophostemon confertus), turpentine (Syncarpia glomulifera) and a few large diameter tallowwoods (Eucalyptus microcorys) which is mapped by CHCC as dry sclerophyll forest. Tallowwood are recognised as an important koala food tree (KFT). The remainder of this precinct consists individual native trees, and exotic grassland, shrubs and trees.







1.2 Aims and objectives

This VMP aims to:

- retain mapped koala habitat and remnant vegetation on the site
- provide linkages of remnant vegetation on the site with extant vegetation to provide suitable wildlife corridors
- provide details of how vegetation is to be retained and managed during construction works including the identification of vegetation management zones across the two precincts
- identify the targets, goals and objectives to monitor progress of the rehabilitation areas over time
- to progress each vegetation management zone as far as possible towards full recovery, relative to an appropriate local indigenous reference ecosystem.

The objective of the VMP is to maximise the ecological value of the site by:

- enhancing habitat value in E2 and proposed E3 zoned areas as per the design drawings through planting of appropriate species i.e. 'gap filling', connectivity plantings and weed control
- utilising koala feed trees in appropriate areas
- providing specialised management details for the bio-retention basin
- identifying areas for buffer zones around remnant vegetation
- identifying areas for weed control and maintenance activities.



Vegetation management 2

In urban and urban fringe areas, wildlife corridors are smaller, less defined linkages that provide local connections. They can consist of creek lines, wetlands, large single trees, or ridgelines, and are an important component of an overall regional landscape conservation framework as outlined in Landscape Corridors of the Coffs Harbour Local Government Area Final Report May 2015 (CHCC 2015).

The Bark Hut Road site contains areas of native vegetation that contribute to the local connectivity network linking wildlife habitat through both corridors and stepping stones, forming a locally derived network that is nested within regional, state and continental wide connectivity conservation planning.

The site has been divided into six management zones. Each management zone will require rehabilitation to improve connectivity between remnant patches of vegetation, as well as planting within existing patches to develop ecosystem resilience and enhance biodiversity. Weed control will also be conducted in all zones (refer to Section 4).

Based on the Society for Ecological Restoration Australasia (SERA) 2017 standards, the primary objective of vegetation management at the two precincts will be to ensure that adjacent threats are being managed or mitigated and to ensure a very low threat from undesirable species on site. Using the SERA one to five star recovery wheel the intention for this site overall is to reach level 3 to 5, depending on the restoration area (See Appendix 2 for a review of the five star recovery levels based on the SERA standards). A survey conducted on 6 December 2017 observed that a moderate subset of characteristic weed species such as lantana (Lantana camara), bitou bush (Chrysanthemoides monilifera), setaria grass (Setaria sphacelata), winter senna (Senna pendula var. glabrata) and groundsel bush (Baccharis halimifolia) are established on the site.

The site already has some baseline evidence of ecosystem functionality with good connectivity and enough remnant vegetation to establish an ongoing seed source for natural regeneration. While the proposed development will impact some of these values it is expected that the areas to be protected will remain viable and be better connected. Based on these observations, the respective restoration areas will quickly reach level 3 – 5 on the recovery wheel through the vegetation management actions as described in this plan.



Vegetation management zones 2.1

The key areas of ecological value identified in the ecological assessment (Ecosure 2017) are proposed to be retained as:

- E2 Environmental Conservation (Zone 1)
- E3 Environmental Management (Zone 2a, 2b, 3, 4, 5 and 6).

These areas have been identified as corridors and refuges for wildlife with important habitat value. Asset protection zones (APZ) must not impinge on any E2 or E3 zoned area (See Section 3), and weed control must be applied in all zones (see Section 4).

2.1.1 Enhancement and connectivity planting

Remnant vegetation located in both the northern and southern precincts has been divided up into zones (Table 1). Zones 1, 2a, 2b and 3 which are mapped as dry sclerophyll forest, Zone 4 is mapped as wetland (bio-retention basin), and Zone 5 and Zone 6 (biolink) are mapped as wet sclerophyll forest. Enhancement planting should be undertaken using appropriate species and densities for each zone outlined below and in Table 2. Connectivity planting will also be undertaken in Zones 2a and 2b where there is currently no significant native vegetation.

Revegetation and enhancement planting will incorporate koala feed trees where possible, particularly in Zones 1, 2a, 2b and 3 which are mapped as secondary and tertiary koala habitat (CHCC). Tubestock will be used for revegetation and should be sourced from a nursery specialising in local provenance species.

Planting density will achieve one tree or shrub per 4 m², and one groundcover or grass every 1 m². These densities will allow for improved ecological value and accommodate planting requirements. Planting densities for vegetation management zones are listed below.

- Canopy trees and midstorey shrubs one plant per 4 m²
 - Note planting at these rates will only be necessary where there is sufficient vacant space within the respective zones
- Groundcovers/grasses one plant per 1 m².

Zone 1

This area includes remnant vegetation located in the northern precinct in the northwest and southwest corners and is mapped as dry sclerophyll forest. The vegetation in the northwest corner is mapped by CHCC as tertiary koala habitat and will be retained as E2 – Environmental Conservation. Enhancement planting will be undertaken within both the northern and southern sections of this zone.



Zone 2a and 2b

These zones are located in open grassy areas and have virtually no native shrubs or trees and will require intensive revegetation to restore their functionality. They are located on the western boundary of the northern precinct (Zone 2a) and on the southern boundary linking better quality remnant vegetation (Zone 2b). Once revegetated they will provide important linkages and buffers to surrounding vegetation. Revegetation will be undertaken in these zones using appropriate plant species outlined in Table 2, and densities listed above.

Zone 3

This area includes an isolated patch of dry sclerophyll forest, and is mapped by CHCC as tertiary koala habitat. It is located adjacent to the bio-retention basin on the southern boundary of the northern precinct. Enhancement planting should be undertaken in this area using species and densities outlined in Table 2.

Zone 4 – Bio-retention basin (wetland)

The bio-retention basin is located on the southern boundary of the northern precinct, adjacent to Zone 3. Stormwater run-off naturally accumulates in this location as it is situated at a low point in the landscape and has previously been dammed. Currently it contains a number of wetland species of plants and could be further enhanced to accommodate increased run-off as a result of the development. Refer to section 2.1.2 for details of plant species and densities.

Zone 5

This zone includes a linear area of wet sclerophyll forest along the northern boundary of the southern precinct and connects to remnant vegetation associated with Poundyard Creek. This area is mapped by CHCC as secondary koala habitat. Enhancement planting will be undertaken using species outlined in Table 2.

Zone 5 may require some bushfire fuel management to ensure APZs are appropriately maintained to protect future dwellings to the south.

Zone 6 (biolink)

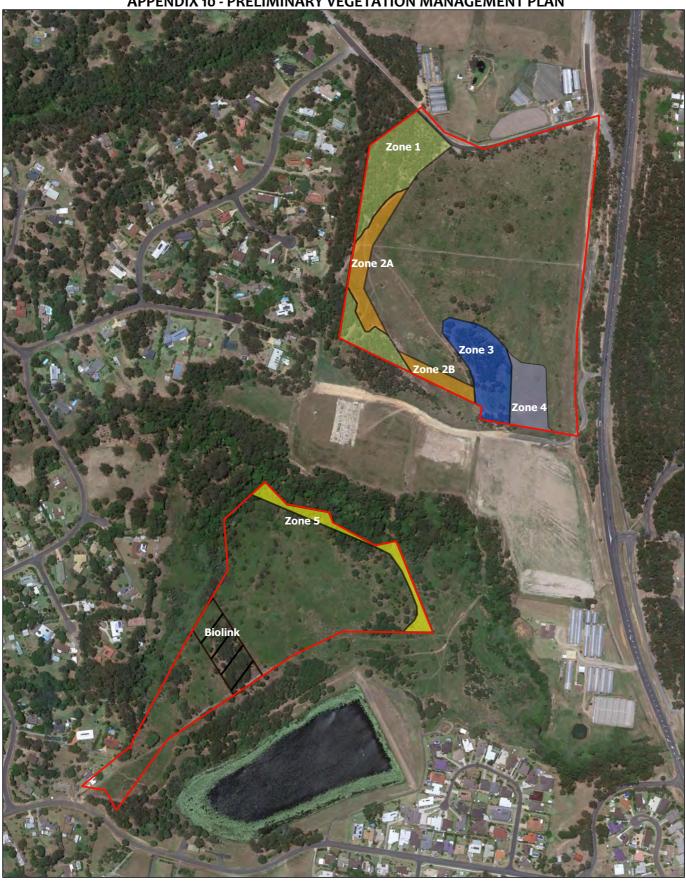
This zone represents an area of mapped dry sclerophyll forest (CHCC). It is located in the centre of the southern precinct and includes a patch of large, mature native trees that provide a linkage between remnant vegetation along Poundyard Creek and a large freshwater wetland outside the southern boundary of the southern precinct. Enhancement planting should include species outlined in Table 2.

The biolink may require some bushfire fuel management to ensure APZs are appropriately maintained to protect future dwellings that surround this zone.



Table 1 Details of planting zones

Zone	Location	Area (ha)	Vegetation community
1	Northwest corner of northern precinct	1.20	Dry sclerophyll forest
2a	Western boundary of northern precinct.	0.74	Dry sclerophyll forest
2b	Southern boundary in the northern precinct	0.29	Dry sclerophyll forest
3	Eucalypt forest along the southern boundary in the northern precinct	1.28	Dry sclerophyll forest
4	Bio-retention basin in the northern precinct	0.74	Freshwater wetland
5	North eastern boundary with Poundyard Creek in the southern precinct	0.62	Wet sclerophyll forest
6	Biolink	0.77	Wet sclerophyll forest



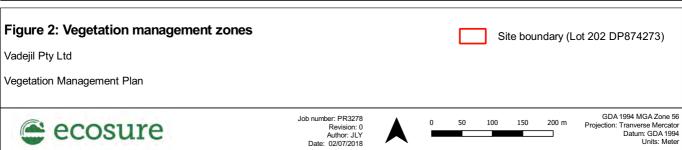




Table 2 Planting species list for enhancement and connectivity planting in management zones

(Note – see Table 3 for species list for Zone 4, bio-retention basin).

Scientific name	Common name	Layer	Height	Growth rate	Habitat values/comments		
North Coast Dry Sclerophyll Forest							
Acacia irrorata	Green wattle	Midstorey	4-12 m	F	Flowers following good rain providing nectar for insects. Sap eaten by Sugar Gliders. Fast growing hardy tree, well suited to revegetation sites.		
Allocasuarina torulosa	Forest Oak	Mid storey	12 m	М	Cones a major food source for Glossy Black Cockatoo		
Angophora costata	Smooth-barked Apple	Canopy	25 m	F	Older trees readily develop hollows. Flowers late spring/early summer. Important nectar resource for insects, birds and arboreal mammals.		
Corymbia intermedia	Pink bloodwood	Canopy	30 m	F	Flowers in summer. Important nectar resource for insects, birds and arboreal animals. Sap provides food resource for sugar gliders. Older trees readily develop hollows.		
Cymbopogon refractus	Barbed Wire Grass	Ground layer					
Dianella caerulea	Blue Flax-lily	Ground layer					
Davesia ulicifolia	Gorse Bitter Pea	Understorey					
Eleocarpus reticularis	Blueberry ash	Mid storey	12 m	М	Blue berries attractive to a range of frugivorous birds. Germination is difficult. Often grown from cuttings.		
Eucalyptus pilularis	Blackbutt	Canopy	60 m	F	Important nectar and pollen resource for a range of animals, birds and insects. Older trees have many hollows. Slightly susceptible to Myrtle Rust. Koala feed tree.		
Eucalyptus propinqua	Small-fruited grey gum	Canopy	30 m	F	Koala feed tree.		
Glochidion ferdinandi	Cheese Tree	Mid storey	10 m	F	Small red seeds are consumed by a number of birds. Excellent pioneer species for revegetation sites.		



Scientific name	Common name	Layer	Height	Growth rate	Habitat values/comments
Hibbertia scandens	Climbing Guinea Flower	Understorey			
Imperata cylindrica	Blady Grass	Ground layer			
Leucopogon pimeleoides	Beard Heath	Understorey	3 m	S	Small red fruit eatern by birds. Very difficult to germinate but cuttings strike.
Lomandra longifolia	Spiny-headed Mat-rush	Ground layer			
Persoonia stradbrokensis	Geebung	Midstorey	5 m	F	Often pollinated by native short-tongued Leioproctus bees. Fruits eaten by a variety of birds. Difficult to propagate.
Pultenaea villosa	Hairy bush-pea	Understorey	2 m		Germinates and restores soil nitrogen after fire.
Syncarpia glomulifera	Turpentine	Canopy	20 m		Flowers in spring. Nectar resource for insects and birds. Young growth very susceptible to Myrtle Rust.
Themeda triandra	Kangaroo Grass	Ground layer			
North Coast Wet Scl	erophyll Forest				
Acacia irrorata	Green wattle	Midstorey	4-12 m	F	Flowers following good rain providing nectar for insects. Sap eaten by Sugar Gliders. Fast growing hardy tree, well suited to revegetation sites.
Acacia melanoxylon	Blackwood	Mid storey			
Allocasuarina torulosa	Forest Oak	Mid storey	12 m	М	Cones a major food source for Glossy Black Cockatoo
Angophora costata	Smooth-barked Apple	Canopy	25 m	F	Older trees readily develop hollows. Flowers late spring/early summer. Important nectar resource for insects, birds and arboreal mammals.
Breynia oblongifolia	Coffee Bush	Mid storey	3 m	М	Pollinated by a single species of moth from the family Gracillariidae. Food plant for the Large Grass Yellow butterfly. Ripe berries eaten by a range of birds.
Cordyline stricta	Slender Palm Lily	Mid storey	5 m		Adaptable species growing on swampy as well as well drained sites.



Scientific name	Common name	Layer	Height	Growth rate	Habitat values/comments
Cryptocarya glaucescens	Jackwood	Canopy	20 m	S	Purple-black drupes attract numerous frugivorous birds.
Dianella caerulea	Blue Flax-lily	Ground layer			
Eucalyptus microcorys	Tallowwood	Canopy	30 m	F	Koala feed tree.
Eucalyptus tereticornis	Forest Red Gum	Canopy	30 m	F	Koala feed tree.
Eucalyptus pilularis	Blackbutt	Canopy	60 m	F	Important nectar and pollen resource for a range of animals, birds and insects. Older trees have many hollows. Slightly susceptible to Myrtle Rust.
Lomandra longifolia	Spiny-headed Mat-rush	Ground layer			
Lophostemon confertus	Brush Box	Canopy	30 m	F	
Polyscias sambucifolia	Elderberry Panax	Mid storey			
Syncarpia glomulifera	Turpentine	Canopy	20 m	М	Flowers in spring. Nectar resource for insects and birds. Young growth very susceptible to Myrtle Rust.



2.1.2 Zone 4 - Bio-retention basin (wetland)

Bio-retention basins operate by slowing and filtering stormwater runoff through densely planted surface vegetation, followed by fine filtration, absorption and biological uptake that occurs sub-surface. Excess water then accumulates in the basin, and either slowly disperses or overflows into an adjoining drainage system such as a creek.

Given the bio-retention basin's proximity to Poundyard Creek, increasing the extent of peripheral vegetation through buffer planting would assist in facilitating the removal of sediment and pollutants such as nitrogen and phosphorus. Trees, shrubs and in particular, a high density of suitable native grasses should be installed above and on the slope of the basin banks. Within the littoral zone, selected rushes and sedges should be installed. These species continue the filtration process and also provide habitat for wetland animal species. Deadstanding or fallen timber identified for removal from the development area during the construction phase should be reinstalled within the bio-retention basin area.

Planting densities for canopy and midstorey species in the bio-retention basin will be one plant per 4 m². Groundcover species will be planted at a higher density of two plants per m² in order to reduce weed occurrence and reduce turbulence from water run-off.

Table 3 Wetland plant species and planting zones for bio-retention basin (Zone 4)

Scientific name	Common name	Layer	Wetland planting zone
Casuarina glauca	Swamp Oak	Canopy	Inflow and periphery
Melaleuca nodosa	Prickly-leaved Paperbark	Canopy – midstorey	Inflow and periphery
Acacia melanoxylon	Blackwood	Midstorey	High-bank and periphery
Leptospermum polygalifolim	Tantoon Tea-tree	Midstorey	Inflow and periphery
Callistemon salignus	Willow Bottlebrush	Midstorey	Inflow and mid-bank
Melaleuca sieberi	Sieber's Paperbark	Midstorey	Inflow and mid-bank
Gahnia clarkei	Tall Saw Sedge	Groundcover	Inflow, mid-low bank and edge
Dianella caerulea	Blue Flax-lily	Groundcover	Inflow and periphery
Lomandra longifolia	Spiny-headed Mat-rush	Groundcover	Inflow and periphery
Imperata cylindrica	Blady Grass	Groundcover	Inflow and periphery
Juncus usitatus	Common Rush	Wetland	Littoral
Philydrum lanuginosum	Wooly Frogmouth	Wetland	Littoral
Eleocharis acuta	Common Spike Rush	Wetland	Littoral
Baumea juncea	Bare Twig Rush	Wetland	Littoral
Baumea teretifolia	Common Twig Rush	Wetland	Littoral



Tree protection measures 3

Prior to any machinery arriving at the site, tree protection fencing is to be installed around the tree protection zone (TPZ) of trees to be retained. Where groups of trees are being retained, the fencing can be around the group rather than each single tree.

The tree protection fencing can be either:

- High visibility power webbing/mesh installed with 1500 mm stakes with 3 m centres, or;
- Rope flagging installed with 1500 mm stakes at 3 m centres.

Signs should be installed intermittently (at high visibility locations) stating that the fenced area is a TPZ. Once installed, fencing is not to be removed or altered until works with machinery have ceased, or access is required for rehabilitation purposes. In accordance with AS 4970 -2009 (Protection of trees on development sites), the following activities are not permitted within the fenced off tree protection area:

- trenching or excavation
- placing of fill or sediment
- installation of sediment fencing
- cultivation activities, or parking of vehicles or plant
- storage of items
- mixing, storage or preparation of chemicals
- machine or equipment wash downs or cleaning
- damage to vegetation
- any other activity detrimental to the ongoing health of the tree or vegetation to be retained.

In accordance with AS 4970-2009, the TPZ is calculated at 12 x diameter at breast height (DBH). All personnel are to be briefed at the site induction on the tree protection locations and other relevant information, including the fact that the fencing is not to be removed. Fencing inspections are to be included on the supervisor's daily inspection sheet and maintained as required. Trees to be removed are to be felled away from any TPZ.

Please refer to the Tree Protection Plan prepared by a qualified arborist for further details (Appendix).



Weed management 4

Weeds species identified on the site within the vegetation management zones are to be managed in accordance with the Biosecurity Act 2015 (the Act) which came into effect on 1 July 2017 and repeals various pieces of legislation including the Noxious Weeds Act 1993. Under the Act, weed management applies to all land whether government or privately owned (NCLLS 2017). Priority weeds and landholder responsibility for management and control have been identified in Schedule 3 of the Act.

Species identified on site and listed as priority weeds in the North Coast Local Land Service area in the regional plan (NCLLS 2017) include bitou bush, groundsel bush, camphor laurel, fireweed, and lantana. Management categories within the regional plan and relevant to the site include 'containment' and 'asset protection', while plants that are state listed are also included.

Table 4 Priority weed species under the Biosecurity Act 2015 identified on site (DPI 2017)

Weed	Duty of landholder
Bitou Bush	A Biosecurity Zone for Bitou Bush occurs over all land within the State of NSW except if within 10 km of the mean high water mark between Cape Byron and Point Perpendicular (Jervis Bay).
	Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone.
	Outside the Biosecurity Zone: the regional strategic response is to manage the weed in accordance with published weed management plans (NCLLS 2017).
Groundsel Bush	Regional Recommended Measure: Exclusion zone: whole region excluding the core infestation area of Richmond Valley Council, Ballina Shire Council, Lismore Council, Kyogle Council, Byron Shire Council and Tweed Shire Council
	Whole region: The plant or parts of the plant should not be traded, carried, grown or released in the environment. Exclusion zone: Land managers should mitigate the risk of spread of the plant from their land. Land managers should mitigate the risk of the plant establishing on their land. Core infestation: Land managers should reduce impacts from the plant on priority assets.
Lantana	Must not be imported into the State or sold.



Table 5 Management categories applicable for weeds at the site

Category	Objective	Characteristic
Containment	To prevent the ongoing spread of the species in all or part of the region	These species have a limited distribution in the region. Regional containment strategies aim to prevent spread of the weed from an invaded part of the region (core infestation), and/or exclude the weed from an uninvaded part of the region (exclusion zone).
Asset protection	To prevent the spread of weeds to key sites/assets of high economic, environmental, and social value, or to reduce their impact on these sites if spread has already occurred.	These weed species are widespread and unlikely to be eradicated or contained within the wider regional context. Effort is focussed on reducing weed threats to protect priority value assets.

Table 6 Weed species and management category for priority weeds (NCLLS 2017).

Common name	Scientific name	Zone 1	Zone 2a and 2b	Zone 3	Zone 4 (bio- retention basin)	Zone 5	Zone 6 (Biolink)	Management Category
Bitou bush	Chyrsanthemoides monilifera subsp. rotunda	X	X					Containment
Groundsel bush	Baccharis halimifolia	X	x	х	×	х	х	Containment
Lantana	Lantana camara	Х	Х	Х		Х	Х	Asset protection
Camphor laurel	Cinnamomum camphora	X		Х		Х		Asset protection
Asparagus fern	Asparagus aethiopicus	Х	Х	х			Х	Asset protection

Weed control will be undertaken in all five management zones and is required in the early stages of revegetation works and generally every three months for the first 24 months. After approximately two years weed control will only be required on an on-going as-needs basis. All personnel engaged in chemical weed control would be expected to have attained a minimum AQF III level in Chemical Application.

Personnel with a minimum of Certificate III in Conservation and Land Management (Natural Area Restoration) plus 500 hours of practical bushland regeneration under an experienced supervisor. Supervisors would be required to have at least some supervisory experience, preferably a higher qualification (AQF IV or V) and a minimum of 700 hours bush regeneration experience. Lead supervisors should also be a member of the Australian Association of Bush Regenerators (AABR).



Works will need to be undertaken by a suitably qualified contractor with Australian Association of Bush Regenerators membership. They will need to specialise in ecological restoration and have relevant experience in weed control, revegetation, plant identification, site management and on-going monitoring/maintenance works.

4 1 Weed treatment methods

Cut-scrape-paint method (CS&P)

This method applies to all woody shrubs, trees and some vines.

Cut plant low to the ground (approx. 1–2 cm above soil level) and level so herbicide does not run off. Cut stems are less hazardous to workers who may kneel on the ground at a later date. Apply herbicide immediately at the suitable rate with a paintbrush approximately 1.5 cm wide. Scrape 3-4 sides of the remaining stump lightly to reveal green tissue and apply the herbicide to the scraped area. Take care that the brush is not contaminated with soil.

Note all seed that has high viability and longevity should be removed from the parent and removed from the site e.g. Senna spp. and other members of the Fabaceae family with large seed pods or plants with a high invasive potential such as moth vine (Araujia sericifera).

Note larger trunks, stems or tubers should be scraped and painted in sections as cells quickly shut down once exposed preventing the translocation of herbicide.

Gouge-paint method

This method applies to those plant species that have a fleshy root system such as rhizomes or large bulbs. It is particularly appropriate for the treatment of Kahili ginger (Hedychium gardnerianum) or canna lily (Canna indica) but can also be applied to prickly pear (Opuntia *spp.*), if each cladode (flattened stem) is treated.

1. Cut the stems of the plant at head height and then at ground level. The stems are then cut up and spread over the ground to act as part of the leaf litter. Gouge out sections of the fleshy base with a knife. Apply herbicide at the recommended rate with a paintbrush approximately 1.5 cm wide avoiding contact with soils.

Stem Injection method

This method applies to all woody trees and shrubs with a diameter of about 6-10 cm or greater and is suited to umbrella trees and camphor laurel on site.

- 1. With a tomahawk make a cut the width of the blade at an angle of about 45 degrees into the trunk.
- 2. Apply herbicide at recommended rate immediately into the cut using a tree injecting
- 3. Repeat this procedure in a brickwork pattern around the circumference of the tree as close to the ground as possible. Where the presence of a crotch angle makes this difficult make a cut above it. Ensure cuts are also made on the inside of forks. This



may need to be done with a Drill, Hand Saw or Chisel. Note two rows of cuts will be sufficient for trees with trunks of 6-10 cm. Larger trunk diameters will need correspondingly more.

4. Treat all visible lateral roots as per 1 and 2.

Note stem injection can also be carried out using a drill. Holes can be inserted approximately 10 cm apart and filled with the appropriate herbicide. Lateral roots should also be drilled and filled with the appropriate herbicide. It is also essential that stem injection is not applied to umbrella trees while in flower as herbicide may be translocated to flowers and affect bids feeding on nectar. Vegetation Management Plan Urunga Heights Final Report ecosure.com.au | 20

Scrape and paint method

This method is applicable to many species of vines where it is desirable to treat the vines intact, particularly those with aerial tubers such as Madeira vine (Anredera cordifolia) or those that will propagate from segments e.g. Cape ivy (*Delairia odora*ta).

- 1. Remove and bag tubers before scraping to avoid dislodging them during treatment.
- 2. Scrape the stem tissue on one side of the stem only for up to 100cm if possible before leaving a small gap (approx. 5cm) and changing sides. Note: on Madeira vine it's necessary to scrape heavily, to expose white inner tissue. Scrape as much of the stem as possible.
- 3. Apply undiluted Glyphosate with a paintbrush within 7 seconds of scraping the stem i.e. scrape and paint in sections.
- In the case of Anredera cordifolia (madeira vine) it is essential that ground tubers and 4. lateral roots are also treated with a heavy scrape and paint. If the tuber is of substantial size a gouge can be made into the tuber with a knife and apply herbicide. Any side roots must also be scraped and painted.

Spot spraying method

This is carried out using a 15 litre backpack spray unit with a modified spray nozzle that gives an accurate and easily adjustable spray pattern e.g. Rega®. It is advised to fill up the backpack to 10 litres only, to avoid back strain, particularly where spraying for extended periods. Glyphosate and metsulfuron methyl are the main herbicides used with the addition of a marker dye. A surfactant such as Pulse® is added in some treatments to assist the transfer of the herbicide through the surface tissue – particularly plants with waxy leaves, such as camphor laurel, Madeira vine and trad. Additives such as Pulse or herbicides such as metsulfuron methyl may need to be avoided in some areas (i.e. low-lying areas or at certain times of the year (e.g. when frogs are breeding).

Overspray method

This method is applicable to large, dense infestations of such plants as lantana (Lantana camara). This method may be used where it is desirable to leave partially dead or dead plants intact to prevent erosion and over exposure of large areas, provide habitat and protect native seedlings from predators such as wallabies. Avoid trampling to retain habitat, identify an edge



(e.g. to prevent machinery from impacting the site) and to save on resources.

Spray over the top of the infestation when the plant is actively growing (i.e. not stressed) using a solution of water and herbicide at the recommended rate. Note any native plants that may be under the weed may need to be protected by preparing or cutting the lantana away from native plants. The type of spray pattern and density of foliage cover of the weed will need to be assessed. Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.

42 Weed control methods

Ratios for application of herbicide

Dilution ratios for the application of herbicide are provided in the table below. Always read and follow the directions on the product label and obtain a Material Safety Data Sheet for each chemical and additive. For some weeds a combination of glyphosate and metsulfuron-methyl (such as Associate®) is recommended, permitted under APVMA off-label permit numbers PER 11463 and PER 9868. A surfactant such as Pulse® is added in some treatments to assist the transfer of the herbicide through the surface tissue – particularly plants with waxy leaves, such as camphor laurel, Madeira vine and trad.

Abbreviations and application rates

Table 7 Abbreviations commonly used in weed control techniques and recommended application rates

Common name	Scientific name	Control method
bitou bush	Chrysanthemoides monilifera	Spray 1:100 Gly Spary to wet all foliage. Apply to actively growing bushes during winter. Do not apply during period of drought stress. Use the higher rate of 1:50 for plants over 1.5 m (DPI 2014)
broad-leaf paspalum	Paspalum mandiocanum	Spray 1:100 Gly + O + dye. Can be hand weeded and left in-situ.
camphor laurel	Cinnamomum camphora	Hand pull seedlings or spray 1:50 Gly + S + dye or for better results spray 1:50 Gly + 1.5 g MM:10L water + S + dye. Saplings CS&P Gly 1:1.5. Trees stem inject 1:1.5 Gly.
cobbler's pegs	Bidens pilosa	Spray 1:100 Gly + O + dye
fireweed	Senecio madagascariensis	Spray 1:100 Gly + O + dye Can be hand weeded and debris hung up to prevent re-shooting.
groundsel bush	Baccharis halimifolia	Hand pull seedlings. Saplings and trees CS&P 1:1.5 Gly. Spray seedlings/regrowth 1:50 Gly + O + dye
lantana	Lantana camara	Lopper, then CS&P bases 1:1.5 Gly. Spot spray regrowth and overspray large infestations 1:100 Gly + O + dye. Red flowering species will require a rate of 1: 50 Gly + O + dye. Splatter gun method Gly 1:9 (1 part Gly to 9 parts water) + dye (best results when plants actively growing).



Common name	Scientific name	Control method
purpletop	Verbena bonariensis	Spray 1:50 Gly + O + dye
senna	Senna pendula var. glabrata	Spot spray seedlings 1:50 Gly + S + dye. CS&P medium plants 1:1.5 Gly. Stem inject large specimens 1:1.5 Gly. (bag seed pods and dispose off site)
whisky grass	Andropogon virginicus	Spray 1:50 Gly + O + dye if sufficient active growth; Crown smaller infestations
umbrella tree	Schflerra actinophylla	Spray 1:50 Gly + O + dye; seedlings can be hand weeded; CS&P medium plants 1:1.5 Gly. Stem inject large specimens 1:1.5 Gly (not if in flower)



Monitoring and ongoing maintenance 5

Maintenance of revegetation works should occur six months after initial planting with ongoing maintenance occurring yearly for a period of five years to ensure a successful level of plant establishment. Maintenance within the bio-retention basin area may require more frequent maintenance from potentially high levels of water run-off damaging plants and increased frequency of weed treatment due to increased nutrients and soil moisture.

Maintenance activities in the management zones will include:

- Watering
- Weed control (see Section 4 above)
- Replacement of lost plants (if losses are greater than 20%)
- Mulching (if required).

For each of the management zones, a restored state will be considered to have been achieved when each management zones attributes are on a secure trajectory approximating those of the target ecological reference community (star rating - see table in Appendix 2). The objectives of the VMP will be achieved if no further repair-phase interventions are required. Following this phase, the relevant management zone under recovery would be considered 'self-organising' and increasingly resilient to natural disturbances. Table 8 below indicates the current star rating for each management zone and its predicted rating at the completion of management in five years.

Table 8 Targets and criteria for each management zone for Bark Hut Road over five years

Management zone	Current star rating	Year 5
Zone 1 (enhance)	4	5
Zone 2a (rehabilitate)	1	3
Zone 2b (rehabilitate)	1	3
Zone 3 (enhance)	2	4
Zone 4 (enhance) – Bio-retention basin	3	4
Zone 5 (rehabilitate)	2	4
Zone 6 (enhance) - Biolink	3	4



Conclusion 6

The proposed Bark Hut Road subdivision contains areas of remnant vegetation that contain important ecological values that contribute to local biodiversity and the local landscape connectivity network. This VMP outlines how these areas will be improved by drawing upon relevant documents that will successfully guide rehabilitation by enhancing habitat quality and increasing linkages across the site. This document should be read in conjunction with the ecological assessment (Ecosure 2017).

This VMP also provides details of how the site is to be managed during construction and identifies the targets and objectives to monitor progress of rehabilitation of the site over time. These restoration principles have been adopted in accordance with the National Standards for the practice of ecological restoration in Australia. Restoration together with planned revegetation works and ongoing weed control and maintenance will further aid in improving the ecological value of the site and assist in mitigating any impacts that arise from vegetation removal on site.



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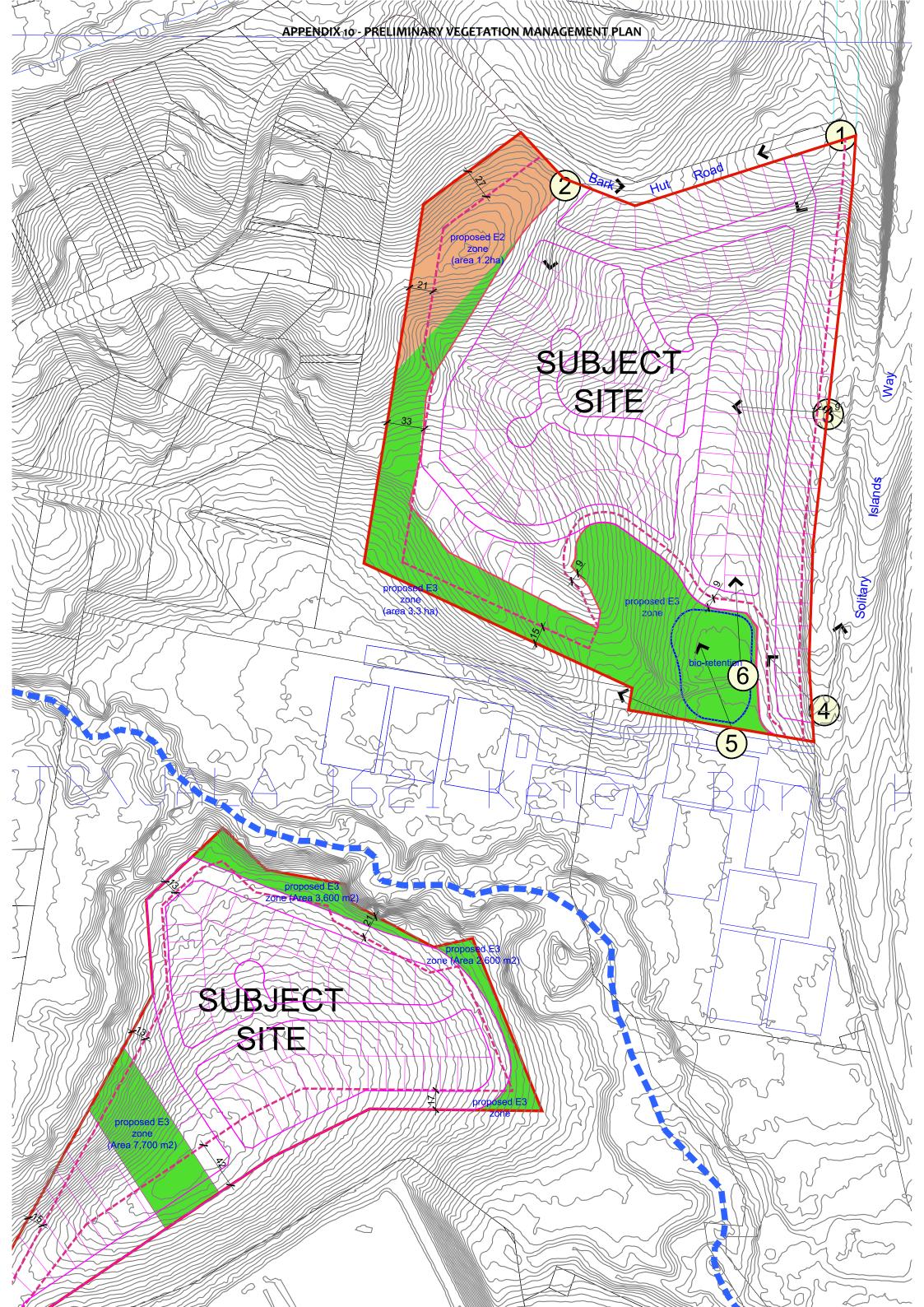
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Appendix 1 Concept design





Appendix 2 Summary of generic standards for one to five star recovery levels

Number of stars	Recovery outcome modelled on an appropriate local indigenous ecological reference
1	Ongoing deterioration prevented. Substrates remediated (physically and chemically). Some level of indigenous biota present; future recruitment niches not negated by biotic or abiotic characteristics. Future improvements for all attributes planned and future site management secured
2	Threats from adjacent areas starting to be managed or mitigated. Site has a small subset of characteristic indigenous species and there is low threat from undesirable species on site. Improved connectivity arranged with adjacent property holders.
3	Adjacent threats being managed or mitigated and very low threat from undesirable species on site. A moderate subset of characteristic indigenous species are established and evidence of ecosystem functionality commencing. Improved connectivity in evidence.
4	A substantial subset of characteristic biota present (representing all species groupings), providing evidence of a developing community structure and commencement of ecosystem processes. Improved connectivity established and surrounding threats being managed or mitigated.
5	Establishment of a characteristic assemblage of biota to a point where structural and trophic complexity is likely to develop without further intervention other than maintenance. Appropriate ecosystem exchanges are enabled and commencing and high levels of resilience is likely with return of appropriate disturbance regimes. Long term management arrangements

Note 1: Each level is cumulative

Note 2: The different attributes will progress at different rates

Ref: National standards for the practice of ecological restoration in Australia (SER 2017)



Appendix 3 Images of vegetation management zones





Plate 1 North west corner of Zone 1 remnant Plate 2 Zone 4 bio-retention basin (foreground) and vegetation and enhancement planting Zone 3 remnant vegetation (background)





Plate 3 Zone 3 viewed from the north

Plate 4 Native Marsdenia sp. located in Zone 1 (southern section)



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00	29/06/2018	Draft Vegetation Management Plan	Vanessa Cain, Scientist	Nigel Cotsell, Manager Coffs Harbour	Phil Shaw, Managing Director
01	06/07/2018	Final Vegetation Management Plan	Nigel Cotsell, Manager Coffs Harbour	Trudy Thompson, Senior Environmental Scientist	Phil Shaw, Managing Director

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Report compiled by Ecosure Pty Ltd

ABN: 63 106 067 976

admin@ecosure.com.au www.ecosure.com.au

PR3278-RE.VMP.FI

Adelaide	Brisbane	Coffs Harbour
PO Box 145	PO Box 675	PO Box 4370
Pooraka SA 5095	Fortitude Valley QLD 4006	Coffs Harbour Jetty NSW 2450
P 1300 112 021	P 07 3606 1030	P 02 5621 8103
M 0407 295 766		
Gladstone	Gold Coast	Rockhampton

PO Box 5420 PO Box 404
Gladstone QLD 4720 West Burleigh QLD 4219
P 07 4994 1000 P 07 5508 2046
F 07 5508 2544

P 1300 112 021

Sunshine CoastSydneyPO Box 1457PO Box 880Noosaville QLD 4566Surry Hills NSW 2010

Environment Quality Health & Safety ISO 14001 ISO 9001 AS 4801

P 07 5357 6019

PO Box 235 Rockhampton QLD 4700

P 07 4994 1000

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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	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 fluvially 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	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 southeastern 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. 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
Aerial Photo 1964 Black and white	Onsite: The Site remains largely unchanged since 1956 aside from some apparent tree clearing within the western portion of the Site. 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.
Aerial Photo 1974 Black and white	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. 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.
Aerial Photo 1984	This aerial photo was noted to have poor resolution. Onsite: The Site remains largely unchanged since 1974 aerial photograph.

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
Black and white	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.
	Several structures/ buildings possibly associated with Woolgoolga High School have been constructed since 1974 beyond Solitary Islands Way approximately 200m east of the Site.
	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.
Aerial Photo	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.
1994 Colour	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.
Aerial Photo	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.
2001 Colour	Offsite: A series of trackways cross each other in a grid pattern on the parcel of land immediately offsite to the south.
Aerial Photo	Onsite: Only the east west orientated vehicle trackway is visible on the aerial photograph.
2011 Colour	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.
Aerial Photo	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.
2018 Colour	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.
	ng types in areas surrounding the Site remain unknown. Anecdotal information suggests a former on the property north of Bark Hut Road (refer to Section 3.7).

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	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.
iviapping 1942	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.
Historical Mapping 1974	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).

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 (PROXIMTY 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 southwest of the Site	Current	Logging operations
20590	OHL Construction Pacific Pty Itd	Approximately 2km southwest 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 be 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 3: Looking north-east from the southern portion of the Site.



Photograph 2: Looking north-west from south-western portion of the Site



Photograph 4: Scrap metal located near the eastern Site boundary within northwestern 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

Table 8 Data Quality Object	
STEP	TASKS
Step 1 State the problem	 The primary objectives of the assessment programs were to: Assess the potential for soil contamination to be present at the nominated site Provide recommendations on the need for further investigations and/or management. The main problems are: 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	 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	 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	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.
Step 5 Develop the analytical approach (decision rule)	 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	We have assumed the following to be true in the absence of contrary evidence (i.e. the null hypothesis): Contamination at the Site currently poses a potential risk to human and environmental receptors. The possibility exists of making the following decision errors based on the data obtained during this investigation:

STEP	TASKS
	 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. 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. 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.
Step 7 Optimise the design for obtaining data	 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. The following sampling design was adopted: 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 2011Table 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 < 1 m.

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 300m 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

Tuble 9 Sampling and Analysis Schedule						
			TESTING SUITE NUMBER OF PRIMARY SAMPLES ANALYSED			
AEC	DESCRIPTION	NUMBER OF SAMPLING LOCATIONS (IDENTIFIERS)	Herbicides (phenoxy acid)	Pesticid es (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 precent 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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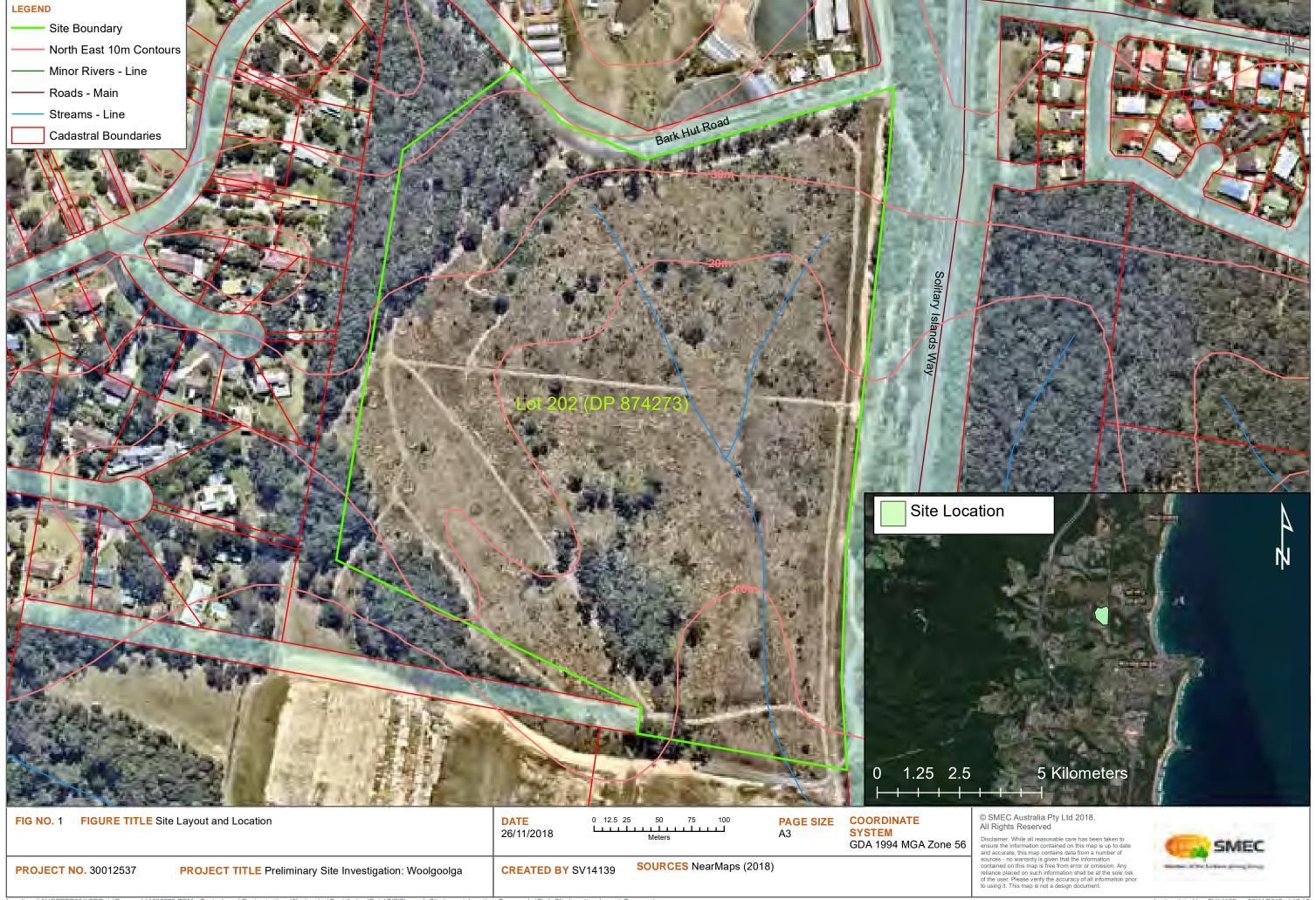
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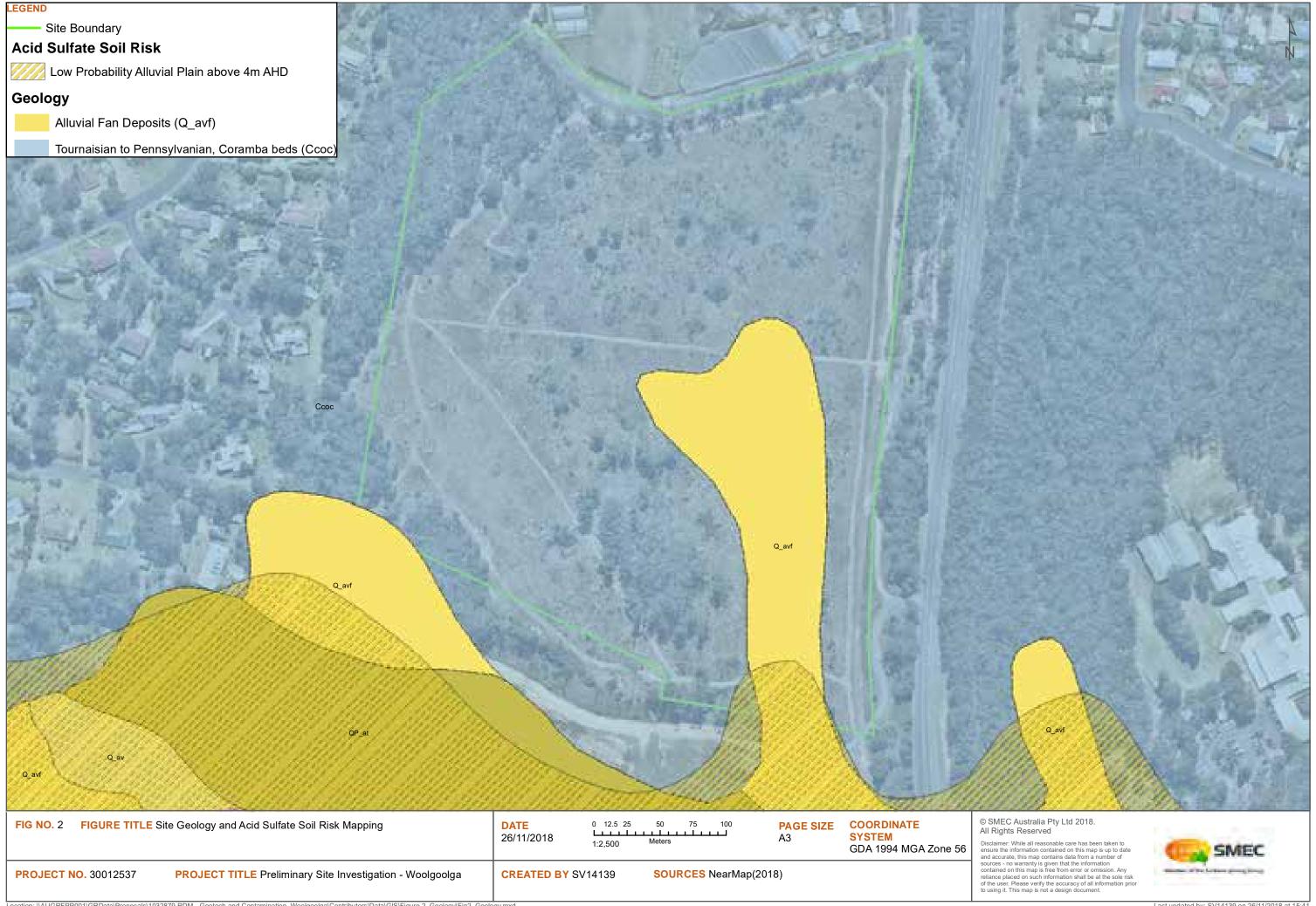
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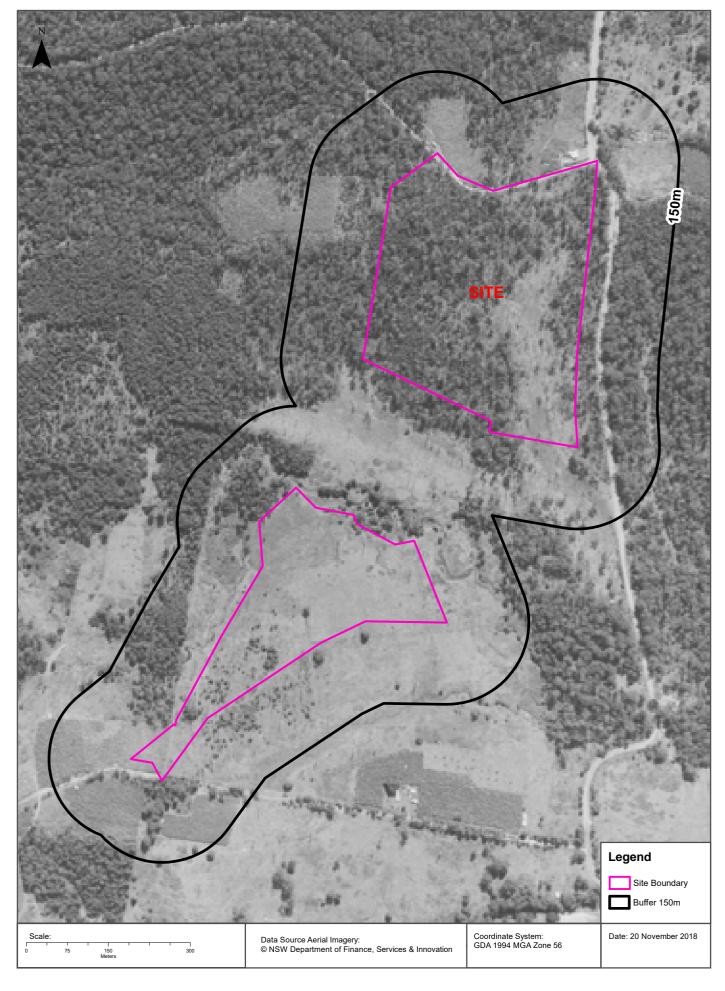
Appendix A Site figures

- 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

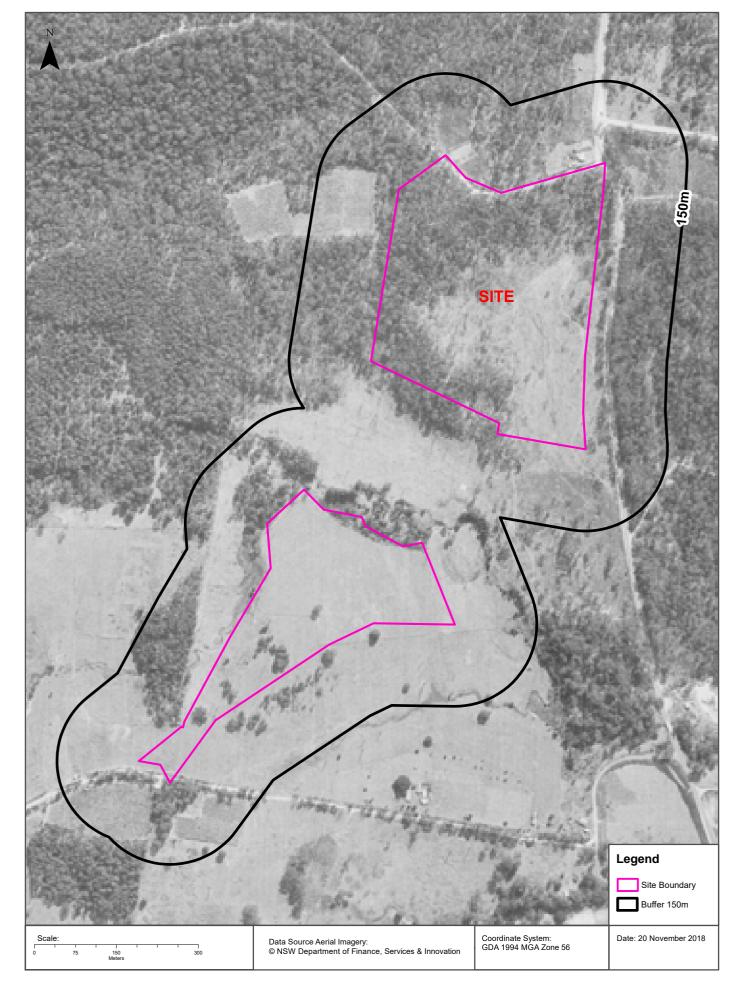




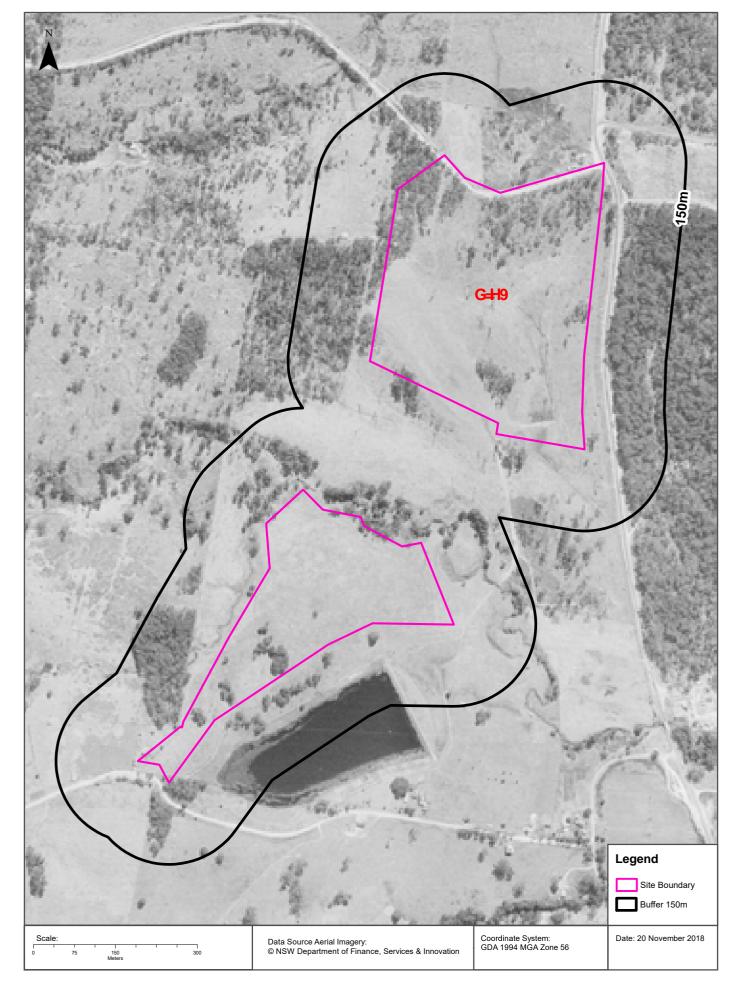




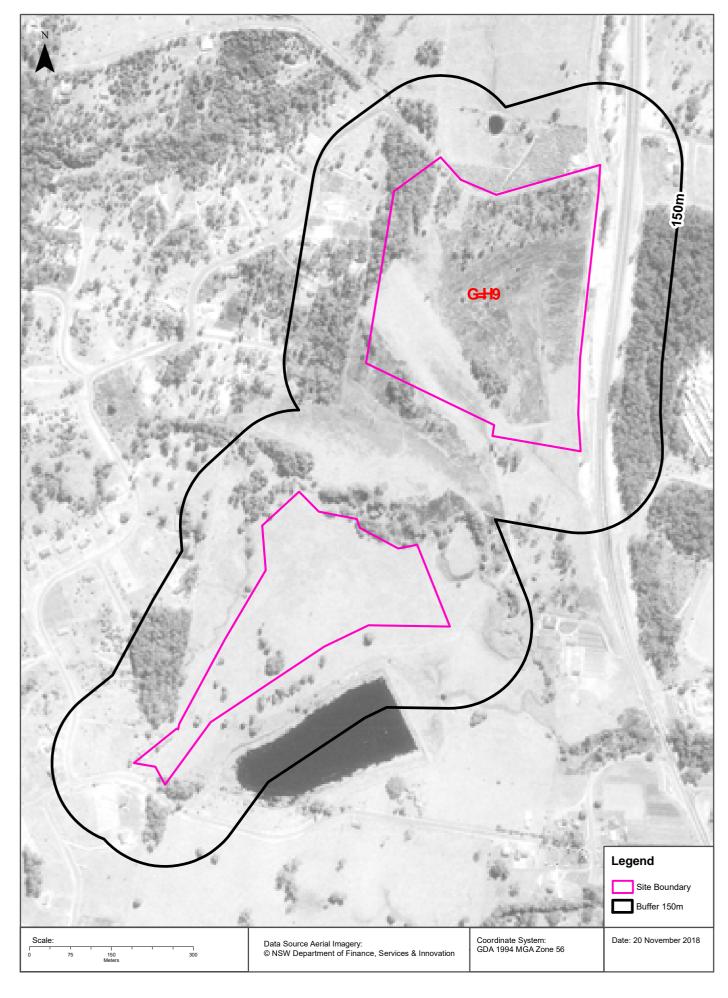






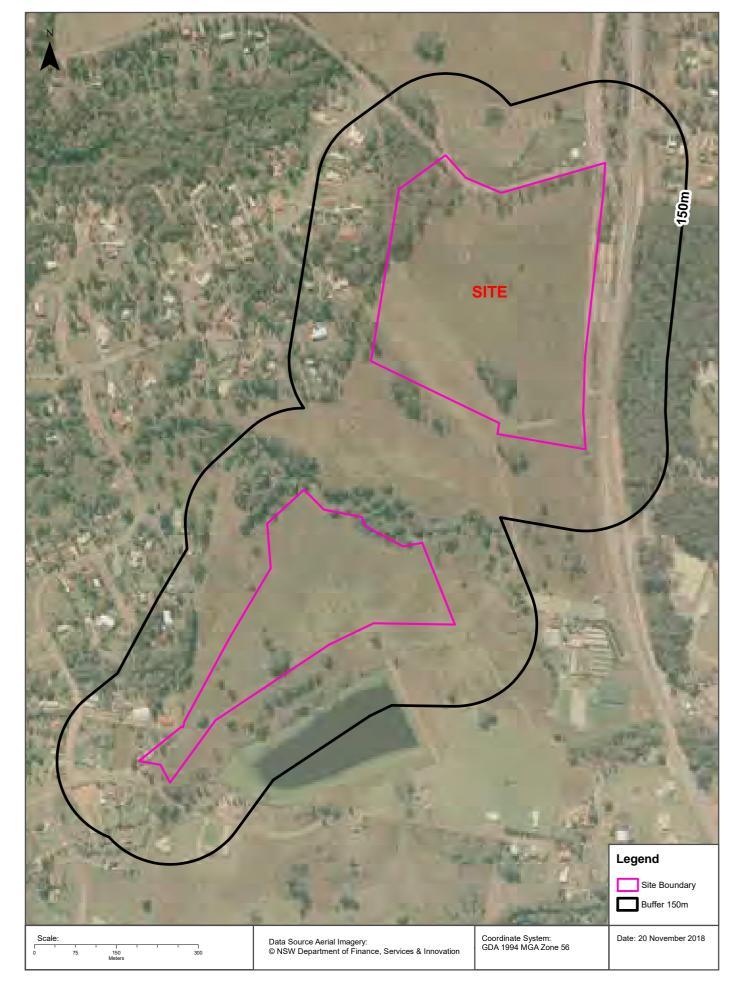




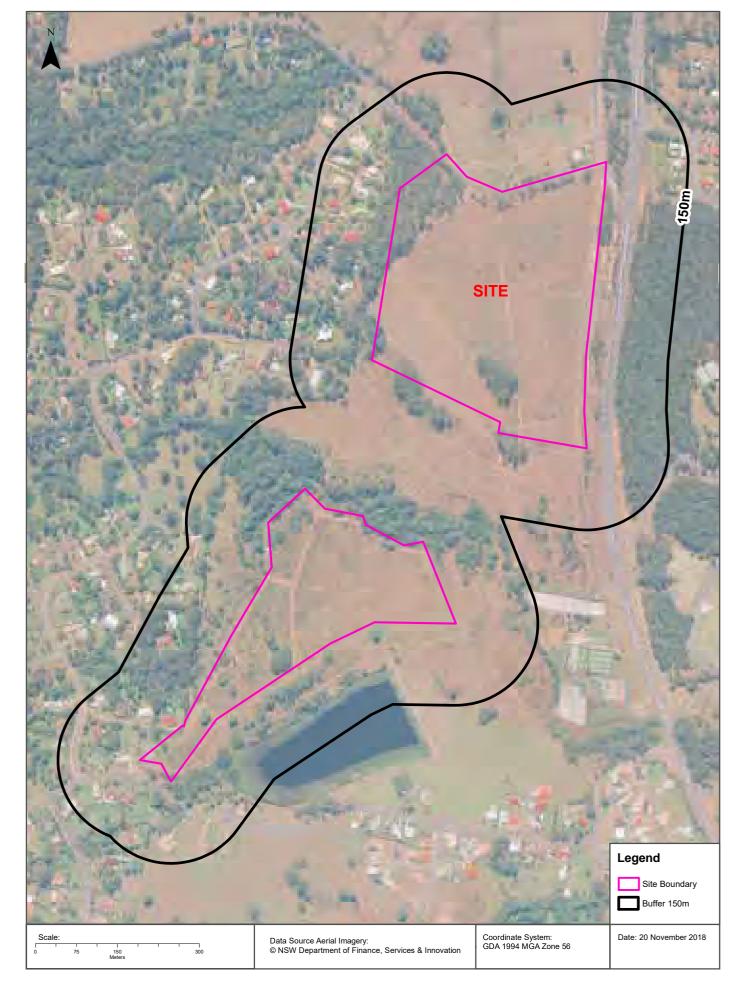


Aerial Imagery 1994

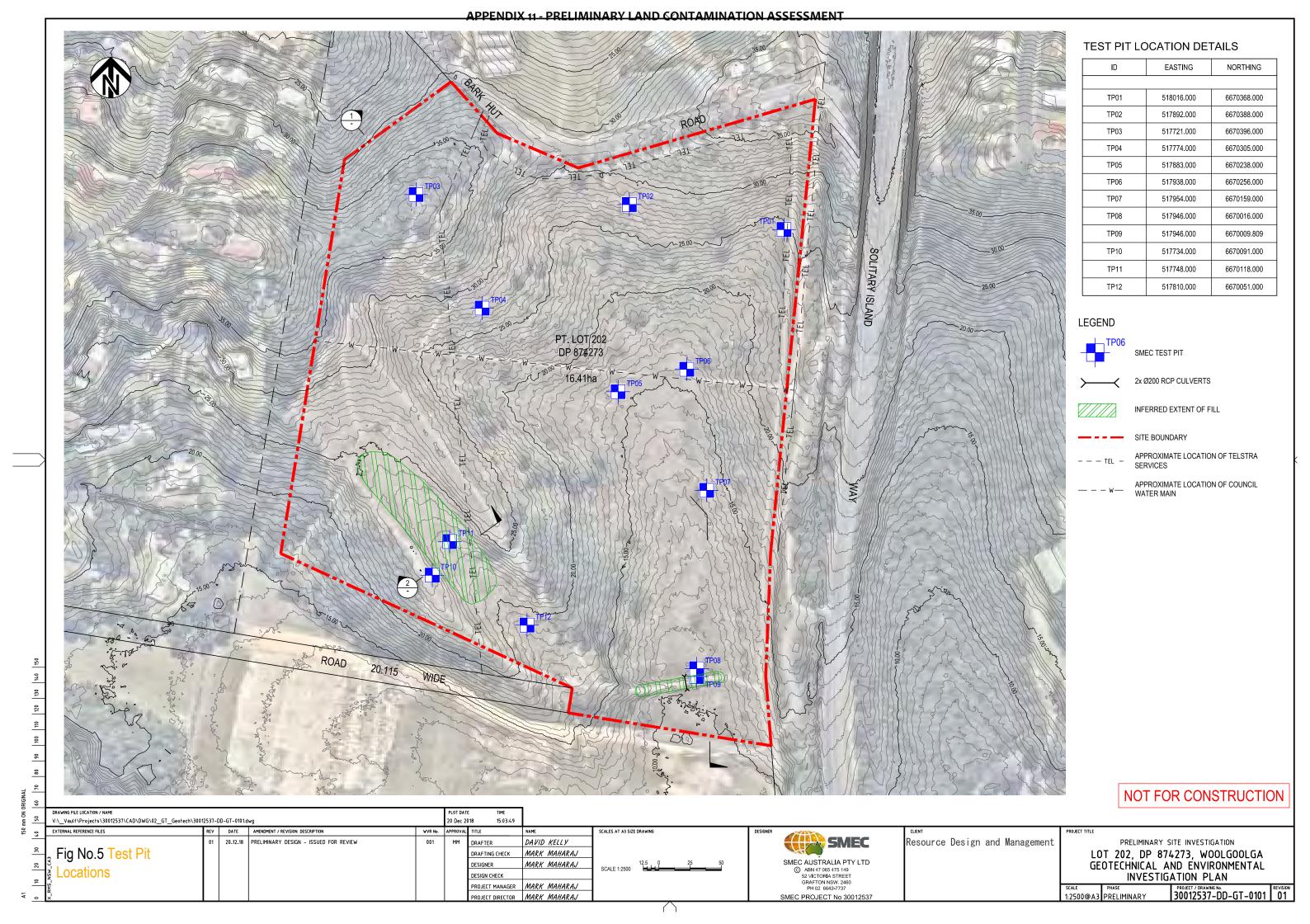


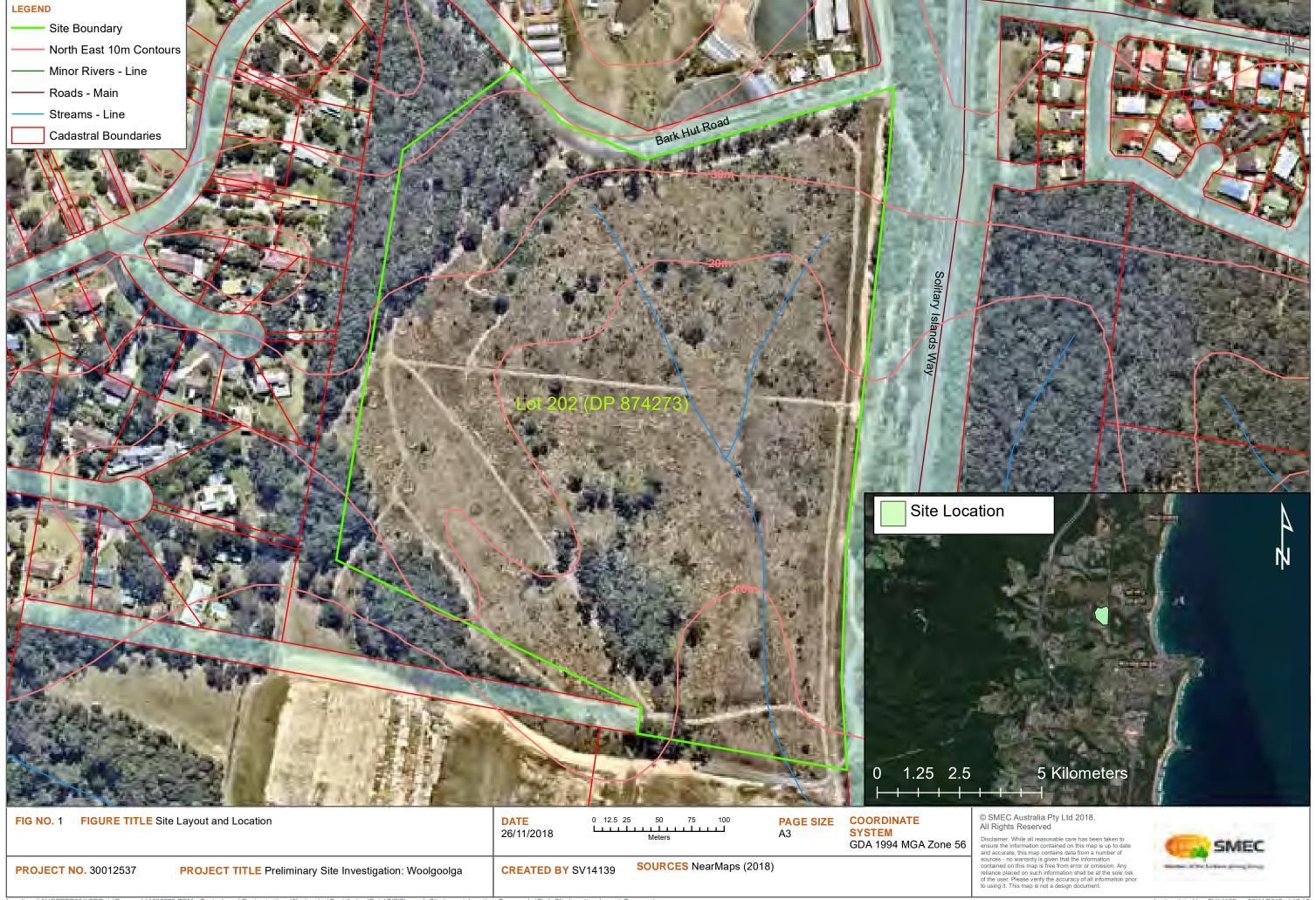












Appendix B Soil landscape information

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*

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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 midslopes.

SOILS

Dominant Soil Materials

me1- Browni	ish black	earthy	loam	(topsoil—	A
horizon)					

Colour brownish black (7.5YR 3/2) to dark brown

(7.5YR 3/4)

Texture loam to loam, fine sandy

Structure earthy

Fabric rough-faced peds

Field pH mildly to moderately acid (pH 6.5 -

Coarse

fragments usually a few angular fragments of

substrate (6 - 60 mm)

abundant to common Roots

Exposed

condition loosely coherent when dry; soft when

moist

Permeability moderately high

upper Boambee Creek Valley (Map Type location

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; B, horizon)

Colour brownish black (7.5YR 3/2) through

dark reddish brown (5YR 3/3) to reddish brown (5YR 4/8) in moister areas

clay loam to silty clay loam

Structure moderately pedal; sub-angular blocky

peds (10 - 50 mm)

Fabric rough to smooth-faced peds

Field pH mildly to moderately acid (pH 6.0 -

Coarse

Texture

fragments common angular fragments of substrate

(6 - 60 mm)

Roots common

Exposed

condition coherent to hardsetting when dry; firm

when moist

Permeability moderate

upper Boambee Creek Valley (Map Type location

> reference 5 **04**75*E, 66 **45**50*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 -

Texture light clay

Structure 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

upper Boambee Creek Valley (Map Type location

> 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%) silty clay loam to silty light clay

Structure 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

Texture

fragments common angular fragments of substrate

(6 - 60 mm)

Erosional Landscapes 65

Roots

few

Exposed

condition

coherent to hardsetting when dry; usually soft and sticky when moist

Permeability

Type location

moderate 1 km east of Karangi Dam opposite old mill (Map reference 5 **03**20*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.

OUALITIES AND LIMITATIONS

Landscape Limitations

Steep slopes (localised)

Mass movement hazard (localised) High water erosion hazard (localised)

Foundation hazard (localised)

Soil Limitations

me2

me3

me1 Low wet bearing strength

High organic matter Strong acidity Stoniness (localised) Low wet bearing strength

High erodibility

Strong to very strong acidity Aluminium toxicity potential

Low fertility

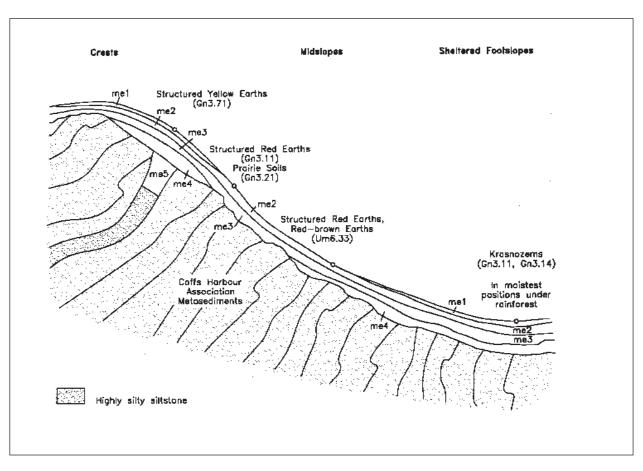
High organic matter (localised) Hardsetting surface (when exposed)

Stoniness (localised)
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
me 4	riigii piasticity

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

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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)



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		1000	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017		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	-	-	-

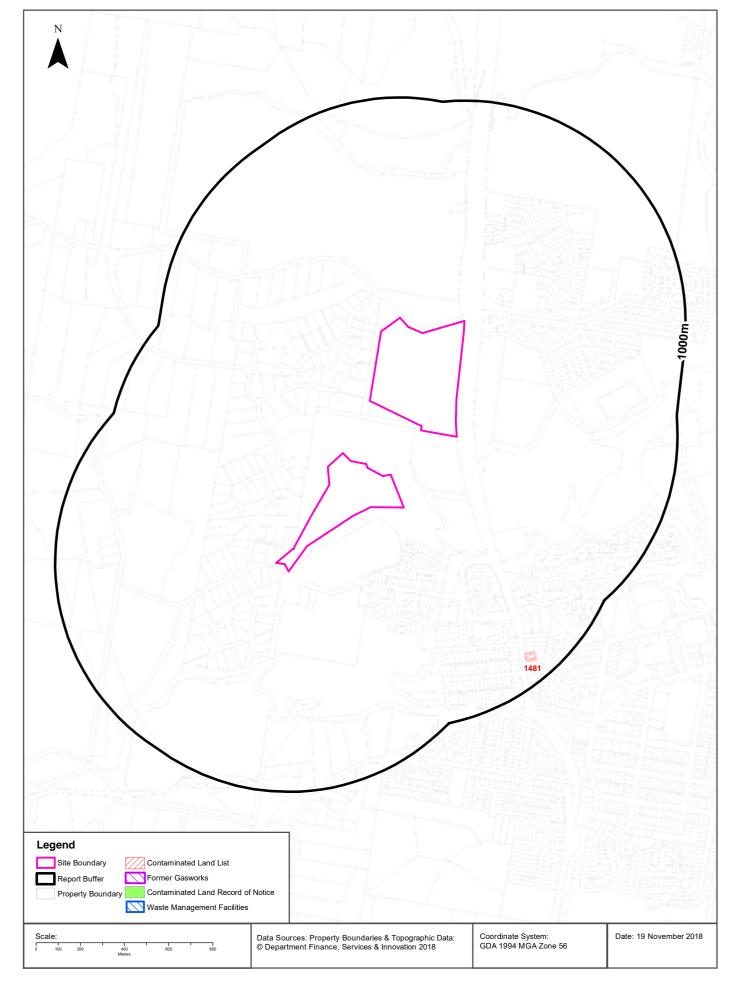
Aerial Imagery 2018





Contaminated Land & Waste Management Facilities





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:

ld	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





EPA Activities

Bark Hut Road, Woolgoolga, NSW 2456

Licensed Activities under the POEO Act 1997

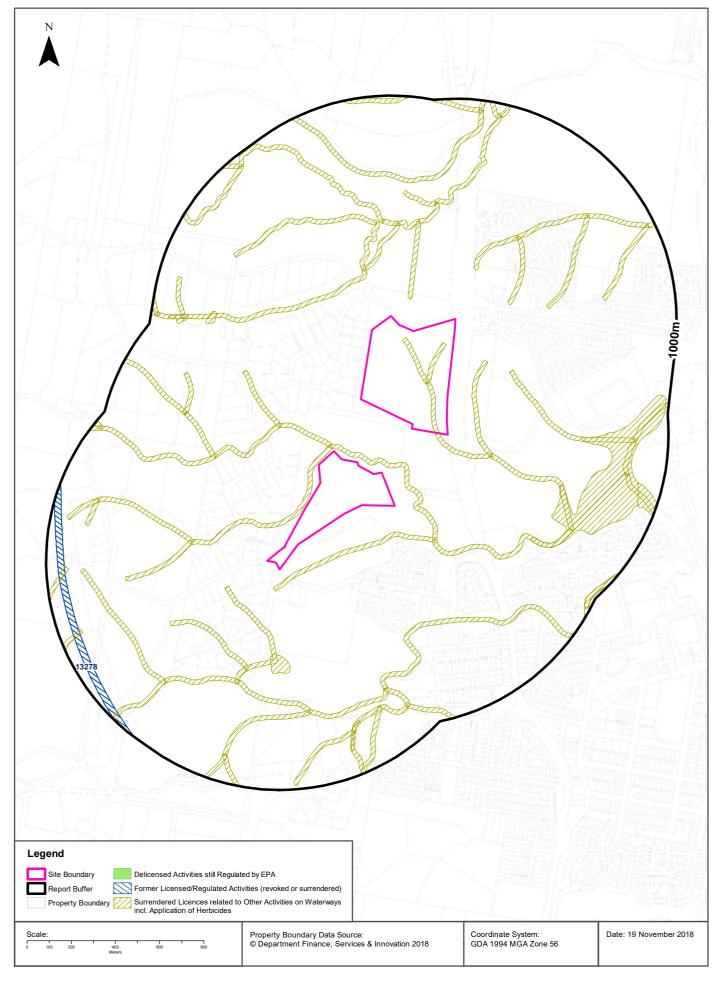
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

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





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		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

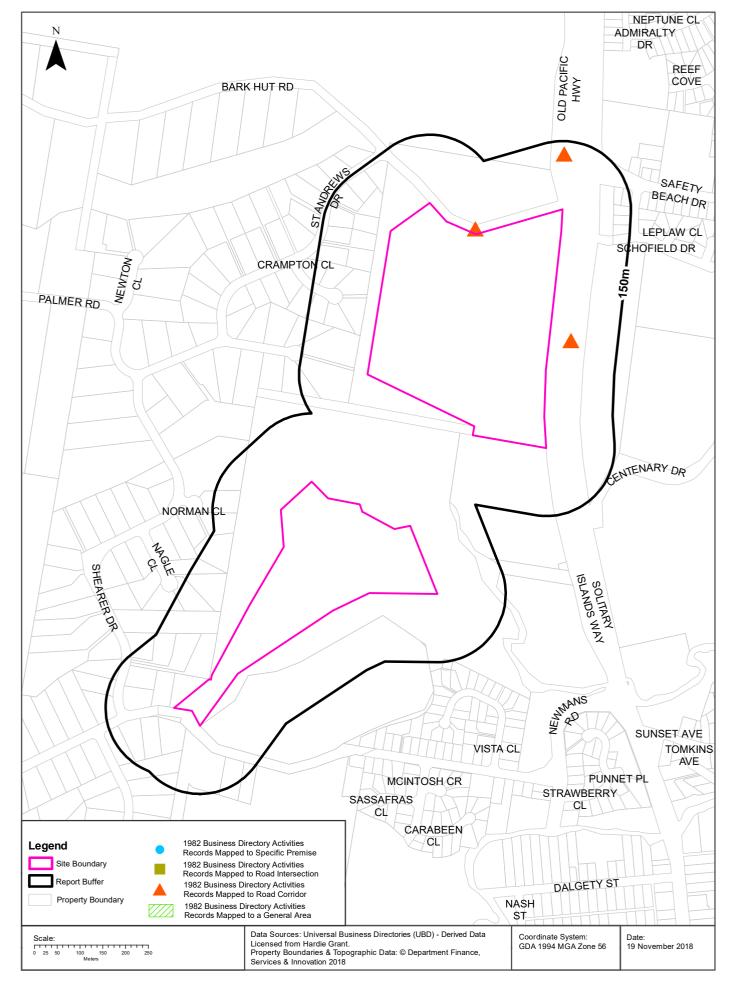
UPSS Sensitive Zones





1982 Historical Business Directory Records





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.	 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

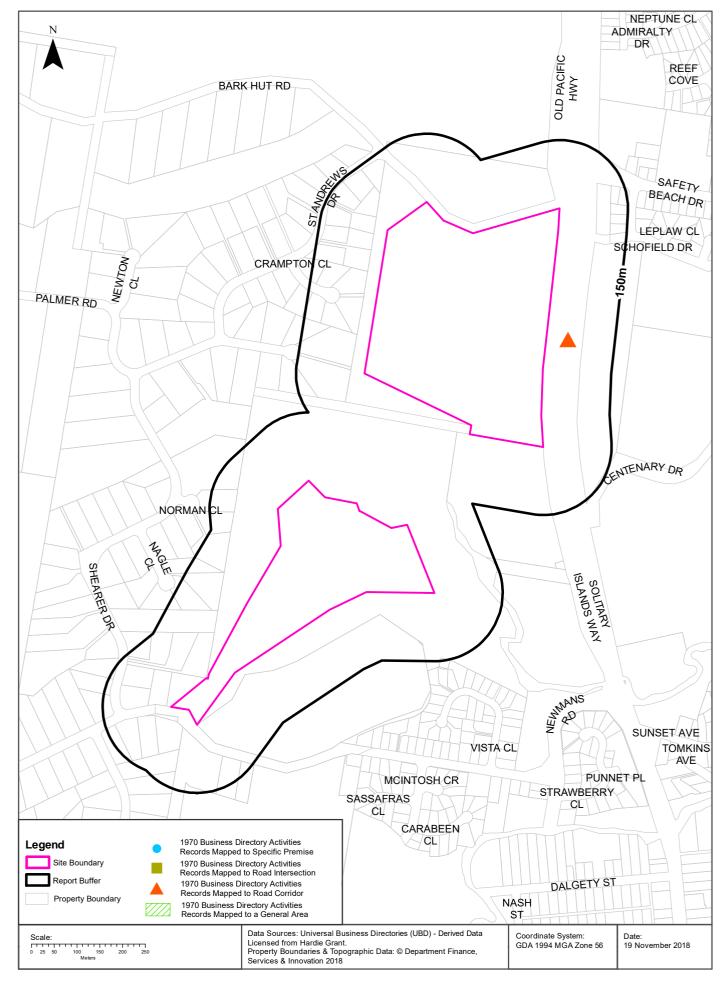
Records from the 1982 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

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, Pacitic Highway., Woolgoolga	98408	Road Match	0m
Not Listed	Featherstone, W. D. & M.Carrier, Pacitic 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





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:

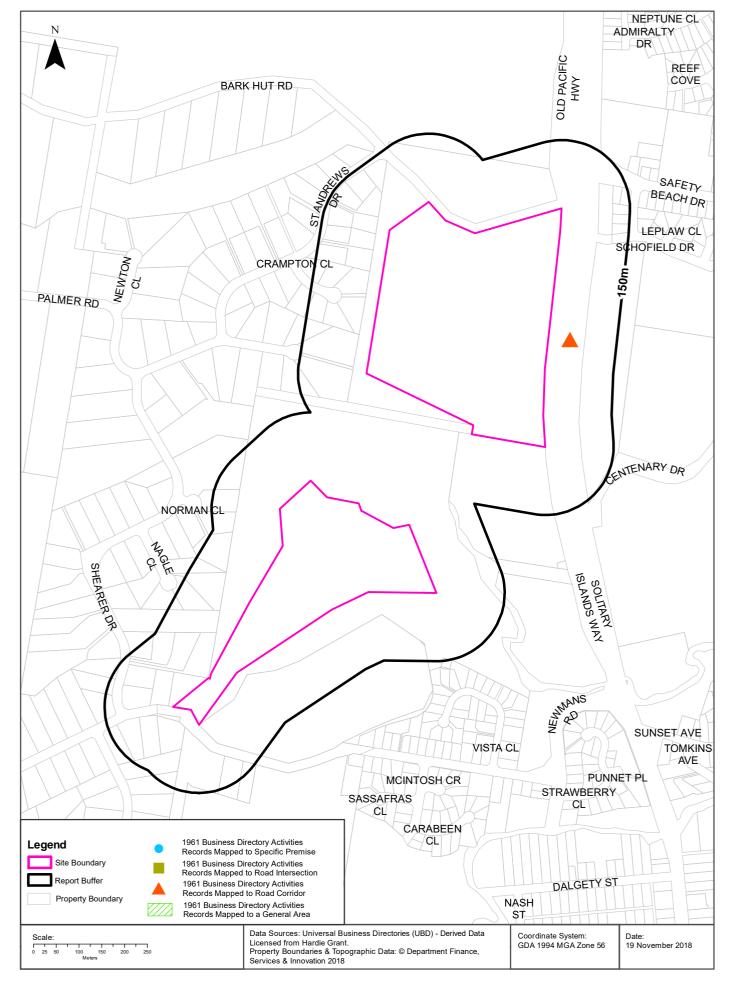
Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
MILK VENDORS	Bp Woolgoolga Service Station Pacific Highway, Woolgoolga	616442	Road Match	0m
BOTTLED GAS-SUPPLIERS &/OR REFILLERS	BP Woolgoolga Service Station, Pacific Hghwy., Woolgoolga	616348	Road Match	0m
CAFES, 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 MACHI NERY 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





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:

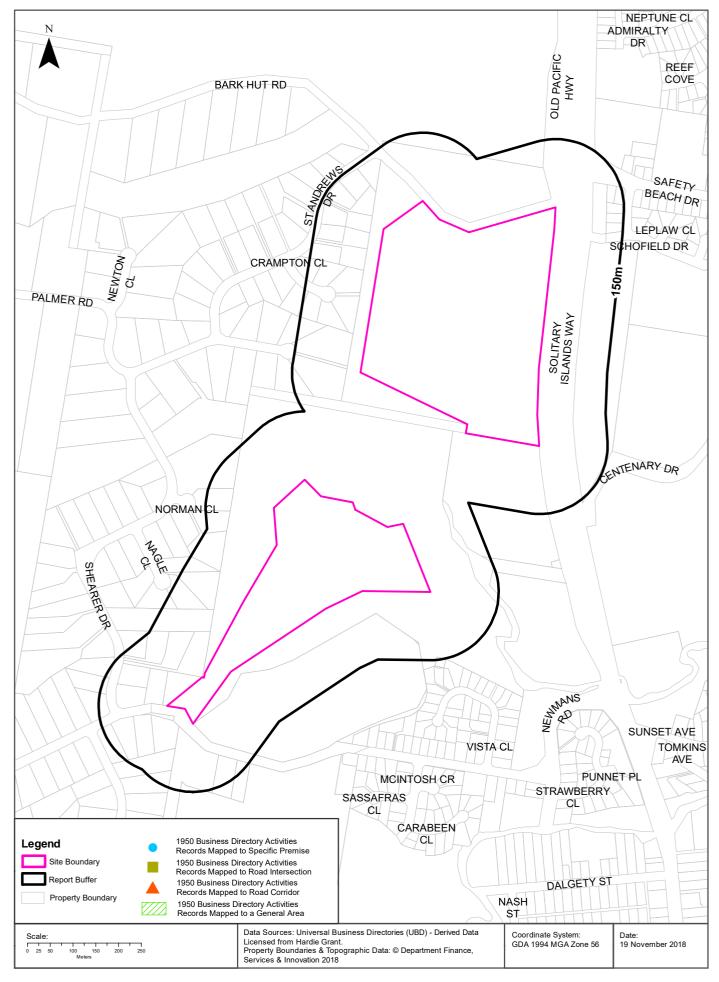
Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
MOTOR GARAGES & ENGINEERS	Clouten's, H., Golden Fleece Service Station, Pacific Highway., Woolgoolga	178249	Road Match	0m
MINERAL SANDS-SEPARATION SPECIALISTS	Freeman, R. S., Pacific Highway, Woolgoolga	178237	Road 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





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

 $\hbox{\it Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant}$

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.

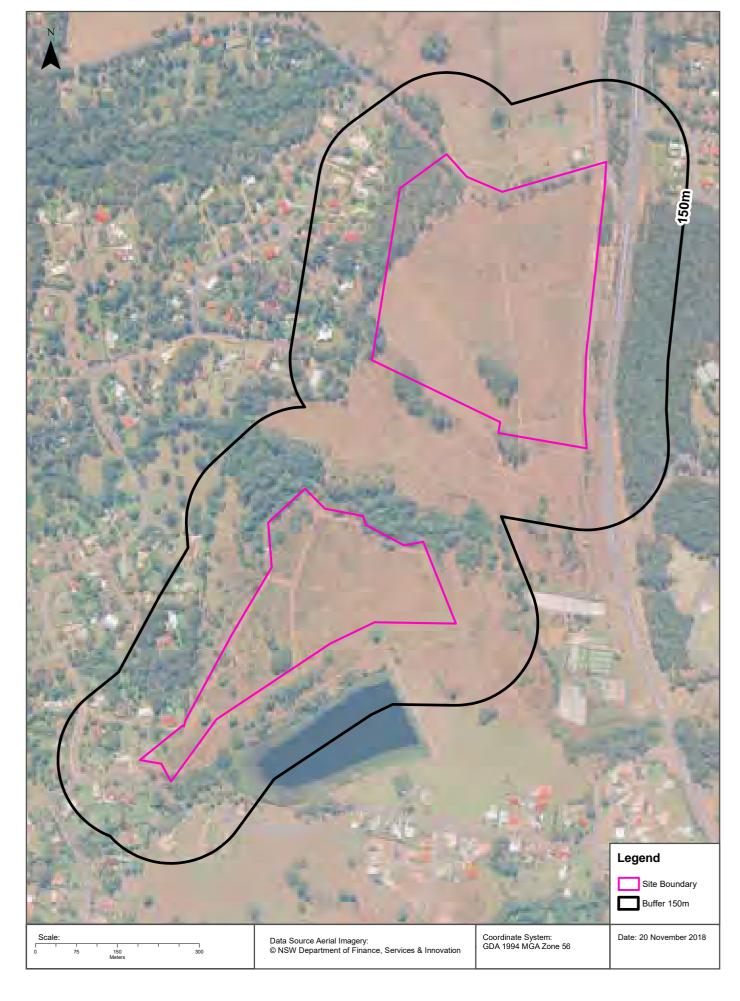
Aerial Imagery 2011





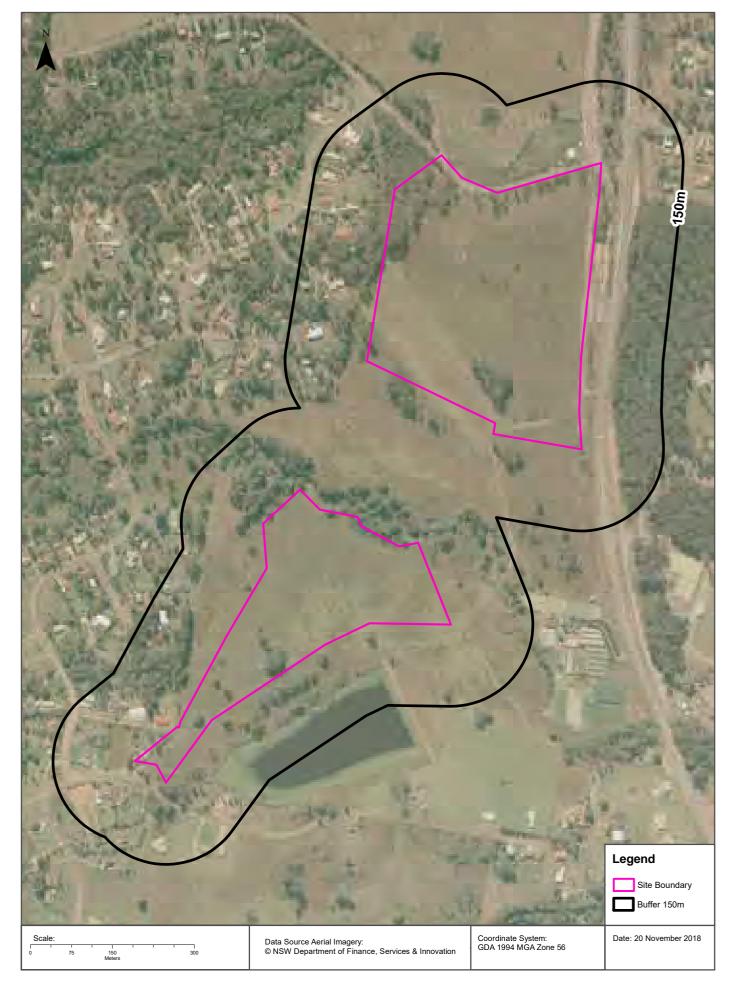
Aerial Imagery 2001



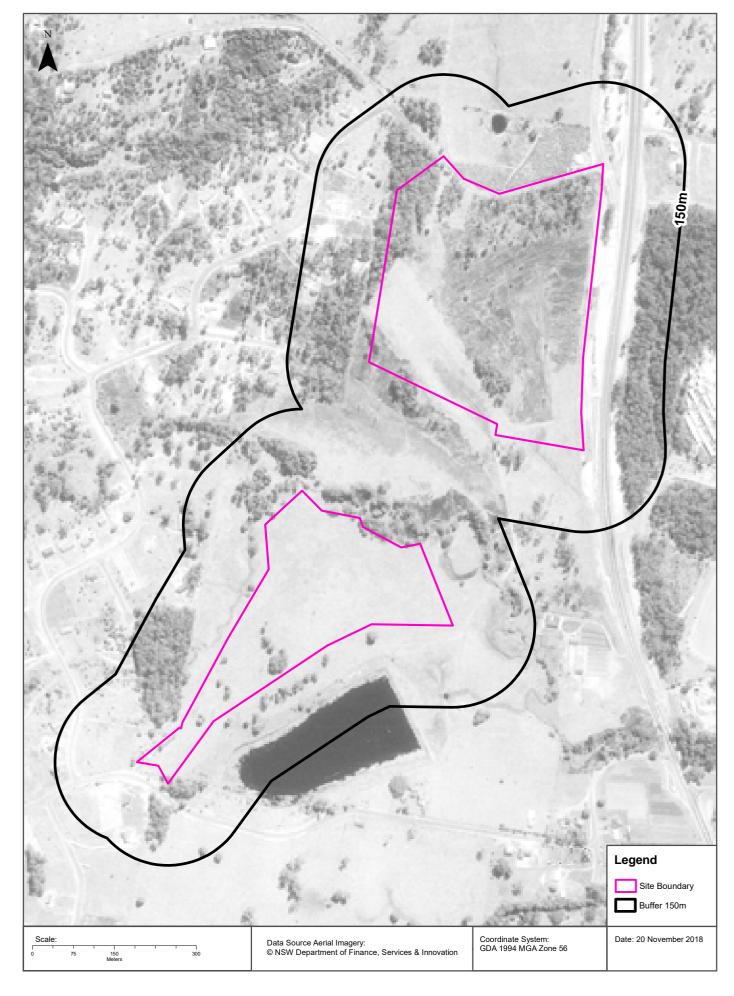


Aerial Imagery 1994

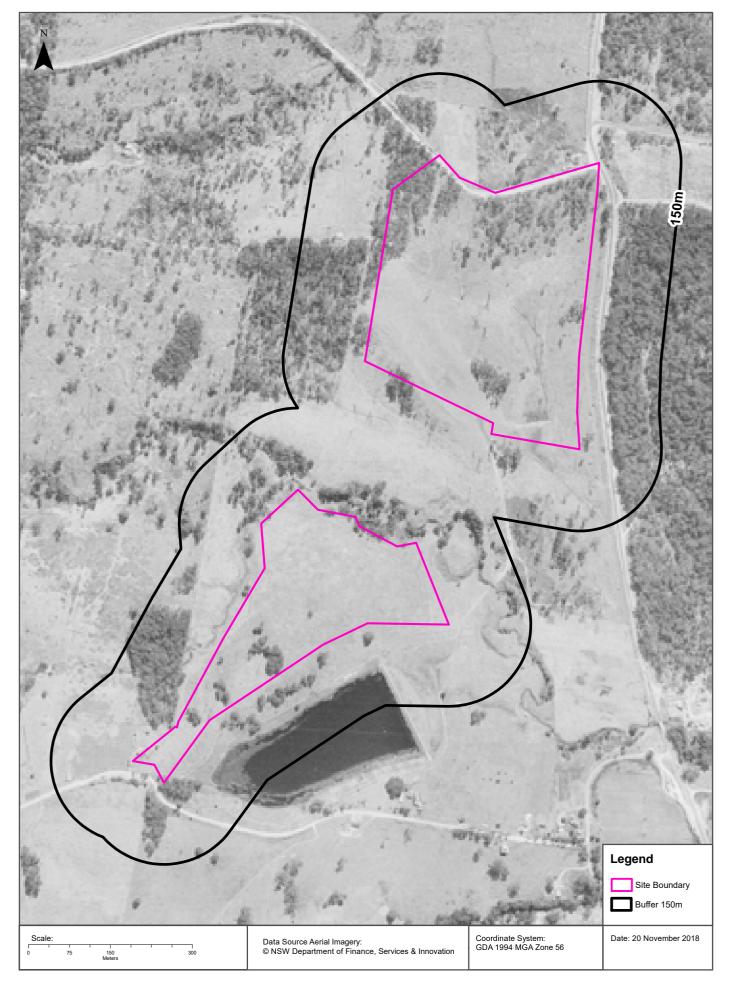




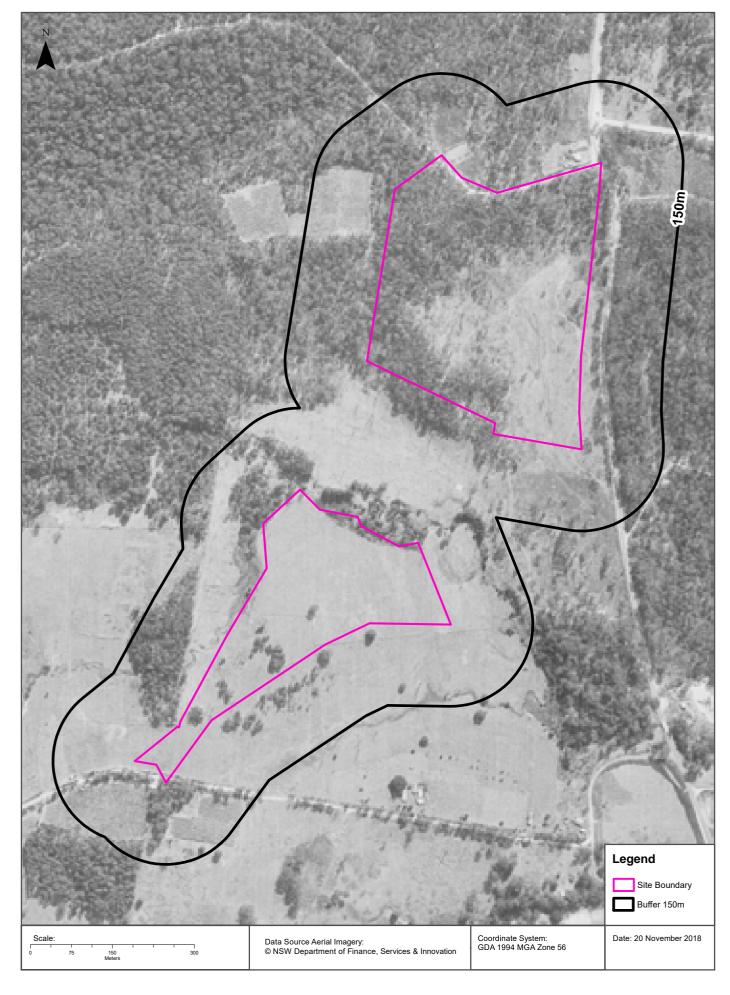




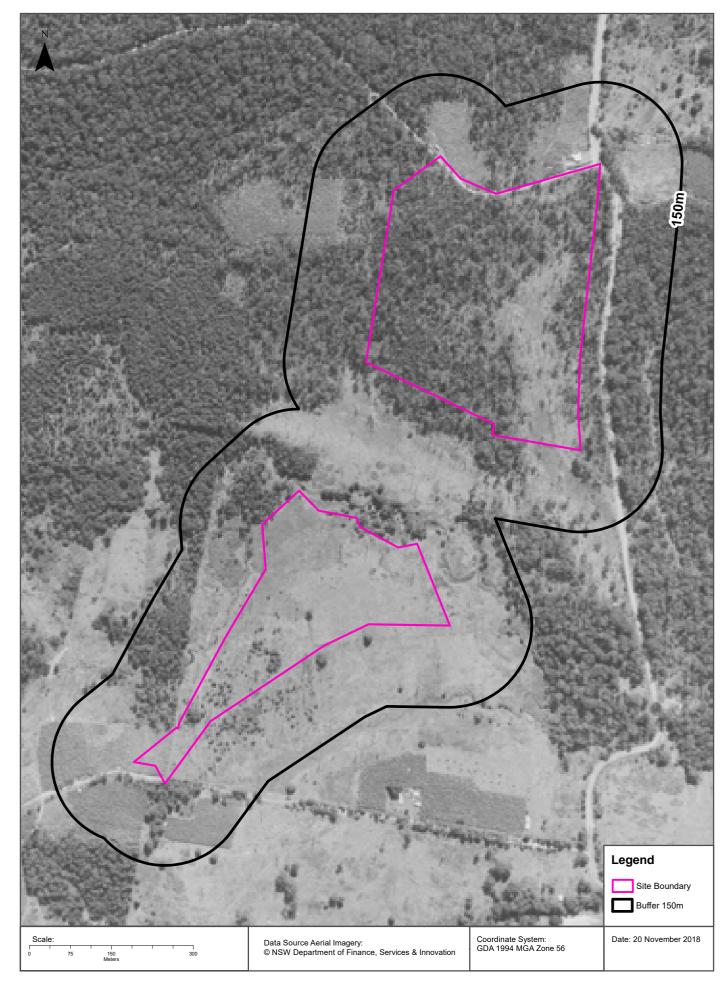






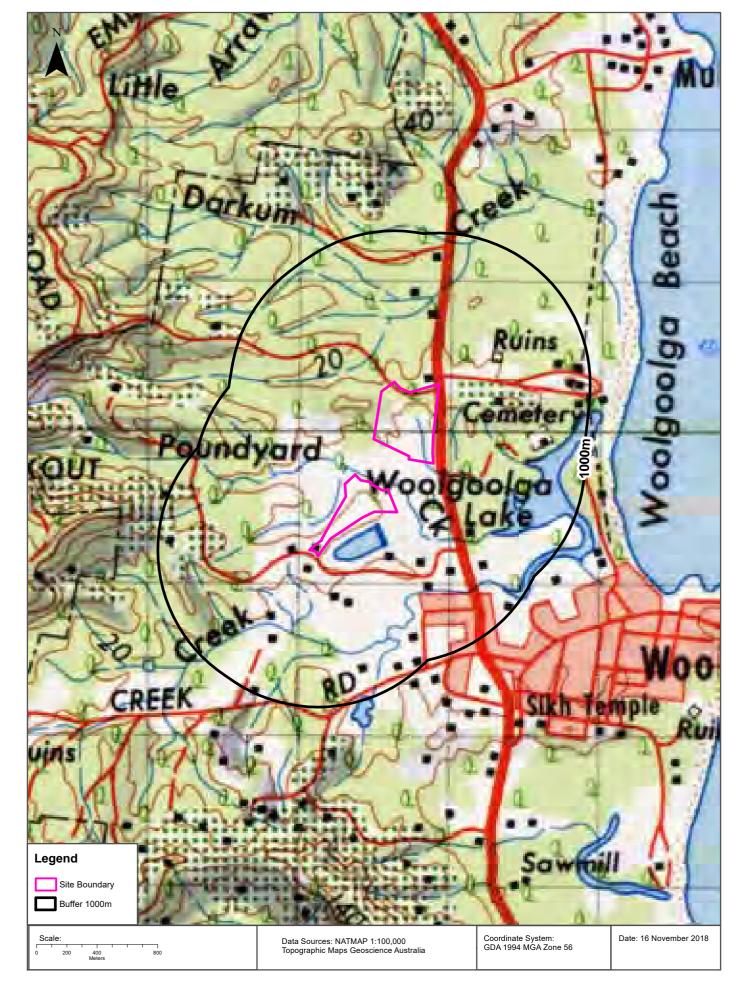






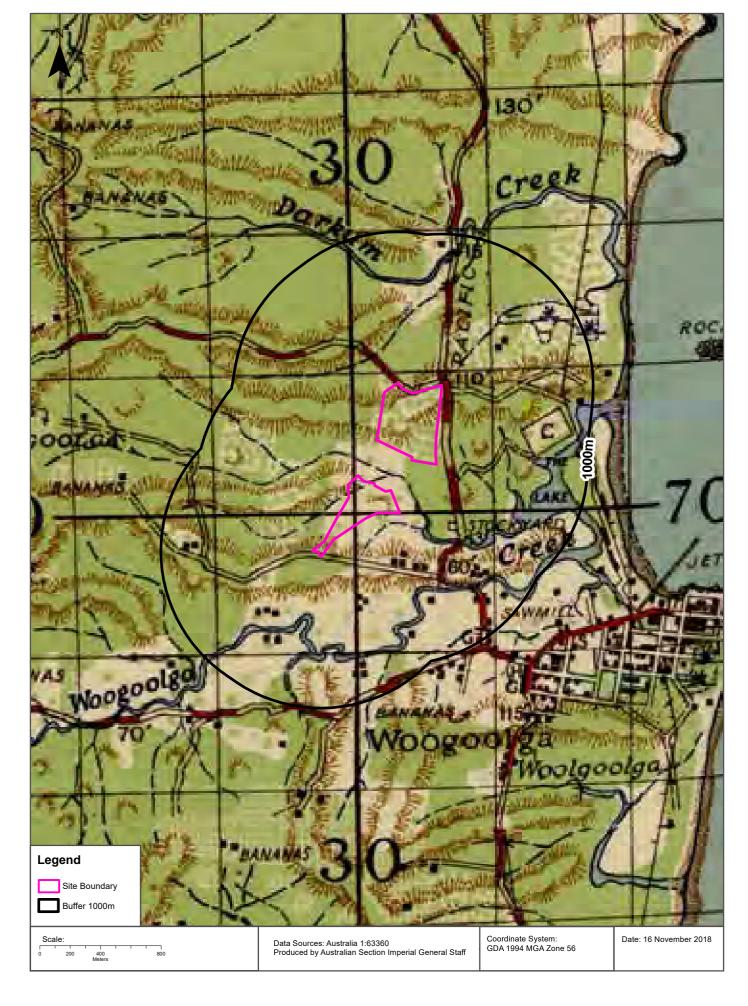
Historical Map 1974





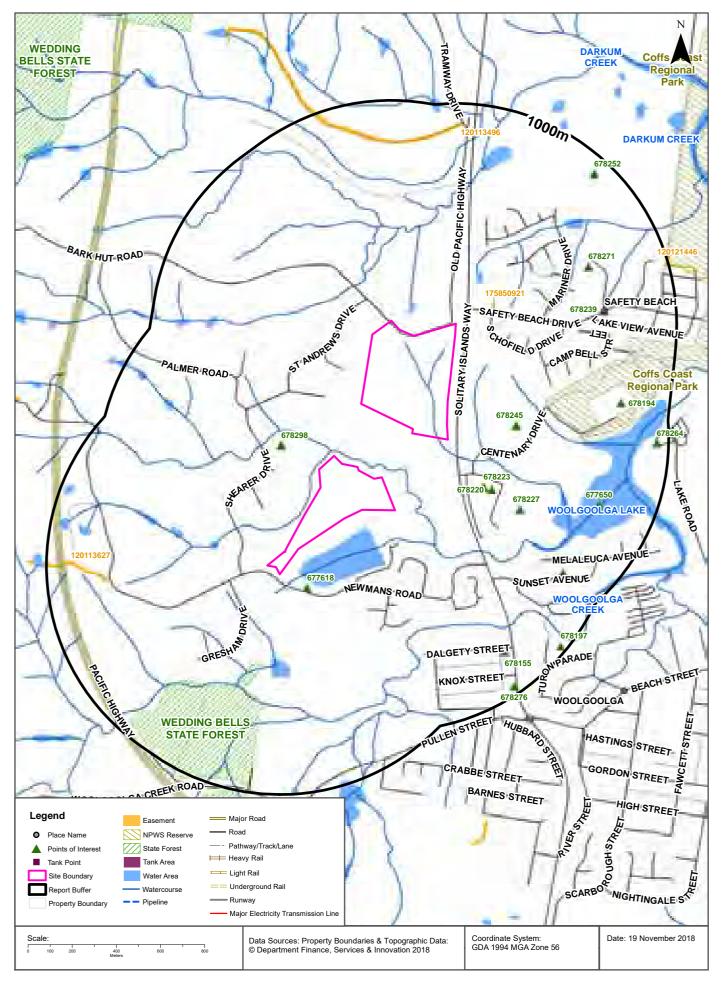
Historical Map 1942





Topographic Features





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?

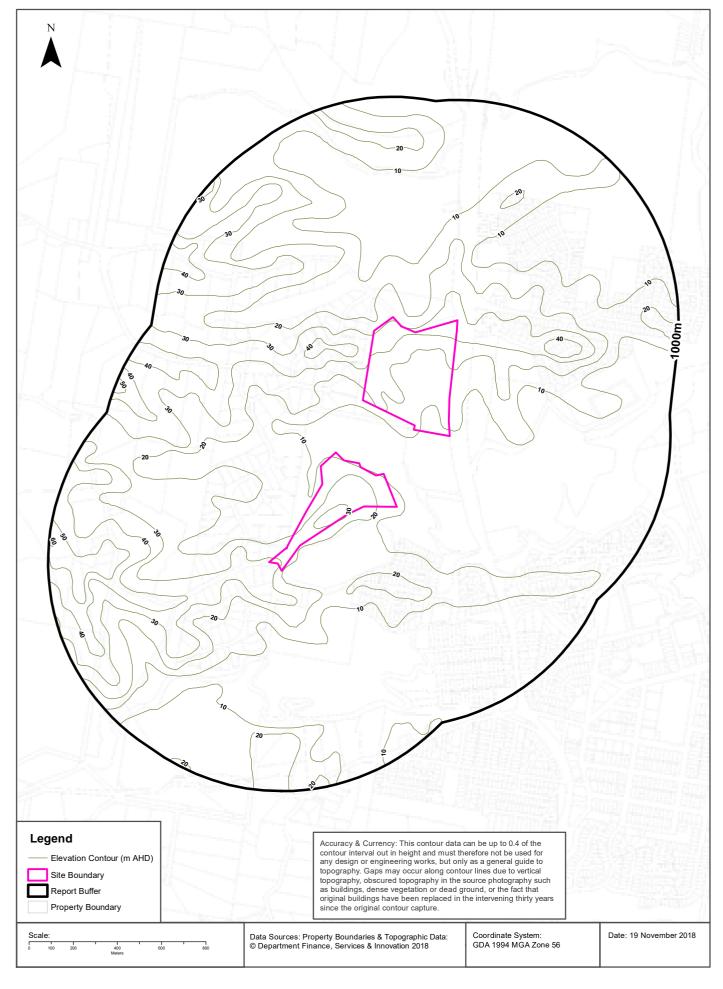
Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N1002	REGIONAL PARK	Coffs Coast Regional Park	03/10/2003	437m	South

NPWS Data Source: © Land and Property Information (2015)

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Elevation Contours (m AHD)





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

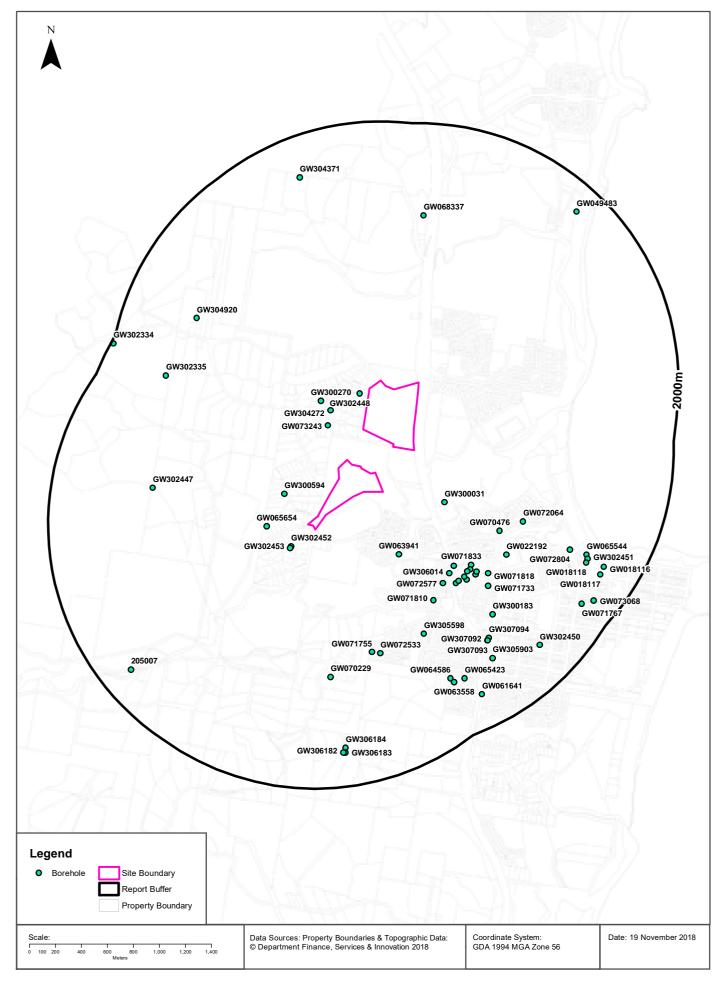
Groundwater management zones relating to the Botany Sand Beds aquifer within the dataset buffer:

Management Zone No.	Restriction	Distance	Direction
N/A	No records in buffer		

Botany Groundwater Management Zones Data Source: NSW Department of Primary Industries

Groundwater Boreholes





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)		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	18.0 0	0.694		269m	North West
GW073 243	30BL176 329	Bore	Private	Domestic	Domestic, Stock		10/11/1994	53.00	53.00	Good	10.0 0	0.610		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	20.0 0	2.273	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)		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		21.0 0	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	12.0 0	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			70.0 0	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	10.0 0	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	18.0 0	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)		Elev (AHD)	Dist	Dir
GW049 483	30BL109 572	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/07/1979	12.20	12.20					1792m	North East
GW073 068	30BL176 056	Bore	Private	Domestic	Domestic		20/09/1994	14.30	14.30	S.Salty	1.50	1.500		1807m	South East
GW302 334	30BL143 111	Bore		Domestic, Irrigation	Stock		25/06/1992	61.00	61.00	Good	27.0 0	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 Shale12.00m-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 Clay19.00m-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

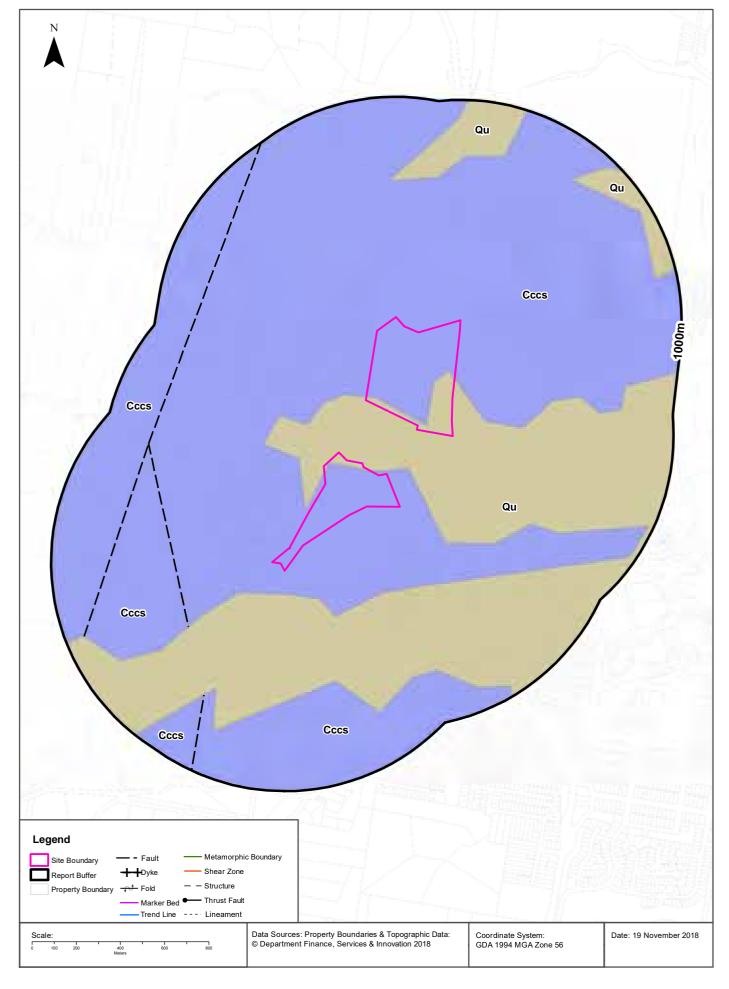
Groundwater No	Drillers Log	Distance	Direction
GW068337	0.00m-2.00m Fill 2.00m-13.00m Clay 13.00m-21.00m Soft Shale 21.00m-24.00m Hard Shale 24.00m-58.00m Basalt 58.00m-61.00m Quartz Seams 61.00m-70.00m Basalt	1287m	North
GW307094	0.00m-0.20m Fill; Concrete 0.20m-1.50m Silty Clay; high plasticity, red-brown, 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 HARD18.00m-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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Geology 1:250,000





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

Naturally Occurring Asbestos Potential

Bark Hut Road, Woolgoolga, NSW 2456

Naturally Occurring Asbestos Potential

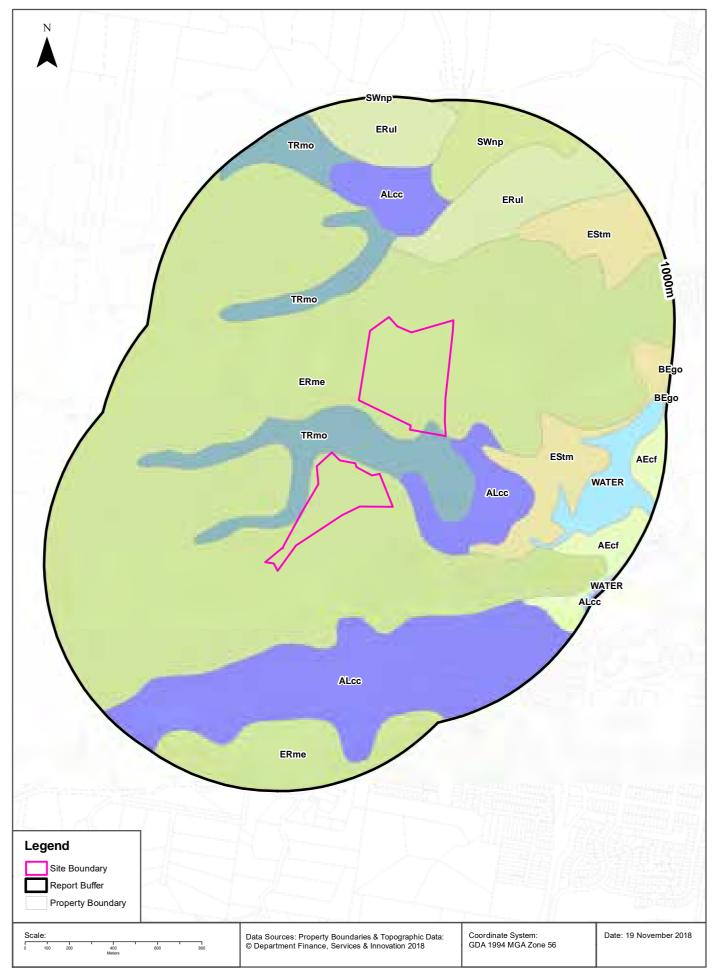
Naturally Occurring Asbestos Potential within the dataset buffer:

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





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

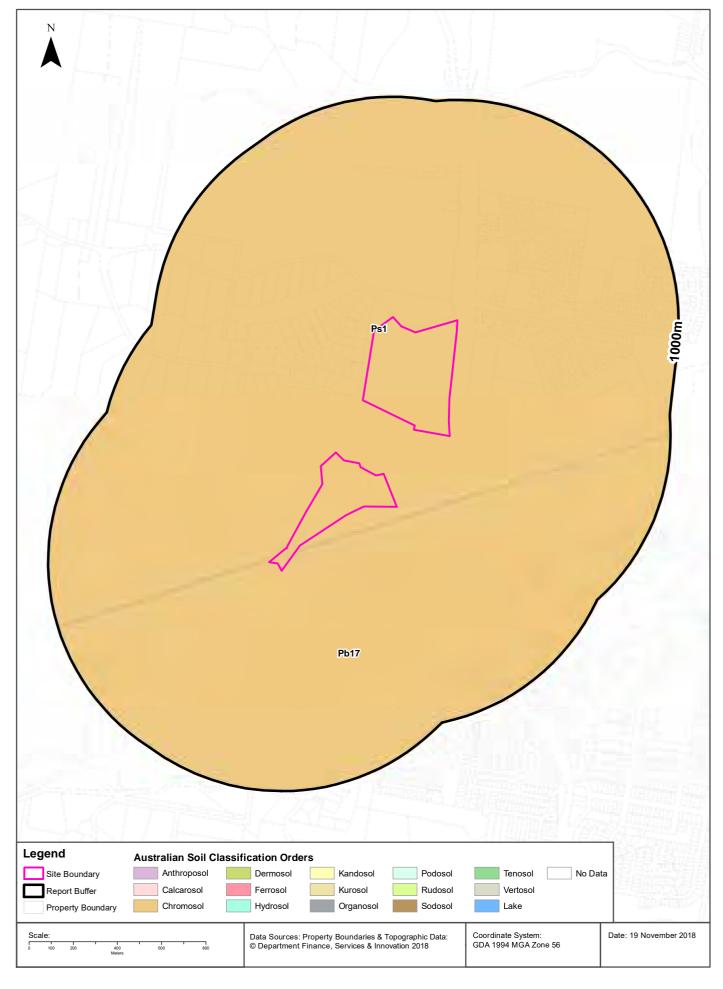
What are the Soil Landscapes within the dataset buffer?

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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Atlas of Australian Soils





Soils

Bark Hut Road, Woolgoolga, NSW 2456

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

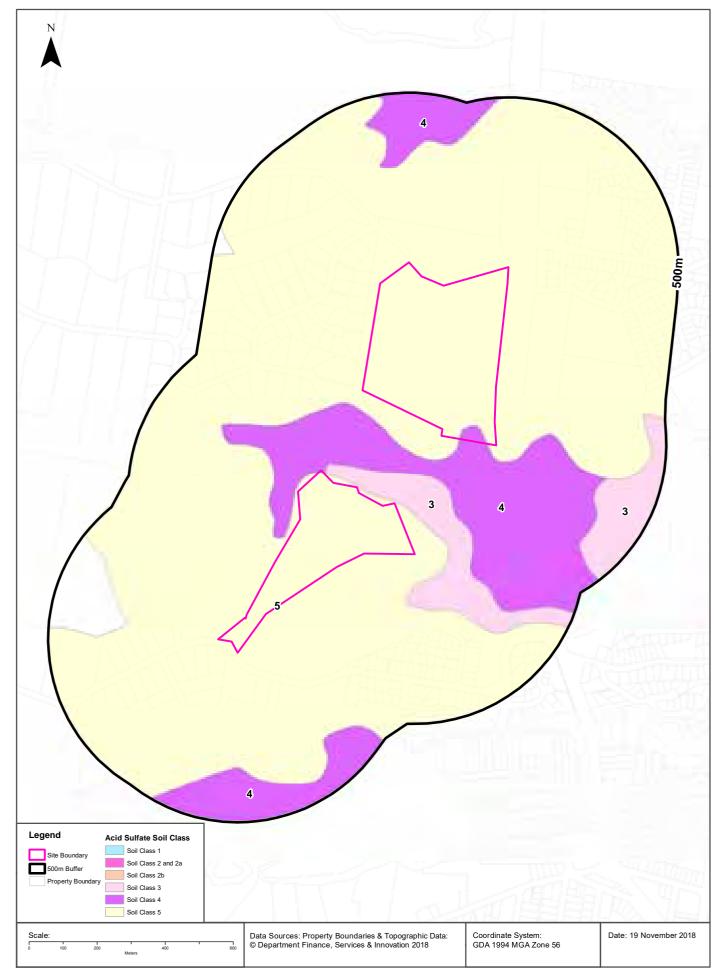
Map Unit Code	Soil Order	Map Unit Description	Distance
Pb17	Chromosol	Hilly areas alternating with small wet flats: hilly areas of hard acidic red soils (Dr2.21 and Dr2.11) possibly with other (D) soils, and small wet flats of such soils as (Gn3.94). Soils data are limited.	0m
Ps1	Chromosol	Steep hills 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





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 Creative Commons 4.0 © Commonwealth of Australia https://creativecommons.org/licenses/by/4.0/

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
В	Low Probability of occurrence. 6-70% chance of occurrence.	0m
С	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m
А	High Probability of occurrence. >70% chance of occurrence.	1m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Mining Subsidence Districts

Bark Hut Road, Woolgoolga, NSW 2456

Mining Subsidence Districts

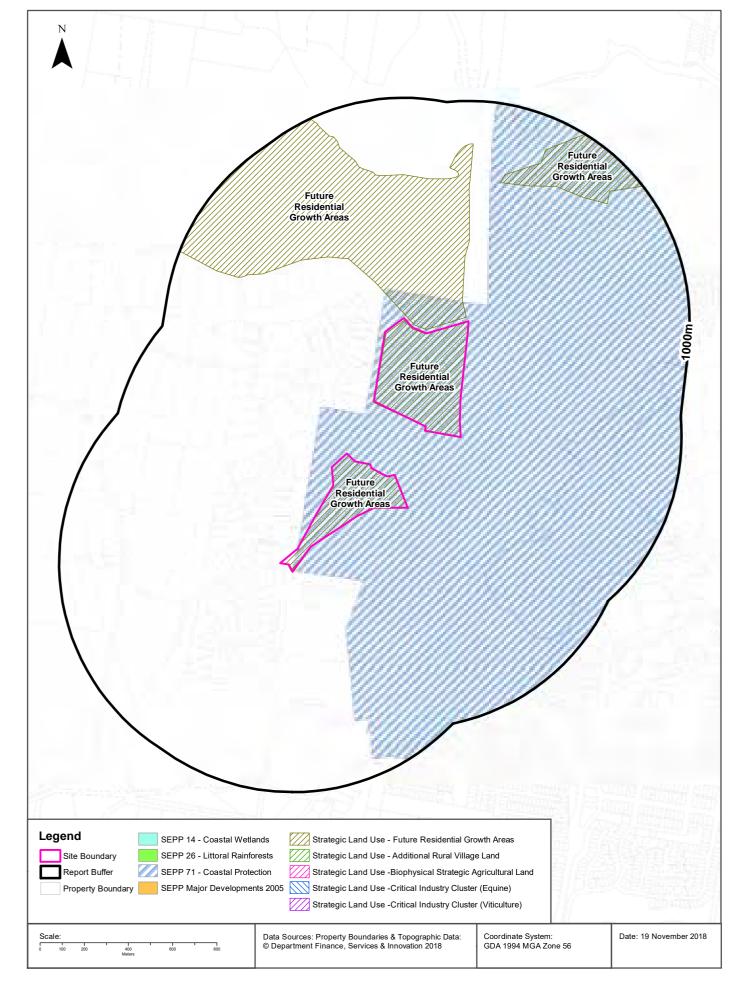
Mining Subsidence Districts within the dataset buffer:

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





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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

State Environmental Planning Policy Strategic Land Use Areas

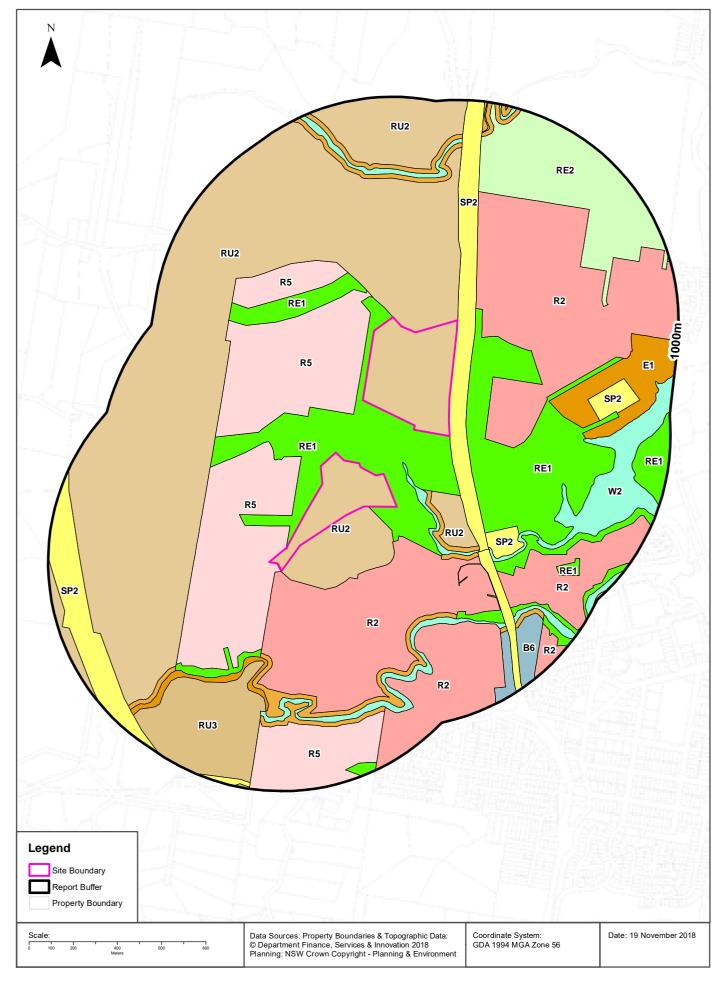
State Environmental Planning Policy Strategic Land Use Areas onsite or within the dataset buffer:

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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

EPI Planning Zones





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

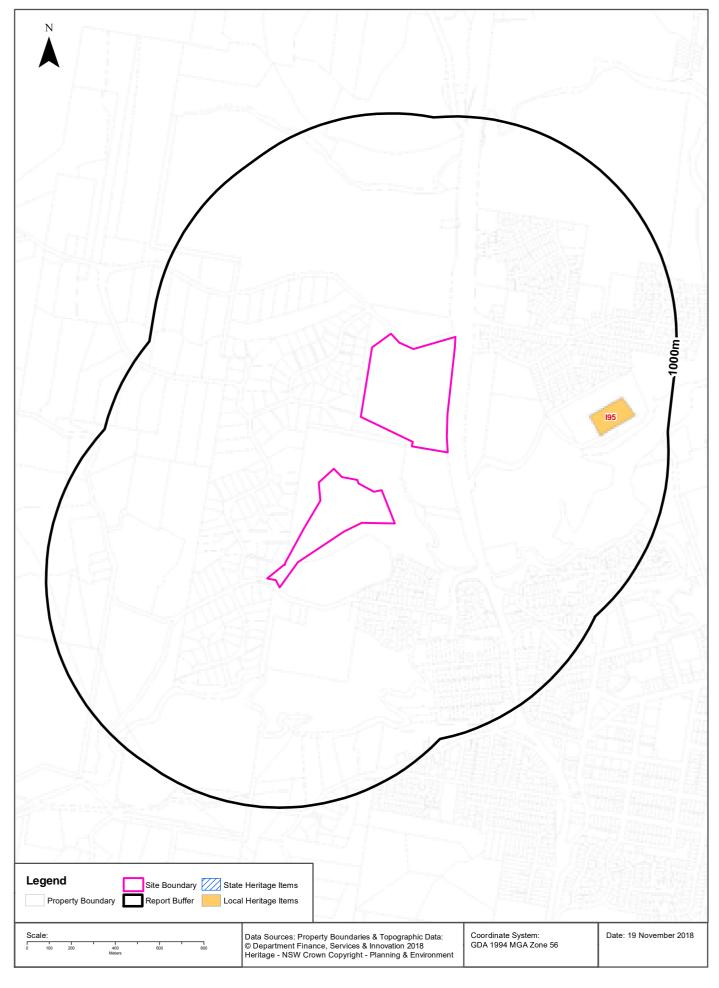
Land Reservation Acquisition

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							

Heritage Items





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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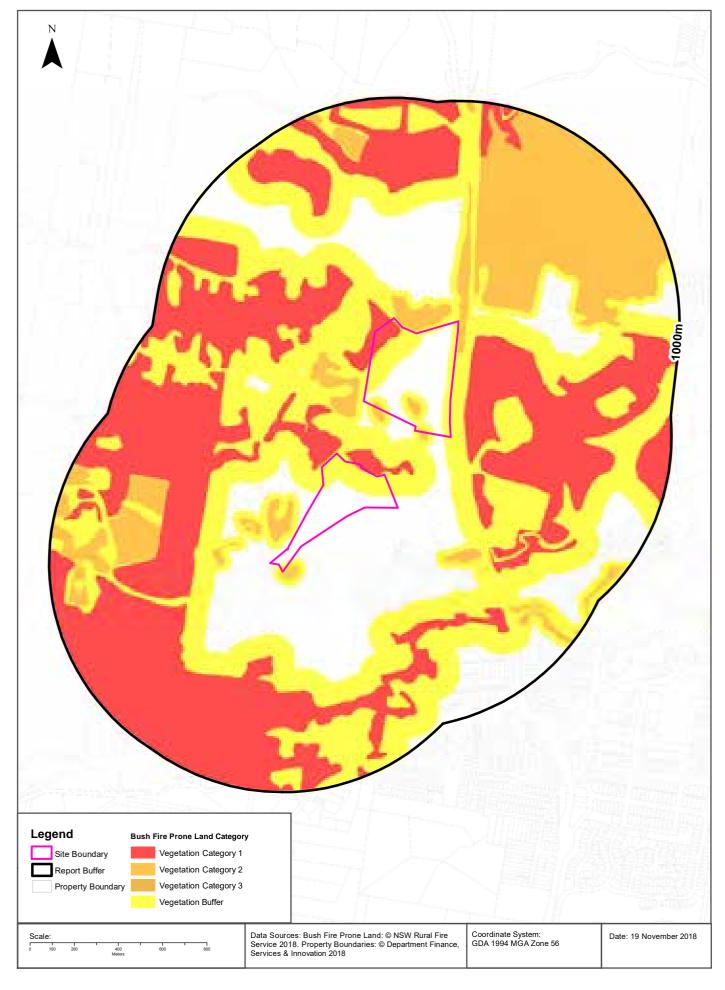
Environmental Planning Instrument - Heritage

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
195	Woolgoolga Cemetery	Item - General	Local	Coffs Harbour Local Environmental Plan 2013	27/09/2013	27/09/2013	09/02/2013	637m	East

Natural Hazards - Bush Fire Prone Land





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





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 tereticonis, 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 monfiifera*.	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 Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

RAMSAR Wetlands

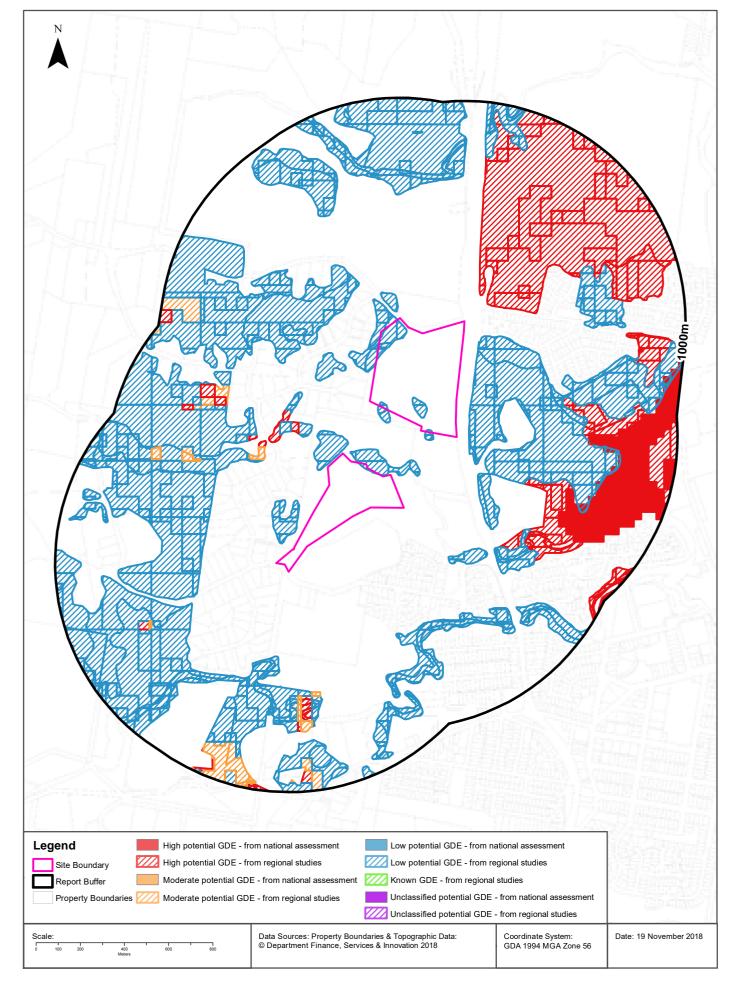
What RAMSAR Wetland areas exist within the dataset buffer?

Map Id	RAMSAR Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

 ${\it RAMSAR\ Wetlands\ Data\ Source: @\ Commonwealth\ of\ Australia\ -\ Department\ of\ Environment}$

Ecological Constraints - Groundwater Dependent Ecosystems Atlas





Ecological Constraints

Bark Hut Road, Woolgoolga, NSW 2456

Groundwater Dependent Ecosystems Atlas

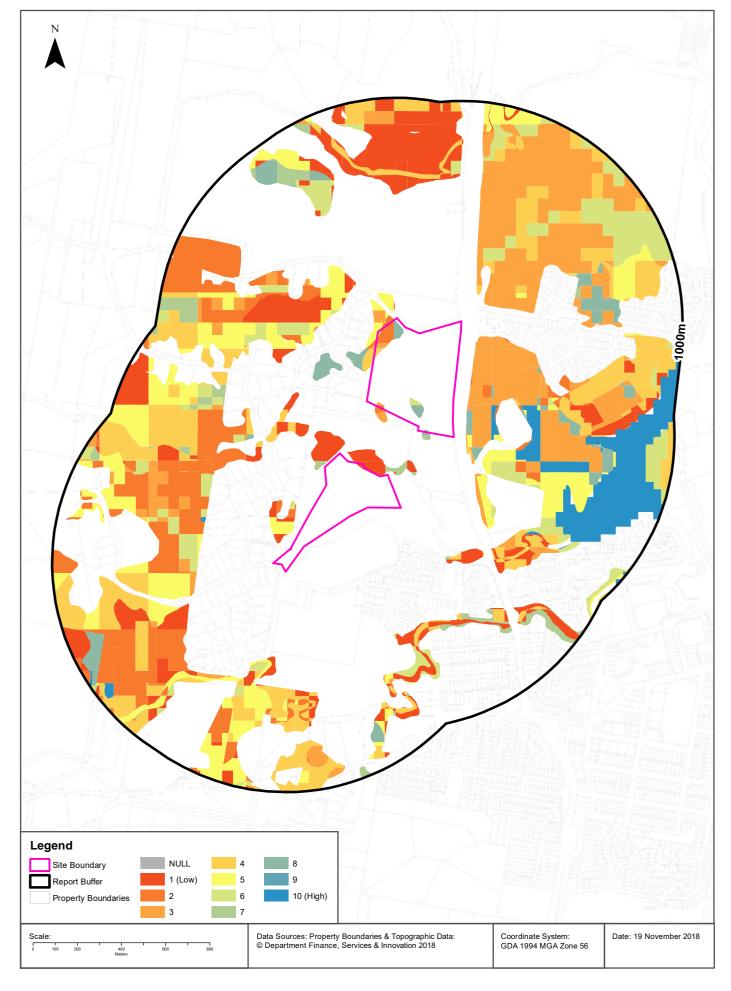
Туре	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	Low potential GDE - from regional studies	Coastal lowlands on weak sedimentary rocks, with littoral and alluvial plains.	Vegetation		0m
Terrestrial	Low potential GDE - from regional studies	Plateau flank dissected into 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

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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

Туре	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

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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	Curlew 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 lathami	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	Tringa incana	Wandering Tattler	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Mammalia	Aepyprymnus rufescens	Rufous Bettong	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur- seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Chalinolobus nigrogriseus	Hoary Wattled Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Dugong dugon	Dugong	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Kerivoula papuensis	Golden-tipped Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Megaptera novaeangliae	Humpback Whale	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Miniopterus australis	Little Bentwing- bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Mormopterus norfolkensis	Eastern Freetail- bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petauroides volans	Greater Glider	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	Petaurus australis	Yellow-bellied Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petaurus norfolcensis	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Planigale maculata	Common Planigale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad- nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Syconycteris australis	Common Blossom-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	Eretmochelys imbricata	Hawksbill Turtle	Not Listed	Not Sensitive	Vulnerable	
Animalia	Reptilia	Hoplocephalus stephensii	Stephens' Banded Snake	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Acronychia littoralis	Scented Acronychia	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Angophora robur	Sandstone Rough-barked Apple	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Belvisia mucronata	Needle-leaf Fern	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Boronia umbellata	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	Parsonsia 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.

NSW BioNet: $\ensuremath{\mathbb{Q}}$ State of NSW and Office of Environment and Heritage

Data obtained 16/11/2018

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Appendix D Laboratory summary tables

Preliminary Site Investigation: Laboratory Analytical Results Woolgoolga, NSW

30012537 Preliminary Site Investigation, Site off Bark Hut Road, Woolgoolga NSW

Soil	Δna	lvtica	l Racı	ıltc	Tak	•
3011	Alla	ıvııca	ı nesi	uits	ıaı	u

						BTEX				Phenols	Halogenated Benzenes							Herbicides		
SMEC		'			a	a a					enzene	noxy	(ex)		noxybuta	do.	лоху	Herbidides		
Member of the Surbana Jurong Group	Asbest Identifica		ene	e u	Senzene	e (m &	e (o)	e Total	ВТЕХ	E a	thlorob	2,4,5- Trichlorophe Acetic Acid	TP (Silv	lau	oropher	Dichlorpr	orophe: acid	lopyralid	mba	cypyr
	Presen absen	nce	Benz	Tolue	Ethylbo	Xylen	Xylen	Xylen	Total	Piclor	Нехас	2,4,5- Trichl	2,4,5-	Hedon	2,4- dichl	2,4-	4-Chlor acetic a	U	Dica	Fluro
Unit of Measusrment	NA O 1 /		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
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 NEPM 2013 Table 1B(7) Management Limits in Res /			77	NL	NL			NL												
Parkland, Coarse Soil NSW 2014 General Solid Waste CT1 (No Leaching)			10	288	600			1,000		60				200						40
NSW 2014 General Solid Waste CT1 (No Leaching) NSW 2014 General Solid Waste SCC1 (with leached)			18	518	1,080			1,800		110				10						75
NSW 2014 General Solid Waste TCLP1 (leached)			10	310	1,000			1,000		110				10						
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 2-4m			0.5 0.5	220				60 95												
>=4m			0.5	310 540				170												
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public			0.5	340				170												
Open Space NEPM 2013 Table 1A(1) HILs Res A Soil										4,500	10	600		900						
Field ID Date										4,500	<u>j 10</u>	000		300						
TP01-0.1m 6/12/20	18 Not Dete	erted	<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 6/12/20			<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	V0.04	-	- 0.04	- 0.04	- 0.04	-	-	-	-	-	-
TP02-1.0m 6/12/20	_		<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2		_	_	_	_	-	_	_	_	_	_
TP02. 0.1m 6/12/20			10.2	10.5	10.5	10.5	10.5	10.5	10.2	<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 6/12/20			<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2							0.0.				
TP03-0.1m 6/12/20			-	-	-	-	-	-	-	<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 6/12/20			-	-	-	-	-	-	-	<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 6/12/20	.8 -		-	-	-	-	-	-	-	<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 6/12/20	- 18		-	-	-	-	-	-	-	<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 7/12/20			-	-	-	-	-	-	-	<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 7/12/20			-	-	-	-	-	-	-	<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 7/12/20			-	-	-	-	-	-	-	<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 7/12/20			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.0m 7/12/20			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08-2.4m 7/12/20			0.2						0.2	- 1		0.02					0.02			
TP09-0.1m 7/12/20 TP09-0.5m 7/12/20			<0.2 <0.2	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.2 <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 DUP 7/12/20		LULLU	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-
TP09-1.1m 7/12/20		ected	-	-	-	-	-	-	-	<u> </u>	-	-	_	_	_	-	_	_	_	_
TP10-0.1m 7/12/20			-	-	-	-	-	-	-	<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 7/12/20			<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 7/12/20		ected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12-0.1m 7/12/20		ected	-	-	-	-	-	-	-	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Statistics																				
Number of Results	6	6	8	8	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	0	0
Minimum Concentration	1	1	<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
Minimum Detect	1	1	ND	ND	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	<0.5	<0.2	<0.04	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Maximum Detect	1	1	ND	ND	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	0.25	0.1	0.018	0.025	0.018	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	0.25	0.1	0.02	0.025	0.02	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	0.0038	0	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038
* A Non Detect Multiplier of 0.5 has been applied.	1	1	0.1	0.25	0.25	0.25	0.25	0.25 _{age 1}	of 6 0.1	0.0203	0.025	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203	0.0203

^{95%} UCL (Student's-t) *

* A Non Detect Multiplier of 0.5 has been applied.

			1	I		Lead				Metals			1		I		ı	I			1
SMEC Member of the Surbana Jurong Group		2-Methyl-4- chlorophenoxyacetic acid	2-Methyl-4- Chlorophenoxy Butanoic Acid	lecoprop	riclopyr	paq	rsenic	admium	hromium (III+VI)	opper	1ercury	ickel	inc	,4-DDE	внс	Aldrin	ldrin + Dieldrin	.BHC	ılordane	Chlordane (cis)	Chlordane (trans)
Unit of Measusrment		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	ங் mg/kg	₹ mg/kg	mg/kg	<u>ف</u> 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																				İ	
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) NSW 2014 General Solid Waste TCLP1 (leached)					75	1,500	500	100			50	1,050									
NSW 2014 General Solid Waste FCET (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 NEPM 2013 Table 1A(1) HILs Res A Soil		600	600	600		300	100 100	20		6,000	40	400	7.400				6		50		
1451 141 5012 1 apric 17(1) 1112 ues y 2011		000	000	וויסטט		300	100	20		0,000	40	400	7,400				6		50		
Field ID	Date																				
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		- 0.04			8	<5	<1	11	<5 <5	<0.1	2	27	- 0.05	- 0.05	- 0.05	- 0.05	- 0.05	- -0.0E	- 0.05	- 0.05
TP02 .0.1m TP02 1.0M DUP	6/12/2018 6/12/2018	<0.04	<0.04	<0.04	<0.04	9 8	<5 <5	<1	5 10	<5 <5	<0.1	<2 <2	<5 22	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
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 TP08-0.1m	7/12/2018 7/12/2018	<0.02 <0.04	<0.02	<0.02	<0.02 <0.04	15 14	7 <5	<1	16 7	<5 <5	<0.1	4	14	<0.05	<0.05	<0.05	<0.05 <0.05	<0.05	<0.05	<0.05	<0.05
TP08-0.1m TP08-0.6m	7/12/2018	<0.04	<0.04	<0.04	<0.04	- 14	-	<1	-	-	<0.1	2	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TP08-0.0m	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 TP10-0.1m	7/12/2018 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 <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	13	13	13	13	13	13	13	13
Number of Detects		0	0	0	0	18	6	0	18	0	0	11	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	<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	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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Maximum Detect		ND	ND 0.010	ND	ND 0.010	26	8	ND	16	ND	ND	4	27	ND 0.035	ND	ND	ND 0.035	ND	ND	ND 0.035	ND 0.035
Average Concentration * Median Concentration *		0.018	0.018	0.018 0.02	0.018 0.02	13 13.5	2.5	0.5 0.5	10 10.5	2.5	0.05	1.9	12 12	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 0.025	0.025 0.025
Standard Deviation *		0.02	0.02	0.002	0.02	4.3	2.5	0.5	3.1	0	0.05	0.96	5.9	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
95% UCL (Student's-t) *		0.0203	0.0038	0.0038	0.0203	15.11	4.917	0.5	9.1 Page 11.33	2.5	0.05	2.284	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.		1							Page Z OF6	_,_			1 - 2.000		2.320						

^{*} A Non Detect Multiplier of 0.5 has been applied.

			ı	ı	Organochlor	ine Pesticides	S	1			Γ	1		ı	ı	ı	<u> </u>				
SMEC Member of the Surbana Jurong Group					DDE+DDD	Ē	dosulfan	iulfan I	ulfan II	ulfan sulphate	_	ı aldehyde	ketone	BHC (Lindane)	chlor	chlor epoxide	oxychlor	ophos methyl	phos-ethyl	ophenothion	Chlorfenvinphos
, , , , , , , , , , , , , , , , , , ,		д-внс	QQQ	DDT	DDT+	Dieldrin	Endos	Endos	Endos	Endos	Endrin	Endrin	Endrin	в-внс	Нерта	Нерта	Metho	Azinoı	Вгот	Carb	Chlorf
Unit of Measusrment		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	0.2	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) NSW 2014 General Solid Waste TCLP1 (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							240														
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				180	240		270				10				6		300				
					240		2,0				10						300				
Field ID	Date																				
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	<u> </u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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 TP07-0.1m	6/12/2018 7/12/2018	<0.05	<0.05 <0.05	<0.2 <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	<0.05 <0.05	<0.05 <0.05	<0.05	<0.05 <0.05	<0.05 <0.05	<0.2 <0.2	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05
TP07-0.1m	7/12/2018	<0.05 <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	<0.05	<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	<u> </u>	_	-	_	_	-	-	-	-	_	-	-	-	-	-	_	-	_	-	-
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	- <0.05	- <0.05		- -0.0F	- 0.05	- <0.0F		- -0.05	- <0.0F	- <0.0F	- 0.05	- 0.05	- <0.0F	- <0.05	- 0.05		-0.05	40.0F	<0.0F	-0.0F
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
Number of Detects		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	<0.2	<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
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	<0.2	<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
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	0.1	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	0.1	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
95% UCL (Student's-t) *		0.025	0.025	0.1	0.025	0.025	0.025	0.025	Page 3025	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.

Preliminary Site Investigation: Laboratory Analytical Results

Woolgoolga, NSW

				Organop	hosphorous I	Pesticides														
SMEC		ifos	ifos-methyl	_	so	ate			uo	parathion	rotophos	so	ıthene	naphthylene	ene	ınthracene	nzo(a) pyrene	Benzo(a)pyrene TEQ (LOR)	o(b+j)fluoranthe	nzo(g,h,i)perylene
Member of the Surbana Jurong Group		Chlorpyrifos	Chlorpyrifos	Diazinon	Dichlorve	Dimethoate	Ethion	Fenthion	Malathio	Methyl p	Monocre	Prothiofos	Acenaphthe	Acenaph	Anthrace	Benz(a)anthra	Benzo(a	Benzo(a) (LOR)	Benzo(b ne	Benzo(g,
Unit of Measusrment		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 CT1 (No Leaching)		7.5															10			
NSW 2014 General Solid Waste TCLP1 (leached)		7.5															- 20			
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																		
NEFTY 2013 Table 1A(1) THES NES A 30H		100																		
Field ID	Date																			
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 TP08-2.4m	7/12/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09-0.1m	7/12/2018 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
TP09-0.1m	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	<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	-	-	-	-	-	-	-	-
Chatichica		•																		
Statistics Number of Results		13	13	13	13	13	13	13	13	13	13	13	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
Minimum Concentration		<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
Maximum Concentration		<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
Average Concentration *		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	0.1	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
95% UCL (Student's-t) *		0.025	0.025	0.025	0.025	0.025	0.025	0.025	Page 4 0 6	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	·													· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·				

^{*} A Non Detect Multiplier of 0.5 has been applied.

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		P.A υ	М	I -	I	I	I	Γ		1		PCBs	0	rganophosph	orus Pesticid	es			Т	
SMEC Member of the Surbana Jurong Group		:o(k)fluoranthene	ene	nz(a,h)anthracen	ranthene	uorene	no(1,2,3- 3yrene	aphthalene	anthrene	9	(Sum of total)	(Sum of total)	eton-S-methyl	namiphos	rathion	irimphos-ethyl		.14	C28	-C36
		Benz	Chryse	Diber	Fluors	Fluor	Inde c,d)ı	Марђ	Phen	Pyren	PAHs	PCBs	Deme	Ē	Parat	Pirim	62-92	C10-C1	C15-C	C29
Unit of Measusrment		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) CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance								2,200												
Worker) Sand 0m to <2m																				
NEPM 2013 Table 1B(7) Management Limits in Res /																				
Parkland, Coarse Soil											222									
NSW 2014 General Solid Waste CT1 (No Leaching) NSW 2014 General Solid Waste SCC1 (with leached)											200	50 50					650 6,500			
NSW 2014 General Solid Waste TCLP1 (leached)											200	30					0,300			
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			222									
NEPM 2013 Table 1A(1) HILs Res A Soil											300	1								
Field ID	Date																			
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 TP06-0.1m	6/12/2018 6/12/2018	-	-	-	-	-	-	-	-	-	-	-	<0.05 <0.05	<0.05 <0.05	<0.2 <0.2	<0.05 <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	<0.5	<0.1	<0.05	<0.05	<0.2	<0.05	<10	<50	<100	<100
TP09-0.5m TP09-0.5m DUP	7/12/2018 7/12/2018	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5 <0.5	<0.1 <0.1	-	-	-	-	<10 <10	<50 <50	<100 <100	<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																				
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 10.5	ND	ND 10.5	ND	ND 10.5	ND 10.5	ND 10.5	ND 10.5	ND	ND 10.5	ND 10.1	ND 10.05	ND 10.05	ND 10.2	ND 10.05	ND 110	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 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	ND 0.25	0.05	ND 0.025	ND 0.025	ND 0.1	ND 0.025	ND 5	ND 25	ND 50	ND 50
Average Concentration * 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 *		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.023	0.023	0.1	0.023	0	0	0	0
95% UCL (Student's-t) *		0.25	0.25	0.25	0.25	0.25	0.25	0.25	Page 0:25 6	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.									1 0 10 C 380 1											

^{*} A Non Detect Multiplier of 0.5 has been applied.

Preliminary Site Investigation: Laboratory Analytical Results

30012537

		То	tal Recoverab	le Hydrocarb	ons				
SMEC Member of the Surbana Jurong Group		C6-C10	C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Unit of Measusrment		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	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		4,400	3,300	4,300			0,300		
Density) CRC Care Table B3 HSL-A Vapour Intrusion (Maintenance		5,600	4,200	5,800			8,100		
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)		700	1,000	2,300	10,000		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 >=4m								110	440
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public								200	
Open Space									
NEPM 2013 Table 1A(1) HILs Res A Soil									
1		•	<u> </u>				•		
Field ID	Date	_							
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								
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	<u> </u>	-	-	-	-	-	-	-
TP07 -0.6m	7/12/2018	<u> </u>	-	-	-	-	-	-	-
TP08-0.1m	7/12/2018	-	-	-	-	-	-	-	-
TP08-0.6m	7/12/2018	<u> </u>	-	-	-	-	-	-	-
TP08-2.0m	7/12/2018	<u> </u>	-	-	-	-	-	-	-
TP08-2.4m	7/12/2018	<u> </u>	-	-	-	-	-	-	-
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	<u> </u>	-	-	-	-	-	-	-
TP10-0.1m	7/12/2018			- 100	- - -	- - -	- 100		
TP11-0.2m	7/12/2018 7/12/2018	<10	<50	<100	<50	<50	<100	<10	<50
TP11-0.2m TP12-0.1m	7/12/2018	-	-	-	-	-	-	-	-
<u> 0.2</u>	1.1 12/2010	<u>. </u>		I -	<u> </u>				1 -
Statistics									
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
* A Non Detect Multiplier of 0.5 has been applied		5	25	50	25	25	50	5	Page 6 of 6
T A Non Detect Multiplier at A E has been applied									

^{*} A Non Detect Multiplier of 0.5 has been applied.

Table E9 - Relative percentage difference - soils and sediment

direction	SME	•						Me	etals							ВТЕХ						TRH			PA	М	PCB
Mamilton of the	SIVIC STORY S	350			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)	РАН В(а)Р ТЕQ	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			
	LOF	R (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							1				·		·		•	•										
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	<01	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									1																	
Results still to be	•																										

Notes:

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%.

^{*}Sample dates have been corrected as per the field logs. Some differences with laboratory reports are noted.

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.

Signatories	Position	Accreditation Category
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

Page : 2 of 24 Work Order : ES1837559

Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

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.



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: SMEC AUSTRALIA PTY LTD Client

30012537 Project



Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	TP01-0.1m	TP01 - 0.5m	TP02. 0.1m	TP02-1.0m	TP03-0.1m	
,	Cli	ent sampli	ng date / time	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 @ 10	5-110°C)								
Moisture Content		1.0	%	16.0	19.2	16.1	14.1	5.8	
A200: AS 4964 - 2004 Identification	of Ashestos 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					
G005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5	
Cadmium	7440-43-9	1	mg/kg	<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	
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	
G035T: Total Recoverable Mercury			3 3						
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
		0.1	mg/kg	10.1	10.1	-0.1		-0.1	
P066: Polychlorinated Biphenyls (P0 Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	<0.1		<0.1		
		0.1	ilig/kg	~0.1	~0.1		~ 0.1		
P068A: Organochlorine Pesticides (0.05		10.05		.0.05		.0.05	
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	

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

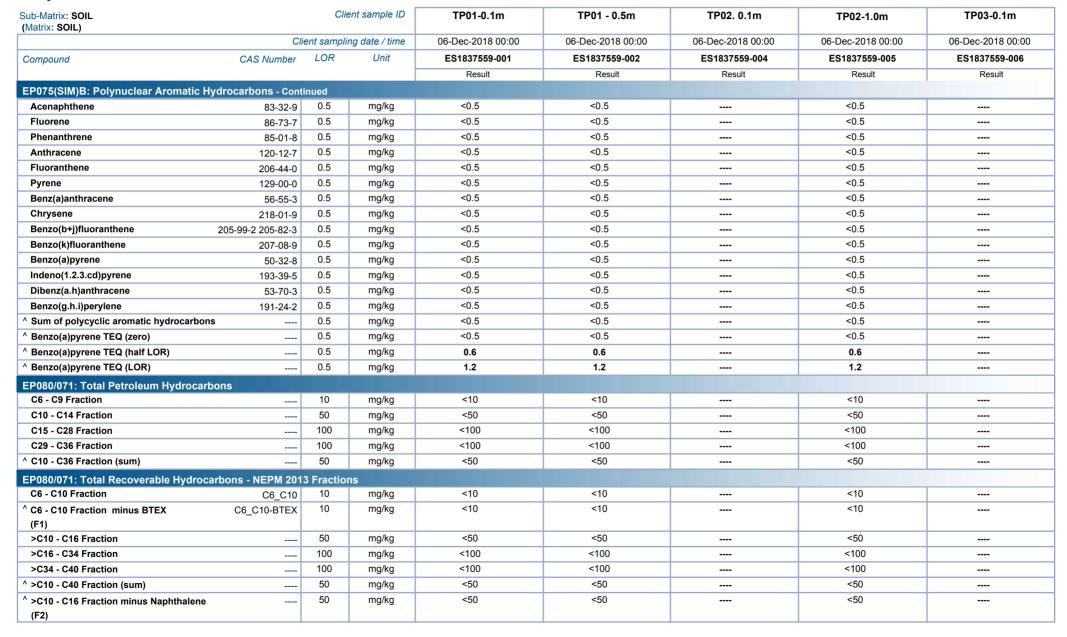




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

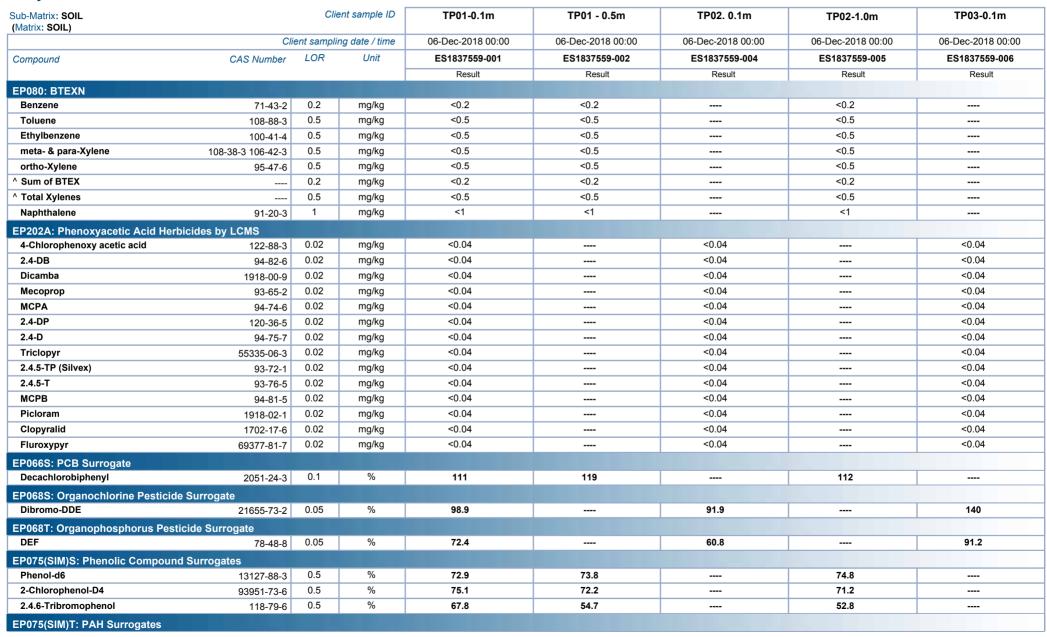




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

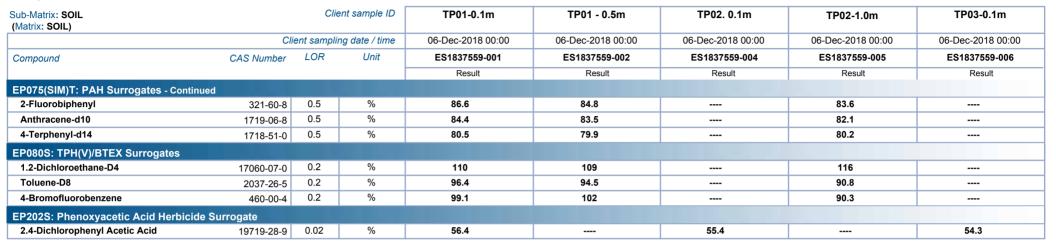




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537





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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

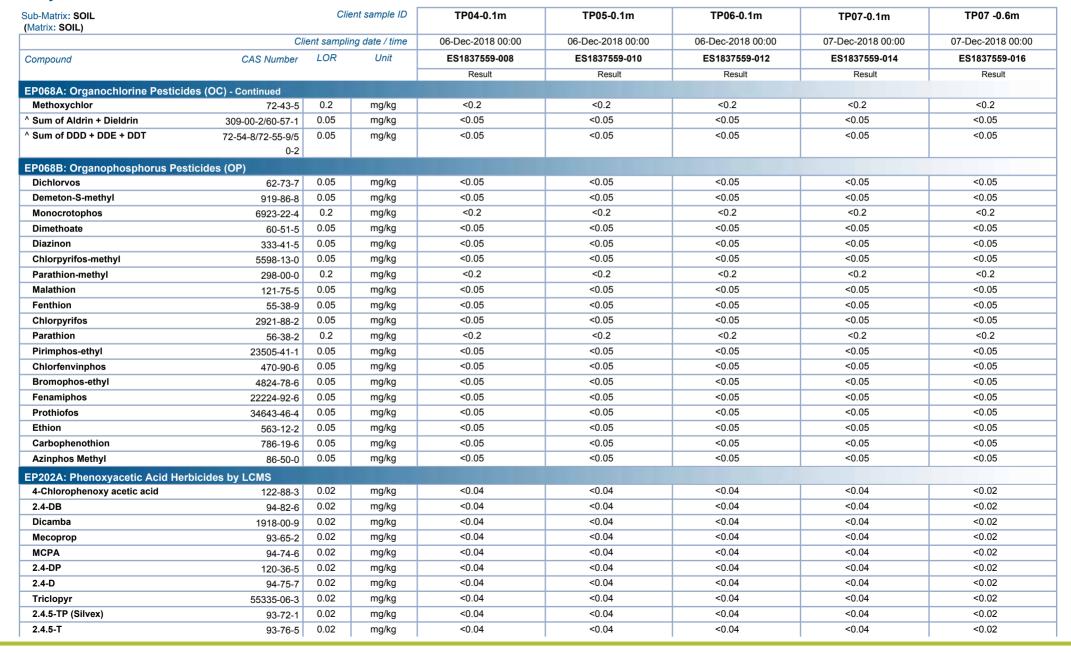


Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	TP04-0.1m	TP05-0.1m	TP06-0.1m	TP07-0.1m	TP07 -0.6m
	CI	ient samplii	ng date / time	06-Dec-2018 00:00	06-Dec-2018 00:00	06-Dec-2018 00:00	07-Dec-2018 00:00	07-Dec-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837559-008	ES1837559-010	ES1837559-012	ES1837559-014	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 Mercu	urv by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticide								
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
1 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

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

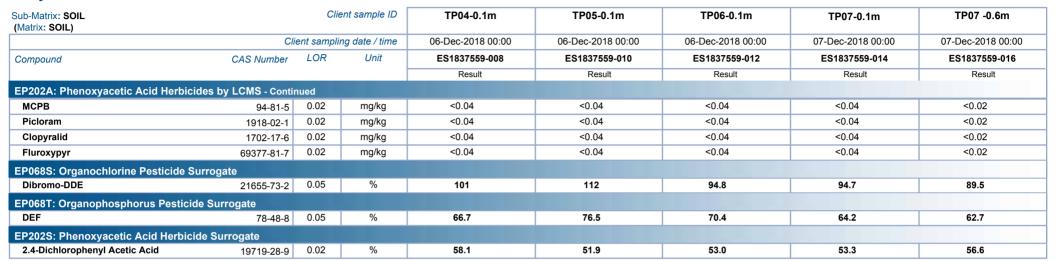




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

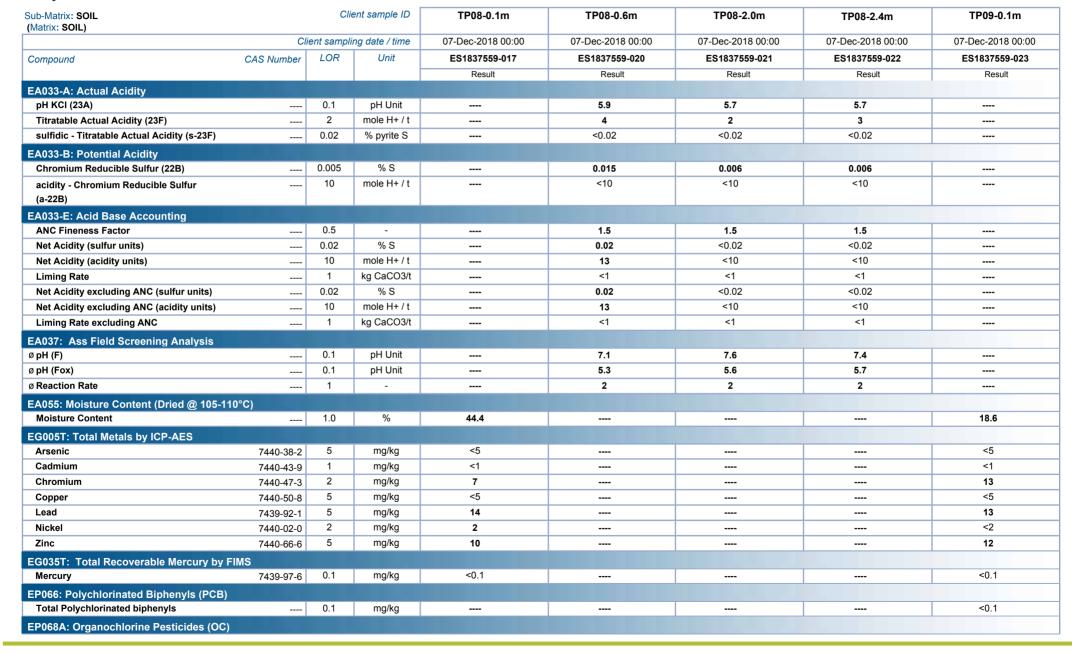




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

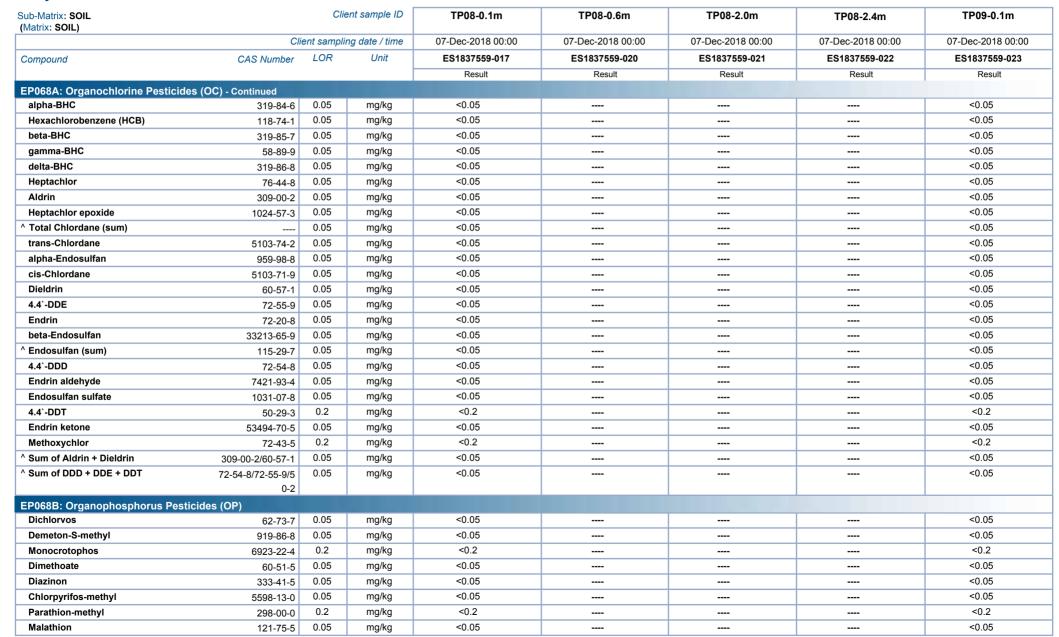




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

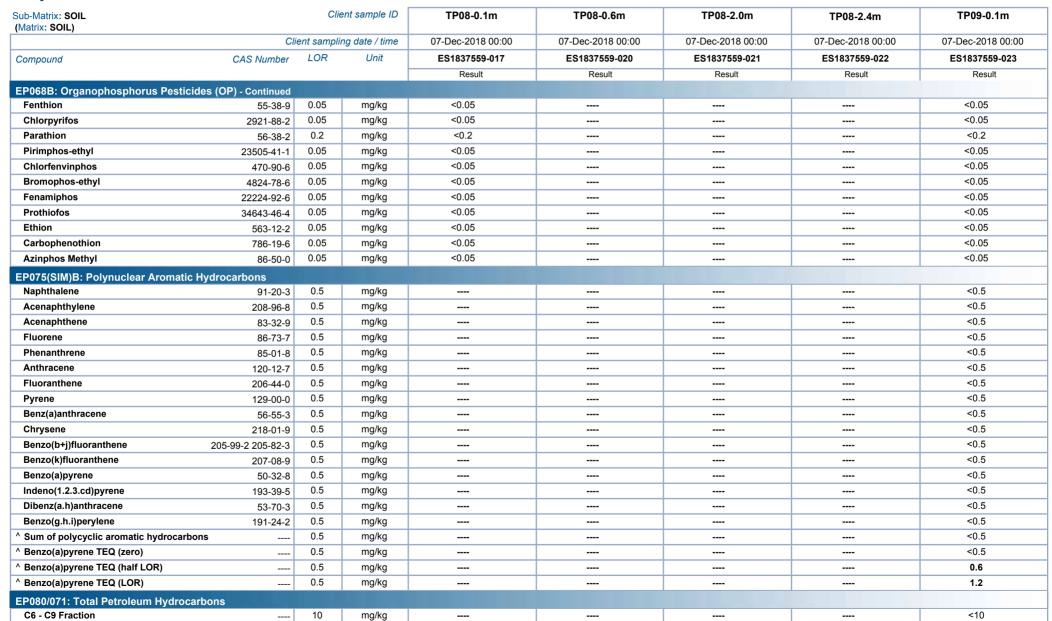




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

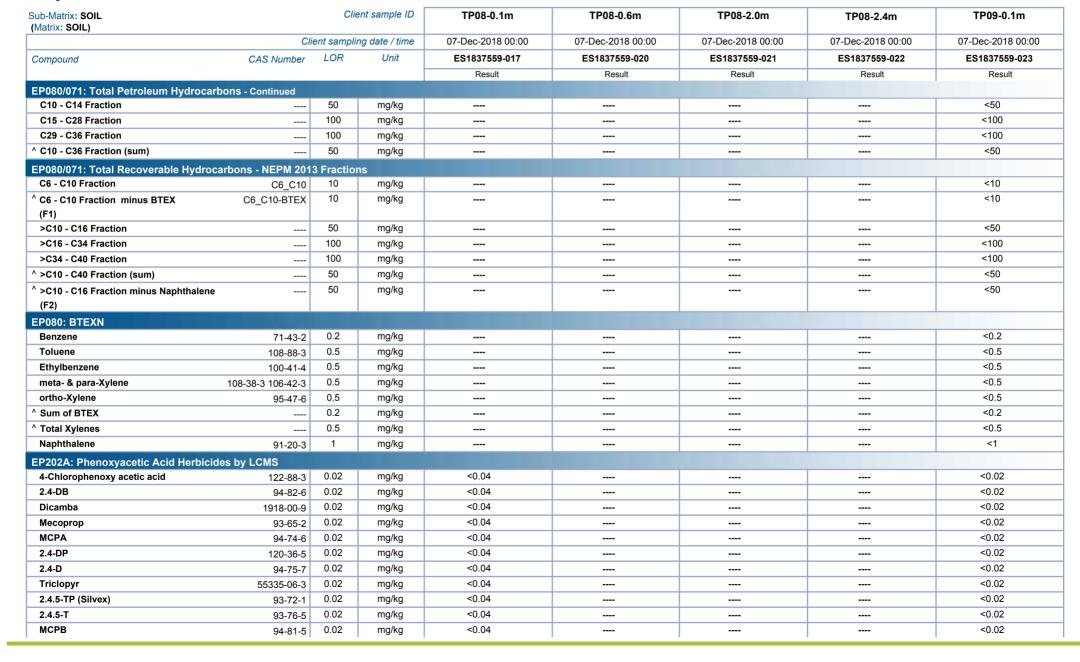




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

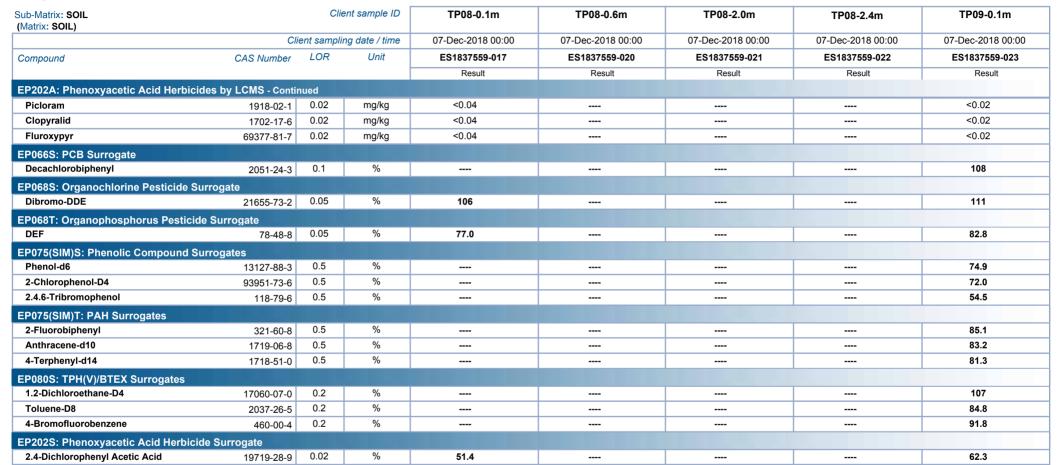




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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537





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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

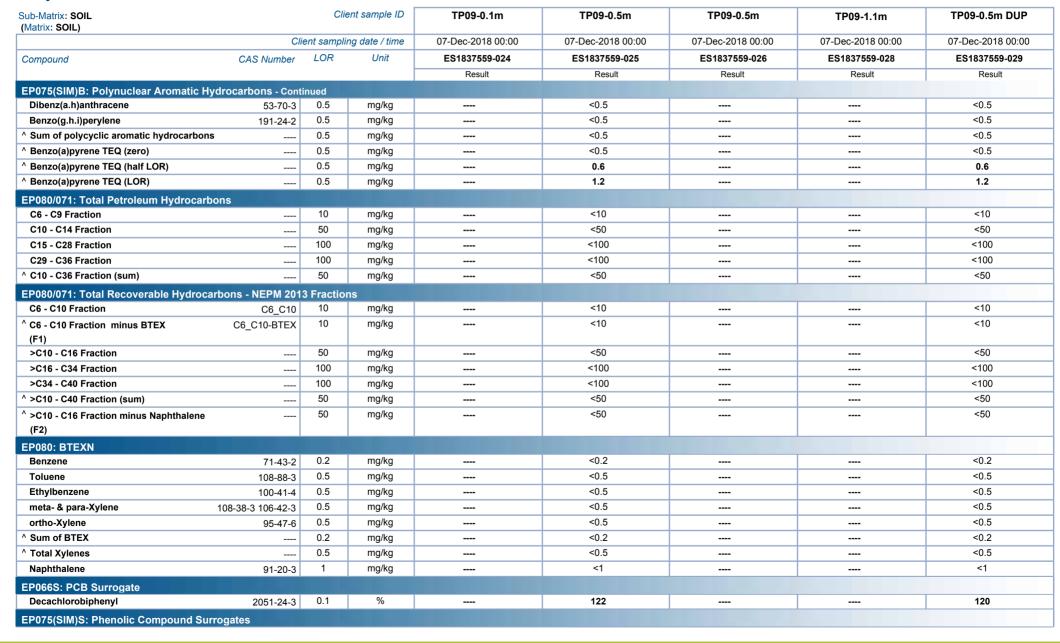


ub-Matrix: SOIL Matrix: SOIL)		Clie	ent sample ID	TP09-0.1m	TP09-0.5m	TP09-0.5m	TP09-1.1m	TP09-0.5m DUP
	Cli	ent sampli	ng date / time	07-Dec-2018 00:00				
Compound	CAS Number	LOR	Unit	ES1837559-024	ES1837559-025	ES1837559-026	ES1837559-028	ES1837559-029
•				Result	Result	Result	Result	Result
A055: Moisture Content (Dried @	105-110°C)							
Moisture Content		1.0	%		20.1			28.5
A200: AS 4964 - 2004 Identification	n 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	
G005T: 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
G035T: Total Recoverable Mercur								
Mercury	7439-97-6	0.1	mg/kg		<0.1			<0.1
P066: Polychlorinated Biphenyls (
Total Polychlorinated biphenyls		0.1	mg/kg		<0.1			<0.1
P075(SIM)B: Polynuclear Aromatic			gg					
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
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
	30-32-0	0.0	9,9		10.0			1

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Client : SMEC AUSTRALIA PTY LTD

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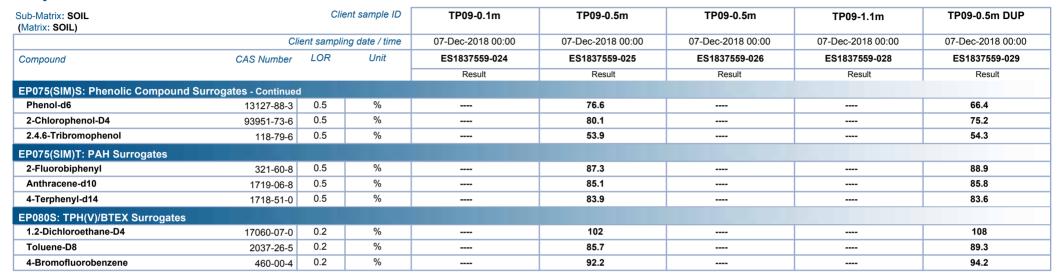




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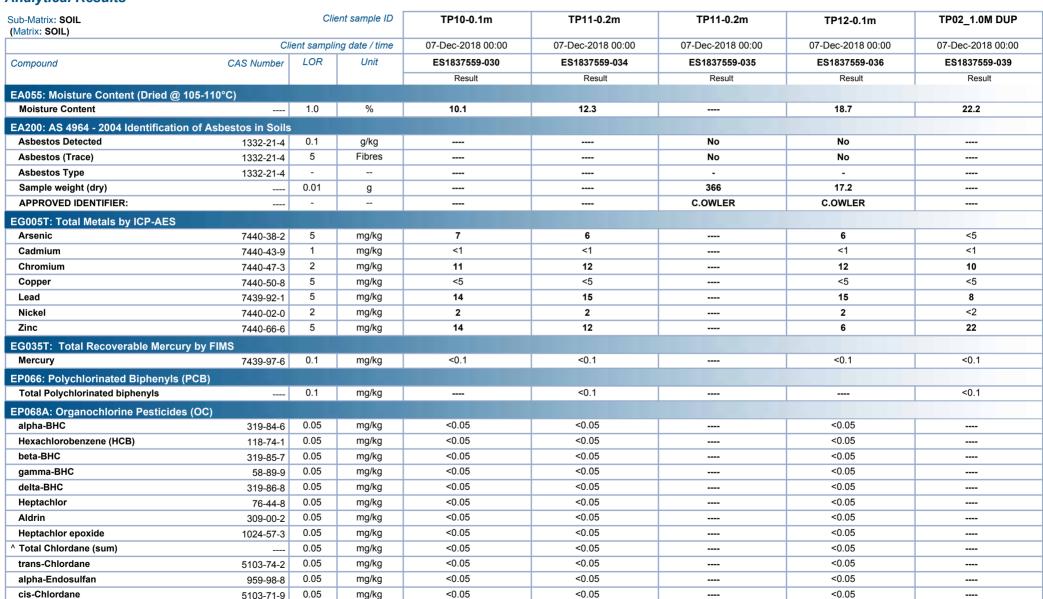
Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

Analytical Results

Dieldrin

4.4`-DDE



< 0.05

< 0.05

60-57-1

72-55-9

0.05

0.05

mg/kg

mg/kg

<0.05

< 0.05

< 0.05

<0.05

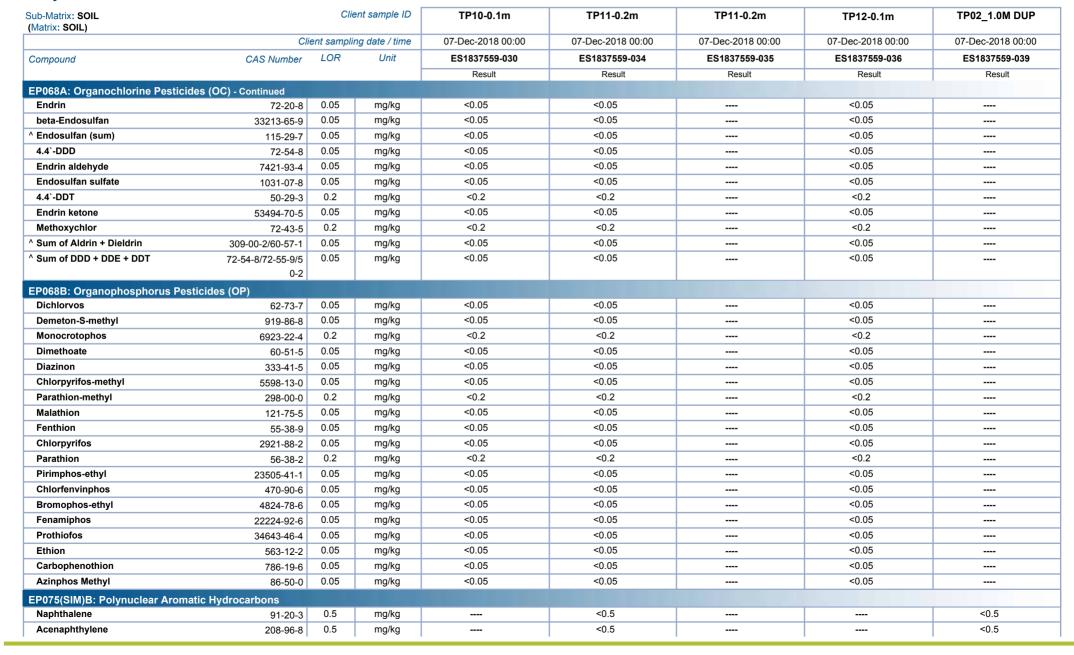


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Client : SMEC AUSTRALIA PTY LTD

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Analytical Results





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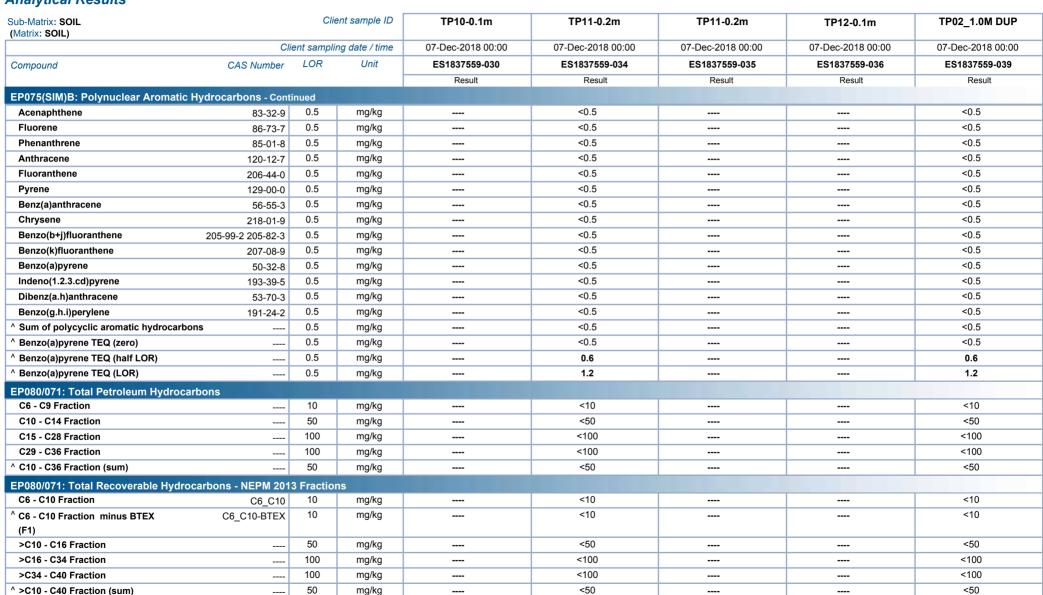
Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

^ >C10 - C16 Fraction minus Naphthalene

(F2)

Analytical Results



50

mg/kg

<50



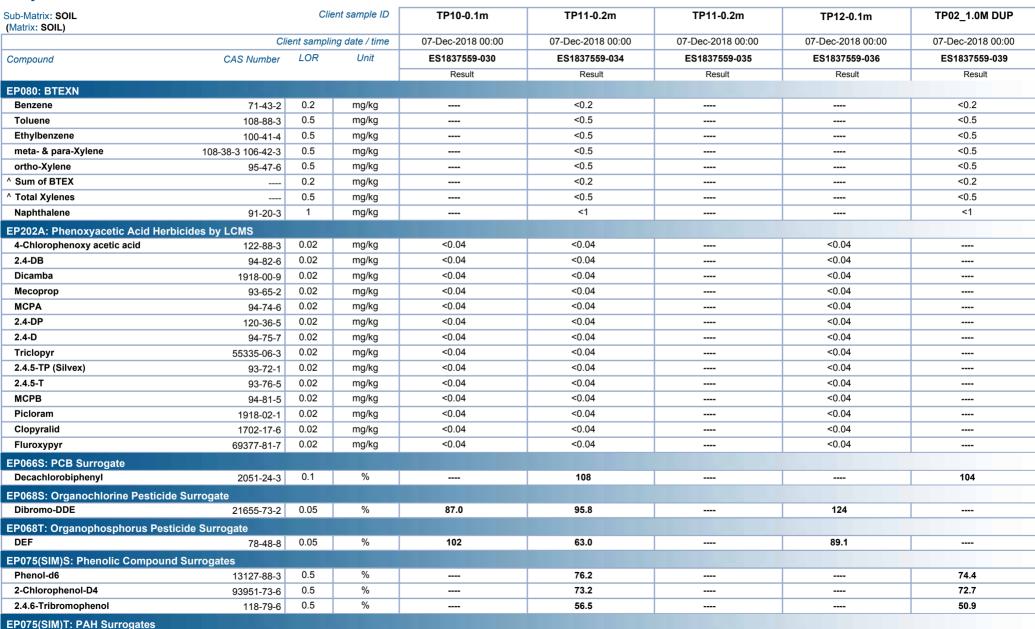
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Client : SMEC AUSTRALIA PTY LTD

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Analytical Results





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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

Analytical Results



Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	TP10-0.1m	TP11-0.2m	TP11-0.2m	TP12-0.1m	TP02_1.0M DUP
	Cli	ent sampli	ing date / time	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 Su	ırrogate							
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

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

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

: 1 of 12

: +6138549 9644

Work Order : ES1837559 Page

Client : SMEC AUSTRALIA PTY LTD Laboratory : Environmental Division Sydney

Contact : SAM VAUGHAN Contact : Larissa Burns

Address : PO BOX 1052 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NORTH SYDNEY NSW, AUSTRALIA 2060

Telephone ; ---- Telephone

 Project
 : 30012537
 Date Samples Received
 : 13-Dec-2018

 Order number
 : 30012537
 Date Analysis Commenced
 : 14-Dec-2018

C-O-C number : ---- | Issue Date : 19-Dec-2018 | Sampler : MM

Site :---

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

: EN/025/18 - Primary work

Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits

Matrix Spike (MS) Report; Recovery and Acceptance Limits

: 40

: 25

Signatories

Quote number

No. of samples received

No. of samples analysed

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.

Signatories	Position	Accreditation Category
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537

ALS

Laboratory Dunlicate (DLIP) Report

General Comments

Sub Matrixe COII

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 I	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 Ac	idity (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: 20979	917)							
EM1819703-005	Anonymous	EA033: Chromium Reducible Sulfur (22B)		0.005	% S	0.618	0.618	0.00	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur		10	mole H+ / t	385	386	0.00	0% - 20%
		(a-22B)							
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		10	mole H+ / t	<10	<10	0.00	No Limit
		(a-22B)							
EA037: Ass Field S	creening Analysis (Q	C 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 Co	ontent (Dried @ 105-11	0°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 Co	ontent (Dried @ 105-11	0°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 Meta	ls by ICP-AES (QC Lo	t: 2098367)							

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Client : SMEC AUSTRALIA PTY LTD



Sub-Matrix: SOIL									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Meta	als 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 Red	overable Mercury by FI	MS (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: Polychlorin	ated 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: Organoch	lorine 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

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Client : SMEC AUSTRALIA PTY LTD



Sub-Matrix: SOIL						Laboratory L	Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)		
EP068A: Organoch	Iorine 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: Organoph	osphorus Pesticides (0	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		

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Client : SMEC AUSTRALIA PTY LTD



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: Organopho	osphorus 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: Polyn	uclear Aromatic Hydroca	arbons (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
		<u>.</u>	205-82-3						
		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

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Client : SMEC AUSTRALIA PTY LTD



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: Polyn	nuclear Aromatic Hydro	ocarbons (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 Pe	troleum Hydrocarbons	. , , , , , , ,							
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 Pe	troleum Hydrocarbons								
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 Re	,	ons - NEPM 2013 Fractions (QC Lot: 2093507)			3 3				
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 Re	ecoverable Hydrocarbo	ons - NEPM 2013 Fractions (QC Lot: 2094792)			3 3				
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	•	LF 080. CO - CTO Fraction	00_010	10	mg/kg	110	110	0.00	TTO EITHE
ES1836902-008	Anonymous	ED000 Decrees	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
L31030902-000	Anonymous	EP080: Benzene 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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EF000. Heta- & para-xylene	106-38-3	0.0	mg/kg	10.0	10.0	0.00	140 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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EDOGG # V I	106-42-3 95-47-6	0.5	ma/lea	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	91-20-3	1	mg/kg	<0.5	<0.5	0.00	No Limit
EDOGGA DI	and a Antal Handstotal and	EP080: Naphthalene	91-20-3	ı	mg/kg	<u> </u>	<u> </u>	0.00	NO LITTIL
		by LCMS (QC Lot: 2099300)	100.00.0	0.00		2.24	201	2.22	N. 11. 11
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 94-74-6	0.02	mg/kg	<0.04 <0.04	<0.04 <0.04	0.00	No Limit No Limit
		EP202: MCPA			mg/kg				
		EP202: 2.4-DP	120-36-5	0.02	mg/kg	<0.04	<0.04	0.00	No Limit

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Client : SMEC AUSTRALIA PTY LTD



Sub-Matrix: SOIL						Laboratory I	Duplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP202A: Phenoxyao	cetic Acid Herbicides b	y 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		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

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537



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 Blank (MB)		Laboratory Control Spike (LCS) Report		
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	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: 209	3508)							
EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	1 mg/kg	88.0	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 209	3509)							
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

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Client : SMEC AUSTRALIA PTY LTD



Sub-Matrix: SOIL			Method Blank (MB)		Laboratory Control Spike (LCS		
			Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound CAS Nur	nber LOR	Unit	Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2093509) - contin	ued						
EP068: 4.4`-DDD 72-5	4-8 0.05	mg/kg	<0.05	0.5 mg/kg	103	69	121
EP068: Endrin aldehyde 7421-9	3-4 0.05	mg/kg	<0.05	0.5 mg/kg	84.9	56	120
EP068: Endosulfan sulfate 1031-0	7-8 0.05	mg/kg	<0.05	0.5 mg/kg	108	62	124
EP068: 4.4`-DDT 50-2	9-3 0.2	mg/kg	<0.2	0.5 mg/kg	102	66	120
EP068: Endrin ketone 53494-7	0.05	mg/kg	<0.05	0.5 mg/kg	102	64	122
EP068: Methoxychlor 72-4	3-5 0.2	mg/kg	<0.2	0.5 mg/kg	95.1	54	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2093509)							
EP068: Dichlorvos 62-7	3-7 0.05	mg/kg	<0.05	0.5 mg/kg	97.4	59	119
EP068: Demeton-S-methyl 919-8	6-8 0.05	mg/kg	<0.05	0.5 mg/kg	98.4	62	128
EP068: Monocrotophos 6923-2	2-4 0.2	mg/kg	<0.2	0.5 mg/kg	96.6	54	126
EP068: Dimethoate 60-5	1-5 0.05	mg/kg	<0.05	0.5 mg/kg	96.8	67	119
EP068: Diazinon 333-4	1-5 0.05	mg/kg	<0.05	0.5 mg/kg	80.0	70	120
EP068: Chlorpyrifos-methyl 5598-1	3-0 0.05	mg/kg	<0.05	0.5 mg/kg	83.1	72	120
EP068: Parathion-methyl 298-0	0-0 0.2	mg/kg	<0.2	0.5 mg/kg	83.5	68	120
EP068: Malathion 121-7	5-5 0.05	mg/kg	<0.05	0.5 mg/kg	87.8	68	122
EP068: Fenthion 55-3	8-9 0.05	mg/kg	<0.05	0.5 mg/kg	90.1	69	117
EP068: Chlorpyrifos 2921-8	8-2 0.05	mg/kg	<0.05	0.5 mg/kg	92.6	76	118
EP068: Parathion 56-3	8-2 0.2	mg/kg	<0.2	0.5 mg/kg	86.1	64	122
EP068: Pirimphos-ethyl 23505-4	1-1 0.05	mg/kg	<0.05	0.5 mg/kg	85.9	70	116
EP068: Chlorfenvinphos 470-9	0.05	mg/kg	<0.05	0.5 mg/kg	83.7	69	121
EP068: Bromophos-ethyl 4824-7	8-6 0.05	mg/kg	<0.05	0.5 mg/kg	92.2	66	118
EP068: Fenamiphos 22224-9	2-6 0.05	mg/kg	<0.05	0.5 mg/kg	76.6	68	124
EP068: Prothiofos 34643-4	6-4 0.05	mg/kg	<0.05	0.5 mg/kg	97.9	62	112
EP068: Ethion 563-1	2-2 0.05	mg/kg	<0.05	0.5 mg/kg	90.8	68	120
EP068: Carbophenothion 786-1	9-6 0.05	mg/kg	<0.05	0.5 mg/kg	97.7	65	127
EP068: Azinphos Methyl 86-5	0-0 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 91-2	0-3 0.5	mg/kg	<0.5	6 mg/kg	116	77	125
EP075(SIM): Acenaphthylene 208-9	6-8 0.5	mg/kg	<0.5	6 mg/kg	119	72	124
EP075(SIM): Acenaphthene 83-3	2-9 0.5	mg/kg	<0.5	6 mg/kg	107	73	127
EP075(SIM): Fluorene 86-7	3-7 0.5	mg/kg	<0.5	6 mg/kg	121	72	126
EP075(SIM): Phenanthrene 85-0	1-8 0.5	mg/kg	<0.5	6 mg/kg	118	75	127
EP075(SIM): Anthracene 120-1	2-7 0.5	mg/kg	<0.5	6 mg/kg	102	77	127
EP075(SIM): Fluoranthene 206-4	4-0 0.5	mg/kg	<0.5	6 mg/kg	124	73	127
EP075(SIM): Pyrene 129-0	0-0 0.5	mg/kg	<0.5	6 mg/kg	121	74	128
EP075(SIM): Benz(a)anthracene 56-5	5-3 0.5	mg/kg	<0.5	6 mg/kg	113	69	123
EP075(SIM): Chrysene 218-0	1-9 0.5	mg/kg	<0.5	6 mg/kg	112	75	127
EP075(SIM): Benzo(b+j)fluoranthene 205-9	9-2 0.5	mg/kg	<0.5	6 mg/kg	102	68	116
205-8	2-3						

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Client : SMEC AUSTRALIA PTY LTD



Sub-Matrix: SOIL				Method Blank (MB)		Laboratory Control Spike (LCS	S) Report	
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbo	ns (QCLot: 2093506) - con	tinued						
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 (QCL	ot: 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 (QCL	ot: 2094792)							
EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	85.2	68	128
EP080/071: Total Recoverable Hydrocarbons - NI	EPM 2013 Fractions (QCLo	ot: 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 - NI	EPM 2013 Fractions (QCLo	ot: 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	0.5	mg/kg	<0.5	2 mg/kg	96.6	66	118
, ,	106-42-3							
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 LCM	S (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

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537



ub-Matrix: SOIL				Method Blank (MB)	Laboratory Control Spike (LCS) Report					
			Report	Spike	Spike Recovery (%)	Recovery	Limits (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High		
EP202A: Phenoxyacetic Acid Herbicides by LCN	MS (QCLot: 2099300) - cc	ontinued								
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.

ub-Matrix: SOIL	r-Matrix: SOIL								
				Spike	SpikeRecovery(%)	Recovery L	imits (%)		
aboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High		
G005T: Total Me	tals 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		
G035T: Total Re	coverable Mercury by FIMS (QCLot: 2098368)								
ES1837494-019	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	82.9	70	130		
P066: Polychlori	nated Biphenyls (PCB) (QCLot: 2093508)								
ES1837559-001	TP01-0.1m	EP066: Total Polychlorinated biphenyls		1 mg/kg	91.0	70	130		
P068A: Organoc	hlorine 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		
P068B: Organop	hosphorus 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		
P075(SIM)B: Poly	ynuclear Aromatic Hydrocarbons (QCLot: 20935	06)							
ES1837559-001	TP01-0.1m	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	91.3	70	130		

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Client : SMEC AUSTRALIA PTY LTD



ub-Matrix: SOIL		М	atrix Spike (MS) Report				
		Spike	SpikeRecovery(%)	Recovery I	Limits (%)		
aboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
P075(SIM)B: Poly	ynuclear Aromatic Hydrocarbons (QCLot:	2093506) - continued					
ES1837559-001	TP01-0.1m	EP075(SIM): Pyrene	129-00-0	10 mg/kg	107	70	130
P080/071: Total F	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
P080/071: Total F	Petroleum Hydrocarbons (QCLot: 2094792)					
S1836902-008	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	79.1	70	130
P080/071: Total F	Recoverable Hydrocarbons - NEPM 2013 Fi	ractions (QCLot: 2093507)					
S1837559-001	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
P080/071: Total F	Recoverable Hydrocarbons - NEPM 2013 Fi	ractions (QCLot: 2094792)					
ES1836902-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.5	70	130
P080: BTEXN (Q	CLot: 2094792)						
S1836902-008	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
P202A: Phenoxy	acetic Acid Herbicides by LCMS (QCLot: 2	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
		2. 202. 1 10.01.01.11					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.

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537



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 <u>VOC in soils</u> 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.

Matrix: SOIL					Evaluation	i: 🗴 = Holding time	breach; ✓ = With	n holding time	
Method		Sample Date	Ex	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			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	✓	

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Client : SMEC AUSTRALIA PTY LTD



Matrix: SOIL					Evaluation	n: × = Holding time	breach; ✓ = With	in holding tim
Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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,	TP01 - 0.5m,	06-Dec-2018				15-Dec-2018	20-Dec-2018	✓
TP02. 0.1m,	TP02-1.0m,							
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EA055)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018				15-Dec-2018	21-Dec-2018	✓
TP08-0.1m,	TP09-0.1m,							
TP09-0.5m,	TP09-0.5m DUP,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m,	TP02 1.0M DUP							
EA200: AS 4964 - 2004 Identification of Ask	pestos in Soils							
Snap Lock Bag (EA200)								
TP09-0.1m,	TP09-0.5m,	07-Dec-2018				17-Dec-2018	05-Jun-2019	✓
TP09-1.1m,	TP11-0.2m							,
Snap Lock Bag - Subsampled by ALS (EA20	00)							
TP01-0.1m	•	06-Dec-2018				17-Dec-2018	04-Jun-2019	✓
Snap Lock Bag - Subsampled by ALS (EA20	10)							
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,	TP01 - 0.5m,	06-Dec-2018	17-Dec-2018	04-Jun-2019	✓	17-Dec-2018	04-Jun-2019	✓
TP02. 0.1m,	TP02-1.0m,							
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EG005T)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018	17-Dec-2018	05-Jun-2019	✓	17-Dec-2018	05-Jun-2019	✓
TP08-0.1m,	TP09-0.1m,							
TP09-0.5m,	TP09-0.5m DUP,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m,	TP02 1.0M DUP							

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Client : SMEC AUSTRALIA PTY LTD



Matrix: SOIL					Evaluation	ı: 🗴 = Holding time	breach ; ✓ = With	n holding tim
Method		Sample Date	E	ktraction / Preparation		Analysis		
Container / Client Sample ID(s)			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,	TP01 - 0.5m,	06-Dec-2018	17-Dec-2018	03-Jan-2019	✓	17-Dec-2018	03-Jan-2019	✓
TP02. 0.1m,	TP02-1.0m,							
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EG035T)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018	17-Dec-2018	04-Jan-2019	✓	17-Dec-2018	04-Jan-2019	✓
TP08-0.1m,	TP09-0.1m,							
TP09-0.5m,	TP09-0.5m DUP,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m,	TP02_1.0M DUP							
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
TP01-0.1m,	TP01 - 0.5m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP02-1.0m								·
Soil Glass Jar - Unpreserved (EP066)								
TP09-0.1m,	TP09-0.5m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP09-0.5m DUP,	TP11-0.2m,							·
TP02_1.0M DUP								
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
TP01-0.1m,	TP02. 0.1m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EP068)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP08-0.1m,	TP09-0.1m,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m								
EP068B: Organophosphorus Pesticides (OP)								
Soil Glass Jar - Unpreserved (EP068)								
TP01-0.1m,	TP02. 0.1m,	06-Dec-2018	14-Dec-2018	20-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EP068)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018	14-Dec-2018	21-Dec-2018	✓	16-Dec-2018	23-Jan-2019	✓
TP08-0.1m,	TP09-0.1m,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m	- ,							

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Client : SMEC AUSTRALIA PTY LTD



Matrix: SOIL					Evaluation	n: 🗴 = Holding time	e breach ; ✓ = With	in holding tim
Method		Sample Date	Ex	xtraction / Preparation			Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbo	ons							
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 - N	EPM 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	1	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	1	16-Dec-2018	21-Dec-2018	✓

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Matrix: SOIL					Evaluation	: × = Holding time	breach ; ✓ = Withi	n holding time
Method		Sample Date	Ex	ktraction / Preparation			Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
TP01-0.1m,	TP01 - 0.5m,	06-Dec-2018	15-Dec-2018	20-Dec-2018	✓	16-Dec-2018	20-Dec-2018	✓
TP02-1.0m								
Soil Glass Jar - Unpreserved (EP080)								
TP09-0.1m,	TP09-0.5m,	07-Dec-2018	15-Dec-2018	21-Dec-2018	✓	16-Dec-2018	21-Dec-2018	✓
TP09-0.5m DUP,	TP11-0.2m,							
TP02_1.0M DUP								
EP202A: Phenoxyacetic Acid Herbicides by L	.cms							
Soil Glass Jar - Unpreserved (EP202)								
TP01-0.1m,	TP02. 0.1m,	06-Dec-2018	17-Dec-2018	20-Dec-2018	✓	17-Dec-2018	26-Jan-2019	✓
TP03-0.1m,	TP04-0.1m,							
TP05-0.1m,	TP06-0.1m							
Soil Glass Jar - Unpreserved (EP202)								
TP07-0.1m,	TP07 -0.6m,	07-Dec-2018	17-Dec-2018	21-Dec-2018	✓	17-Dec-2018	26-Jan-2019	✓
TP08-0.1m,	TP09-0.1m,							
TP10-0.1m,	TP11-0.2m,							
TP12-0.1m								

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Client : SMEC AUSTRALIA PTY LTD

Project : 30012537



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 Quality Control Sample Type			ount		Rate (%)		not within specification; ✓ = Quality Control frequency within spec Quality Control Specification
Analytical Methods	Method	OC C	Regular	Actual	Expected	Evaluation	Quality Control Specification
	Mountain and the second	U.C.	redular	Actual	LXDected		
aboratory Duplicates (DUP) ASS Field Screening Analysis	EA037	2	20	10.00	10.00	1	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA037	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
Fotal Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
FRH - 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	<u> </u>	NEPM 2013 B3 & ALS QC Standard
aboratory Control Samples (LCS)	2. 000				10100		
Chromium Suite for Acid Sulphate Soils	EA033	1	16	6.25	5.00	√	NEPM 2013 B3 & ALS QC Standard
AH/Phenois (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	1	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	14	7.14	5.00	<u> </u>	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	8	12.50	5.00	<u> </u>	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	√	NEPM 2013 B3 & ALS QC Standard
otal Metals by ICP-AES	EG005T	1	20	5.00	5.00	√	NEPM 2013 B3 & ALS QC Standard
RH - 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	1	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	1	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
otal Mercury by FIMS	EG035T	1	20	5.00	5.00	√	NEPM 2013 B3 & ALS QC Standard
otal Metals by ICP-AES	EG005T	1	20	5.00	5.00	√	NEPM 2013 B3 & ALS QC Standard
RH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
RH Volatiles/BTEX	EP080	1	20	5.00	5.00	1	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	1	NEPM 2013 B3 & ALS QC Standard

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Matrix: SOIL	Evaluation: ★ = Quality Control frequency not within specification; ✓ = Quality Control frequency within speci							
Quality Control Sample Type		C	ount		Rate (%)		Quality Control Specification	
Analytical Methods	Method	OC	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	

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Project : 30012537

ALS

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 (SnCl2) (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 SnCl2 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.

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Analytical Methods	Method	Matrix	Method Descriptions
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.
Preparation Methods	Method	Matrix	Method Descriptions
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 Address : 277-289 Woodpark Road Smithfield

NORTH SYDNEY NSW, AUSTRALIA NSW Australia 2164

2060

 Telephone
 : -- Telephone
 : +6138549 9644

 Facsimile
 : -- Facsimile
 : +61-2-8784 8500

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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 : 18-Dec-2018 Scheduled Reporting Date : 18-Dec-2018

Date

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.

: 14-Dec-2018 Issue Date

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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 S	Sample(s) and R	equested Analysis							
process necessatasks. Packages as the determintasks, that are inclif no sampling default 00:00 on	may contain ad ation of moisture uded in the package. time is provided, the date of sampling sampling date wi	the sampling time will ng. If no sampling date ill be assumed by the ackets without a time	(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/BTEXN/PAH
ID	date / time		<u>5</u> <u>2</u>	SOI	SOII	SOI Poly		SOI	SOII 8
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			1				
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		✓		✓	✓		✓

: 14-Dec-2018 Issue Date

Page

: 3 of 4 : ES1837559 Amendment 0 Work Order Client SMEC AUSTRALIA PTY LTD



			(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/BTEXN/PAH	
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 06-Dec-2018 00:00	TP03-0.1m TP04-0.1m	-		√	√				
ES1837559-008 ES1837559-010	06-Dec-2018 00:00	TP04-0.1m	-		∀	∀				
ES1837559-010	06-Dec-2018 00:00	TP05-0.1m	-		∀	∀				
ES1837559-014	07-Dec-2018 00:00	TP07-0.1m	+		√	∀				
ES1837559-014	07-Dec-2018 00:00	TP07-0.1111	-		▼	▼				
ES1837559-017	07-Dec-2018 00:00	TP08-0.1m	+-		√	√				
ES1837559-020	07-Dec-2018 00:00	TP08-0.6m	1	1						
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			√	· ✓				
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Proactive Holding Time Report

 $Sample(s) \ have \ been \ received \ within \ the \ recommended \ holding \ times \ for \ the \ requested \ analysis.$

: 14-Dec-2018 Issue Date

Page

4 of 4 ES1837559 Amendment 0 Work Order Client : SMEC AUSTRALIA PTY LTD



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
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Appendix F Test pit logs

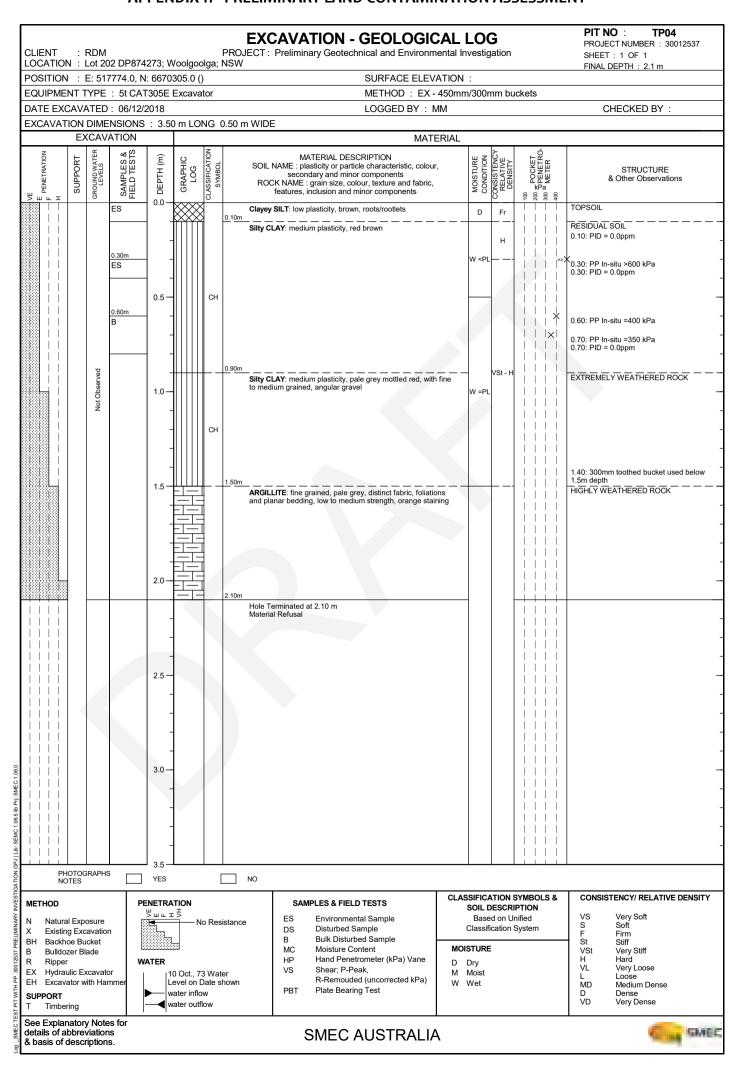
PIT NO · **TP01 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 3 m POSITION : E: 518016.0, N: 6670368.0 () SURFACE ELEVATION: EQUIPMENT TYPE: 5t CAT305E 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 MATERIAL DESCRIPTION POCKET PENETRO METER PENETRATION $\widehat{\mathbf{E}}$ MOISTURE CONDITION ONSISTENCY RELATIVE DENSITY SAMPLES 8 FIELD TEST SUPPORT GRAPHIC SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WAT LEVELS P0G STRUCTURE DEPTH (& Other Observations kPa 8 8 8 8 0.0 TOPSOIL 11, 11, Sandy SILT: low plasticity, brown, trace clay, with trace roots/rootlets 1 11 1 FS RESIDUAL SOIL Clayey SILT: low plasticity, mottled red brown, trace fine grained sand, with trace roots/rootlets 0.30: PP In-situ >600 kPa ML 0.50m 0.5 0.50: PP In-situ =400 - 600 kPa ES 0.60m 0.60m DS Silty CLAY: medium - high plasticity, mottled red brown 0.60: PID = 0.0ppm 0.80: PP In-situ =360 - 600 kPa 1.00m 1.00: PID = 0.1ppm СН /St - F 1.50: PP In-situ =300 - 600 kPa 2.0 EXTREMELY WEATHERED MATERIAL Silty CLAY: medium plasticity, mottled pale grey, red-orange [¥]2.30: PP In-situ >600 kPa СН Н 2.50m 2.5 2.60m EXTREMELY WEATHERED MATERIAL / Clayey GRAVEL: fine to coarse, angular, blue-grey, mottled D Hole Terminated at 3.00 m 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose Hydraulic Excavator VS FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for **SMEC AUSTRALIA** details of abbreviations SMEC & basis of descriptions.

PIT NO · **TP02 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 1.6 m 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 **FXCAVATION** MATERIAL POCKET PENETRO-METER MATERIAL DESCRIPTION MOISTURE CONDITION PENETRATION ONSISTENCY RELATIVE DENSITY DEPTH (m) SAMPLES 8 FIELD TEST SUPPORT GRAPHIC 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 GROUND WA-LEVELS P0G STRUCTURE & Other Observations kPa 8 8 8 8 0.0 TOPSOIL 11/11/ Clayey SILT: low plasticity, brown, trace fine sand, ΟI D F Sitty CLAY: medium plasticity, orange brown mottled red, trace rootlets RESIDUAL SOIL FS 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 0.50m СН 0.5 0.50: PID = 0.0 ppm ES /St -Observed 0.80m ğ DS Clayey SAND: fine grained, white mottled orange, with ironstone gravel, with silt EXTREMELY WEATHERED MATERIAL 0.90: PP In-situ =300 - 600 kPa 1.00m 0.90: HP = 300-600 Kpa 0.91: PID = 0.0ppm B ES М MD 1.10: 300mm toothed bucket below 1.3m HIGHLY WEATHERED ROCK ARGILLITE: fine grained, pale grey, distinct foliations, low to 1.30: Closely Fractured 50-100mm, planar jointing/bedding medium strength, orange staining D Hole Terminated at 1.60 m Material Refusal 2.0 2.5 3.0 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD шцт Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE VSt H VL Very Stiff Hard MC Moisture Content Bulldozer Blade Hand Penetrometer (kPa) Vane HP WATER Dry Very Loose VS FX Hydraulic Excavator 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations **SMEC AUSTRALIA** SMEC & basis of descriptions.

PIT NO · TP03 **EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 0.9 m 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 200 A POCKET 300 M METER 400 MOISTURE CONDITION PENETRATION ONSISTENCY RELATIVE DENSITY SAMPLES & FIELD TEST DEPTH (m) SUPPORT SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GRAPHIC GROUND WA-LEVELS P0G STRUCTURE & Other Observations 8 TOPSOIL GM _{0.07m} Silty GRAVEL: fine to coarse, angular, roots/rootlets D Fr EXTREMELY WEATHERED ROCK Sandy Silty GRAVEL: fine to coarse, angular, pale brown, roots/rootlets ES-1 D Š 0.50m D 0.5 DS-1 ES-1 0.50: 300mm toothed bucket below 0.5m WEATHERED ROCK ARGILLITE: fine grained, grey, highly to moderately weathered, low to medium strength, orange staining D 0.75: numerous subhorizontal and subvertical defects Hole Terminated at 0.90 m Material Refusal 1.0 1.5 2.0 2.5 3.0 3.5 PHOTOGRAPHS NOTES YES □ NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** BH Backhoe Bucket Stiff MOISTURE VSt H VL Very Stiff Hard MC Moisture Content Bulldozer Blade Hand Penetrometer (kPa) Vane HP WATER Dry Very Loose Loose Hydraulic Excavator VS FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations & basis of descriptions. **SMEC AUSTRALIA** SMEC



PIT NO · TP05 **EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 3 m 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 ONSISTENCY RELATIVE DENSITY MATERIAL DESCRIPTION POCKET PENETRO METER PENETRATION MOISTURE CONDITION DEPTH (m) GRAPHIC LOG SAMPLES 8 FIELD TEST SUPPORT SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WA-LEVELS STRUCTURE & Other Observations kPa 8 8 8 8 0.0 11, 11, TOPSOIL Clayey SILT: low plasticity, dark brown, trace fine sand, trace roots/rootlets OL М Fr 0.10: PID = 0.0 ppm **E**S5m RESIDUAL SOIL Clayey SILT: low plasticity, red-brown, rootlets Fr 0.30: PP In-situ =500 kPa 0.30: PID = 0.0 ppm ML Н 0.5 ix Silty CLAY: medium to high plasticity, red-brown, some carbonaceous charcoal inclusions (black), trace fine sand 0.50: PP In-situ =350 kPa 0.70m DS 0.70: PID = 0.0 ppm СН VSt 0.80: PP In-situ =350 kPa 1.10: PP In-situ =350 - 400 kPa Silty CLAY: high plasticity, mottled red-grey, trace ironstone 1.5 СН 2.0 VSt to EXTREMELY WEATHERED MATERIAL Silty CLAY: high plasticity, mottled red-grey, with fine to coarse grained gravel, remant rock fabric 2.40m DS 2.40: minor water seepage below 2.4m seepage in to pit 2.5 СН W Hole Terminated at 3.00 m 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose FX Hydraulic Excavator 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme W Wet Medium Dense PBT water inflow Plate Bearing Test Dense SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for **SMEC AUSTRALIA** details of abbreviations SMEC & basis of descriptions.

PIT NO · **TP06 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 3 m 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 **FXCAVATION** MATERIAL POCKET PENETRO-METER MATERIAL DESCRIPTION MOISTURE CONDITION PENETRATION ONSISTENCY RELATIVE DENSITY SAMPLES & FIELD TEST DEPTH (m) SUPPORT GRAPHIC SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WA' P0G SYMBOL STRUCTURE & Other Observations kPa 8 8 8 8 0.0 TOPSOIL 11/11/ Clayey SILT: low plasticity, dark brown, roots/rootlets OΙ М Fr RESIDUAL SOIL FS Clayey SILT: medium plasticity, brown, rootlets 0.10: PID = 0.0 ppm ML Н 0.30m ¥ 0.30: PP In-situ =200 kPa 0.30: PID = 0.0 ppm ES Silty CLAY: medium to high plasticity, brown-orange СН 0.50m St to VSt 0.5 IЖК Silty CLAY: high plasticity, grey mottled orange, trace carbonaceous inclusions 0.50: PP In-situ =150 - 200 kPa 0.50: PID = 0.0 ppm DS 0.60: 300mm toothed bucket used below As above, becomes mottled red-grey X 0.80: PP In-situ =200 kPa 1.00m ** DS 1.00: PP In-situ =200 - 300 kPa СН VSt × 1.5 1.50: PP In-situ =200 kPa 2.0 2.00: PP In-situ =150 - 200 kPa 2.00: Moderate water seepage into pit between 2.0m and 2.2m DS Sandy CLAY: high plasticity, mottled pale grey-orange, with some clayey sand lenses 2.5 СН 2.90m DS Hole Terminated at 3.00 m 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD SOIL DESCRIPTION ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose Hydraulic Excavator FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations & basis of descriptions. **SMEC AUSTRALIA** SMEC

PIT NO · **TP07 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 1.6 m 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 **FXCAVATION** MATERIAL MATERIAL DESCRIPTION POCKET PENETRO METER PENETRATION MOISTURE CONDITION ONSISTENCY RELATIVE DENSITY DEPTH (m) SAMPLES 8 FIELD TEST SUPPORT GRAPHIC SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WA-LEVELS P0G STRUCTURE & Other Observations kPa 8 8 8 8 0.0 11, 11, TOPSOIL Clayey SILT: low plasticity, dark brown, trace fine sand, roots/rootlets OL 0.10: PID = <u>0.0ppm</u> ES Clayey SILT: low to medium plasticity, orange-brown, trace rootlets RESIDUAL SOIL 0.30m 0.30: PID = 0.0 ppm ES 0.40: PP In-situ =400 kPa Silty CLAY: medium plasticity, mottled orange-grey 0.50m 0.5 İΧ 0.50: PP In-situ =350 kPa DS 0.60m СН VSt *0.60: PP In-situ =300 kPa 0.60: PID = 0.0 ppm ES Not Observ 0.80: PP In-situ =180 kPa 0.85m CLAY: high plasticity, pale grey with orange, trace rootlets D.S. СН St GP 1.10m Clayey GRAVEL: medium to coarse, angular, blue grey EXTREMELY WEATHERED MATERIAL MD WEATHERED ROCK ARGILLITE: blue grey, highly fractured, fracture spacing typically less than 50mm, moderately weathered, high strength, stained red 1.10: Switched to 300mm toothed bucket Hole Terminated at 1.60 m. 2.0 2.5 3.0 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD шцт Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose Hydraulic Excavator VS FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations **SMEC AUSTRALIA** SMEC & basis of descriptions.

PIT NO · **TP08 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 2.5 m 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 100 200 A POCKET 300 M METER 400 MATERIAL DESCRIPTION MOISTURE CONSISTENCY RELATIVE DENSITY PENETRATION DEPTH (m) SAMPLES 8 FIELD TEST SUPPORT GRAPHIC SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WA-LEVELS P0G STRUCTURE & Other Observations 0.0 1/2 1/2 TOPSOIL Silty CLAY: high plasticity, dark brown, roots/rootlets 0.05: Reeds on surface. Low lying poorly drained land. 0.10: PID = 0.0 ppm <u>v| 100 | 101</u> FS ALLUVIUM Silty CLAY: high plasticity, orange-brown, trace rootlets and occasional ironstone gravels .30m 0.30: PP In-situ =90 kPa 0.30: PID = 0.0 ppm DS ES to St 0.40: PP In-situ =110 kPa 0.40: PID = 0.0 ppm 0.5 0.60m 0.60: PP In-situ =120 kPa 0.60: PID = 0.0 ppm As above, orange and grey streaks B DS ES * 0.80: PP In-situ =100 - 120 kPa 1.0 Obser СН ğ X 1.30: PP In-situ =180 kPa 1.5 2.00m 2.0 F to St 2.00: PP In-situ =100 - 180 kPa DS EXTREMELY WEATHERED MATERIAL Gravelly CLAY: high plasticity, blue-grey mottled orange, medium to coarse grained, angular gravel, remnant rock fabric 2.40m DS Hole Terminated at 2.50 m Target Depth 3.0 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose Hydraulic Excavator VS FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations & basis of descriptions. **SMEC AUSTRALIA** SMEC

PIT NO · TP09 **EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 1.5 m 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 **FXCAVATION** MATERIAL 200 A POCKET 300 M METER 400 MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY PENETRATION DEPTH (m) SAMPLES 8 FIELD TEST GRAPHIC LOG SUPPORT MATERIAL DESCRIPTION

SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components

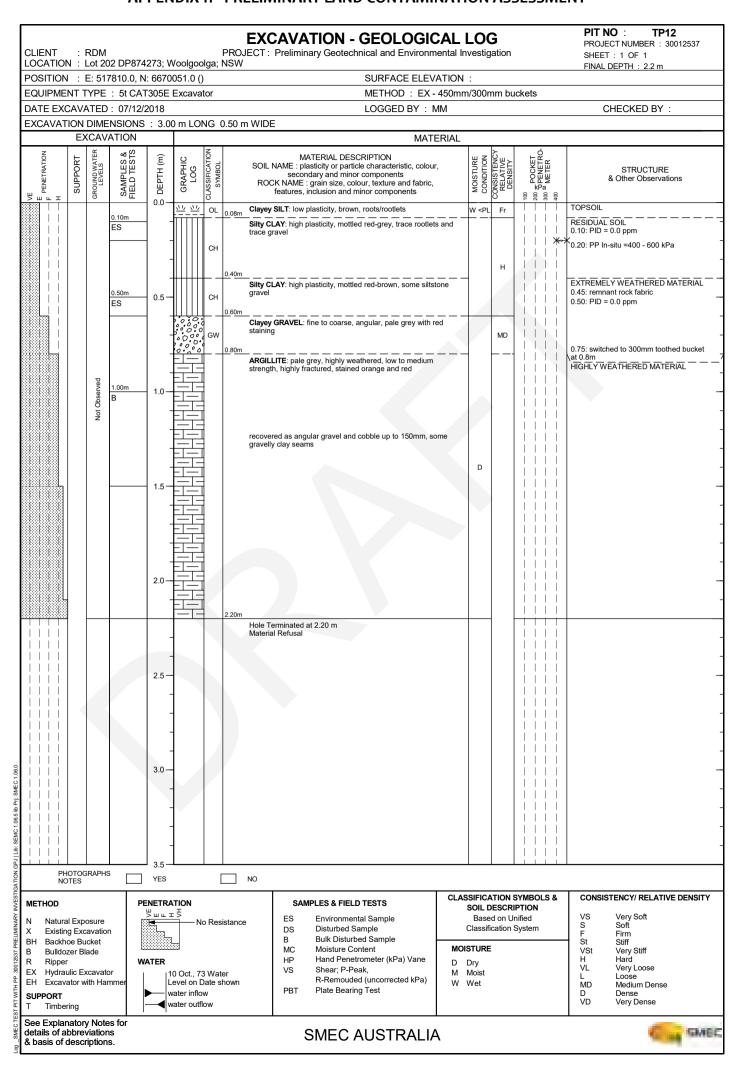
ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GROUND WA-LEVELS STRUCTURE & Other Observations 0.0 FILL: Silty CLAY: medium to high plasticity, mottled red-grey, trace siltstone gravel and cobble, angular, fine to coarse grained FILL 0.10: PID = 0.0 ppm FS 0.50m 0.5 0.50: PID = 0.0 ppm ES Н Observed ž 1.0 .10m 1.10m TOPSOIL ES Silty CLAY: high plasticity, dark brown-black, trace rootlets СН ALLUVIUM Silty CLAY: high plasticity, mottled orange-brown-grey СН Hole Terminated at 1.50 m 2.0 2.5 3.0 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD шцт Based on Unified ES Environemtal Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE VSt H VL Very Stiff Hard MC Moisture Content Bulldozer Blade HP Hand Penetrometer (kPa) Vane WATER Dry Very Loose Loose VS Hydraulic Excavator FX 10 Oct., 73 Water Level on Date shown Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme w Medium Dense Dense Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations & basis of descriptions. **SMEC AUSTRALIA** SMEC

PIT NO · TP10 **EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 1.6 m 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 200 A POCKET
300 B METER
400 MATERIAL DESCRIPTION MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY PENETRATION Ξ SAMPLES 8 FIELD TEST SUPPORT MATERIAL DESCRIPTION

SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components

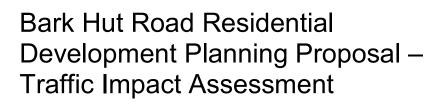
ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GRAPHIC GROUND WA 500 STRUCTURE DEPTH (& Other Observations 8 0.0 D OL 0.05m Clayey SILT: low plasticity, brown, roots/rootlets EXTREMELY WEATHERED MATERIAL 0.10: PID = 0.0 ppm Gravelly CLAY: medium plasticity, mottled red-grey-orange FS СН D Fr 0.40m Clayey GRAVEL: coarse, angular, pale grey with orange staining EXTREMELY WEATHERED MATERIAL to HIGHLY WEATHERED MATERIAL ES 0.5 0.40: PID = 0.0 ppm D to VD GF 0.60: Switch to 300mm toothed bucket Observed WEATHERED ROCK ğ ARGILLITE: pale grey, highly to moderately weathered, low to medium strength, highly fractured intersecting subvertical joint sets; planar, smooth, orange staining 0.90: recovered as angular cobble tpically 65mm to 150mm D recovered angular cobbles up to 150mm nominal size Hole Terminated at 1.60 m. 2.0 2.5 3.0 3.5 PHOTOGRAPHS NOTES YES NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD ᄪᄪᄑᅗ Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** ВН Backhoe Bucket Stiff MOISTURE Very Stiff Hard MC Moisture Content VSt Bulldozer Blade Hand Penetrometer (kPa) Vane H VL HP WATER Dry Very Loose VS FX Hydraulic Excavator 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations **SMEC AUSTRALIA** SMEC & basis of descriptions.

PIT NO · **TP11 EXCAVATION - GEOLOGICAL LOG** PROJECT NUMBER: 30012537 CLIENT PROJECT: Preliminary Geotechnical and Environmental Investigation SHEET: 1 OF 1 LOCATION: Lot 202 DP874273; Woolgoolga; NSW FINAL DEPTH: 0.75 m 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 **FXCAVATION** MATERIAL 200 A POCKET 300 M METER MATERIAL DESCRIPTION MOISTURE CONDITION CONSISTENCY RELATIVE DENSITY PENETRATION SAMPLES 8 FIELD TEST DEPTH (m) SUPPORT SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components ROCK NAME: grain size, colour, texture and fabric, features, inclusion and minor components GRAPHIC GROUND WA-LEVELS P00 SYMBOL STRUCTURE & Other Observations 8 0.0 FILL / TOPSOIL 0.07m FILL: Clayey SILT: low plasticity, brown, roots/rootlets W <PL FILL: MIXTURE OF CLAY AND SILT: medium to high 0.10: Argillite boulder buried in topsoil; 300mm, angular, slightly weathered, high plasticity, mottled red, brown, orange, trace rootlets .20m ES strength 0.20: PID = 0.0 ppm Obsen Not HIGHLY WEATHERED MATERIAL Clayey GRAVEL: medium to coarse, angular, pale grey with red and orange staining, with angular cobble 0.5 GP W WEATHERED ROCK ARGILLITE: pale grey, moderately weathered, medium to high D 0.75: Refusal on rock with 300mm strength toothed bucket Hole Terminated at 0.75 m Material Refusal 1.0 1.5 2.0 2.5 3.0 3.5 PHOTOGRAPHS NOTES YES □ NO CLASSIFICATION SYMBOLS & SOIL DESCRIPTION CONSISTENCY/ RELATIVE DENSITY PENETRATION SAMPLES & FIELD TESTS METHOD шцт Based on Unified ES Environmental Sample Natural Exposure No Resistance S F St Disturbed Sample Classification System DS Existing Excavation Firm **Bulk Disturbed Sample** BH Backhoe Bucket Stiff MOISTURE VSt H VL Very Stiff Hard MC Moisture Content Bulldozer Blade Hand Penetrometer (kPa) Vane HP WATER Dry Very Loose Hydraulic Excavator VS FX 10 Oct., 73 Water Level on Date shown М Moist MD D R-Remouded (uncorrected kPa) EΗ Excavator with Hamme Medium Dense Dense W Wet PBT water inflow Plate Bearing Test SUPPORT VD Very Dense water outflow Timbering See Explanatory Notes for details of abbreviations & basis of descriptions. **SMEC AUSTRALIA** SMEC



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Part Lot 202, DP 874273 Bark Hut Road, Woolgoolga

22 March 2019

George Stulle Traffic Engineering
P 0418 219 358
E george.stulle@exemail.com.au



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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 Wav.



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	North	bound	South	bound
200m North of Centenary Drive	7700	AM Peak	PM Peak	AM Peak	PM Peak
		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.

APPENDIX 12 - 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	North	bound	South	bound
200m North of Centenary Drive	8851	AM Peak	PM Peak	AM Peak	PM Peak
		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;

Mornii	ng Peak H	our	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		
Α	< 14	Good operation		
В	15 to 28	Acceptable delays & spare capacity		
С	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 10year planning horizon assessed in this report.

APPENDIX 12 - 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	L 57	244							
R 15	R 141								

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	L 117	390							
R 25	R 202								

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.

APPENDIX 12 - TRAFFIC IMPACT ASSESSMENT

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.

APPENDIX 12 - TRAFFIC IMPACT ASSESSMENT

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

Austroads Guide to Road Design

Appendix A – CHCC Solitary Islands Way Traffic Count Data

<u>Coffs Harbour City Council - Traffic Data</u> 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)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Average	es
						<u> </u>		1 - 5	1 - 7
Hour									
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								l I	
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		

<u>Coffs Harbour City Council - Traffic Data</u> <u>Weekly Vehicle Counts South Bound (Virtual Week)</u>

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)

`	Mon	Tue	Wed	. ` Thu	Fri	Sat	Sun	Average	es
								1 - 5	1 - 7
Hour									
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 2300-2400	9.3	13.0	13.5 9.5	14.5	20.7 9.0	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								l I	
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 428.7	0800 491.0	0800 460.5	0800 525.0	0800 461.5	0900 372.7	1100 326.7		
PM Peak	1500 369.0	1500 378.5	1500 392.5	1600 353.5	1500 362.0	1200 302.0	1200 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)

Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand F	lows HV	Deg. Satn	Average Delay	Level of Service	95% Back o	of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		venicies	m	Q 51 5 51 5 51	per veh	km/h	
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	
Approa	ach	319	2.7	0.152	0.5	NA	0.0	0.0	0.00	0.05	59.2	
North:	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	
Approa	ach	573	3.0	0.298	0.1	NA	0.0	0.0	0.00	0.00	59.9	
West:	Conce	ot Access R	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	
Approa	ach	128	0.0	0.405	19.9	LOS B	1.7	12.2	0.78	0.96	37.6	
All Veh	icles	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)

Giveway / Yield (Two-Way)

Mover	Movement Performance - Vehicles												
Mov	OD	Demand F		Deg.	Average	Level of	95% Back o	of Queue	Prop.	Effective	Average		
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed		
		veh/h	%	v/c	sec		veh	m		per veh	km/h		
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		
Approa	ıch	576	2.6	0.256	0.9	NA	0.0	0.0	0.00	0.09	58.7		
North:	Solitary	Islands Wa	у			''							
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		
Approa	ıch	453	3.0	0.233	0.1	NA	0.0	0.0	0.00	0.01	59.8		
West: 0	Concept	Access Ro	ad										
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		
Approa	ich	67	0.0	0.234	19.0	LOS B	0.8	5.9	0.77	0.90	38.2		
All Veh	icles	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.

APPENDIX 12 - TRAFFIC IMPACT ASSESSMENT

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) Giveway / Yield (Two-Way)

Moven	Movement Performance - Vehicles												
Mov ID	OD Mov		nand lows HV %	Deg. Satn v/c	Average Delay	Level of Service	95% Back o	Distance	Prop. Queued	Effective Stop Rate	Average Speed km/h		
South:	Solitary	Islands W		٧/٥	sec		veh	m		per veh	KIII/II		
1	L2 T1	33 419	0.0 3.0	0.018 0.219	5.5 0.0	LOS A LOS A	0.0 0.0	0.0 0.0	0.00 0.00	0.58 0.00	49.1 60.0		
Approa	ch	452	2.8	0.219	0.4	NA	0.0	0.0	0.00	0.04	59.4		
North:	Solitary	Islands W	'ay		<u>'</u>								
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		
Approa	ch	445	2.9	0.225	0.2	NA	0.0	0.0	0.00	0.02	59.7		
West: 0	Concept	Access R	load										
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		
Approa	ch	208	0.0	0.496	18.1	LOS B	2.4	16.6	0.73	0.94	38.9		
All Veh	icles	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) Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total HV		Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles Distance		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
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
Approac	ch	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
Approac	ch	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 Vehi	cles	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



Appendix D – Solitary Islands Way shared intersection concept design













Gateway Determination

Planning proposal (Department Ref: PP-2021-5577): rezone land at Bark Hut Road, Woolgoolga from RU2 Rural Landscape to part R2 Low Density Residential, E2 Environmental Conservation and E3 Environmental Management and amend associated controls

I, the Director, Northern Region at the Department of Planning, Industry and Environment, as delegate of the Minister for Planning and Public Spaces, have determined under section 3.34(2) of the *Environmental Planning and Assessment Act 1979* (the Act) that an amendment to the Coffs Harbour Local Environmental Plan (LEP) 2013 to rezone land at Bark Hut Road, Woolgoolga from RU2 Rural Landscape to part R2 Low Density Residential, E2 Environmental Conservation and E3 Environmental Management should proceed subject to the following conditions:

- 1. Prior to public exhibition, the planning proposal is to be updated to:
 - a) reference the correct legal description for the land;
 - b) amend reference in Explanation of Provisions dot point 3 (page 5) of Council's Planning Proposal Report, from E3 Environmental Conservation to E3 Environmental Management;
 - c) include current key sites and terrestrial biodiversity maps.
- 2. Public exhibition is required under section 3.34(2)(c) and schedule 1 clause 4 of the Act as follows:
 - (a) the planning proposal must be made publicly available for a minimum of **28 days**; and
 - (b) the planning proposal authority must comply with the notice requirements for public exhibition of planning proposals and the specifications for material that must be made publicly available along with planning proposals as identified in section 6.5.2 of *A guide to preparing local environmental plans* (Department of Planning and Environment, 2018).
- 3. Consultation is required with the following public authorities/organisations under section 3.34(2)(d) of the Act and/or to comply with the requirements of relevant section 9.1 Directions:
 - Transport for NSW
 - Environment, Energy and Science Group Biodiversity Conservation Division
 - Department of Premier and Cabinet Heritage NSW
 - NSW Rural Fire Service
 - Department of Primary Industries Agriculture

APPENDIX 13 - GATEWAY DETERMINATION

- Coffs Harbour and District Local Aboriginal Land Council
- NSW Department of Natural Resources Access Regulator
- Department of Primary Industries Mining, Exploration and Geoscience

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

- 4. A public hearing is not required to be held into the matter by any person or body under section 3.34(2)(e) of the Act. This does not discharge Council from any obligation it may otherwise have to conduct a public hearing (for example, in response to a submission or if reclassifying land).
- 5. The time frame for completing the LEP is to be **6 months** following the date of the Gateway determination.

Dated 1day of November 2021.

Jeremy Gray

1. Gray

Director, Northern Region Local and Regional Planning Department of Planning, Industry and

Environment

Delegate of the Minister for Planning and Public Spaces