

A decorative background on the left side of the page consisting of light green topographic contour lines. The lines are irregular and wavy, representing elevation changes. They are most dense in the upper left and middle sections, with some circular patterns that could represent hills or depressions.

# Akolele Sewerage Scheme Review of Environmental Factors

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**Eurobodalla Shire Council**

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Template 2.8.1

## Executive summary

This Review of Environmental Factors (REF) has been prepared by Eco Logical Australia Pty Ltd (ELA) under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on behalf of the Eurobodalla Shire Council. This REF assesses the potential environmental impacts associated with the installation of a pressure sewerage collection system in Akolele Village. The project will allow for the connection of 63 existing lots (dwellings) in the village to a reticulated sewerage collection system not currently provided.

This REF considers the matters affecting or likely to affect the environment by reason of the project, including any mitigation measures to be implemented as part of the project. To support the preparation of this REF, a review of previous reports and database information, desktop and field assessments has been carried out.

The key findings of this REF include:

- Terrestrial ecology
  - Vegetation observed within the forest remnants within the northern edge of the study area, which are considered to be good quality, is most consistent with PCT 777 Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion. The urban areas of Akolele likely once supported this PCT as evidenced by the continuation of large mature canopy species throughout the area.
 

Vegetation along the lake shore on Wallaga Lake Road is dominated by *Casuarina glauca* (Swamp Oak), *Melaleuca ericifolia* (Swamp Paperbark), *Allocasurina litorallis* (Black She-oak), and *Pittosporum undulatum* (Sweet Pittosporum). The dominance of Swamp Oak and Swamp Paperbark is characteristic of the TEC PCT 1234 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion. The Project area has been modified and now avoids the lake foreshore and associated TECs.

The TEC PCT 1126 Coastal Saltmarsh in estuaries of the Sydney Basin and South East Corner was identified consistent with areas mapped to the east of Serendip Lane and north of Merriwanga Creek. This TEC is located primarily outside the study area and impact area of the project. None of the vegetation within the impact footprint of the project comprises any TEC listed on the BC Act or EPBC Act.

Threatened and migratory species threatened populations and threatened ecological communities (TECs) that have been recorded or have the potential to occur within the locality have been assessed for their likelihood to inhabit the study area (refer Appendix C). While it is possible that species listed under the EPBC Act may occur within the study area on occasion, the project are not likely to impact any MNES (refer Appendix E). One TEC Coastal Saltmarsh in estuaries of the Sydney Basin and South East Corner (PCT 1126) is located marginally within the study area south of Serendip Lane. The TEC is located outside of the impact area on the southern side of the property fencing and is unlikely to be affected by the project which are positioned approximately 56 m northwest.

The northern section of study area contains multiple Eucalyptus spp. which provide a potential food source for the Koala. There are 13 records of the Koala within 5 km of the study area, none of which are within 2.5 km the site (DPE BioNet, 2022). No signs of Koalas, including scats or scratches on trees were identified during the site survey.

The project is not likely to significantly impact on threatened species, populations or ecological communities listed under the *Biodiversity Conservation Act 2016* (BC Act) or *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

- Cultural heritage
  - Two Aboriginal sites have been recorded in close proximity to the study area, and one site has been recorded within the impact area (AHIMS ID 62-7-0464). No known Aboriginal sites are expected to be impacted within the project's impact area. The proposed impacts appear to be confined to areas within the road corridor and in areas that have previously been disturbed by driveways, the installation of services and residential dwellings, indicating that there is a low potential for intact subsurface archaeological deposits to be present within the proposed impact area. Any proposed impacts to AHIMS ID 62-7-0464 must abide by the conditions of AHIP no. C0002143, issued to John and Kathryn McNamara in September 2016 and active until September 2036.
- Historic heritage
  - The project has not been identified as having the potential to impact upon any historical heritage items or areas of historical archaeological significance. Whilst the proposed impact area is located within the curtilage of Brauer House, the proposed works will be largely conducted away from the house and are minor, subsurface works, for the purpose of establishing essential services. Some vegetation disturbance in the curtilage is expected during construction, however these impacts are considered to be minor and temporary in nature. The proposed works will have no significant impact on the visual, aesthetic or historic significance of the house.
- Water quality
  - The project does not cross any waterways; however, the impact area is in close proximity to the and Merriwanga Creek and Wallaga Lake. The southern extent of the impact area is located as close as 10m from the Wallaga Lakefront, and approximately 100m from the Merriwanga Creek. Potential sedimentation and erosion may occur during the construction stage due to soil excavations required to install the project. There is also potential for discharge of pollutants such as hydrocarbons from construction equipment and sewage from commissioning of the project. Impacts on water quality will be avoided through the application of appropriate mitigation measures while sewage infrastructure is commissioned and implementation of a CEMP to avoid discharges of sediment and pollutants to surrounding waterways.
- Traffic and transport
  - Traffic and transport impacts would be restricted to inconveniences associated with traffic control measures during the construction activities and impacts associated with construction noise and increase in construction traffic. While the project is not likely to significantly impact on traffic flow, it is recommended that consultation with TfNSW and ESC be undertaken prior to commencement to determine whether a Road Occupancy Licence under the Roads Act 1993 will be required. Consultation with ESC and TfNSW should be undertaken prior to works commencing for all impacts proposed within road alignments and verges. Temporary impacts to some residents may occur where the construction works are required to occur close existing dwellings. Notification to individual residents is recommended prior to works.

- Air quality
  - Sewers emit odorous hydrogen sulfide and various volatile organic sulfur and carbon compounds, which require control and mitigation to avoid impacts to adjoining neighbours. Safeguards have been provided to minimise the likelihood of odour impacts during the construction and operation phase including appropriate design and mitigation measures. Provided these measures are implemented for the project, odour emissions have a low potential to impact adjoining residents.
  - Dust emissions may arise during dry weather with wind blowing towards a receptor, and when mitigation measures are not fully effective. It is expected that dust emissions will have a minor impact to the adjoining residents given the short-term duration. Mitigation measures have been recommended to reduce this impact considering the proximity of residents to the disturbance footprint.
- Noise and vibration
  - While the project may result in some minor short-term noise and vibration impacts to nearby properties and residents, these will be limited to standard work hours. It is not expected that vibration from use of small excavation machinery will cause any impact above a negligible level to the Brauer House. Noise generation will be minimised through maintenance of equipment and turning off equipment that is not required to be used.
- Visual amenity and landscape
  - The project has the potential to present a minor temporary reduction in the visual amenity of the study area due to the presence of construction plant and materials and any construction compound areas that will be required. Untidy work practices, haphazard storage of machinery and areas of bare earth all contribute to a reduction in visual amenity. However, it is considered unlikely that the decline in visual amenity at the site-specific scale would extend to a decline in the broader landscape.

The environmental impacts associated with this project are expected to be minor given the already disturbed nature of the sites, the short duration of the activity and implementation of recommended mitigation measures. The key environmental issues associated with the project include potential for erosion and sedimentation and decreased surface water quality and runoff. However, it is expected that each of these potential impacts would be adequately controlled through the implementation of mitigation measures relevant to the activity.

A Construction Environmental Management Plan (CEMP) and associated sub-plans will be developed prior to the commencement of the works. All mitigation measures set out in this REF will be incorporated into the site-specific CEMP and adopted for the duration of works, or longer as required.

The project is required to be assessed under Division 5.1 of Part 5 of the EP&A Act. This REF has examined and considered to the fullest extent possible all matters affecting or likely to affect the environment by reason of the project. The project is not likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. As such it is not necessary for further assessment under section 5.7 of the EP&C Act.

The project is not likely to have a significant impact on any matters of national environmental significance or the environment on Commonwealth land for the purposes of the EPBC Act and a referral under the EPBC Act is not required.

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## Abbreviations

Abbreviation	Description
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASS	Acid Sulphate Soils
AWTF	Aerated Wastewater Treatment Systems
BC Act	Biodiversity Conservation Act 2016 (NSW)
BCSEPP	State Environmental Planning Policy (Biodiversity Conservation) 2021
BPESC	Best Practice Erosion and Sediment Control
BS Act	Biosecurity Act (Cth)
CEMP	Construction Environmental Management Plan
CMP	Coastal Management Program
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
ELA	Eco Logical Australia
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPA	Environmental Protection Authority (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
ESC	Eurobodalla Shire Council
ESC	Eurobodalla Shire Council
ESCP	Erosion and Sediment Control Plan
FFA	Flora and Fauna Assessment
FM Act	Fisheries Management Act 1994
HDD	Horizontal Direction Drilling
HDPE	High-density Polyethylene
KFH	Key Fish Habitat
LEP	Local Environment Plan
MNES	Matters of National Environmental Significance
NML	Noise Management Level
NP&W Act	National Parks and Wildlife Act 1974 (NSW)
OEH	NSW Office of the Environment and Heritage
OH&S	Occupational Health and Safety
PAD	Potential Archaeological Deposit

Abbreviation	Description
PCT	Plant Community Type
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
PSS	Pressure Sewerage System
PSU	Pressure Sewer Unit
REF	Review of Environmental Factors
RHSEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP	State Environmental Planning Policy
SES	State Emergency Service
SHR	State Heritage Register
SMF	Sewage Management Facility
SoHI	Statement of Heritage Impact
SoHI	Statement of Heritage Impact
STP	Sewage Treatment Plant
SWMP	Soil and Water Management Plan
TEC	Threatened Ecological Community
TfNSW	Transport for New South Wales
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
TMP	Traffic Management Plan
WM Act	Water Management Act 2000 (NSW)

# 1. Introduction

## 1.1 Background

Eurobodalla Shire Council (ESC) propose to install a pressure sewerage system (PSS) in Akolele Village to connect 63 lots (dwellings) to the existing combined Wallaga Lake Koori Village PSS, here after referred to as 'the project'. The project will enable connection of the Akolele Village to a reticulated sewer system via a PSS which will convey sewage to the Bermagui Sewage Treatment Plant (STP) via the Wallaga Lake Koori Village PSS. The project will include the installation of PSS infrastructure as described in Section 2.

Figure 1 identifies the location of the study area, impact area and indicative layout of the pressure sewer mains and discharge pipes to each lot associated with the project that is subject to this REF.



Figure 1: Akolele Village project location overview

## 1.2 Definitions

'**The project**' is defined in section 1.5 which outlines the main components of the proposed Akolele PSS.

The '**study area**' refers to the wider area of the Akolele Village within which consideration of impacts to the environment has occurred for the preparation of this REF.

The '**impact area**' refers to the area that may be disturbed by the installation of the sewage collection system.

The '**indicative layout**' refers to the indicative location of the pressure sewer mains and discharge pipes to each lot.

## 1.3 Purpose of the REF

This Review of Environmental Factors (REF) has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of ESC to assess the potential environmental impacts associated with the project. For the purposes of the project, ESC is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

On that basis, development consent is not required, and the project is required to be assessed by ESC as the proponent and determining authority under Division 5.1 of Part 5 of the EP&A Act.

In particular:

1. section 5.5 of the EP&A Act requires that in considering the project, ESC must 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment' by reason of the project; and
2. clause 171 of the *Environmental Planning and Assessment Regulation 2021* (NSW) (EP&A Reg) requires that when considering the likely environmental impact of the project on the environment under section 5.5 of the EP&A Act, ESC is required to take the factors specified in clause 171 into account.

ESC has prepared this REF to enable it to comply with its obligations under s 5.5 of the EP&A Act and clause 171 of the EP&A Reg in respect of the project (Appendix A). This REF describes the project, identifies and discusses relevant planning legislation, identifies potential heritage, ecology, water quality, and amenity values and assesses the likely impacts of the project, including any mitigation measures, on the environment.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured. The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian

Government Department of Climate Change, Energy, Environment and Water (DCCEEW) for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

### 1.3.1 Environmental safeguards

A Construction Environmental Management Plan (CEMP) will be prepared to guide the construction works and will incorporate the findings of the REF and the associated mitigation and management measures.

### 1.3.2 Assumptions and limitations

This REF has been based on the scope of work and methodology detailed in the Akolele PSS Design Report (Pressure Sewer System Solutions Pty Ltd, 2017) and Akolele Sewerage Scheme Construction Methodology documents provided by ESC. Changes to the scope and methodology will require a reassessment of potential impacts, both direct and indirect and a revision of this REF.

It is assumed that there will be no additional disturbance beyond the impact area outlined in Figure 1. Vegetation clearing will not be required, and all sewerage scheme upgrade impacts, including construction related impacts will be contained within the impact area. Construction related impacts include but are not limited to site access, site storage, vehicle parking.

## 1.4 Land ownership

The project will be contained predominantly within road reserve and freehold property within the following land, listed in Table 1 and Table 2 No land acquisition is proposed for the project.

**Table 1: Properties affected by study area, and their ownership**

Lot	DP/SP	Street Number	Street	Ownership
1	125779	361 <sup>1</sup>	Bermagui Road	Freehold
1	23391	302	Bermagui Road	Freehold
21	746726	304	Bermagui Road	Freehold
3 & 4	23391	306-308	Bermagui Road	Freehold
5	23391	310	Bermagui Road	Freehold
6	23391	312	Bermagui Road	Freehold
7 & 8	23391	314-316	Bermagui Road	Freehold
20	23391	318	Bermagui Road	Freehold
21	23391	320	Bermagui Road	Freehold
100	558139	321	Bermagui Road	Freehold
22	23391	322	Bermagui Road	Freehold
23	23391	324	Bermagui Road	Freehold
24	23391	326	Bermagui Road	Freehold

<sup>1</sup> Boundary kit only will be installed

Lot	DP/SP	Street Number	Street	Ownership
25	23391	328	Bermagui Road	Freehold
26	23391	330	Bermagui Road	Freehold
27 & 28	23391	332-334	Bermagui Road	Freehold
29	23391	336	Bermagui Road	Freehold
2	125779	359	Bermagui Road	Freehold
30	23391	1	Flower Circuit	Freehold
31	23391	3	Flower Circuit	Freehold
54 & 55	23391	4-6	Flower Circuit	Freehold
32	23391	5	Flower Circuit	Freehold
33	23391	7	Flower Circuit	Freehold
581	718756	8	Flower Circuit	Freehold
34	23391	9	Flower Circuit	Freehold
582	718756	10	Flower Circuit	Freehold
35	23391	11	Flower Circuit	Freehold
583	718756	12	Flower Circuit	Freehold
36	23391	13	Flower Circuit	Freehold
37	23391	15	Flower Circuit	Freehold
38	23391	17	Flower Circuit	Freehold
39	23391	19	Flower Circuit	Freehold
40 & 41	23391	21-23	Flower Circuit	Freehold
2	398665	25	Flower Circuit	Freehold
A	417024	27	Flower Circuit	Freehold
44	23391	29	Flower Circuit	Freehold
45	23391	31	Flower Circuit	Freehold
46	23391	33	Flower Circuit	Freehold
47	23391	35	Flower Circuit	Freehold
48	23391	37	Flower Circuit	Freehold
49	23391	39	Flower Circuit	Freehold
50 & 51	23391	41-43	Flower Circuit	Freehold
52	23391	45	Flower Circuit	Freehold
53	23391	47	Flower Circuit	Freehold
C	361031	12	Serendip Lane	Freehold
19	23391	4	Turner Drive	Freehold
18	23391	6	Turner Drive	Freehold
17	23391	8	Turner Drive	Freehold
16	23391	10	Turner Drive	Freehold
15	23391	12	Turner Drive	Freehold



Lot	DP/SP	Street Number	Street	Ownership
22	746726	13	Turner Drive	Freehold
14	23391	14	Turner Drive	Freehold
13	23391	16	Turner Drive	Freehold
12	23391	18	Turner Drive	Freehold
103	624281	20	Turner Drive	Freehold
102	624281	22	Turner Drive	Freehold
101	624281	24	Turner Drive	Freehold

**Table 2: Public roads impacted by the study area**

Road	Management
Bermagui Road	NSW Government Public road managed by ESC
Bermagui Road (Service Road)	Council controlled road reserve
Turner Drive	Council controlled road reserve
Flower Circuit	Council controlled road reserve
Serendip Lane	Council controlled road reserve

## 1.5 Proposal objectives and development criteria

### 1.5.1 Proposal objectives

Objectives of the proposal include:

- Improve sewer network efficiency.
- Improve environmental safety for all properties in the village, particularly relating to the use of septic systems.
- Improve amenity of the village by removing older septic treatment systems within an urban area.

### 1.5.2 Development criteria

Development criteria for the proposal include:

- Provide new reticulated sewer for the village of Akolele
- Provide house connections to new pressure sewer network.

The design criteria are provided in further detail in Section 2.

### 1.5.3 Alternatives and options considered

The following describe the options that have been considered and assessed over the development of the proposal.

A concept design option in addition to a 'Do nothing' options were considered for Akolele PSS. These options were developed based on the strategic design, future needs analysis and the site-specific requirements.

The following options were considered:

- Do-nothing – no upgrade and regular maintenance would continue

- Option 1 – new PSS and house connections

#### 1.5.3.1 *Do nothing*

The option of ‘Do nothing’ would limit the scope of work to carrying out activities required to maintain operation of the existing septic systems, including property owners undertaking regular maintenance. Parts of the existing systems are in poor condition, and long-term likelihood of an accidental release would continue to increase. Undertaking regular maintenance would not correct these issues, and the systems are not currently suitable for long-term operation.

Although it would present the lowest initial capital cost and least environmental impact, the ‘Do nothing’ option was discounted as it would not meet the objectives of the proposal to improve environmental safety.

#### 1.5.3.2 *Option 1 – new PSS and house connections*

This option meets the objectives of the proposal as well as the relevant strategy documents by providing environmental safety for residents of Akolele village. It would also continue improved integration into the wider sewer network by improving infrastructure that ties in with and complements the wider reticulated network.

Design refinements to the Option 1 concept design were undertaken as follows:

- Removal of the sections within close proximity to known cultural heritage sites on Wallaga Lake Road. This design element was desirable, however was removed based on an evaluation taking into account potential impact to cultural heritage sites.
- Inclusion of areas in Serendip Lane.

The refined Option 1 concept design that has been assessed in this REF and is described in detail in Chapter 2 and shown on Figure 1 above. This design may be further developed during detailed design.

#### 1.5.4 *Justification for the activity*

The project will benefit 63 lots in Akolele through the provision of a sewerage reticulation services through a new PSS which will connect to the existing Wallaga Lake Koori Village PSS. The project will replace existing onsite treatment systems. PSS’s are beneficial on small residential properties where on-site sewage management systems such as septic tanks can pose an environmental and health risk. Pressure sewerage systems are often used in place of traditional gravity-fed systems due to reduced installation cost, and environmental and social impacts.

Project alternatives have been considered throughout concept design development and the project has been adapted throughout the preparation of this REF to ensure that impacts are minimised on cultural heritage and ecological values.

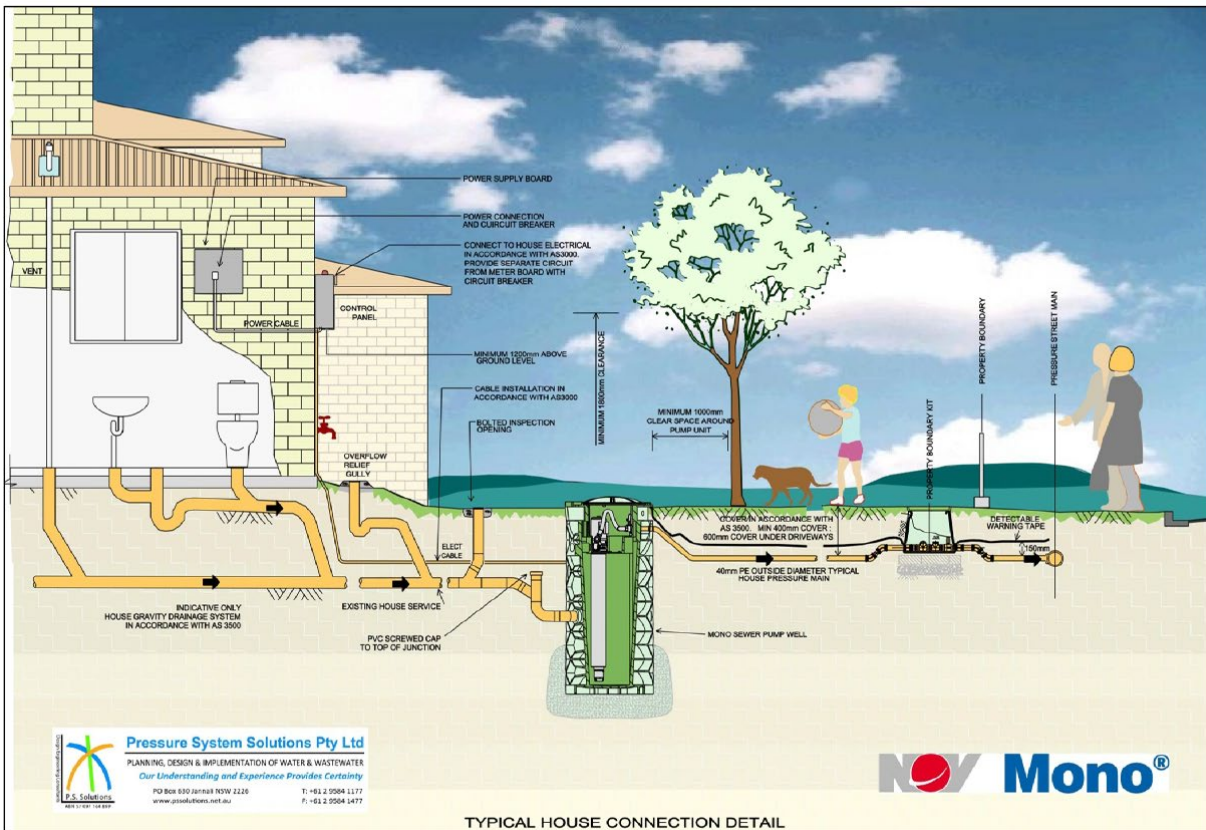


Figure 2: Typical house connection details

## 2. Description of the project

Typical house connection details for the project are found in Figure 2. The proposed Akolele PSS will service 63 lots. Of these lots a total of 53 will have pressure sewer units (PSU), gravity sewer pipes and pump control panels installed, with the remaining vacant and consolidated lots having only boundary kits and discharge pipes installed. The main components of the project are as follows:

### 2.1 The project

The scope of work for the project was provided by ESC and is outlined below:

#### 2.1.1 On-property works

On property works includes:

- Installation of PSU 2 m deep x 1 m wide/long using a 5-tonne excavator
- Installation of discharge pipe – either via small horizontal direction drilling (HDD) machine or small excavator (Photo 1)
- Connection of discharge pipe to boundary kit (Photo 2)
- Installation of gravity sewer pipe and electrical conduit
- Installation of pump control panel



**Photo 1: Installation of PSU and gravity sewer line****Photo 2: Excavation for pressure sewer lateral and boundary kit**

#### 2.1.1.1 *Collection tank, pump unit and gravity sewer pipe*

The below-ground collection tank/PSU is installed at a depth of approximately 2 m and collects household sewage via a gravity sewer pipe similarly to a septic tank. The PSU contains a pump which grinds up solids and transports waste through small diameter pipes to the street mains. The pump unit is activated once the tank volume reaches a certain level which is set low as a contingency in the event of power failure. The unit is accessible via a lid above ground level for maintenance and repairs.

#### 2.1.1.2 *Pump control panel and electrical conduit*

The pump control panel is connected to the property's electrical switchboard via a dedicated power circuit and is usually located on an external wall. The pump unit is connected to the switchboard via an electrical conduit. In the case of a system failure, a visual and audible alarm on the control panel will display and sound.

#### 2.1.1.3 *Discharge pipe*

Sewage discharges from the collection tank to the pressure sewer main via a 40 mm polyethylene discharge pipe. The discharge pipe does not require a downhill gradient due to the fully sealed pressure system.

#### 2.1.1.4 *Boundary kit*

A boundary kit will be located near the boundary of each lot adjacent to where the discharge pipe connects to the pressure sewer main. The kit contains a non-return valve to ensure sewage only flows in one direction, and an isolation valve for maintenance purposes.

### 2.1.2 **Street main installation**

Off-property street main installation works include:

- Installation of small diameter HDPE sewer rising mains (< 75 mm) in the road reserve by horizontal directional drilling (HDD). HDD will be used in selected locations such as street crossings to avoid impacts to roads (Photo 4)
- Installation of boundary kits and pressure sewer laterals using small excavator
- Installation of air valve pits and flushing kits using small excavator
- Installation of isolation valves using small excavator (Photo 3)



**Photo 3** Excavation for isolation valve and wye connection



**Photo 4: HDD equipment installing street main**

#### 2.1.2.1 Pressure sewer main

A pressure sewer main (street main) will be installed along the roadsides of Bermagui Road (and service road), Turner Drive, Flower Circuit and Serendip Lane. The discharge pipe from each lot will connect into the street main. The street main will connect into the existing Koori Village Wallaga Lake PSS which transports waste to the Bermagui STP.

#### 2.1.3 Construction activities

The appointed Contractor would confirm the final construction activities in discussion with ESC. As such, this section only indicates a likely method and work plan as it may vary due to the identification of additional constraints before work starts, detailed design refinements, community and stakeholder feedback, and Contractor requirements/limitations. Should the work method differ from what is proposed in this REF, the Contractor would consult ESC to determine if additional assessment is needed.

##### 2.1.3.1 Site Set-Up and Protection

A CEMP will be prepared to describe the mitigation measures and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to commencement of the Proposed Works and will be reviewed and certified by the ESC Project Manager, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and sub-plans will be developed in accordance with the specifications set out in:

- *Managing Urban Stormwater: Soils and Construction* (blue book) Landcom, 4th edition, March 2004.

- *Best Practice Erosion and Sediment Control (BPESC)* document (white book), International Erosion Control Association Australasia (IECA) 2008 draft & 2016, draft.

The CEMP will also prescribe controls during the construction period and include all mitigation measures outlined in Section 6. In addition, but not limited to, the CEMP will include the following;

- weed control protocols;
- traffic management plan (TMP);
- soil and water management plan (SWMP); and
- spill response plan.

#### 2.1.3.2 *Site establishment activities*

- machinery and materials would be transported to the site by truck and trailer as well as light vehicles;
- installation of erosion and sediment controls designed in accordance with *The Blue Book - Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and included as part of the CEMP;
- establishment of a construction compound and stockpile sites; and
- installation of traffic management measures (in accordance with the traffic control plan).

#### 2.1.3.3 *Construction equipment*

The following construction equipment would be used:

- Small excavator or HDD machine for installation of discharge lines, street mains, and small diameter HDPE
- Small trucks carrying construction materials, and to transport excavated material from the site
- Dewatering pump (to pump out stormwater if required)
- Passenger vehicles to transport workers
- Standard hand tools for electrical and plumbing work

#### 2.1.3.4 *Working hours*

The *Interim Construction Noise Guidelines* (DECC 2009) outlines recommended standard construction working hours as:

- Monday to Friday 7 am to 6 pm.
- Saturdays 8 am to 1 pm.
- No work on Sundays or public holidays.

The proposed works would comply with these recommended hours.

#### 2.1.3.5 *Rehabilitation activities*

- rehabilitation of disturbed areas;
- site clean-up and removal of waste and traffic management measures; and
- solid and liquid wastes would be transported by an appropriately licenced service provider and disposed of at licensed facilities.



### 3. Consultation

Part 2, Division 1 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) identifies situations where consultation needs to be undertaken by public authorities with local council or other government agencies prior to the commencement of some forms of development. Consideration of these requirements is set out in Table 3, below.

**Table 3 TISEPP Clause 2.10-2.16 consultation requirements**

TISEPP Clause	Clause Relevance	Consultation Required
Clause 2.10	<p>Consultation with councils—development with impacts on council-related infrastructure or services</p> <p>(1) This section applies to development carried out by or on behalf of a public authority that this Chapter provides may be carried out without consent if, in the opinion of the public authority, the development—</p> <p>(a) will have a substantial impact on stormwater management services provided by a council, or</p> <p>(b) is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or</p> <p>(c) involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or</p> <p>(d) involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or</p> <p>(e) involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council’s management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or</p> <p>(f) involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the Roads Act 1993 (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).</p> <p>(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority or the person has—</p> <p>(a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and</p> <p>(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.</p>	No— consultation is not required as the project is being undertaken by Council.
Clause 2.11	<p>Consultation with councils—development with impacts on local heritage</p> <p>This section applies to development carried out by or on behalf of a public authority if the development—</p> <p>(a) is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential, and</p> <p>(b) is development that this Chapter provides may be carried out without consent.</p> <p>(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority, or the person has—</p> <p>(a) had an assessment of the impact prepared, and</p>	No – consultation is not required as there will be no impacts that are more than minor on local heritage (see section 5.3 and 5.4 for heritage impact consideration)

TISEPP Clause	Clause Relevance	Consultation Required
	<p>(b) given written notice of the intention to carry out the development, with a copy of the assessment and a scope of works, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and</p> <p>(c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given</p>	
<p>Clause 2.12</p>	<p>Consultation with councils—development with impacts on flood liable land</p> <p>(1) In this section, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time.</p> <p>(2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Chapter provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has—</p> <p>(a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and</p> <p>(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.</p>	<p>No – consultation is not required as the project is being undertaken by Council.</p>
<p>Clause 2.13</p>	<p>Consultation with State Emergency Service (SES)—development with impacts on flood liable land</p> <p>(1) In this section, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time.</p> <p>(2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Chapter provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has—</p> <p>(a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and</p> <p>(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.</p> <p>(2) Any of the following provisions in Part 2.3 is a relevant provision—</p> <p>(a) Division 1 (Air transport facilities),</p> <p>(b) Division 2 (Correctional centres and correctional complexes),</p> <p>(c) Division 6 (Emergency services facilities and bush fire hazard reduction),</p> <p>(d) Division 10 (Health services facilities),</p> <p>(e) Division 14 (Public administration buildings and buildings of the Crown),</p> <p>(f) Division 15 (Railways),</p> <p>(g) Division 16 (Research and monitoring stations),</p> <p>(h) Division 17 (Roads and traffic),</p> <p>(i) Division 20 (Stormwater management systems).</p> <p>(3) This section does not apply in relation to the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance.</p> <p>(4) In this section, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the</p>	<p>Yes – notice to be given to SES that works will be occurring.</p>

TISEPP Clause	Clause Relevance	Consultation Required
	<p>manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time.</p>	
<p>Clause 2.14</p>	<p>Consultation with councils—development with impacts on certain land within the coastal zone</p> <p>(1) This section applies to development on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land.</p> <p>(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies, which this Chapter provides may be carried out without development consent, unless the authority or person has—</p> <p>(a) given written notice of the intention to carry out the development to the council for the local government area in which the land is located, and</p> <p>(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.</p> <p>(3) In this section—</p> <p>certified coastal management program has the same meaning as in State Environmental Planning Policy (Coastal Management) 2018.</p> <p>coastal vulnerability area has the same meaning as in the Coastal Management Act 2016.</p>	<p>No – the project is within a coastal area and in proximity to a coastal wetland area. A coastal management program (CMP) has not been prepared for ESC; therefore the activity is not inconsistent with a current CMP.</p>
<p>Clause 2.15</p>	<p>Consultation with public authorities other than Councils</p> <p>(1) A public authority, or a person acting on behalf of a public authority, must not carry out specified development that this Chapter provides may be carried out without consent unless the authority or person has—</p> <p>(a) given written notice of the intention to carry out the development (together with a scope of works) to the specified authority in relation to the development, and</p> <p>(b) taken into consideration any response to the notice that is received from that authority within 21 days after the notice is given.</p> <p>(2) For the purposes of subsection (1), the following development is specified development and the following authorities are specified authorities in relation to that development—</p> <p>(a) development adjacent to land reserved under the National Parks and Wildlife Act 1974 or to land acquired under Part 11 of that Act—the Office of Environment and Heritage,</p> <p>(b) development on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone, other than land reserved under the National Parks and Wildlife Act 1974—the Office of Environment and Heritage,</p> <p>(c) development comprising a fixed or floating structure in or over navigable waters—Transport for NSW,</p> <p>(d) development that may increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map—the Director of the Observatory,</p> <p>(e) development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument—the Secretary of the Commonwealth Department of Defence,</p> <p>(f) development on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961—the Mine Subsidence Board.</p> <p>(3) In this section—</p> <p>dark sky region map means the map marked “Dark Sky Region Map” held in the head office of the Department of Planning and Environment.</p>	<p>No – the project does not affect any matter listed in sub clauses (a) to (f)</p>

TISEPP Clause	Clause Relevance	Consultation Required
Clause 2.16	<p>(1) This section applies to development for the following purposes that this Chapter provides may be carried out without development consent—</p> <ul style="list-style-type: none"> <li>(a) health services facilities,</li> <li>(b) correctional centres,</li> <li>(c) residential accommodation.</li> </ul> <p>(2) A public authority, or a person acting on behalf of a public authority, must consider <i>Planning for Bush Fire Protection</i> before carrying out the development in an area that is bush fire prone land.</p> <p>(3) In this section—</p> <p><b>bush fire prone land</b> means land recorded for the time being as bush fire prone land on a map certified under the Act, section 10.3(2).</p> <p><b>Planning for Bush Fire Protection</b> means the document entitled <i>Planning for Bush Fire Protection</i>, ISBN 978 0 646 99126 9, prepared by the NSW Rural Fire Service in co-operation with the Department of Planning, Industry and Environment, dated November 2019</p>	N/A

### 3.1.1 Stakeholder consultation

Consultation is a standard part of project development, to ensure affected stakeholders are notified and regulatory bodies are in a position to provide concurrence. ESC has begun consultation with members of the community in Akolele via written letter correspondence which included a fact sheet of the project. On site meetings and information sessions have been planned by ESC to allow the community to view the various components of the project to be installed on each property. A Communication Plan will be developed by ESC that identifies stakeholders that may need to be contacted to ensure appropriate consultation takes place, including but not limited to the Bega Valley Shire Council and DPI (due to the proximity of the project to the Batemans Marine Park).

## 4. Planning and statutory matters

### 4.1 Legislative context

#### 4.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation provide the framework for development and environmental assessment in NSW.

As Council is the proponent, the works have been assessed as ‘development permissible without consent’ under Part 5 of the EP&A Act. Therefore, the activity has been assessed in accordance with sections 5.5, 5.6 and 5.7 of that Act by examining and considering to the fullest extent possible all matters which are likely to affect the environment. Environmental Planning Instruments made under the EP&A Act 1979 may also be relevant and are addressed below.

#### 4.1.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

*State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 2.125(6) of the TISEPP provides that development for the purpose of sewage collection systems may be carried out by or on behalf of a public authority without consent on any land.

The project would comprise development for the purpose of a sewage system, which is defined in clause 2.124 of the TISEPP and the *Standard Instrument – Principal Local Environmental Plan* to mean a *biosolids treatment facility, sewage reticulation system, sewage treatment plant, water recycling facility or a building or place that is a combination of any of these*. The project would be carried out by ESC, which is a public authority for the purposes of cl 2.125 (1) of the TISEPP.

#### 4.1.3 Eurobodalla Local Environmental Plan 2012

The study area is predominantly zoned R2 (Low Density Residential), with small areas to the north and southeast zoned C2 (Environmental Conservation), and to the east of Bermagui and Serendip Road RU1 (Primary Production) in accordance with the Eurobodalla Local Environmental Plan 2012 (LEP) (Figure 3). The objectives of these zones are, as follows:

##### 4.1.3.1 R2 Low Density Residential

- To provide for the housing needs of the community within a low-density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To encourage residential development that is consistent with the character of the neighbourhood.

The project is consistent with the objectives of the P2 Low Density Residential Zone and will help support the needs of the community through implementing sewerage reticulation services for housing in Akolele.

##### 4.1.3.2 C2 Environmental Conservation

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

- To identify sensitive coastal lakes, estuaries, wetlands, overland flow paths and riparian zones and those areas at risk from coastline hazards, including sea level rise.
- To protect and improve water quality.
- To protect and enhance the natural environment for recreation purposes.
- To manage items, places and landscapes of Aboriginal cultural heritage significance into the future in collaboration with the local Aboriginal community.

This REF provides mitigation measures to ensure water quality, items, places and landscapes of Aboriginal cultural heritage significance, and ecological and cultural values are protected. Provided these mitigation measures are implemented, it is considered that the project will be consistent with the objectives of the C2 Environmental Conservation Zone.

#### 4.1.3.3 *RU1 Primary Production*

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To minimise the visual impact of development on the rural landscape.
- To provide for recreational and tourist activities that support the agricultural, environmental and conservation value of the land.

The project's visual impacts on the rural landscape are minor and temporary in nature and consistent with the objectives of the RU1 Primary Production Zone.

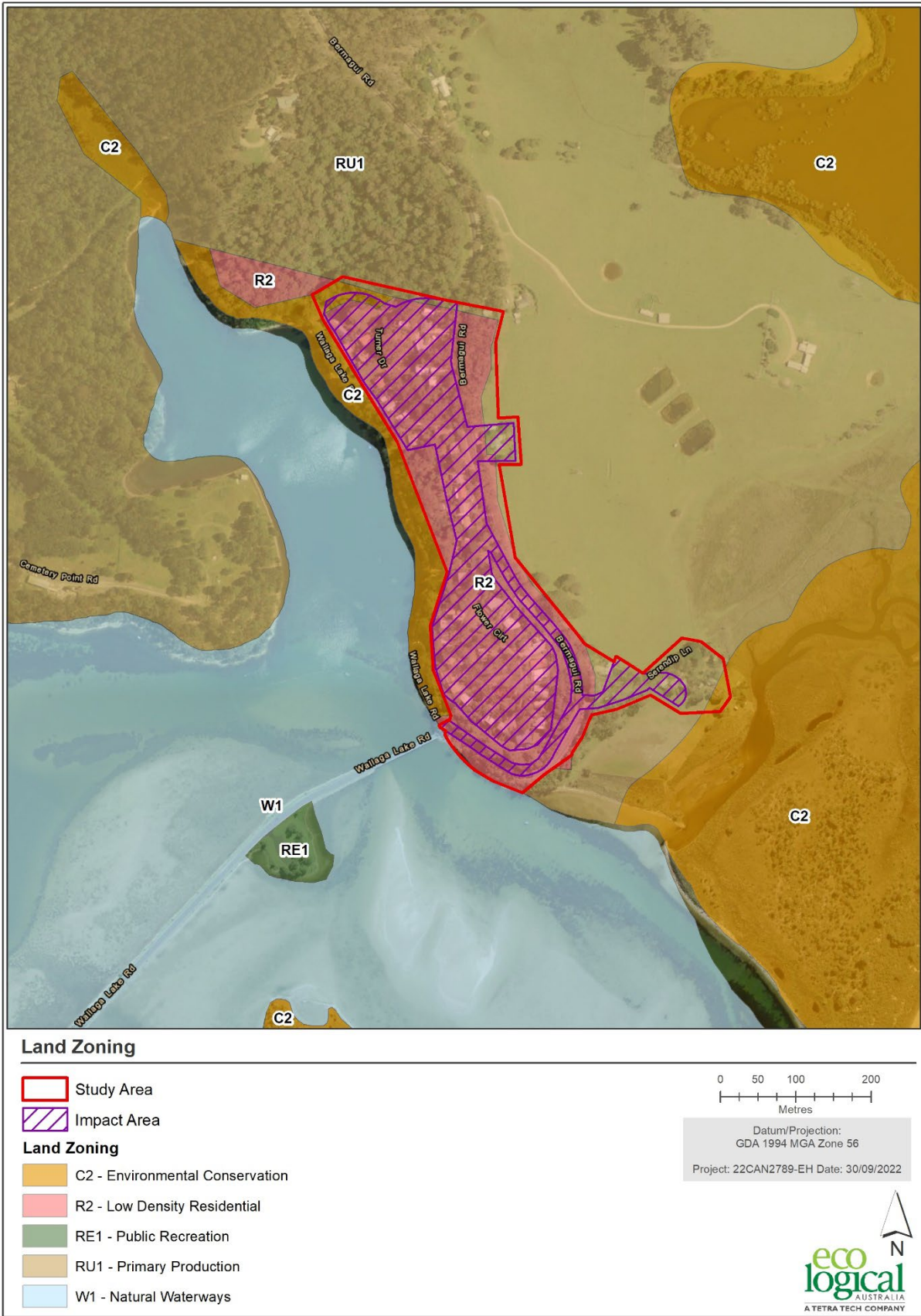


Figure 3: Land zoning applicable to study area and surrounds

## 4.2 Other relevant legislation

Table 4 provides a description of the legislative context for the project. Where a particular approval or consideration is required, this report addresses the objectives and requirements of the legislation.

**Table 4 Legislative Context**

Name	Relevance to the Project	Section in this report
<b>Commonwealth</b>		
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	The EPBC Act protects Matters of National Environmental Significance (MNES) such as wetlands of international importance, threatened species and communities, listed migratory species and National Heritage places (among others). Any action that may or is likely to have a significant impact on MNES must be referred to the Commonwealth to determine whether it is a Controlled Action that requires approval from the Commonwealth. Significant impacts are defined by the Commonwealth (reference <a href="http://www.environment.gov.au/epbc/guidelines-policies.html">http://www.environment.gov.au/epbc/guidelines-policies.html</a> ) for MNES. Potential impacts to Matters of National Environmental Significance (MNES) have been assessed in this report. No MNES are considered likely to be adversely affected by the proposed development.	Section 5.1 and Appendices
<b>State (NSW)</b>		
<i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development projects. The project is development permitted without consent under the Clause 2.125(6) of the TISEPP and is therefore to be assessed under Division 5.1 of Part 5 of the EP&A Act. Accordingly, Client must satisfy Sections 5.5 of that Act by examining, and taking into account to the fullest extent possible, all matters which are likely to affect the environment. This REF is intended to assist, and ensure compliance, with the EP&A Act including Sections 5.5. This report also addresses the requirements of Clause 171 of the EP&A Reg.	Whole document
<i>Biodiversity Conservation Act 2016</i> (BC Act)	The BC Act seeks to conserve biological diversity at bioregional and State scales; to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations; to assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process; and to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity. Section 7.3 of the Act requires proponents of activities subject to Part 5 of the EP&A Act to determine whether they will have a significant impact on threatened species. The test for significant impact is described in section 7.3 of the Act. A significant impact also occurs if the activity is carried out in an area of outstanding biodiversity value. Tests of significance for the impact to threatened species and TECs in accordance with Section 7.3 of the BC Act have been undertaken for the proposed works. It was concluded that the project will not have a significant impact on threatened species	Section 5.1 and Appendices
<i>National Parks and Wildlife Act 1974</i> (NP&W Act)	The NP&W Act is administered by the Director-General of the National Parks and Wildlife Services, who is responsible for the control and management of all national parks, historic sites, nature reserves, and Aboriginal areas (among others). The main aim of the Act is to conserve the natural and cultural heritage of NSW. The Act aims to conserve the natural and cultural heritage of NSW. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required. It was concluded that the proposed works will not disturb Aboriginal objects, therefore a permit is not required.	Section 5.3 and Appendix I



Name	Relevance to the Project	Section in this report
<i>Heritage Act 1977</i>	<p>The Heritage Act aims, amongst other things, to encourage the conservation of the heritage of NSW and regulates development impacts on the state’s heritage places, buildings, works, relics, moveable objects or precincts that are important to the people of NSW. These include items of Aboriginal and historic heritage significance. Where these items have State heritage significance, they may be listed on the State Heritage Register (SHR).</p> <p>The project does not involve an item or place listed on the SHR. Approval of works on the site is therefore not required under s63 of the <i>Heritage Act 1977</i>.</p>	Section 5.3 and 5.4
<i>Protection of the Environment Operations Act 1997 (POEO Act)</i>	<p>The POEO Act is the key environmental protection and pollution statute. The POEO Act is administered by NSW Office of Environment and Heritage (OEH) and establishes a licensing regime for waste, air, water and pollution. Relevant sections of the Act are listed below:</p> <ul style="list-style-type: none"> <li>• Part 5.3 Water Pollution</li> <li>• Part 5.4 Air Pollution</li> <li>• Part 5.5 Noise Pollution</li> <li>• Part 5.6 Land Pollution and Waste</li> </ul> <p>Any work potentially resulting in pollution must comply with the POEO Act. Activities listed under Schedule 1 of the POEO Act are known as ‘scheduled activities’ which require an environment protection licence (EPL).</p> <p>It is considered that the project can be carried out without causing water, air, noise and land pollution, provided appropriate mitigation measures outlined in the report are followed, therefore a licence for the purpose of regulating water pollution would not be required.</p>	Section 5.7, 5.8, 5.9 and 5.15.
<i>Fisheries Management Act 1994 (FM Act)</i>	<p>The FM Act provides for the protection, conservation, and recovery of threatened species defined under the Act. It also makes provision for the management of threats to threatened species, populations, and ecological communities defined under the Act, as well as the protection of fish and fish habitat in general. In particular, the FM Act has mechanisms for the protection of mangroves, seagrasses and seaweeds on public water land and foreshores.</p> <p>The proposed works do not involve harm to marine vegetation or banks below the mean high-water mark and, therefore a permit under s205 or s199 consultation of the FM Act is not required.</p>	Section 5.2
<i>Biosecurity Act 2015 (BS Act)</i>	<p>The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.</p> <p>Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. Appendix 1 of each RSWMP identifies the priority weeds for control at a regional scale. However, landowners and managers must take appropriate actions to reduce the impact of problem weed species regardless of whether they are listed in Appendix 1 of the RSWMP or not as the general biosecurity duty applies to these species.</p> <p>Any priority weeds identified on site will be managed in accordance with the South East Regional Strategic Weed Management Plan (2017 – 2022). Appendix 1 of this Plan includes the list of priority weeds for the South East Region.</p>	Section 5.1
<i>Water Management Act 2000 (WM Act)</i>	The objects of the WM Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit for both present and	N/A

Name	Relevance to the Project	Section in this report
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future generations. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the WM Act (s91). A 'Controlled activity' means:

- the erection of a building or the carrying out of a work (within the meaning of the EP&A Act);
- the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise;
- the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise; or
- the carrying out of any other activity that affects the quantity or flow of water in a water source.

Clause 41 of the *Water Management (General) Regulation 2018* states that public authorities are exempt from the requirement to obtain a controlled activity approval in relation to all controlled activities that it carries out in, on or under 'waterfront land'. Therefore, Council is not required to obtain a controlled activity approval under this Act for any works which may be required within waterfront land.

**Planning Instruments**

<p><i>State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)</i></p>	<p>The aim of this Policy is to facilitate the effective delivery of infrastructure across NSW by identifying whether certain types of infrastructure require consent, can be carried out without consent or are exempt development.</p> <p>The project is development permitted without consent under the Clause 2.125(6) of the TISEPP and is therefore to be assessed under Division 5.1 of Part 5 of the EP&amp;A Act. Part 2.2 Division 1 of the TISEPP contains provision for public authorities to consult with other agencies prior to the commencement of development, as described in Section 3. Consultation requirements of the TISEPP have been considered in relation to the project in Table 3 .</p>	<p>Section 3</p>
<p><i>State Environmental Planning Policy (Biodiversity Conservation) 2021 (BCSEPP)</i></p>	<p>This policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas (<i>Phascolarctos cinereus</i>) to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.</p> <p>Under the BCSEPP, core Koala habitat is defined as:</p> <ul style="list-style-type: none"> <li>• An area of land which contains highly suitable Koala habitat and where koalas are recorded as being present at the time of assessment, or</li> <li>• An area of land which contains highly suitable Koala habitat and where koalas have been recorded as being present within 2.5 km of the site in the previous 18 years.</li> </ul> <p>While the study area is considered to provide potential habitat for this species due to the presence of eucalypt forest, it does not constitute core Koala habitat. The proposal will not require the removal of any trees or significant modifications to the existing environment and therefore will not adversely impact the Koala or its habitat.</p>	<p>Section 5.1</p>
<p><i>State Environmental Planning Policy (Resilience and Hazards) 2021 (RHSEPP)</i></p>	<p>Chapter 2 of the RHSEPP aims to manage development within coastal zones and protect the environmental assets of the coast. In accordance with Section 5 of the Coastal Management Act 2016 (CM Act), the term coastal zone is defined as any area of land that is comprised of the following coastal management areas:</p> <ul style="list-style-type: none"> <li>• Coastal wetlands and littoral rainforests</li> <li>• Coastal vulnerability areas</li> <li>• Coastal environment areas</li> <li>• Coastal use areas.</li> </ul>	<p>Section 5.1, 5.3, 5.4, 5.7, 5.10 and 5.11</p>

Name	Relevance to the Project	Section in this report
	<p>The impact area is mapped within the NSW Department of Planning and Environment RHSEPP as a coastal environment area, coastal use area and coastal wetland proximity area (Figure 4).</p> <p>The provisions of Division 1, clause 10 do not apply to the development as the impact area is not on land identified as “coastal wetlands” or “littoral rainforest”. The impact area does intersect land identified as “proximity area for coastal wetlands” (see Figure 4) and will comply with Division 1, clause 11, including not significantly impacting on:</p> <ul style="list-style-type: none"> <li>• The biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest</li> <li>• The quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest</li> </ul> <p>The impact area also intersects land identified as “coastal use area” and ‘coastal environmental area’ (see Figure 4) and will also comply with the development provisions of Division 3 and Division 4, including not adversely affecting the following:</p> <ul style="list-style-type: none"> <li>• the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment</li> <li>• coastal environmental values and natural coastal processes</li> <li>• 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</li> <li>• marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms</li> <li>• Aboriginal cultural heritage, practices and places</li> <li>• the use of the surf zone</li> <li>• existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability</li> <li>• overshadowing, wind funnelling and the loss of views from public places to foreshores</li> <li>• the visual amenity and scenic qualities of the coast, including coastal headlands</li> <li>• cultural and built environment heritage</li> </ul>	

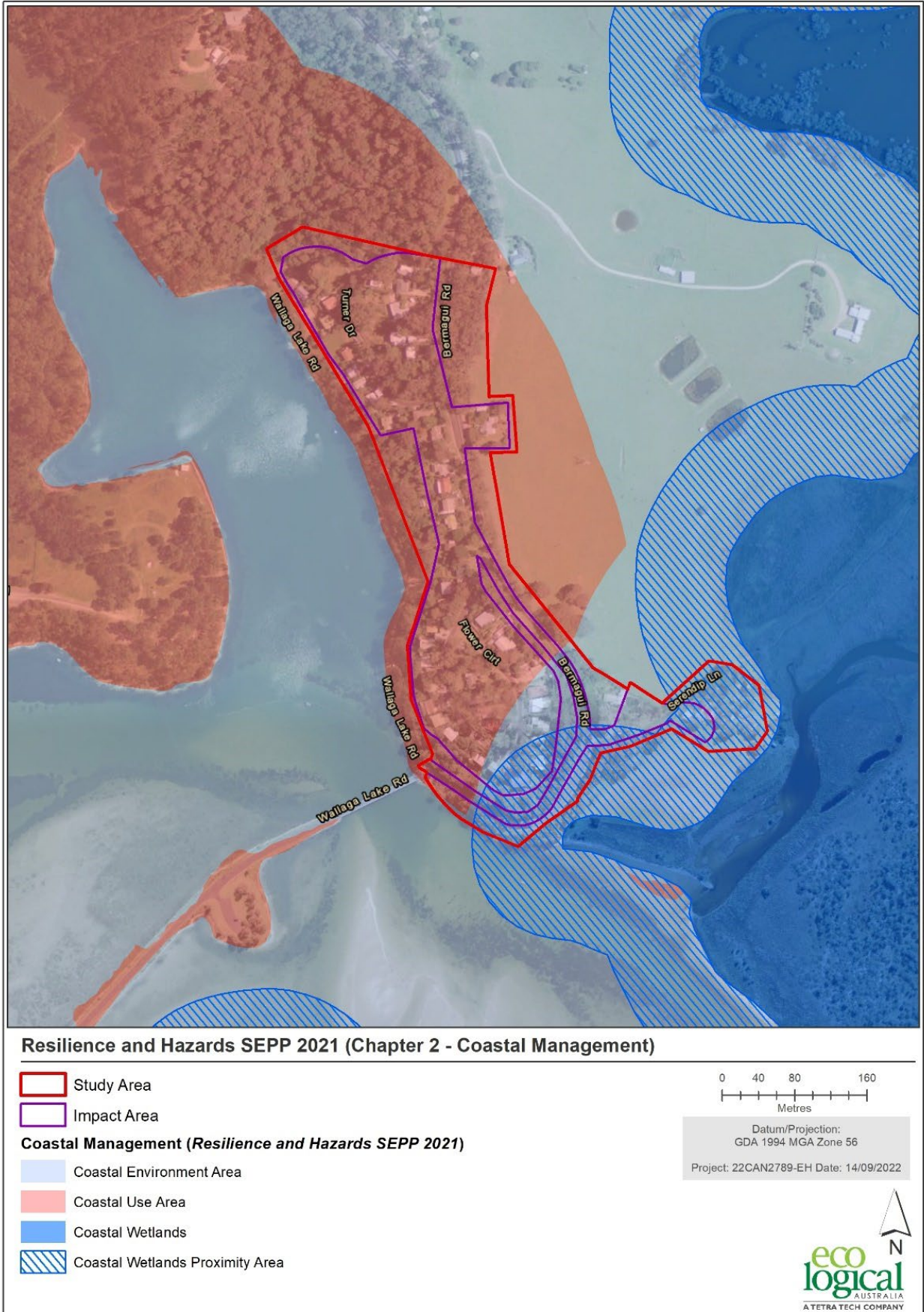


Figure 4 Coastal management areas relevant to the study area (RHSEPP 2021)

## 5. Environmental assessment

This section of the report provides an assessment of the potential environmental impacts of the project. This chapter describes the existing characteristics, potential impacts and mitigation measures forming part of the project for the following:

- Terrestrial Ecology
- Aquatic Ecology
- Aboriginal Heritage
- Non-Aboriginal Heritage
- Topography, Geology and Soils
- Soil Contamination and Acid Sulfate Soils
- Surface Water Quality, Flooding and Hydrology
- Hydrogeology
- Air Quality and Odour
- Noise and Vibration
- Traffic and Access
- Visual Amenity and Landscape
- Socio-economic and Human Health Risk
- Energy and Climate Change
- Bushfire Risk
- Waste Management and Resource Use
- Cumulative Impacts.

### 5.1 Terrestrial ecology

#### 5.1.1 Methodology

The ecology assessment within this REF has been drafted using a three-step process to determine the likely presence of, and impacts of the project on threatened species, populations, and ecological communities listed under either the NSW BC Act, FM Act and/or the Commonwealth EPBC Act as described below.

##### 5.1.1.1 Step 1: Database review

A desktop review of relevant background literature and databases was undertaken to identify ecological values and guide field inspections. This included a review of:

- Threatened species/populations listed under the EPBC Act or BC Act that have previously been recorded within or near the study area (5 km buffer).
- Aerial imagery and any available vegetation mapping.
- 1:25,000 hydro-line data (Natural Resource Access Regulator).
- existing reporting, where relevant.

##### 5.1.1.2 Step 2: Rationalisation of database data and likelihood assessment

Following the analysis of the database sources and understanding of the areas for impact, a likelihood of occurrence assessment was conducted for each species.

The assessment of likelihood was made for threatened and migratory species identified from the database search. This assessment applies to the identified study areas in Figure 1. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the study area and professional judgement.

The terms for likelihood of occurrence are defined below:

- “known” = the species was or has been observed on the site;
- “likely” = a medium to high probability that a species uses the site;
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur;
- “unlikely” = a very low to low probability that a species uses the site;
- “no” = habitat on site and within the study area is unsuitable for this species.

#### 5.1.1.3 Field validation

The field survey was undertaken by ELA ecologist Kylie Lopes over the course of a day on 14 July 2022, 26 July and 15 August 2022 to address changes to the proposed layout. The entire study area was surveyed on foot to:

- Validate or ‘ground truth’ the extent and quality of terrestrial native vegetation.
- Identify the presence of threatened flora, fauna or ecological communities, or whether potential habitat for these entities is present.
- Identify any key fauna habitat features likely to be impacted by the proposal.
- Note opportunistic fauna sightings.

A targeted species survey was undertaken on the 15th of August 2022 for threatened Square Raspwort (*Haloragis exalata* subsp. *exalata*) around the perimeter of Wallaga Lake adjacent to the study area.

#### 5.1.2 Existing environment

The study area is located within the locality of Akolele on the NSW south coast. The study areas extends from Bermagui Road in the east, to within approximately 50 m of the water’s edge (Wallaga Lake) in the west, and also includes a dwelling on the eastern side of Bermagui Road (321 Bermagui Road), as shown in Figure 1. The southern boundary of the study area stops at the Wallaga Lake bridge and extends around the properties along Serendip Lane in the southeast. The northern boundary runs along the outside of Turner Drive to join with Bermagui Road and includes a section of remnant forest.

The study area is 30 m above sea level at the highest point (northern end of Bermagui Road) and slopes towards the surrounding estuarine habitats associated with Wallaga Lake to the west and south, and Merriwanga Creek to the east. The lowest point of the study area sits at <5 m above sea level (properties along Serendip Lane). The study area is located within the coastal foothills of Gulaga Mountain, East of the Great Dividing Range.

The study area is located to the southeast of Gulaga National Park and south of the Merrimans Local land council reserve lands. Primary use of surrounding areas is comprised mostly of small-scale farmland/agriculture (primarily dairy production), semi-rural residential, and residential areas. Several tourist parks are located along Wallaga Lake to the south within the locality of Wallaga Lake Heights and Beauty Point. Wallaga Lake Koori Village is located to the west of the study area.

### 5.1.2.1 Results of desktop and field assessment

#### DESKTOP MAPPED VEGETATION COMMUNITIES

The streets of Akolele that make up the main urban area are not mapped as supporting a Plant Community Type (PCT). Forested areas within the northern parts of the study area and along Bermagui Road, and forest on the north-western boundary of the study area are mapped as PCT 777 *Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion*. The northern most section of this forested area is mapped as PCT 1148 *Silvertop Ash - Blue-leaved Stringybark - Woollybutt shrubby open forest on coastal foothills central South East Corner Bioregion*.

There are no Threatened Ecological Communities (TEC) mapped within the study area, however, PCT 1126 *Coastal Saltmarsh in estuaries of the Sydney Basin and South East Corner Bioregions* occurs to the east of Serendip Lane and north of Merriwinga Creek.

Mapped vegetation is shown in Figure 5.



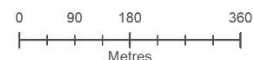
**Vegetation**

- Study Area
- Impact Area

**Plant Community Types (South East Local Land Services, 2014)**

- 659: Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin and South East Corner
- 772: Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion
- 777: Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner
- 828: Floodplain wetlands of the coastal lowlands, southern South East Corner
- 875: Grey Myrtle - Lilly Pilly dry rainforest in dry gullies of the Sydney Basin Bioregion and South East Corner Bioregion
- 920: Mangrove forest in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion
- 1108: River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion

- 1126: Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion
- 1148: Silvertop Ash - Blue-leaved Stringybark - Woollybutt shrubby open forest on coastal foothills central South East Corner
- 1212: Spotted Gum - Grey Ironbark - Woollybutt grassy open forest on coastal flats, southern Sydney Basin and South East Corner
- 1220: Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner
- 1232: Swamp Oak - Prickly Tea-tree - Swamp Paperbark swamp forest on coastal floodplains, Sydney Basin Bioregion and South East Corner Bioregion
- 1236: Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion
- 1337: Yellow Stringybark - Mountain Grey Gum moist shrubby open forest on coastal ranges, southern South East Corner
- 1339: Yellow Stringybark - Silvertop Ash open forest on dry slopes of the escarpment ranges, northern South East Corner



Datum/Projection:  
GDA 1994 MGA Zone 56  
Project: 22CAN2789-EH Date: 30/09/2022



Figure 5: Mapped vegetation communities (DPI SEED mapping)



### 5.1.2.2 Identified vegetation communities

Vegetation observed within the forest remnants within the northern edge of the study area, which are considered to be good quality, is most consistent with PCT 777 *Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion*. The urban areas of Akolele likely once supported this PCT as evidenced by the continuation of large mature canopy species throughout the area. However, the extent of urban development in the area has removed most understory species which may have once formed part of this PCT. Some non-characteristic canopy species occur toward the lakes edge such as *Eucalyptus botryoides* (Bangalay), likely due to estuarine influence.

Vegetation along the lake shore on Wallaga Lake Road is dominated by *Casuarina glauca* (Swamp Oak), *Melaleuca ericifolia* (Swamp Paperbark), *Allocasurina litorallis* (Black She-oak), and *Pittosporum undulatum* (Sweet Pittosporum) (Photo 5). The dominance of Swamp Oak and Swamp Paperbark is characteristic of the TEC PCT 1234 *Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion*. However, this area is very heavily degraded and modified for recreational use, with the presence of a frequently used gravel road, boat storage and launching areas and incursion of exotic species. Due to these factors it is not believed that this area comprises this TEC, though it may have been in the past. In any case, the study area has been modified and now avoids the lake foreshore and associated TECs.

The TEC PCT 1126 *Coastal Saltmarsh in estuaries of the Sydney Basin and South East Corner* was identified consistent with areas mapped to the east of Serendip Lane and north of Merriwina Creek (Photo 6). This TEC is located primarily outside the study area and impact area of the project, however a small section of this TEC is present within the southern border of the study area below Serendip Lane. The saltmarsh is not consistent with mapped modelling (shown in Figure 5) South of Serendip Lane and is only present to the fence line of the property (Photo 7). There is no TEC within the impact footprint which will be within the grassed area of the property 56 m away from the nearest identified saltmarsh, however this TEC may be subject to indirect impacts due to the close proximity to the project. This is assessed further within Appendix C and D and a Test of Significance (ToS) has been performed in Appendix G. None of the vegetation within the impact footprint of the project comprises any TEC listed on the BC Act or EPBC Act.



**Photo 5 Lakeside Swamp Oak and Swamp Paperbark vegetation with well used gravel road access. The project design has been modified to avoid the lake foreshore. This area has been removed from the study area and will not be affected by the project**



**Photo 6: Saltmarsh TEC located east of Serendip Lane outside of the study area**



**Photo 7: Saltmarsh (TEC) south of the property in Serendip Lane. The saltmarsh extends only as far as the property fence line 56 m from the proposed impact area (see green dotted line).**

#### 5.1.2.3 Flora (including flora of conservation significance)

The study area was divided into three separate zones based on overall landscape usage (urban housing, lakeside vegetation, forested areas), vegetation types and location. These divisions are outlined and a description of identified vegetation for each zone is provided below. There were 109 flora species recorded within the study area or immediate surrounds; of these, 51 were exotic and 58 were native species. A large number of these species were planted garden ornamentals (Appendix F). Species searches using the NSW BioNet Wildlife Atlas (DPE 2022) and EPBC Act Protected Matters Search tool (DPE 2022) identified 10 threatened flora species which have been recorded or are predicted to occur within 5 km of the study area (Appendix B and C).

*Haloragis exalata subsp. exalata* (Square Raspwort) has been recorded adjacent to the study area at four locations along the lakeside and swamp area to the north. A targeted survey for this species was carried out along the lake shore adjacent to Wallaga Lake Road and extended approximately 100 m beyond the northern boundary of the study area. Square Raspwort was found to be present in large numbers to the north of the study area (Approximately 70 individuals) and in smaller numbers scattered along the entire length of the lake shore (Photo 8 and Figure 6). None of the individual Raspwort plants identified are within the impact area, although some border the study area. Impacts to this species are examined in Appendix C and G and indirect impacts are addressed Appendix D.

Given the good survey coverage within the study area it is considered likely that any threatened flora species within the study area would have been detected, if present, at the time of survey. It is considered unlikely that any threatened flora species other than the identified *Square Raspwort* currently occur within the study area or impact area.



**Photo 8: Square Raspwort identified adjacent to the western edge (Lake side) of the study area**

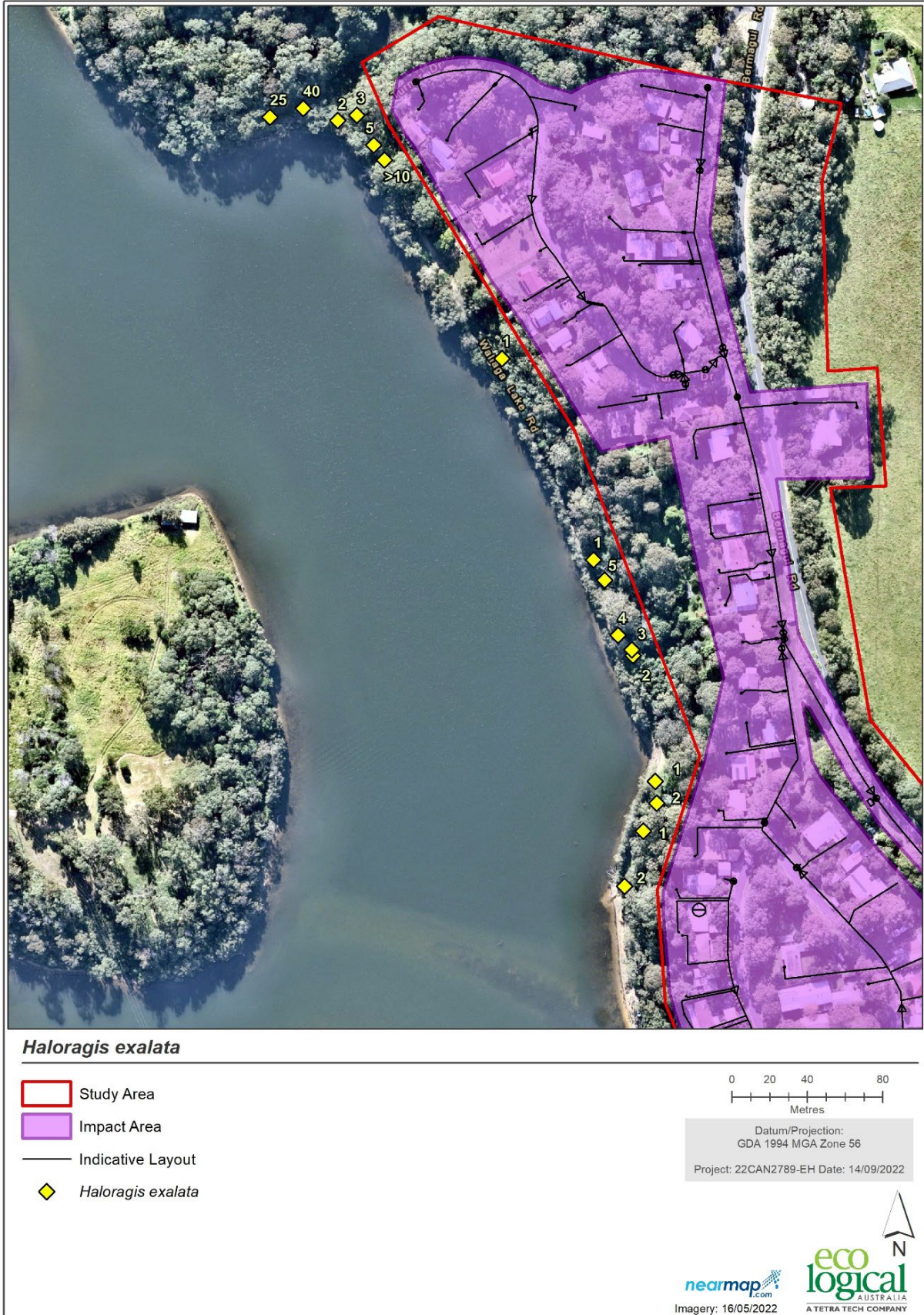


Figure 6: Square Raspwort locations and number of plants observed

The field survey was split into three zones (Village – Zone 1, Bridge Connection – Zone 2 and Forest Remnant – Zone 3) as demonstrated in Figure 7 below.



Figure 7: Survey zones

#### 5.1.2.4 Village (Zone 1)

The Village (zone 1) area is the largest zone and covers approximately 80% of the study area. For the purposes of the assessment zone 1 will be considered to be those areas around the urban street scape including: around Flower Circuit, Turner Drive, the northern end of Wallaga Lake Road, Bermagui Road Service Road, and along Bermagui Road, and Serendip Lane.

This part of the study area is primarily urban gardens, plantings and ornamental species with mown/maintained lawns and verges, fencing, landscaping and sealed road surfaces (Photo 9 - Photo 13). The canopy is sparse and comprises of mostly mature *Eucalyptus tereticornis* (Forest Red-gum), *Eucalyptus botryoides* (Bangalay), *Eucalyptus pilularis* (Blackbutt) and *Angophora floribunda* (Smooth-barked Apple). Black She-oak and Swamp Oak are abundant in patches, particularly closer to the lake and along Turner Drive. Some exotic canopy species including *Jacaranda mimosifolia* (Jacaranda) and *Erythrina x sykesii* (Coral tree) are also present. The understory is almost entirely planted and modified and heavily dominated by exotic vegetation. A comprehensive list of identified species is available in Appendix F.

The ground cover is primarily grass (mown/ maintained lawns), dominated by *Cynodon dactylon* (Couch Grass), *Trifolium repens* (White Clover) and *Cenchrus clandestinus* (Kikuyu).

Much of the project will occur within the boundaries of sealed roads and roadside verges within this area, with some of the works occurring within private property/ front gardens and lawns.



Photo 9: Flower Circuit off Bermagui Road



**Photo 10: Flower Circuit looking northwest**



**Photo 11: Turner Lane looking south**





**Photo 12: Bermagui Road Service Road looking north from Turner Lane**



**Photo 13: Bermagui Road Service Road looking north**

#### 5.1.2.5 Bridge Connection (Zone 2)

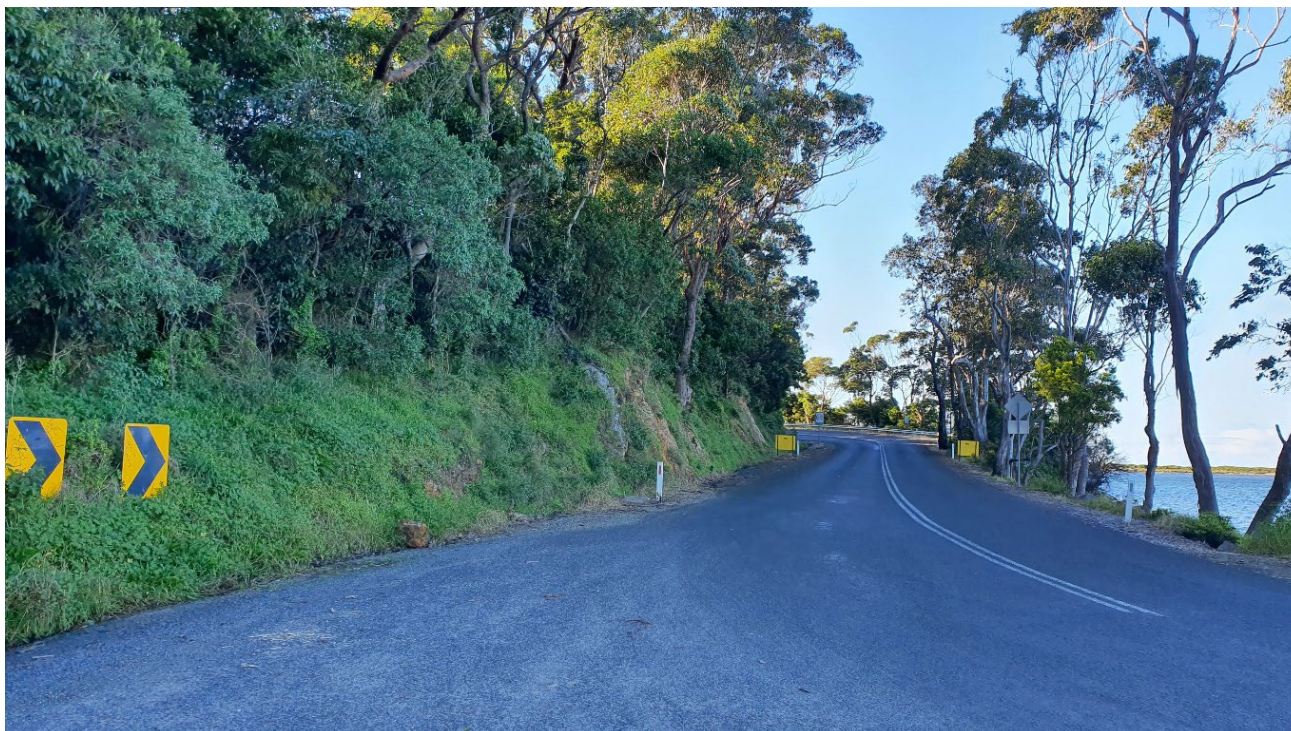
The bridge connection (Zone 2) encompasses the area along Bermagui Road from Flower Lane to Wallaga Lake Bridge and the proposed new sewerage line to be installed from the existing bridge sump and up the vegetated

hillside area through to the lower southern bend of Flower circuit. This is a very small zone and accounts for approximately 5% of the study area.

The vegetated hillside area between Flower Circuit and the Wallaga Lake Bridge is dominated by a canopy of mature Bangalay and Forest Red-gum with a mid-canopy of *Acacia longifolia* (Coast Wattle), Black She-oak and Sweet Pittosporum (Photo 14). This area has a mix of exotic and native ground species, primarily *Asparagus scandens* (Asparagus fern), *Bidens pilosa* (Cobblers Pegs), *Commelina cyanea* and *Dichondra repens* (Kidney Weed). This vegetation continues along Wallaga Lake Road toward Serendip Lane but is degraded with a sparse subcanopy (Photo 15).



**Photo 14: Vegetated hillside between Flower Circuit and the Wallaga Lake Bridge**



**Photo 15: Wallaga Lake Road facing northeast from the bridge with approximate location of pipeline**

#### 5.1.2.6 Forest Remnants (Zone 3)

The forest remnants to the northwest of the urban area adjacent to the study area are made up of primarily native vegetation and make up approximately 15 % of the study area (Photo 16). This area is not within the impact area and only small sections of this remnant vegetation are within the study area at the north end of Turner Lane and Bermagui Road. This forest remnant provides much of the identified fauna habitat within the study area. The canopy is dominated by Blackbutt, Forest Red-gum, *Eucalyptus globoidea* (White Stringybark) and *Eucalyptus paniculata* (Grey Ironbark) with Rough-barked Apple and *Eucalyptus elata* (River Peppermint) scattered throughout. Bangalay is present closer to the lake and estuarine areas.

The subcanopy comprises of Black She-oak, and Black Wattle in the higher areas, but is low, dense and transitions to *Livistona australis* (Cabbage-tree Palm) and Sweet Pittosporum closer to drainage lines.

The ground cover is a mix of leaf litter, fallen debris and mostly native grasses, ferns and sedges including *Gahnia melanocarpa* (Gahnia), *Imperata cylindrica* (Blady Grass), *Lomandra longifolia*, *Macrozamia communis* (Burrawang), *C. cyanea*, *Hardenbergia violacea* (False Sarsparilla) and *Hibbertia scandens* (Climbing Guinea Flower).



**Photo 16: Forest remnant off Bermagui Road**

#### 5.1.2.7 Fauna (including fauna of conservation significance)

Fauna habitat features within or near the study area identified during the field survey included fallen timber and other woody debris, hollow bearing trees and understorey and groundcovers. Eight hollow bearing trees were identified within the study area, with three containing small hollows (<10 cm) and five containing medium hollows (10-25 cm) (Photo 17 and Figure 8), which could provide minor potential nesting habitat for cockatoo species. No hollow bearing trees will be impacted by the project and higher quality nesting habitat is present within the locality. The canopy trees present within the study area provide potential habitat for birds, microchiropteran bats and arboreal mammals. The hollows identified within the study area may provide denning habitat of a suitable height and size for the Yellow-bellied Glider (*Petaurus australis*). Medium and large hollows (>25 cm) which would be suitable for larger fauna species such as owls and other arboreal species are present within the forest remnant to the north of the study area and are likely present within the surrounding landscape.

A known microbat roost is located under Wallaga Lake bridge (Roads and Maritime) which is south of the study area and will not be impacted by the project, impacts to microchiropteran bats is examined in Appendix G.

One threatened fauna species was observed during the field survey, an individual White-bellied Sea Eagle (*Haliaeetus leucogaster*) seen flying overhead. No crushed Black She-oak cones were observed, despite fruiting trees and the presence of large numbers of this feed species, indicating Glossy Black-cockatoo (*Calyptorhynchus lathamii*) has not recently been feeding in the study area. No Yellow-bellied Glider feed trees were identified within or surrounding the study area. Impacts to these threatened species are examined in Appendix G.

Species searches using the NSW BioNet Wildlife Atlas (DPE 2022) and EPBC Act Protected Matters Search tool (DPE 2022) identified 54 threatened fauna species which have been recorded or are predicted to occur within 5 km of the study area (Appendix B and C). While some threatened species (such as the white-bellied Sea Eagle) are likely to travel through or use the study area from time to time, potential impacts from the proposal are considered to be negligible (Appendix G).

There are large areas of potential habitat in the surrounding landscape and most fauna species that may occur within the study area from time to time are highly mobile, with large home ranges or seasonal movements. No important habitat features such as hollow-bearing or feed trees, which provide important foraging and nesting resources for threatened fauna, will be adversely affected by the proposal. Though hollows were identified within the impact area these are unlikely to be affected as the project will only affect ground vegetation. There is a risk of noise disturbance however these hollows and any fauna nesting within are located within urban areas subject to regular noise, cars and machinery. Works will be undertaken in areas which have already been heavily disturbed and are subject to ongoing human use. The project will not fragment or degrade the habitat available to any fauna species. In this context, the potential impacts of the works on threatened fauna species are considered negligible and the proposal is unlikely to have a significant impact on any threatened or non-threatened fauna species.



**Photo 17: Medium sized hollow in a Bangalay within the study area (off Flower Circuit)**



Figure 8: Identified habitat features

### 5.1.2.8 Matter of National Environmental Significance under the EPBC Act

Threatened and migratory species, threatened populations and threatened ecological communities (TECs) that have been recorded or have the potential to occur within the locality have been assessed for their likelihood to inhabit the study area (Appendix C). While it is possible that species listed under the EPBC Act may occur within the study area on occasion, the project are not likely to impact any MNES (Appendix E). One TEC *Coastal Saltmarsh in estuaries of the Sydney Basin and South East Corner* (PCT 1126) is located marginally within the study area south of Serendip Lane. The TEC is located outside of the impact area on the southern side of the property fencing and is unlikely to be affected by the project which are positioned approximately 56 m northwest.

The northern section of study area contains multiple *Eucalyptus* spp. which provide a potential food source for the Koala. There are 13 records of the Koala within 5 km of the study area, none of which are within 2.5 km the site (DPE BioNet, 2022). No signs of Koalas, including scats or scratches on trees were identified during the site survey. While the study area is considered to provide potential habitat for this species due to the presence of eucalypt forest, it does not constitute core Koala habitat. The proposal will not require the removal of any trees or significant modifications to the existing environment and therefore will not adversely impact the Koala or its habitat.

## 5.1.3 Impact

### 5.1.3.1 Direct Impacts

An assumption of this REF is that direct impacts related to the project will be restricted to the impact area (Figure 1). These areas have been previously disturbed by construction of roadways, verges, and residential development. Based on the results of section 5.1.2.1, it is considered unlikely that any threatened flora, fauna or TEC will be directly impacted by the project.

### 5.1.3.2 Indirect Impacts

Indirect impacts are those that have the potential to impact the surrounding areas. The project may locally increase disturbances near the edges of the site (comprising construction disturbances, noise and runoff/sedimentation), with the potential for exotic weed invasion and changes to microclimates for species which may be present.

Three edge effects have been identified as having the chance to occur due to this project:

- Introduction of weeds along boundaries of the disturbed areas that encroach into areas of native vegetation within the study areas
- Temporary modification to fauna assemblages due to an increase disruption from noise and human activity
- Pollution, sedimentation, of downstream aquatic habitat.

As the subject site has been previously cleared and disturbed, edge effects are likely to have already become established within the study areas and therefore the project are unlikely to significantly exacerbate these processes. Indirect impacts are expected to be managed through the mitigation measures specified in Section 5.1.4.

### 5.1.3.3 Assumptions and Limitations

This impact assessment has been prepared with reference to the scope of works detailed in Section 2. As previously discussed, all direct impacts to terrestrial ecology have been avoided by this project as the subject site occurs in areas of no vegetation cover. As such, all impact assessments have been prepared in response to the potential indirect impacts discussed in Section 5.1.3.

The results of biodiversity assessments can be optimised by conducting investigations over a long period to compensate for the effects of unfavourable weather, seasonal changes and climatic variation. In general, the longer the survey the more species detected. Results can also be improved by using a wide range of techniques, since some species are more likely to be detected by a particular method. However, surveys and assessment are subject to constraints that determine the amount of time allocated, the methods used and the timing of the work. The biodiversity values detected during the site survey are a guide to those present, but are by no means definitive. However, the techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the flora and fauna species and vegetation communities within the study area.

### 5.1.4 Mitigation measures

**Table 5 Terrestrial ecology mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
E1	Pollution	<ul style="list-style-type: none"> <li>Develop a Construction Environmental Management Plan (CEMP) to address pollution and contamination issues, such as silt control, run-off and oil/fuel/chemical storage/spill management, which could arise during operation of the site.</li> <li>Sediment and waste runoff control measures (barriers/fences, drainage, dewatering equipment) should be implemented around works to ensure any sediment is contained.</li> <li>Sewerage/waste leaks should be appropriately contained, corrected and removed to avoid any impact to surrounding ecological communities and waterways.</li> </ul>
E2	Vegetation Protection	<ul style="list-style-type: none"> <li>The limits of works (impact area) should be clearly marked (for example, using temporary fencing, flagging and/or bunting) to ensure that disturbance occurs only within the designated works areas and is not unnecessarily extended.</li> <li>Material and equipment storage areas should be restricted to existing disturbed areas.</li> <li>Vehicle movements should be confined to the impact area.</li> <li>Pre-works briefing to be undertaken by ESC staff advising of sensitive areas and relevant safeguards for these areas.</li> <li>Vegetation clearing should be undertaken in a manner to avoid damage to adjacent vegetation.</li> <li>Excavated areas such as trenches should be checked for any fauna/injured animals at the start of each workday.</li> </ul>
E3	Weed and pathogen spread	<ul style="list-style-type: none"> <li>Ensure all plant and machinery are washed down before use on site.</li> <li>Any priority weeds identified on site will be managed in accordance with the South East Regional Strategic Weed Management Plan (2017 – 2022).</li> </ul>



## 5.2 Aquatic ecology

### 5.2.1 Existing environment

The study area is located adjacent to the Wallaga Lake Estuarine Catchment area. There are two first order streams that join into one second order stream in the forested area to the north, and a third order stream, Merriwina Creek, to the southeast of the study area (Strahler stream orders). A small swamp area is located adjacent to the north-western corner of the study area, off Turner Lane.

Areas of Wallaga Lake and Merriwina Creek adjacent to the study area are within the Batemans Marine Park, with the Pacific Ocean to the east. The marine park areas are primarily classified as 'General Use', with the 'Wallaga Lake Entrance Habitat Protection Zone' located on the eastern side of the bridge and extending to the lake entrance.

Key Fish Habitat (KFH), for Australian Grayling (*Prototroctes maraena*) was identified to the west of the study area within the Dignans Creek and Narira Creek which are tributaries of Wallaga Lake (NSW Government, SEED).

### 5.2.2 Impact

No direct impacts on aquatic ecology have been identified as having the potential to occur as a result of the project. However, indirect impacts on downstream habitat may occur if mitigation measures are not in place and effective. Indirect impacts during the project may include increasing turbidity in water, sediment deposition, and oil and pollutant spills.

### 5.2.3 Mitigation measures

**Table 6 Aquatic ecology mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
AE1	Indirect impacts on aquatic fauna – decreased water quality	<ul style="list-style-type: none"> <li>The CEMP to address pollution and contamination issues, such as silt control and oil/fuel/chemical storage/spill management, which could arise during construction entering waterways.</li> <li>Install sediment fences to prevent fine material from travelling into the waterways along the full length of construction work.</li> <li>Avoid storing fill and waste material near waterways.</li> </ul>

## 5.3 Aboriginal heritage

The following section regarding Aboriginal heritage has been conducted in accordance *with Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (hereafter referred to as 'CoP') (DCCEEW 2010).

This due diligence process aims to determine whether Aboriginal objects will be harmed by the project, as required under Part 6 of the NSW National Parks and Wildlife Act 1974 (NSW). The CoP sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

- Identify whether or not Aboriginal objects are, or are likely to be, present in an area;
- Determine whether or not their activities are likely to harm Aboriginal objects (if present); and,

- Determine whether an Aboriginal Heritage Impact Permit (AHIP) from Heritage NSW or further assessment is required.

The methodology of this Aboriginal heritage due diligence assessment is to:

- Undertake a search of the Aboriginal Heritage Information Management System (AHIMS) register maintained by Heritage NSW to establish if there are any previously recorded Aboriginal objects or places within the study area;
- Undertake a search of the NSW State Heritage Inventory, the Australian Heritage Database and the Eurobodalla Local Environmental Plan (LEP) 2012 Schedule 5 (Environmental Heritage) in order to determine if there are any sites of Aboriginal significance or sensitivity located within the study area.
- Undertake a desktop review of relevant previous archaeological assessments to understand the local archaeological context and assist in predicting the likely occurrence of unrecorded archaeological sites or objects.
- Review historic aerial photographs to determine past land use and any historic disturbance to the study area.
- Review landform features to assess whether there are likely to be areas of Aboriginal archaeological potential.
- Undertake a site inspection to identify any Aboriginal objects and sensitive landforms which may suggest Aboriginal objects exist and to provide advice about whether any further works and mitigation measures are required.

### 5.3.1 Existing environment

#### 5.3.1.1 Heritage database searches

Searches of the Australian Heritage Database, the Eurobodalla LEP 2012 and the State Heritage Inventory utilising the term 'Akolele/Uambarra' were conducted on the 22<sup>nd</sup> of June 2022 in order to determine if any places of archaeological significance were located within the study area.

No Aboriginal archaeological sites or heritage items were recorded on these databases as being within the study area.

#### 5.3.1.2 AHIMS search

The Aboriginal Heritage Information Management System (AHIMS) database retains information and records pertaining to identified Aboriginal cultural heritage sites, objects and declared places throughout NSW. It is maintained and regulated by Heritage NSW under Section 90Q of the NPW Act.

An extensive search of the AHIMS database was conducted on 20 June 2022 to identify if any registered Aboriginal sites were present within, or adjacent to, the study area (Appendix I). The AHIMS search represents 7 km around the study area and was conducted within the following coordinates: GDA Zone 56, Eastings 230092-244092, Northings 5966484-5980484, with a buffer of 0 m. The search resulted in the identification of one hundred (100) Aboriginal sites and two (2) Aboriginal places within 7km of the study area (Table 7). A complete list of the AHIMS search results within 7km of the study area is found in Appendix I.

One Aboriginal Place, Merriman Island, is located to the west of the study area and is significant for its 'association with Umbarra, the black duck totem of the Yuin people and a story about King Merriman, a Yuin

Elder'. The frequencies of site types recorded within the AHIMS database search area are listed below. The distribution of recorded Aboriginal sites within 1km of the study area is shown in Figure 9.

**Table 7 Frequencies of site types**

Site Features	Number	%
Aboriginal Ceremony and Dreaming	5	5
Artefact	20	20
Artefact; Potential Archaeological Deposit (PAD)	2	2
Artefact; Shell; Burial	1	1
Burial	2	2
Burial; Aboriginal Ceremony and Dreaming	1	1
Ceremonial Ring (Stone or Earth)	1	1
Fish Trap	2	2
Modified Tree (Carved or Scarred)	3	3
Non-Human Bone and Organic Material	1	1
PAD	1	1
Shell	10	10
Shell; Artefact	45	46
Shell; PAD	2	2
Stone Arrangement	1	1
Stone Quarry; Artefact	1	1
<b>Total</b>	<b>98</b>	<b>100</b>

The majority of sites within 7km of the study area have been recorded as middens (46%) followed by artefact sites (20%). Three sites have previously been recorded in close proximity or within the study area (Table 8, Figure 10).

**Table 8 AHIMS sites in close proximity to or within the impact area**

AHIMS ID	Site name	Site features	Description
62-7-0386	Akolele SU13/L2	Shell; Artefact	<p>Recorded by Julie Dibden for the proposed Koori Village and Akolele pipeline. The site card identifies the site as being within 400m of drinking water, in Akolele, Wallaga Lake. The site comprises of two stone artefacts with shell on a simple slope immediately adjacent to the lake.</p> <p>The shell is exposed in a section of graded driveway in an area measuring 3x5m and the simple slope possesses a gradient of 8 degrees, extending from Turner Drive southward for approximately 50m. It was noted that the 50m slope may contain shell and artefacts, though it was unlikely to be <i>in situ</i> due to the past clearing and road construction. The shell was recorded as being sparse, fragmented cockle and the artefacts were recorded as a black volcanic flake and an artefact of unidentifiable material with anvil pitting and hammer/pounder bruising.</p> <p>The site card states to seek approvals prior to impacts and that further investigation would be required if impacts were proposed to the east of the road.</p>

AHIMS ID	Site name	Site features	Description
			The site has previously been partially disturbed by the construction of the Koori Village Sewer Upgrade under AHIP no. C0001059, which has since expired, and was assessed as having a low archaeological significance.
62-7-0385	Akolele SU13/L1	Shell; Artefact	<p>Recorded by Julie Dibden for the proposed Koori Village and Akolele pipeline. The site card identifies the site as being within 400m of drinking water, in Akolele, Wallaga Lake. The site comprises of shell cockle and a grey, fine grained volcanic flake in an erosional lake shore cutting in an exposed area. The small landform at the edge of the lake had been truncated, with the east side of the road remaining undisturbed, indicating it was possible that intact archaeological deposits remained.</p> <p>The site card states to seek approvals prior to impacts and that further investigation would be required if impacts were proposed to the east of the road.</p> <p>The site has previously been partially disturbed by the construction of the Koori Village Sewer Upgrade under AHIP no. C0001059, which has since expired.</p>
62-7-0464	Akolele 1	Shell	<p>Recorded by Sarah Robertson, site is located at 8 Flower Circuit, Akolele. The site comprises of a midden, with a dense, narrow lense of <i>Anadara trapezia</i> (cockle) exposed approximately 20cm beneath the ground surface.</p> <p>The site has been partially destroyed under AHIP no. C0002143, which is valid until September 2036. A map showing the curtilage covered by AHIP no. C0002143 is found in Figure 11. Impacts within the curtilage do not require any further approval.</p>

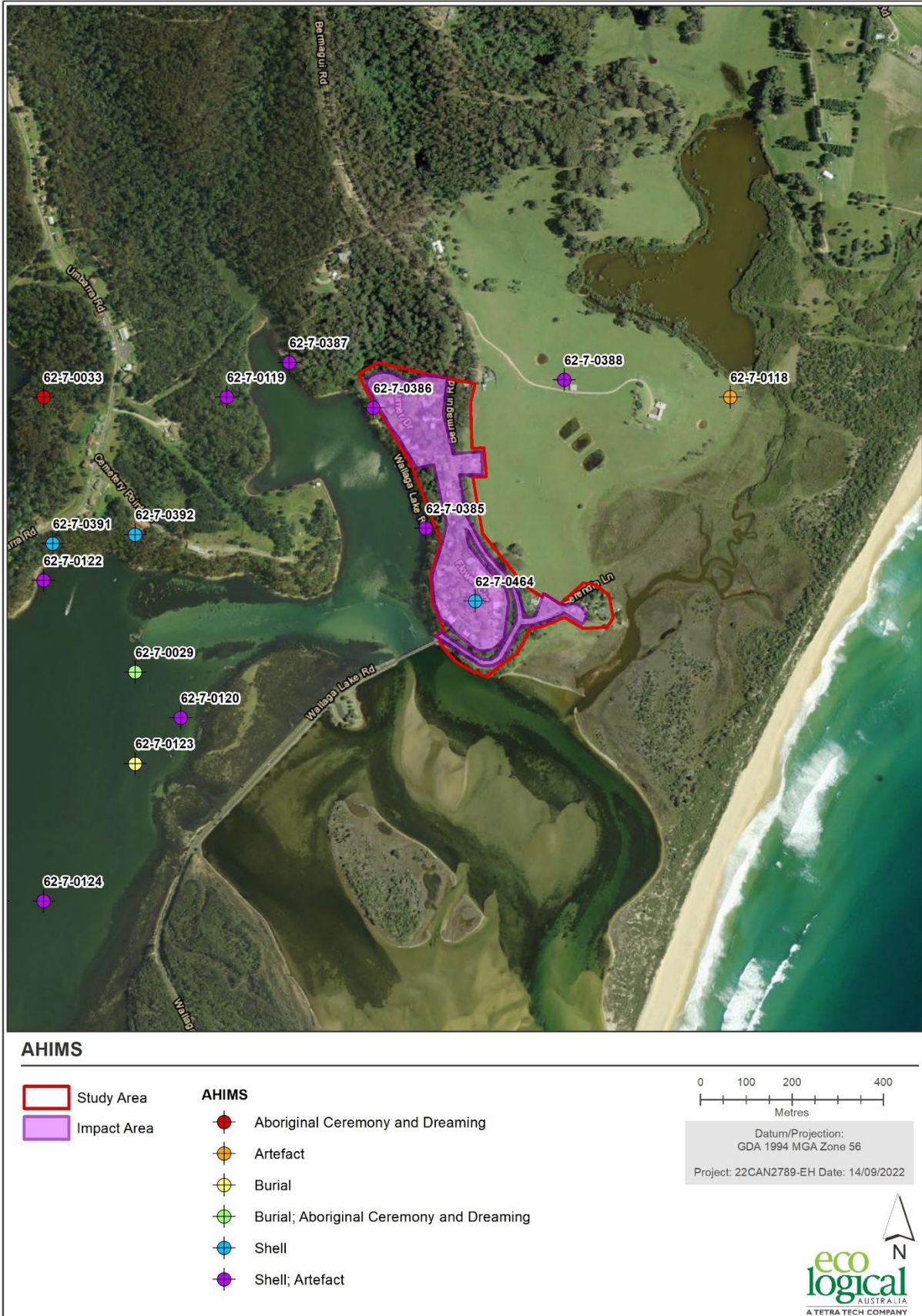


Figure 9: AHIMS sites within the vicinity of the study area

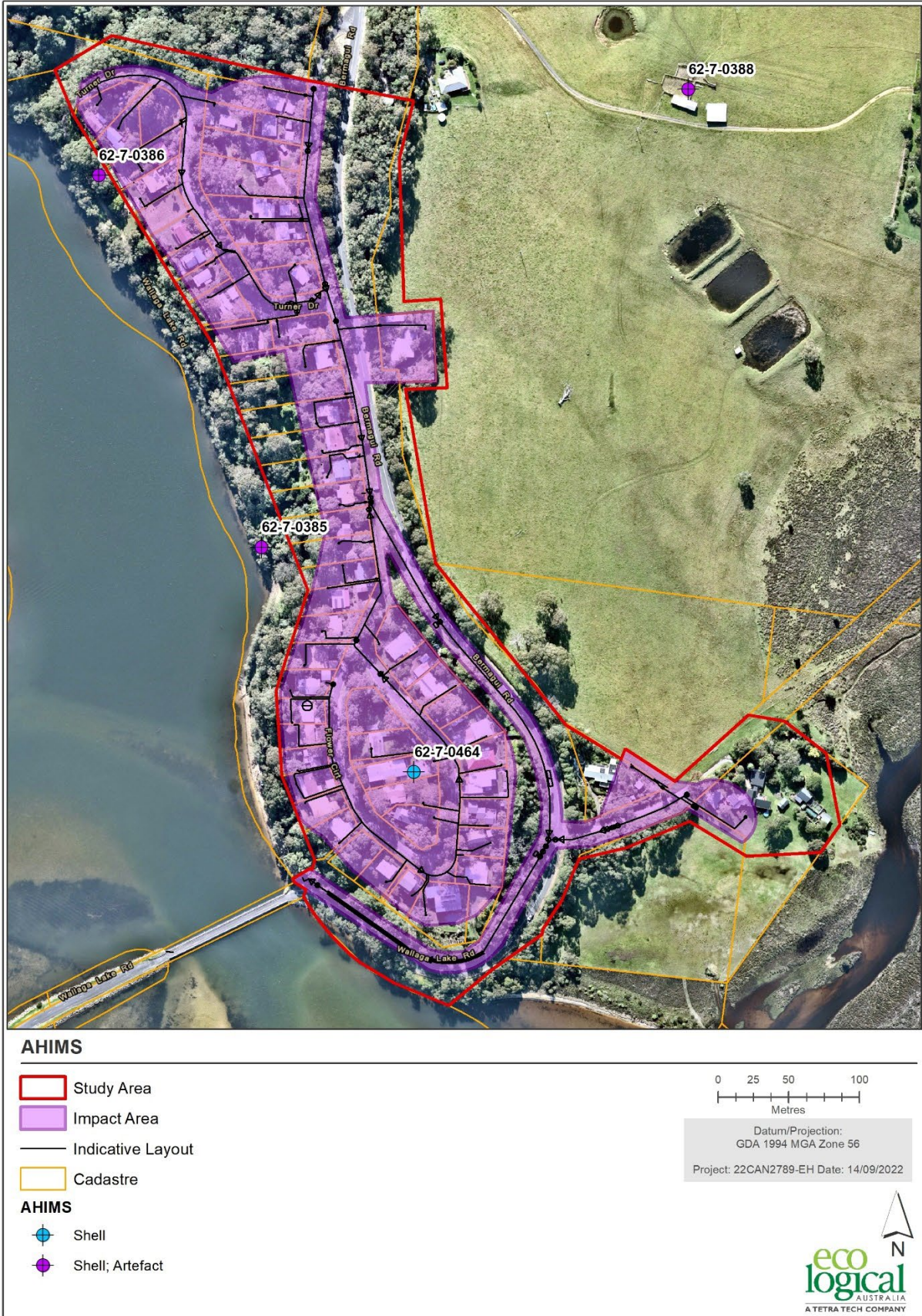


Figure 10: AHIMS Sites located within and in close proximity to the study area

### 5.3.1.3 Previous archaeological assessments

NSW Archaeology 2007. Eurobodalla Southern Villages Sewerage Project: Akolele and the Koori Village Archaeological Impact Assessment. Prepared for NSW Department of Commerce.

NSW Archaeology (Julie Dibden) was previously engaged by NGH Environmental, on behalf of the NSW Department of Commerce, to undertake an archaeological assessment of the proposed Eurobodalla Southern Villages sewerage project, including at Akolele and the Koori Village, within the current study area.

The initial desktop assessment, including an extensive search of the AHIMS database, did not identify any previously recorded Aboriginal sites within the proposed impact areas. Previously recorded sites within the vicinity of the proposed impact area included burial sites, middens and ceremonial sites.

A survey of the proposed impact area was undertaken in fifteen survey units. Sparse distributions of old shell were determined in three survey units in Koori Village; however, the visual inspection alone was not considered enough to determine whether the shell was representative of midden material. It was considered likely that prior to modern disturbances, midden material was present.

In Survey Unit 13, located in Akolele, four locales containing shell and stone artefacts were identified. All locales had been disturbed as a result of prior impacts associated with clearing, road and residential construction, as well as access to Wallaga Lake. Two areas adjacent to an existing track were considered to contain the potential for intact archaeological deposits.

Two of these locales, identified in Survey Unit 13, are located within the current study area, AHIMS ID 62-7-0385/ Locale 1 and AHIMS ID 62-7-0386/ Locale 2. Locale 1 comprised of shell cockle and a grey, fine grained volcanic flake in an erosional lake shore cutting in an exposed area. The small landform at the edge of the lake had been truncated (cut and fill), with the east side of the road remaining undisturbed, indicating it was possible that intact archaeological deposits remained. Locale 2 comprised of two stone artefacts with shell on a simple slope immediately adjacent to the lake. It was noted that the 50 m slope may contain shell and artefacts, though it was unlikely to be *in situ* due to the past clearing and road construction. The shell was recorded as being sparse, fragmented cockle and the artefacts were recorded as a black volcanic flake and an artefact of unidentifiable material with anvil pitting and hammer/pounder bruising.

The identified sites across the proposed impact area were considered to be of low archaeological sensitivity due to prior ground disturbances and it was considered unlikely that intact subsurface archaeological deposits remained in areas that had previously been disturbed. Survey Unit 13/Locale 1 was considered to be a common site type with low scientific significance, however, the area east of the road was considered to possess a high level of significance and potential for intact deposits. Survey Unit 13/Locale 2 was considered to be of low scientific significance due to its highly disturbed nature, and *in situ* deposits were considered unlikely, however it was noted that deposits could be present.

As a result of this assessment, no further investigation or test excavation was recommended due to the disturbance noted across the proposed impact area. Two areas of potential archaeological sensitivity recorded in Akolele, to the east of Wallaga Lake Road (Survey Unit 13/Locale 1), and above the lake track to the north, were identified. If impacts were proposed to those areas, a program of test excavation would be required to determine the nature and significance of the archaeological objects present. As such, it was recommended that the proposed pipeline was kept within the existing road corridor and that an s90 be sought if impacts were proposed to any recorded Aboriginal objects.

NSW Archaeology, 2015. *Koori Village Sewerage Scheme, Wallaga Lake via Bermaqui NSW – Aboriginal and European Cultural Heritage Assessment Report*. Prepared for NSW Public Works.

NSW Archaeology was previously engaged by NSW Public Works to undertake an Aboriginal and European Cultural Heritage Assessment for the proposed provision of sewerage services to the Wallaga Lake Koori Village and Akolele. The area was previously surveyed by Julie Dibden in 2007 and the surveyed area for the assessment comprised of portions of the current study area in Akolele, along Wallaga Lake Road. Previously recorded AHIMS sites included AHIMS ID 62-7-0386 and AHIMS ID 62-7-0385, both recorded as ‘shell; artefact sites with possible midden’:

- AHIMS ID 62-7-0385: *Was previously recorded in an area adjacent to Wallaga Lake Road at Akolele. It consists of shell in a cutting on the east side of the road and one stone artefact at the lake edge on the opposite (west) side of the road. The shell is located in a narrow area of relatively flat land adjacent to the lake and at the base of a steep slope. The shell is exposed in a length of road cutting which measures ca. 0.5 m in length x 0.3 m in height. The small narrow band of flat land measures approximately 20 m long x 4 m wide. It is possible that shell is present along the entire length of this small landform (20m x 4m). The shell consists of small cockle which appears to be old and is possibly of cultural origin. The artefact is a grey, fine grained volcanic flake measuring 58 mm long x 50 mm wide x 22 mm thick (with 20% pebble cortex). The artefact is situated in an erosional lake shore cutting in an exposure measuring 2 m long x 0.4 m high. This small landform at the edge of the lake has been truncated by the formation of the road (covered with some road base). The narrow area of this landform remaining on the east side of the road is potentially undisturbed, or at least, relatively so. It is therefore possible that intact archaeological deposit is present on the east side of the road cutting.*
- AHIMS ID 62-7-0386: *Was previously recorded adjacent to Wallaga Lake Road at Akolele. It consists of shell and two stone artefacts in a home driveway on the east side of the road close to the intersection with Turner Drive. The shell and artefacts are situated on a simple slope immediately adjacent to the lake. The shell is exposed in a section of graded driveway in an area measuring ca. 3 m x 5 m. The shell seems to be limited to the lower part of the slope only. The simple slope in this area possesses a gradient of c. 8°; this gradient slope extends from Turner Drive intersection southward for a distance of approximately 50 m before the slope increases to a steeper gradient. This 50 m length of slope may well contain shell and artefacts that have not been recorded due to ground cover etc. However, it is noted that given past clearing and the high gradient, this locale is unlikely to contain any in situ deposit. The shell is sparse, fragmented cockle which appears to be old and is possibly of cultural origin. The artefacts are described as follows: Black volcanic flake measuring 40 mm long x 33 mm wide x 23 mm thick; Unidentifiable material: broken pebble with anvil pitting and hammer/pounder bruising on end measuring 40 mm long x 33 mm wide x 23 mm thick. This landform at the edge of the lake has been truncated to some degree by the formation of the road (covered with road base). The majority of the simple slope is disturbed as a result of clearance and subsequent erosional processes, road and driveway construction; it is unlikely that intact archaeological deposit is present.*

A survey was undertaken, as part of the 2015 assessment, across the proposed impact area for the pressure sewer main. The surveyed area was assessed as having undergone high disturbance related to urban development and road construction and no new Aboriginal objects were identified. The previously recorded sites were reassessed:



- AHIMS ID 62-7-0386: *Was originally recorded as consisting of shell and two stone artefacts in a home driveway on the east side of the road near to the intersection with Turner Drive. Sparse shell fragments were again observed in the driveway. The original artefacts were not found, but another was (volcanic flake: Hertzian initiation, feather termination; 48 x 61 x 10mm). Given the occurrence of the shell fragments and artefact in a formed driveway on a moderate gradient slope, they are not likely to be in situ. Shell fragments were also seen on the adjacent section of road, but nowhere else on that section of the lake road. This landform at the edge of the lake has been truncated by the formation of the road (covered with road base). The site is unlikely to contain intact archaeological deposit.*
- AHIMS ID 62-7-0385: *It consists of shell in a sandy deposit on the east side of the road. Originally one stone artefact was recorded at the lake edge on the opposite, (west) side of the road. Numerous new exposures of shell were observed in the small landform (20m x 4m). In addition to cockle, small oyster and whelks were also observed. All shell is highly fragmented. The road is graded, highly disturbed and covered with road base. There is no archaeological potential in the road where impacts would occur.*

As a result of the assessment, no areas warranting further archaeological investigation, in the form of test excavation, were identified. An AHIP would be sought for the proposed impacts to the previously recorded Aboriginal sites, and it was determined that it was unlikely for high density artefacts to be present. It was also recommended that a no-go zone be established in the area to the immediate east of Wallaga Lake Road, where AHIMS ID 62-7-0385 had been identified.

NSW Archaeology, 2016. Lot 581 DP718756 (Number 8) Flower Circuit Akolele via Bermaqui NSW – Aboriginal Cultural Heritage Assessment Report. Prepared for Kathy McNamara.

NSW Archaeology was previously engaged by Kathy McNamara to prepare an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed construction of a residence at 8 Flower Circuit, Akolele, located approximately 100m to the east and 100m to the west of the road corridor in the southern portion of the current study area.

The initial heritage assessment was undertaken as the question of whether or not graves (Akolele burials) were present within the proposed study area was raised with Heritage NSW, and an Aboriginal site was recorded within the proposed study area (AHIMS ID 62-7-0464 – a midden). An extensive search of the AHIMS database identified 48 Aboriginal sites within the vicinity of the study area, with the majority of sites being recorded as midden sites.

A survey of the study area was undertaken which identified a discrete occurrence of cockle shell along the excavated road verge in the north-eastern boundary and to the west, with 70% ground exposure and 50% archaeological visibility noted to be present. It was considered to be possible that the discrete area of shell within the vicinity of the proposed study area could be associated with graves, however, this was not confirmed. Within the proposed study area, at 8 Flower Circuit, a sparse scatter of cockle shells and fragments were observed with one stone artefact (a quartz flake piece) identified. There was no evidence of subsurface material despite extensive disturbance which provided a view into the subsurface context, indicating that the site was likely comprised of isolated, small shell clusters rather than a 'midden site' as previously recorded. As such, the recorded Aboriginal site (AHIMS ID 62-7-0464) was considered to be of low archaeological significance due to its low density.

As a result of this assessment, the shell and artefact distribution in the proposed study area was considered to be sparse, shallow and scattered and of low archaeological significance. A test excavation was not recommended, although an AHIP was sought for the impacts to the recorded Aboriginal site within the study area. Mitigation measures included that if burials were found to be located within the study area, a conservation strategy would need to be considered and monitoring for the presence of graves should be undertaken during excavation works.

*NSW Archaeology, 2017. Bega Valley Shire Council Various Works – Aboriginal Cultural Heritage Assessment Report. Prepared for Bega Valley Shire Council.*

NSW Archaeology was previously engaged by Bega Valley Shire Council to conduct an ACHA for various works within the shire, including for the construction of a new walking track along Wallaga Lake, located approximately 2.2km to the south, and upgrades to the existing boat ramp at Beauty Point, located approximately 3.7km to the south-west of the current study area.

An extensive search of the AHIMS database was undertaken which identified a total of 34 previously registered Aboriginal sites within the vicinity of the Wallaga Lake and Beauty Point boat ramp study area. Three Aboriginal sites were identified within proximity to the study area including AHIMS ID 62-7-268 (Murunna Point 11), consisting of artefacts and shell located outside of the impact area. Two sites were recorded at Beauty Point, AHIMS ID 62-7-135, a stratified open midden consisting of shell and charcoal on a rock headland and AHIMS ID 62-7-249, a large, disturbed midden at the edge of the water at the existing boat ramp.

A survey of the Wallaga Lake walking track and Beauty Point boat ramp study areas was undertaken. The Wallaga Lake walking track was determined to be relatively recent and mobile with naturally deposited sand. Lower areas were inundated with lake water and the archaeological visibility was nil. AHIMS ID 62-7-268 to the eastern end of the proposed walking track was eroded, disturbed and of low sensitivity and no Aboriginal objects were recorded on the sand landform within the area of project. Overall, the area was considered to be disturbed and geographically labile, with negligible archaeological sensitivity. The Beauty Point boat ramp study area was considered to have been highly disturbed due to the construction of the existing boat ramp, parking area and road. Ground exposure was low/negligible as the study area was covered with bitumen. AHIMS ID 62-7-249 was found to be located within the area of project, but the accuracy of the site recording was questioned due to the location of the site above the high-water mark indicating shell was likely to have been deposited by storm wash and natural processes. No Aboriginal objects were identified, and the study area was disturbed, with low to negligible archaeological potential, however the presence of the AHIMS site meant an AHIP would be required before further impacts occurred. The AHIMS sites within the study area were considered to be of very low archaeological significance as they had been highly disturbed.

As a result of this assessment, recommendations included no further archaeological investigation was required. At Beauty Point, an AHIP would be required for impacts to AHIMS ID 62-7-135 and AHIMS ID 62-7-249. Recommendations at Wallaga Lake walking track included avoiding any impact to AHIMS ID 62-7-268 and potentially establishing a no-go zone during construction. An AHIP would not be required unless impacts were proposed to that site.

#### 5.3.1.3.1 Predictive model

An archaeologically sensitive landscape is an area that has the potential for archaeological material to be present within it. According to the *Due Diligence Code of Practice* (DCCEEW 2010), archaeologically sensitive landscapes can include areas:

- Within 200m of waters; or
- Located within a sand dune system; or
- Located on a ridge top, ridge line, headland; or
- Located within 200m below or above a cliff face; or
- Within 20m of or in a cave, rock shelter, or a cave mouth and is on land that is not disturbed land.

The *Due Diligence Code of Practice* (DCCEEW 2010 p.18) defines disturbed land as areas that have any land that:

*“Has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.”*

The traditional owners of the Eurobodalla region are the Yuin Aboriginal people, whose custodianship of the land can be understood as a culturally engrained care and concern for the natural world. The regions surrounding Wallaga Lake would have provided rich and diverse natural resources for these Aboriginal people, and would have been utilised for fishing, hunting and as a source of freshwater.

Totems provided kinship links between people and groups and is a term used to describe the complex inter-relationship between people and the natural world. As described by Brinja – Yuin woman, Trisha Ellis, many local totemic species are birds as a result of past mythological happenings:

*“The story starts with a group of Aboriginal people in the Ngarigo (Monaro) area. Their creator Biaami held Dumbi the owl in high regard and expected all people to protect the owl. Two young and foolish boys of this particular tribe saw an owl in a tree. They threw rocks and sticks at it till it fell out of the tree then they plucked out its feathers and replaced them with twigs. Biaami was so outraged he caused a great flood to wash away these horrible people.*

*On the coast as the water level rose the local Yuin people tried to take refuge on Gulaga Mountain. The waters rose so swiftly that many people were taken and drowned. Others tried to save their kin but were drowned too. Dharramullin (what we call Biaami here) seeing what was happening thought he may have been too harsh on all people and relented some. He turned the brave rescuers into diving birds, cormorants, darters, shags, etc so that they could dive deeper and swim stronger to rescue their kin. Many were saved and remember their kinship to the diving birds. (Donaldson, 2007; p. 36).*

The predictive model outlined in Table 9 below has been developed for the study area based on the AHIMS search results and the regional and local Aboriginal archaeological context outlined above.

**Table 9 Predictive model**

Site Type	Description	Likelihood to occur
Open camp sites/stone artefact	Open camp sites represent past Aboriginal subsistence and stone knapping activities and include archaeological remains such as stone artefacts and hearths. This site type usually appears as surface	Low – the study area is situated within a sensitive landform, within 200m of water, with registered AHIMS sites, however no artefact scatters have been recorded within

Site Type	Description	Likelihood to occur
scatters/isolated finds	scatters of stone artefacts in areas where vegetation is limited and ground surface visibility increases.  Isolated finds may represent a single item discard event or be the result of limited stone knapping activity. The presence of such isolated artefacts may indicate the presence of a more extensive, in situ buried archaeological deposit, or a larger deposit obscured by low ground visibility.	the study area indicating this is unlikely to occur.
Potential Archaeological Deposit	Potential Archaeological Deposits (or PADs) are areas where there is no surface expression of stone artefacts, but due to a landscape feature there is a strong likelihood that the area will contain buried deposits of stone artefacts.	Low - there are no registered PADs within the study area.
Shell Midden Deposits	Are commonly made up of the molluscs fragments and remains of shellfish. A midden may also contain fish and animal bones, stone tools, or charcoal. They can vary in size and depth. Middens are sometimes associated with burials. Middens can be found on headlands, sandy beaches and dunes, around estuaries, swamps and tidal stretches of creeks and rivers, and along the banks of inland rivers, creeks and lands. Middens may also be found in the open or in rock shelters. Middens can indicate that a place was, and may continue to be, a key meeting place of significance. Middens can also provide information about the environment that existed when Aboriginal people collected the shellfish, such as changes in species, and tools or raw materials that were used. Middens which contain burials are particularly significant.	Moderate – There are known shell midden deposits within the study area and wider region, indicating this is likely to occur. Those recorded in the study area have low density and low significance.
Scarred or carved trees	Tree bark was utilised by Aboriginal people for various purposes, including the construction of shelters (huts), canoes, paddles, shields, baskets and bowls, fishing lines, cloaks, torches and bedding, as well as being beaten into fibre for string bags or ornaments (sources cited in Attenbrow 2002: 113). Trees may also have been scarred in order to gain access to food resources (e.g. cutting toe-holds so as to climb the tree and catch possums or birds), or to mark locations such as tribal territories. Such scars, when they occur, are typically described as scarred trees.	Low – there are few scarred trees are registered on the AHIMS database within the vicinity of the study area, and the study area appears to have largely been cleared of vegetation, indicating this is unlikely to occur.
Axe grinding grooves	Grinding grooves are the physical evidence of tool making or food processing activities undertaken by Aboriginal people. The manual rubbing of stones against other stones creates grooves in the rock; these are usually found on flat areas of abrasive rock such as sandstone.	Low - no grinding grooves are registered on the AHIMS database as being located within the vicinity of the study area and suitable exposed bedrock is not present.
Bora/ceremonial	Aboriginal ceremonial sites are locations that have spiritual or ceremonial values to Aboriginal people. Aboriginal ceremonial sites may comprise natural landforms and, in some cases, will also have	Low - there is no evidence to suggest this site type occurs within the study area.

Site Type	Description	Likelihood to occur
	archaeological material. Bora grounds are a ceremonial site type, usually consisting of a cleared area around one or more raised earth circles, and often comprised of two circles of different sizes, connected by a pathway, and accompanied by ground drawings or mouldings of people, animals or deities, and geometrically carved designs on the surrounding trees.	
Burial	Mortuary practices often took place in proximity to camp sites, as most people tended to die in or close to camp and it is difficult to move a body over a long distance. Soft, sandy soils on or close to rivers and creeks allowed for easier removal of earth for burial. Similarly, rock shelters or middens also provided accessible burial places. Burial sites may be marked by stone cairns, modified trees, or a natural landmark. They may also be identified through historic records or oral histories.	Low – while there are known burials within the vicinity of the study area, they occur in different landforms. There is no evidence to suggest burials occur within the study area, due to shallow soils.
Contact/historical sites	Artefacts located at such sites may involve the use of introduced materials such as glass or ceramics by Aboriginal people or be sites of Aboriginal occupation in the historical period.	Low – there is no evidence to suggest this site type occurs within the study area.

#### 5.3.1.4 Visual inspection

A visual inspection of the study area was undertaken by ELA Archaeologist Kate Storan on the 26<sup>th</sup> of August 2022. Visual inspection aimed to identify Aboriginal objects if present and assess the archaeological potential of the study area. The visual inspection identified no new Aboriginal objects.

The north-eastern portion of the study area, comprising of Bermagui Service Road, was situated on a moderate east-west orientated slope with limited surface visibility due to grass cover and the bitumen road base (Photo 18 - Photo 21). The area comprising the existing road had been cleared of vegetation and highly modified using cut and fill to level the slope (Photo 18, Photo 20, Photo 21), and the area to the west of the road displayed signs of extensive disturbance where electrical services had been installed and concrete driveways and residential dwellings constructed into the existing topography (Photo 20, Photo 21). The area to the east of the road appeared to have undergone minimal ground disturbance and had not been cleared of native vegetation, however, under the current scope of works, areas to the east of the road are not proposed to be impacted (Photo 18). There was limited surface visibility along the eastern side of the road, though natural erosional processes revealed a mixed deposit of white quartz, shale, leaf litter and a yellow brown sandy clays (Photo 19). No surface artefacts were identified in any areas of exposure and there were no signs of cultural markings on any trees to the east and west of the road.

The north-western portion of the study area, comprising of Turner Drive, intersected with and continued on from Bermagui Service Road, along the moderate east-west slope towards Wallaga Lake (Photo 22- Photo 31). The area comprising of the existing road had been cleared of vegetation, levelled and highly modified (Photo 22- Photo 24; Photo 27), and the majority of the areas proposed to be impacted under the current scope of works, to the east and west of the road, displayed signs of disturbance where services had been installed and concrete driveways and residential dwellings had been constructed into the existing topography (Photo 24,

Photo 26 - Photo 27). There was limited surface visibility to the east and west of Turner Drive, though areas of visibility revealed mixed deposits of gravel, shale, rock and leaf litter (Photo 28). One isolated shell was observed in an exposed area along the slope to the east of Turner Drive, however, this shell appeared to be in a disturbed context and no surface artefacts were observed in association with the shell (Photo 28, Photo 29).

The north-western extent of the study area, where Turner Drive intersects with Wallaga Lake Road, displayed moderate signs of land modification related to the construction of driveways, the existing pressure sewer, the dirt track (Wallaga Lake Road) and vehicular disturbance (Photo 31 - Photo 38). The formation of Wallaga Lake Road had resulted in the clearance of vegetation, though native and regrowth vegetation occurred to the east and west of the road (Photo 34). No cultural markings were observed on any trees within the vicinity of the proposed impact area. The general location of the previously recorded AHIMS ID 62-7-0386 was closely observed (Photo 33 - Photo 37). The landform was situated on a moderate east-west gradient slope down towards Wallaga Lake and had been moderately disturbed by the construction of bitumen, gravel and concrete driveways and the formation of the road at the base of the slope (Photo 33 - Photo 37). There was limited visibility due to grass cover, and in areas of exposures in the driveways and along the track, no surface artefacts were identified. One shell fragment was identified in the driveway comprising of the general location of AHIMS ID 62-7-0386, though this appeared to be in a disturbed context and was found in association with gravel and bitumen (Photo 35). There was evidence of disturbance related to the installation of the pressure sewer to the west of the road and a pipeline through the base of the slope to the east of the road (Photo 37). Under the current scope of works, this area is not proposed to be impacted, however, the landform to the north and south of the existing driveways appeared to be relatively intact and should be avoided.

The south-eastern extent of the study area, comprising of Bermagui Road, had undergone extensive disturbance related to the construction and levelling of the road (Photo 39 - Photo 42). The central portion of the southern extent of the study area, the area comprising of Flower Circuit Drive, had been extensively disturbed related to the construction and levelling of the road, residential dwellings and the installation of services (Photo 42 - Photo 47).

Overall, the study area was situated on a moderate east-west slope, with a good view towards Wallaga Lake, and had undergone varying levels of disturbance. Extensive disturbance was observed where roads had been constructed, services installed, driveways and residences constructed, vegetation cleared, and landscaping undertaken. Moderate disturbance was noted in relation to Wallaga Lake Road, and the landform in areas adjacent to driveways to the east of Wallaga Lake Road appeared to have undergone minimal disturbance and should be avoided. No surface artefacts were observed in any areas of visibility, though some fragments of shell were observed. It should be noted that no properties containing residences were accessed during the inspection, though, these appeared to have largely been built into the existing topography, indicating extensive disturbance had previously occurred.

It is important to note that one shell fragment does not constitute a midden nor does the presence of shell in an estuarine environment mean it is indicative of an Aboriginal shell midden. Shell beds form naturally along shorelines as a result of storm action and currents and dredging results in sand and shell contained in fill and land reclamation. Dibden also notes that the shell identified in the study area is not definitely of cultural origin (NSW Archaeology, 2015). While it is highly likely Aboriginal people collected shellfish and consumed it in the study area, the studies undertaken previously demonstrate that this activity was limited, resulting in insubstantial shell deposits. Over time, erosion and land modification has washed away or removed those deposits with only ephemeral remains of low significance currently present.

Under the current scope of works, areas proposed to be impacted appear to have largely been disturbed, indicating the potential for finding *intact* archaeological deposits is low, however, it is recommended to confine the works to areas that have already been disturbed.



**Photo 18:** View north towards northernmost extent of Bermagui Road showing bitumen road, native vegetation and east-west orientated slope



**Photo 19:** Area of exposure along eastern side of Bermagui Service Road showing mixed deposit of white quartz, leaf litter and yellow-brown sandy clay



**Photo 20:** View south-west showing moderate east-west orientated slope, concrete driveways and residences along Bermagui Service Road



**Photo 21:** View north-west showing services to west of Bermagui Service Road and gravel driveway on a moderate east-west slope down towards residence





**Photo 22: View south showing intersection of Bermagui Service Road/Turner Drive, services and east-west orientated slope**

**Photo 23: View west along Turner Drive showing moderate east-west slope, bitumen road and vegetation alongside road**



Photo 24: View north along Turner Drive showing east-west slope with grass cover, existing power services and bitumen road



Photo 25: View west showing grass cover and moderate east-west slope towards Wallaga Lake from Turner Drive road



Photo 26: View east showing east-west slope from Turner Drive, evidence of services, residence and native vegetation



Photo 27: View south-west showing east-west slope, bitumen road and evidence of electrical services



Photo 28: Area of exposure showing shell, gravel and brown underlying soil profile



Photo 29: View south-east showing location of shell, within wooden staircase, leading towards residence



Photo 30: View west towards Wallaga Lake Road/Turner Drive intersection showing bitumen/gravel road, leaf litter and slope down towards lake



Photo 31: View south at Wallaga Lake Road/Turner Drive intersection showing gravel road, grass cover to east of road and gradient slope towards Wallaga Lake in west



Photo 32: View south along Wallaga Lake Road looking towards general location of AHIMS ID 62-7-0386 showing moderate east-west orientated gradient slope, trees, vegetation and exposures along formed dirt track/ road



Photo 33: View east showing exposures along bitumen/gravel driveway towards residence, moderate east-west slope, near previously recorded location of AHIMS ID 62-7-0386



**Photo 34:** View west towards Wallaga Lake showing slope, gravel driveway, near previously recorded location of AHIMS ID 62-7-0386

**Photo 35:** Eroded exposure in driveway adjacent to Wallaga Lake, near previously recorded location of AHIMS ID 62-7-0386 showing one shell fragment, gravel, leaf litter and shale



**Photo 36:** View east showing concrete/graded driveway towards residence and moderate east-west slope down towards Wallaga Lake, near previously recorded general location of AHIMS ID 62-7-0386



**Photo 37:** View north showing exposures along Wallaga Lake Road and previously recorded general location of AHIMS ID 62-7-0386, with vegetation, pipeline to east of road and sewer main to west



**Photo 38:** View north showing moderate east-west slope, grass cover and exposures along Wallaga Lake Road, Wallaga Lake located to west



**Photo 39:** View south showing southernmost extent of Wallaga Lake Road and Wallaga Lake Bridge to west



**Photo 40:** View east at Wallaga Lake Road/Bermagui Road intersection showing evidence of services



**Photo 41:** View east along Bermagui Road showing steep slope on northern side of road and exposed orange-brown clays



Photo 42: View north along Bermagui Road showing vegetation to east and west of road and moderate west-east slope



Photo 43: View west towards Flower Circuit Drive showing electrical services, landscaped grass area and native vegetation along bitumen road



Photo 44: View west showing installation of services along Flower Circuit Drive



Photo 45: View west along Flower Circuit Drive showing electrical services, residences built into east-west slope and view towards Wallaga Lake



Photo 46: View east along Flower Circuit Drive



Photo 47: View south along Bermagui Road towards Flower Circuit Drive showing native vegetation and east-west slope

### 5.3.2 Impact

Aboriginal objects are protected under the NPW Act regardless of if they are registered on AHIMS or not. It is an offence to disturb or damage these sites without first having obtained an Aboriginal Heritage Impact Permit (AHIP). The desktop review identified one hundred (100) Aboriginal sites and two (2) Aboriginal places within the vicinity of the study area, with the majority of sites being recorded as middens (46%) and artefact sites (20%). Previous archaeological investigations undertaken within the Eurobodalla region and within Akolele have identified Aboriginal sites consisting of middens, shell and stone artefacts.

Two Aboriginal sites have been recorded in close proximity to the study area, AHIMS ID 62-7-0386, AHIMS ID 62-7-0385 and one site, AHIMS ID 62-7-0464 has been recorded within the proposed impact area. Any proposed impacts to AHIMS ID 62-7-0464 must abide by the conditions of AHIP no. C0002143, issued to John and Kathryn McNamara in September 2016 and active until September 2036. A map showing the land applicable to this AHIP is shown in Figure 11.

A visual inspection was undertaken by ELA Archaeologist Kate Storan on the 26<sup>th</sup> of August 2022. The visual inspection did not identify any new Aboriginal sites or objects within the proposed impact area. The overall study area was situated on a moderate east-west orientated slope towards Wallaga Lake and had undergone varying levels of disturbance. The majority of the proposed impact area had previously been disturbed by the construction of roads, residences and driveways, as well as by the installation of existing electrical and sewerage services. There was limited surface visibility due to road base and grass cover, and in areas of visibility some fragments of shell were observed, and no surface artefacts were identified.

No known Aboriginal sites are expected to be impacted based on the project impact area (Figure 10). The project appears to be confined to areas within the road corridor and in areas that have previously been disturbed by driveways, the installation of services and residential dwellings, indicating that there is a low potential for *intact* subsurface archaeological deposits to be present within the proposed impact area. Under the current scope of works, no further archaeological assessment will be required, and a standard unexpected finds policy should be implemented, however, it would be recommended that a heritage induction be undertaken by all construction workers prior to the works.



Figure 11: location of curtilage covered by AHIP no. C0002143



### 5.3.3 Mitigation measures

Based on the findings of the due diligence assessment and the requirements of the NPW Act, the following actions are recommended:

**Table 10 Aboriginal Heritage Mitigation Measures**

Reference	Environmental Aspect	Mitigation Measures
AH1	Aboriginal Heritage – General Measures and Unexpected Finds	<ul style="list-style-type: none"> <li>All contractors undertaking works on site should be briefed on the protection of Aboriginal objects and places under the NPW Act 1974, and the penalties for damage to these items.</li> <li>If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, Heritage NSW must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.</li> <li>In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, Heritage NSW may also be contacted at this time to assist in determining appropriate management.</li> </ul>
AH2	Aboriginal Heritage – General Measures	<ul style="list-style-type: none"> <li>The project should be designed to ensure all impacts required to complete the works are contained to areas that have already been disturbed, in order to avoid impacting any soils that may retain intact archaeological deposits.</li> </ul>

## 5.4 Non-Aboriginal heritage

### 5.4.1 Existing environment

Searches of the Australian Heritage Database, the Eurobodalla LEP 2012 and the State Heritage Inventory utilising the term ‘Akolele/Uambarra’ were conducted on the 22<sup>nd</sup> of June 2022 to determine if any places of historic archaeological significance were located within the study area.

No historic archaeological sites or heritage items were recorded on these databases as being within the study area.

One locally listed heritage item is located within the vicinity of the study area:

- The Wallaga Lake Bridge (item number I126) on the Bega Valley LEP 2013 and located along Wallaga Lake Road, outside of the proposed impact area in the southern portion of the study area, listed for its historic significance for improving the link between Bermagui and the north.

One locally listed built heritage item is located within the study area:

- ‘Brauer House’, item number I306 on the Eurobodalla LEP and listed as an important and early component of a growing body of quality modern architecture designed for and built on the south coast of NSW, and located at 306-308 Bermagui Road in the northern portion of the study area.

The Brauer House is listed as:

*A lightweight building set parallel with the land contour overlooking Wallaga Lake. The east or uphill side of the building is at ground level and the side facing the lake is elevated sufficiently to allow living space*

*beneath. The building is designed around a post and beam system with flat roof and beams extending over the full width deck. Walls are vertical timber boards with some highlights where appropriate. The wall to the deck is fully glazed. Much of the north wall comprises a stone fireplace of large rounded river stones, from which two flues emerge in a manner that creates a strong sculptural composition. Part of the roof extends toward to the road to create a carport. It is understood that much of the interior fixtures and fittings were designed or carefully selected by Snelling (State Heritage Inventory, 2022).*

The statement of significance for the Brauer House is as follows:

*The Brauer House is a very good example of a purpose designed dwelling by award winning mid-twentieth century architect and furniture designer Douglas Snelling. Designed in 1959 for Leroy Brauer and his wife Joy Flower it is historically associated with the increasing development of the South Coast as a tourist and holiday destination in the latter part of the 20th century. Aesthetically it is a simple and elegant design in the modernist style displaying structural competence with a fine control of proportion, space, material and decoration. Snelling's use of a modular grid and long span bearers and roof beams demonstrate a high degree of technical and design competence. The building is an important and early component of a growing body of quality modern architecture designed for and built on the south coast of NSW (State Heritage Inventory, 2022).*

#### 5.4.2 Impacts

The project has not been identified as having the potential to impact upon any historical heritage items or areas of historical archaeological significance. Whilst the proposed impact area is located within the curtilage of Brauer House, the proposed works will be largely conducted away from the house and are minor, subsurface works for the purpose of inputting essential services. It is not expected that vibration from use of small excavation machinery will cause any impact above a negligible level to the Brauer House. The proposed works will have no significant impact on the visual, aesthetic or historic significance of the house. It is unlikely that there will be any impacts to any archaeological resource within the study area and as such, no further work will be required.

#### 5.4.3 Mitigation measures

The following table outlines general mitigation measures in the event unexpected archaeological finds / relics are uncovered during the project:

**Table 11 Non-Aboriginal Heritage Mitigation Measures**

Reference	Environmental Aspect	Mitigation Measures
NAH1	Previously unidentified heritage sites or places are discovered	<ul style="list-style-type: none"> <li>In accordance with Section 146 of the <i>Heritage Act 1977</i>, if an archaeological relic (such as a deposit or artefact) is uncovered during works, work must cease in the affected area and a qualified archaeologist contacted to assess the find. Further advice and clarification may be sought from the Heritage Council of NSW, or the Heritage Division under delegation regarding assessment and approvals. If any suspected 'Relics' or archaeological sites are uncovered during construction, works will cease immediately, and Council's heritage officer or representative will be notified. Further assessment and investigations may be required, such as a Statement of Heritage Impact (SoHI), in line with Heritage Council guidelines and the requirements of the Heritage Act 1977.</li> </ul>

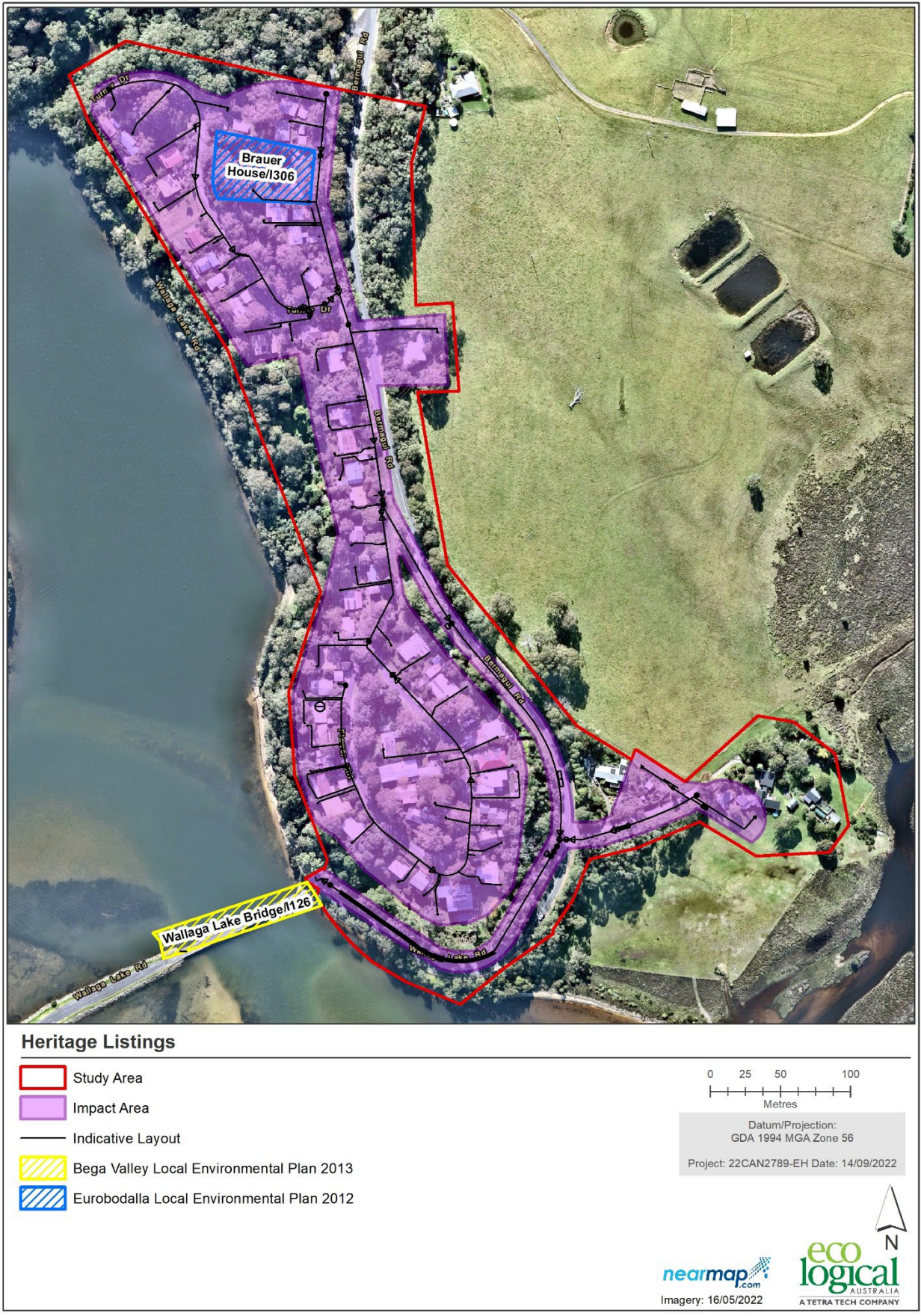


Figure 12: Historical heritage items in proximity to the study area

## 5.5 Topography, geology and soils

### 5.5.1 Existing environment

#### 5.5.1.1 Topography

The impact area is situated on a low rolling hill comprised of a moderately broad ridge that falls to the south towards Wallaga Lake in the west (Terra, 2022), and with elevations between 5 and 30m above sea level (Figure 13).



Figure 13: Topographic map of Akolele

#### 5.5.1.2 Geology

According to the Bega - Mallacoota 1: 250,000 Geology map (Lewis and Glen 1995), the bulk of the study area is underlain by the Wagonga Group Kianga Basalt, which comprises mafic volcanics and chert. The western parts of the study area are underlain by Ordovician sediments and metasediments (undifferentiated deep marine turbidites including siltstones, greywackes, shales and fine sandstones) of the Adaminaby Group.

### 5.5.1.3 Soil landscapes

The impact area is predominately mapped as being within the Murrah erosional soil landscape (DPIE eSPADE v2.2, 2022), with a small area near Serendip Lane mapped as Wagonga soil landscape in accordance with the Soil Landscapes of the Narooma 1:100 000 map sheet (Figure 14). Soils of the Murrah landscape are typified by moderately to well-drained Red Podzolic Soils, Red Soloths and well-drained Yellow Podzolic Soils on crests to midslopes with well-drained Brown-Earths and imperfectly drained Yellow Solodic Soils on lower slopes (Tulau, 2002). Soils of the Wagonga landscape within the study area are typified by well-drained Yellow Podzolic Soils on crests and slopes on chert (Tulau, 2002).

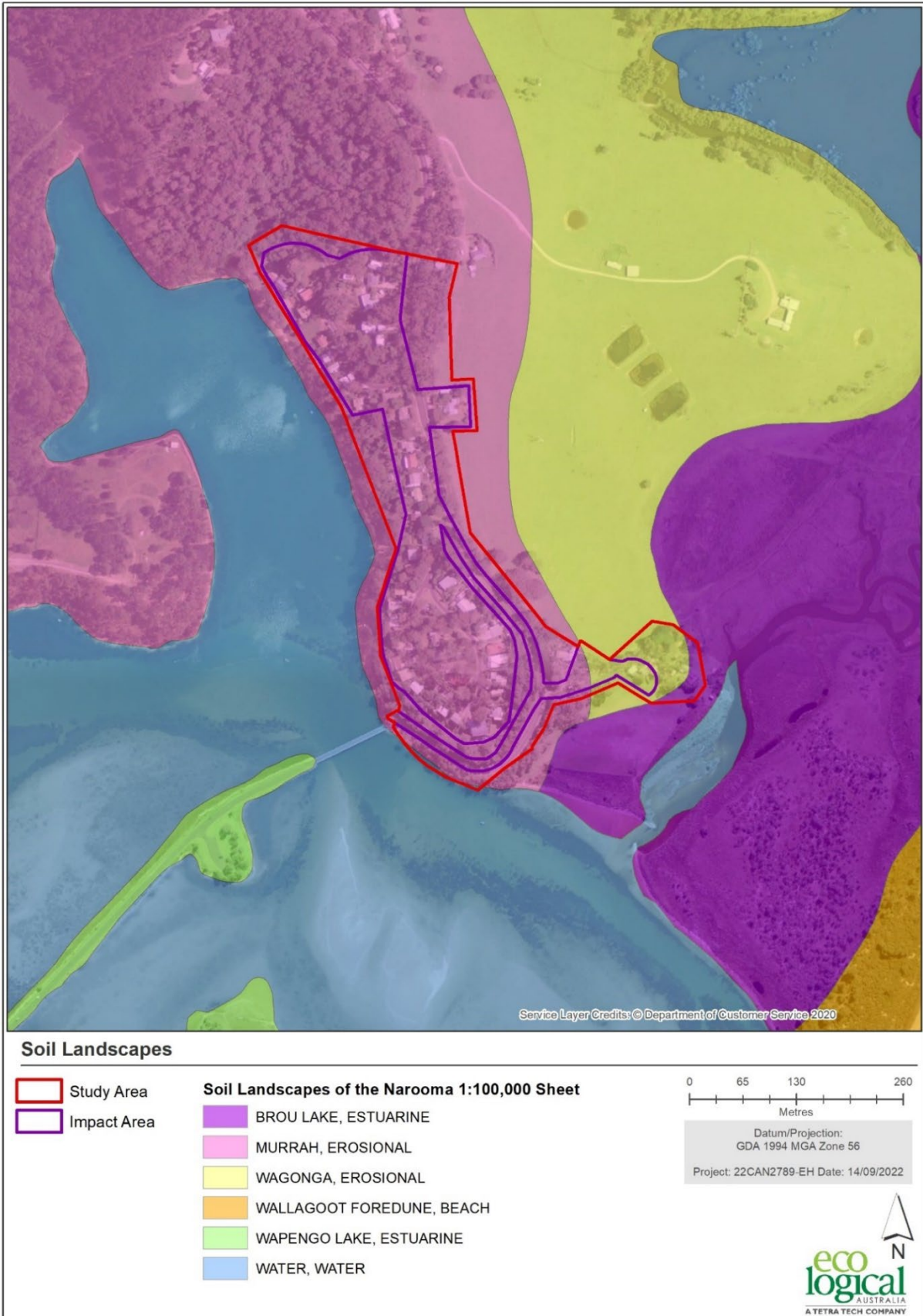


Figure 14: Mapped soil landscapes within the study area

## 5.5.2 Impact

### 5.5.2.1 Construction

Impacts to soils and landscapes within the project footprint would primarily result from temporary stockpiling of any material associated with the construction phase of this project.

Compaction of soils may occur because of machinery movement and parking, stockpiling of materials and soil (including imported fill). Compaction of soils can retard the natural regeneration of ground cover and adversely affect soil stability. However, given the presence of existing residential development in the area and previous site disturbance, the subject sites should already be considered to be located on compacted soils.

Overall, short term risks to soils would be small and localised. Known (demonstrated to be effective on similar projects) mitigation strategies are considered highly likely to be able to adequately address these risks. Medium to long term impacts would be low provided stabilisation strategies are effectively implemented. Stabilisation and revegetation would act to resist soil erosion to the same extent that existing vegetation now functions.

### 5.5.2.2 Operational

It is not anticipated that any further impacts on soils within the area will occur as a result of the project.

## 5.5.3 Mitigation measures

**Table 12: Topography, geology and soils mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
TGS1	Vehicle movements and excavation may result in increased erosion risk and sedimentation of waterways	<ul style="list-style-type: none"> <li>• Erosion and sediment control (ESC) measures are to be implemented prior to any works commencing and remain in place until works are completed.</li> <li>• ESC measures to be appropriately maintained at regular intervals and following any rainfall and runoff events and be implemented in accordance with: <ul style="list-style-type: none"> <li>○ the CEMP</li> <li>○ the guidelines outlined in the 2004 Landcom publication <i>Managing Urban Stormwater: Soils and Construction</i>, 4th edition ("The Blue Book") and Volume 2a <i>Installation of Services</i></li> <li>○ manufacturers specifications</li> </ul> </li> <li>• Ensure that any site access is stabilised to reduce tracking of sediment off site with approaches kept free of dust during works.</li> <li>• Minimise extent of disturbed area through appropriate staging and completion of works in shortest possible timeframe.</li> <li>• Loads of soil and other erodible materials transported to and from the site to be kept covered at all times during transportation and remain covered until unloading for use or disposal at appropriate waste facility.</li> <li>• All spills or soil or other erodible material on sealed access routes or roadways to be immediately cleaned up and removed (by manual means where possible).</li> <li>• Divert surface runoff away from sensitive areas, stockpiles and erodible materials.</li> <li>• Vehicles must be kept in designated areas both when in use and parked.</li> </ul>

Reference	Environmental Aspect	Mitigation Measures
TGS2	Rehabilitation of disturbed terrain	<ul style="list-style-type: none"> <li>Rehabilitation works are to be undertaken for disturbed areas at the work sites and the immediate surrounds as soon as practicable on a progressive manner as works are completed.</li> <li>Spoil material should be replaced within the same area from which it was excavated.</li> </ul>

## 5.6 Soil contamination and acid sulfate soils

### 5.6.1 Existing environment

#### 5.6.1.1 Contaminated land

A search of the Eurobodalla Shire Council LGA on the contaminated land sites register maintained by the NSW EPA under the *Contaminated Land Management Act 1997* identified no contaminated land sites within a 10 km radius of the study area.

#### 5.6.1.2 Acid sulfate soils

A review of the OEH Acid Sulphate Soil Risk Map indicate that ASS have largely not been mapped within the impact area (Figure 15). There is a risk of ASS soils occurring on the edge of the impact area located along Serendip Lane and adjacent to the impact area in the estuarine environment of the Wallaga Lake to the west and the Merriwina Creek to the south-east. The OEH Acid Sulphate Soil Risk Map indicates a higher probability of ASS soils occurring adjacent to the Wallaga Lake and a lower probability occurring adjacent to the Merriwina Creek (within the impact area).

Acid sulfate soils (ASS) do not present a risk on their own, however when they are exposed to air, they react with oxygen to create sulfuric acid. This acid can result in metals in the soil becoming more soluble. This can have damaging effects when these soils are exposed to rainfall, resulting in acid and toxic metal discharges to waterways, killing aquatic life and causing corrosion.

Coastal ASS are found in estuarine environments throughout NSW. They are usually found at elevations less than 1 metre above sea level and are common in mangrove and saltmarsh areas. Inland ASS occur on inland waterways, wetlands and drainage channels. Like their coastal cousins, inland acid sulphate soils develop in waterlogged, saline and anaerobic (which means living without air) conditions.



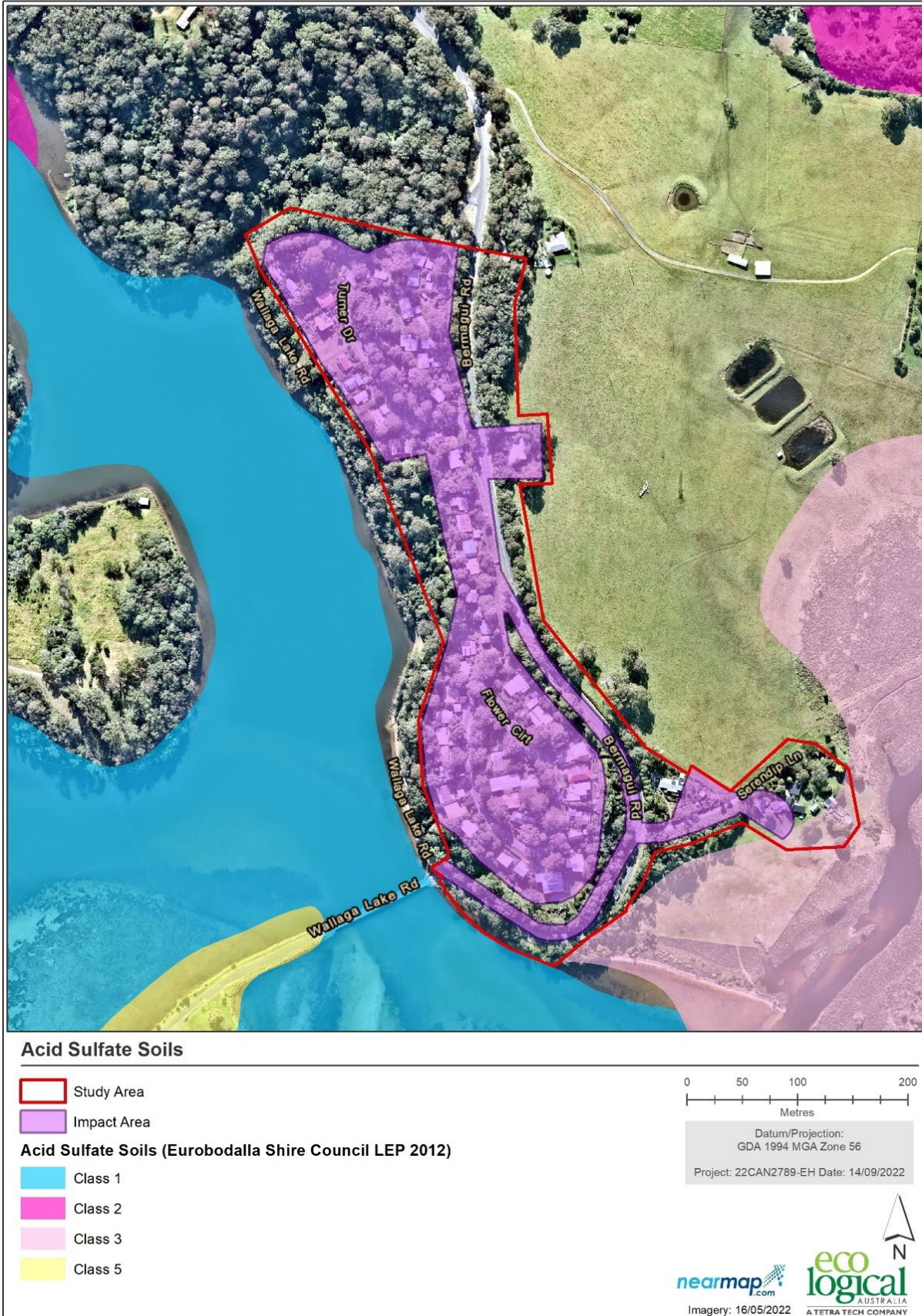


Figure 15: Mapped acid sulfate soils and classes within the study area

### 5.6.2 Impact

The works are unlikely to disturb ASS, which are largely not mapped as being present or likely to occur with the impact area, with the exception of a small area along Serendip Lane in proximity to the Merriwanga Creek where there is a likelihood of occurrence of ASS between 1-3 m of the natural ground surface (Class 3).

The project has the potential to introduce contaminants to soils via construction machinery. These include the following:

- Hydrocarbons, lubricants, oils or other chemical pollutants, particularly at the site compound where vehicle, machinery and other equipment may be stored.
- Spillage, dust or leachate from concrete or concrete wash.
- Water containing biological contaminants such as nutrients and bacteria from site toilets and taps.

### 5.6.3 Mitigation measures

**Table 13: Soil contamination and acid sulfate soils**

Reference	Environmental Aspect	Mitigation Measures
SCASS1	Soil contamination resulting from accidental spills	<ul style="list-style-type: none"> <li>• A site-specific emergency spill plan will be developed as part of the CEMP.</li> <li>• To control the use, storage, or transport of hazardous substances:               <ul style="list-style-type: none"> <li>○ Petrochemicals or other chemicals must be stored in appropriate transportable storage containers, away from watercourses and drainage lines, flow paths.</li> <li>○ Follow product label and directions for use.</li> <li>○ Ensure safety data sheets are available for all substances present on-site</li> <li>○ Ensure spill kit is on-site (including absorptive material, broom, shovel and bags) and staff trained in its use</li> <li>○ Ensure fire extinguisher is on-site</li> <li>○ Any refuelling of plant and equipment to be undertaken away from watercourses and within areas appropriately bunded.</li> </ul> </li> <li>• To control substance leak:               <ul style="list-style-type: none"> <li>○ Conduct prestart checks</li> <li>○ Do not operate plant if leak is detected</li> <li>○ Inform Project Manager if leak, spill or escape occurs</li> <li>○ Equipment, machinery and vehicles should be regularly maintained (and documented).</li> </ul> </li> </ul>
SCASS2	Discovery of contaminated soil	<ul style="list-style-type: none"> <li>• If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Council and/or EPA.</li> </ul>

## 5.7 Water quality and hydrology

### 5.7.1 Existing environment

The project is within the Wallaga Lake catchment which occupies an area of 280 km<sup>2</sup>, with the lake itself covering an area of 7.8 m<sup>2</sup> (Bega Valley Shire Council, 2022). The lake is fed by four main watercourses, the Couria, Dignams Narira and Merriwinga Creeks. While most of the catchment falls within the Bega Valley Shire, the northern part (and impact area) lies with the Eurobodalla Shire. Water quality in Wallaga Lake is generally of good quality based on three-yearly algae and clarity monitoring undertaken by Water NSW.

The terrain of the Wallaga Lake catchment varies significantly from the headwaters in the Gulaga National Park and Mt Dromedary to the flat, coastal areas in the east near the Wallaga Lake and Akolele Village. The study area is situated within the north-eastern area of the catchment, on a low rolling hill with elevations of between 10 m and 20 m above sea level.

### 5.7.2 Impact

#### 5.7.2.1 Topography and soils

The project does not cross any waterways; however, the impact area is in close proximity to the and Merriwinga Creek and Wallaga Lake. The southern extent of the study area is located as close as 10m from the Wallaga Lakefront (Figure 16). Potential sedimentation and erosion may occur during the construction stage due to soil excavations required to install the project. Stockpiling of excavated soil may become mobile during rainfall events. Erosion and sediment controls will be required during construction works as outlined in a site-specific Erosion and Sediment Control Plan (ESCP) (to be prepared by the Contractor and accompany the CEMP). Stabilisation works will be required following completion of the project to prevent any ongoing impacts off-site, including sedimentation of drainage lines and waterbodies. Minimal additional ground disturbance will be required for access to the project during construction. Existing public roads will be used to access the road verges and residential lots within the impact area.

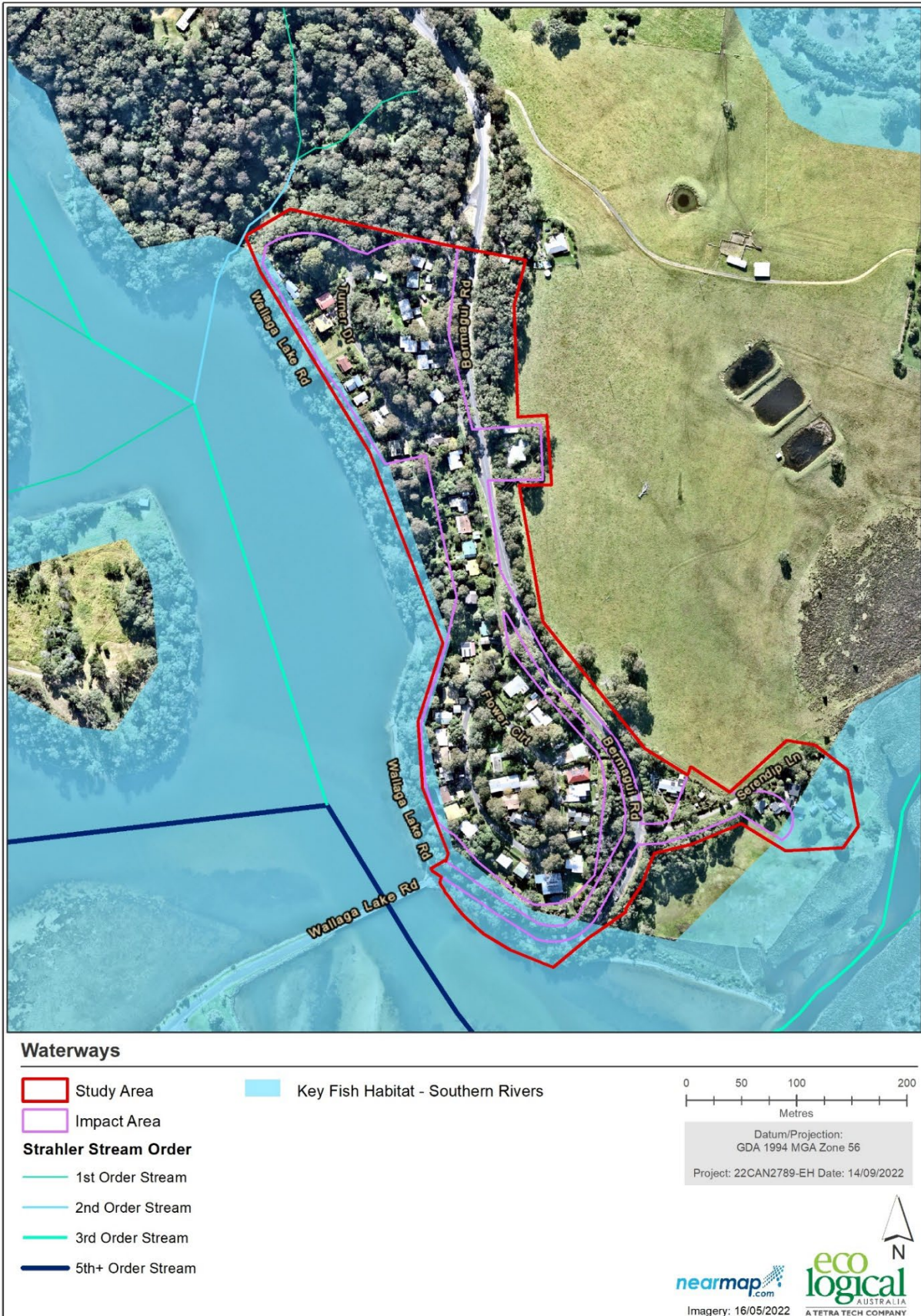


Figure 16: Waterways in proximity to the study area

### 5.7.2.2 Surface water

Impacts on water quality associated with the project have the potential to occur during the construction phase within the study area and downstream areas such as the Wallaga Lake and Merriwina Creek. Key risks relate to the generation and release of contaminated runoff to drainage lines and watercourses and include the following:

- Vegetation clearing, and exposure of soils could result in soil erosion through wind or stormwater action. Sediment could be transported into watercourses with indirect impacts on downstream environments including turbidity, sedimentation and increased nutrient loads.
- Accidental spill or leak of petrochemicals or other chemicals from the use and storage of vehicles, plant and machinery could occur on site. Such chemicals could pollute surface water.
- Solid waste including construction and general domestic waste, if not appropriately collected and disposed of could be released to the environment and watercourses.
- Loss of stockpiled material could occur through wind or stormwater action and transported to watercourses. Similarly, inappropriate placement of stockpiles and construction materials could result in impacts to watercourses.

These impacts can have implications for both aquatic ecosystem health and human health when considering potential effects on sensitive receiving environments downstream. Reduced water quality, decreased light penetration through the water column, filling pools and covering hard substrate with sediments may alter primary (plant) and secondary (animal) production that supports or regulates the aquatic food web.

Water quality impacts associated with construction works can be mitigated with appropriate erosion and sediment controls, chemical and waste management procedures and appropriately sequenced construction. Activities and scheduling should be responsive to changing weather conditions. Impacts on water quality during construction can be minimised effectively with the diligent implementation of mitigation measures outlined in Table 14.

Pipe leakage has the potential to contaminate waterways. The commissioning phase of the project presents the greatest risk of pipe leakage when the PSU's and associated infrastructure is connected to the existing system. All new pipelines will be hydrostatically tested to the maximum operating pressure of the pipeline with potable water prior to commissioning the project. Provided the safeguards are followed, a sewer leak during commissioning is considered to have low potential to occur.

Existing septic tank decommissioning is required to be undertaken by the individual property owners in accordance with *NSW Health Advisory Note 3 — Revised January 2017 Destruction, Removal or Reuse of Septic Tanks, Collection Wells, Aerated Wastewater Treatment Systems (AWTS) and other Sewage Management Facilities (SMF)*.

### 5.7.2.3 Groundwater

Under the WM Act and in accordance with NSW Aquifer Interference Policy (DPI, 2012) activities that may impact or interfere with groundwater aquifers require approval. The policy lists trenches and pipelines as having minimal impact on water-dependent assets. In this context, the installation of sewerage pipelines is unlikely to trigger the relevant requirements of the WM Act and the Aquifer Interference Policy doesn't apply.

There is a possibility that groundwater will be encountered during excavation works required to install the project, and seepage may occur. Dewatering works may be required to manage such seepages. Dewatering

methods shall be outlined in the CEMP with measures to avoid sedimentation arising from dewatering activities outlined in the ESCP. A Water Supply Approval is to be obtained from WaterNSW before any groundwater dewatering works can commence.

### 5.7.3 Mitigation measures

**Table 14: Surface water quality and hydrology mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
HWQ1	Erosion and sedimentation	<ul style="list-style-type: none"> <li>• An ESCP will be prepared by the contractor as part of the CEMP. The ESCP will describe the site-specific measures to be implemented for all works areas, in accordance with the guidelines outlined in the 2004 Landcom publication <i>Managing Urban Stormwater: Soils and Construction</i>, 4th edition (“The Blue Book”) and <i>Volume 2a Installation of Services</i>. The ESCP will be site-specific and would need to address the following issues to prevent erosion, sediment loss and water quality impacts: <ul style="list-style-type: none"> <li>○ Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area.</li> <li>○ Identification of site-specific sediment and erosion control measures wherever erosion is likely to occur.</li> <li>○ Identification of any environmentally sensitive areas on or near construction sites to ensure runoff is diverted away from sensitive areas.</li> <li>○ Requirements for vegetation clearing to be kept to a minimum.</li> <li>○ Retention of all surface runoff on-site and where possible stormwater from off site would be diverted around the construction site.</li> <li>○ Location of construction compounds (at least 50 m from any drainage lines).</li> <li>○ Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas.</li> <li>○ All erosion and sediment controls would be regularly inspected, especially when rain is expected and directly after any rain events.</li> </ul> </li> <li>• All areas where ground disturbance has occurred would be stabilised following completion of works to ensure there is no erosion hazard and restored to their preconstruction condition. This would involve, where required, reshaping the ground surface, covering it with topsoil excavated from the site and re-establishing an appropriate vegetation cover.</li> <li>• Any excess spoil would either be spread across the ground in nearby areas in such a manner as to avoid creating an erosion hazard, or removed off site for disposal in accordance with relevant Council and DPIE requirements.</li> </ul>
HWQ3	Water quality protection	<ul style="list-style-type: none"> <li>• Adequate procedures will be established and detailed in the CEMP, including notification requirements to DPE, for incidents that cause material harm to the environment.</li> <li>• A site-specific spill management plan will be prepared and include the following requirements: <ul style="list-style-type: none"> <li>○ Emergency spill kits are to be kept at the site (vehicle kits).</li> <li>○ Refuelling of machinery to be undertaken in a dedicated area within the construction compound appropriately protected as outlined in the spill management plan.</li> </ul> </li> </ul>

Reference	Environmental Aspect	Mitigation Measures
		<ul style="list-style-type: none"> <li>○ Any chemicals and fuels are to be stored in a bunded area at least 50 m from any waterway or drainage line.</li> <li>○ Any hazardous materials stored on site will be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there.</li> <li>○ Workers will be trained in the spill management plan and the use of the spill kits.</li> <li>• Mitigation measures to manage groundwater would be incorporated into the CEMP which is to address the following issues in relation to groundwater: <ul style="list-style-type: none"> <li>○ Dewatering techniques during excavation.</li> <li>○ Measures to ensure groundwater quality is not impacted during construction.</li> <li>○ Techniques to settle, treat or filter groundwater i.e. diverting groundwater through baffle tanks or filter membranes.</li> </ul> </li> <li>• Appropriate on-site treatment and monitoring regimes of groundwater, including disposal of groundwater in such a way as to prevent adverse impacts (such as erosion and water pollution). Groundwater should not be discharged to a waterway during the sewerage upgrade works.</li> </ul>
HWQ4	Flood protection	<ul style="list-style-type: none"> <li>• As part of the CEMP prepare a flood contingency plan documenting procedures and actions to be taken in the event of high flows or flooding during construction works.</li> <li>• In the event of flooding, works in affected areas will cease during flood events and will not commence until floodwaters have receded. Weather forecasts will be checked regularly at a minimum 12 hourly so that equipment and materials in flood areas can be secured prior to heavy rainfall events.</li> </ul>
HWQ5	Hydrostatic testing	<ul style="list-style-type: none"> <li>• All new pipelines will be hydrostatically tested to the maximum operating pressure of the pipeline with potable water prior to commissioning the project.</li> </ul>

## 5.8 Air quality and odour

### 5.8.1 Existing Environment

The study area is located in a residential area and the existing air quality is considered to be typical of a small coastal village area. Potentially affected sensitive receivers near the project include residential properties along Bermagui Road, Turner Drive, Serendip Lane, Wallaga Lake Road and Flower Circuit.

Emissions from motor vehicles would be the primary source of air pollutants in the study area. The impact of this source is considered minimal due to the low population density and relatively low traffic volumes.

A review of the National Pollutant Inventory reveals that there are no scheduled industries operating within the study area.

Climate data was obtained from the Bureau of Meteorology (BoM 2022) Narooma (Marine Rescue) weather station (069022) approximately 16.1 kilometres north of the project works. The annual average maximum and minimum temperatures experienced at Narooma are 22.1 degrees and 12 degrees, respectively. On

average, January and February are the hottest months. July and August are the coldest months. The average annual mean rainfall is 919.8 millimetres, with the highest rainfall generally occurring over January-March.

Wind speeds, which are of particular importance when determining the potential for dust impacts, are typically greater in spring and summer. Annual wind rose data for the period of 1972 to 2010 shows that average annual 9:00 am wind speeds are 8.8 kilometres per hour and winds are predominantly from the west and south-west (Figure 17). The same data shows that average annual 3:00 pm wind speeds are 13.9 kilometres per hour and winds are predominantly from the east, north-east and south (Figure 18).



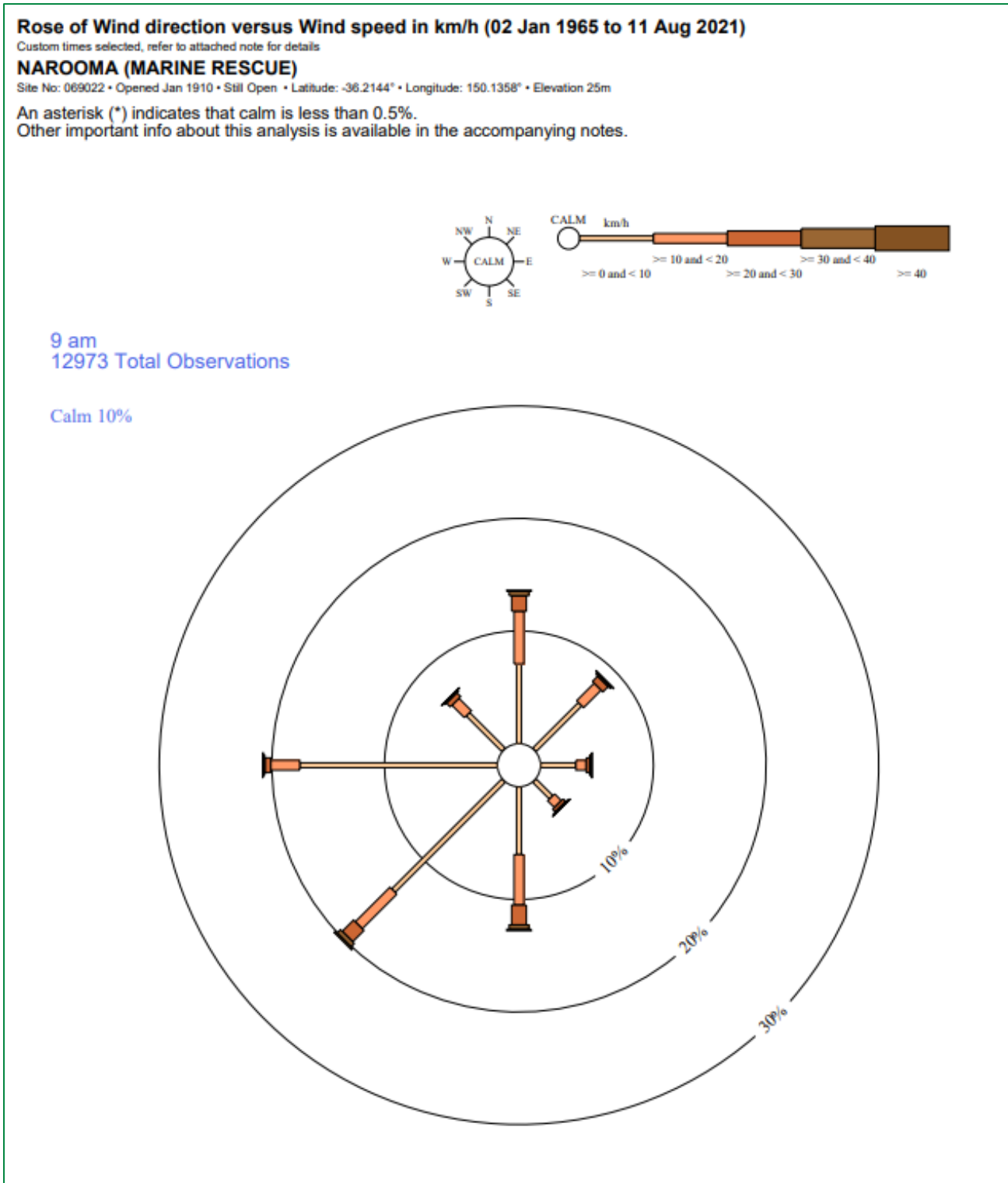


Figure 17: Narooma (Marine Rescue) wind rose 9 am

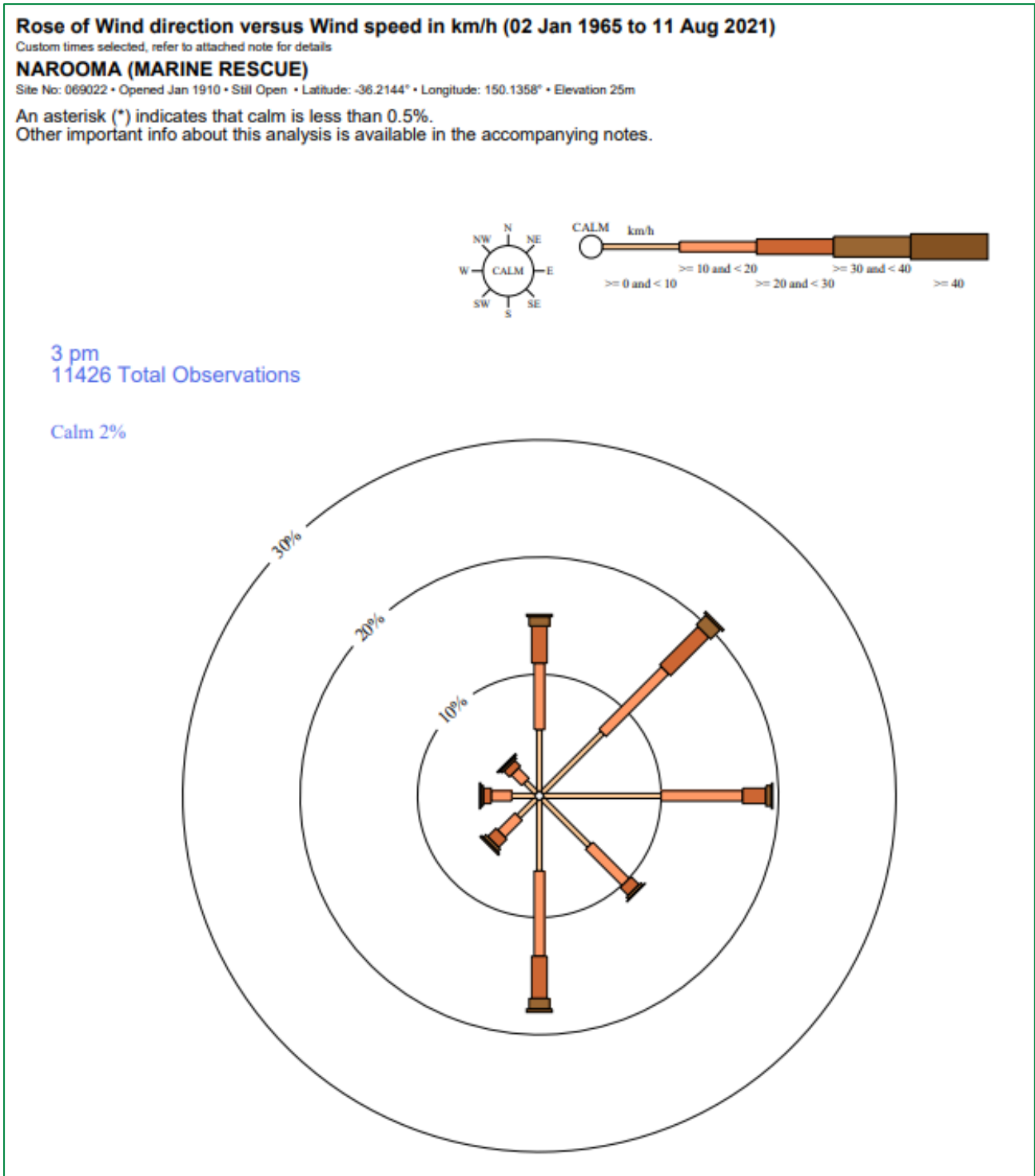


Figure 18: Narooma (Marine Rescue) wind rose 3 pm

**5.8.2 Impact**

Dust and greenhouse gas emissions are predicted during construction work to install elements of the PSU and pipelines. During construction, temporary reductions in air quality are likely to occur due to elevated particulate matter from dust generating activities and exhaust emissions from diesel-powered construction equipment. Potential sources of dust and pollutant generation may also include:

- clearing and grubbing of vegetation;
- excavation and trenching along the alignment of the pipeline and PSUs;
- vehicle movements to and from, and within the site;
- uncovered loads of materials during transportation;
- unloading materials from trucks and placement; and
- aeolian transport from stockpiles (if any) during dry and windy conditions.

Dust emissions may arise during dry weather with wind blowing towards a receptor, and when mitigation measures are not fully effective. It is expected that dust emissions will have a minor impact to the adjoining residents given the short-term duration. Mitigation measures have been recommended to reduce this impact considering the proximity of residents to the disturbance footprint.

Greenhouse gas emissions from the general operation of plant equipment are expected. It is considered that the resulting additional exhaust emissions and associated odour from this activity will be negligible. This determination considered that any additional impacts are negligible when compared to the emissions associated with other activities in the locality i.e., the existing use of the roads in the area.

Sewers emit odorous hydrogen sulfide and various volatile organic sulfur and carbon compounds, which require control and mitigation to avoid impacts to adjoining neighbours. Safeguards have been provided to minimise the likelihood of odour impacts during the construction and operation phase including appropriate design and mitigation measures. Provided these measures are implemented for the project, odour emissions have a low potential to impact adjoining residents. Proposed mitigation measures to minimise odour impacts are set out in Section 5.8.3.

### 5.8.3 Mitigation measures

**Table 15: Air quality and odour mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
AQ01	Construction air quality impacts – transportation	<ul style="list-style-type: none"> <li>• Excavated materials to be covered during transport to minimise dust emissions.</li> <li>• Stabilised and well-maintained site access to reduce tracking of sediment off site and to ensure approaches kept dust free.</li> </ul>
AQ02	Odour impacts from sewerage infrastructure	<ul style="list-style-type: none"> <li>• Use of odour neutralising agents during construction and commissioning</li> <li>• Maintain equipment in good working order, comply with the clean air regulations of the Protection of the Environment Operations Act 1997, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.</li> <li>• Odour levels will be monitored in the new wastewater infrastructure during commissioning and operation to assess if further odour mitigation measures are required.</li> </ul>
AQ03	Greenhouse Emissions Gas	<ul style="list-style-type: none"> <li>• Equipment will be switched off when not required</li> <li>• Vehicles and equipment will be properly maintained</li> <li>• No matter of any kind is to be burnt.</li> </ul>

## 5.9 Noise and vibration

### 5.9.1 Existing environment

The project is situated within a low density residential environment with sensitive receivers located in proximity to the project along Bermagui Road, Flower Circuit, Serendip Lane and Turner Drive. Generally, the existing background and ambient noise and vibration within the local area would be typical of a rural residential area and natural noise sources. The main source of noise in the surrounding area would typically be from traffic along Bermagui Road/Wallaga Lake Road which connects Akolele and Bermagui to the Princes Highway to the north and additionally, from agricultural activities such as the use of farm machinery to the north-east of Akolele.

### 5.9.2 Impact

#### 5.9.2.1 Construction noise

Residential properties located on Bermagui Road, Flower Circuit, Serendip Lane, Wallaga Lake Road and Turner Drive will be the closest sensitive receivers during the project. The rural residences may be affected by noise from plant and machinery (performing site works as well as a general increase in traffic movements of plant, machinery, and personnel vehicles) for the duration of the project.

The NSW 'Interim Construction Noise Guideline' (ICNG, Department of Environment and Climate Change, 2009) sets out the Noise Management Level (NML) for residences (Table 16). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise levels identified below.

**Table 16 Noise management levels (NML)**

Time of day	Management Level
<b>Recommended Standard Hours:</b>	Noise affected RBL + 10dB(A)
<b>Monday to Friday 7 a.m. - 6 p.m.</b>	Highly noise affected 75dB(A)
<b>Saturdays 8 a.m. – 1 p.m.</b>	
<b>Outside recommended standard hours</b>	Noise affected RBL + 5dB(A)

Given that the closest receiver is located within a rural residential setting, the RBL for the area surrounding the Project are assumed to be a minimum of 30dB(A). This is a conservative assumption and the lowest allowable level, as described in the NSW Noise Policy for Industry (2017).

Using the RBL of 30dB(A), the construction noise management level for the closest receiver will be 40dB(A). Given the construction works would be carried out during standard construction hours, only the daytime period is assessed. Noise modelling was not undertaken as part of this assessment as no receiver was predicted to be highly noise affected, as all predicted levels are likely to be below 75dB(A).

Given standard construction equipment is to be used it is recommended that a "feasible and reasonable" approach towards noise management measures be applied to reduce noise levels as much as possible for the closest receiver. No other receivers are considered likely to be affected by construction noise.

While the project may result in some minor short-term impacts to nearby properties and residents, these will be limited to standard work hours. Noise generation will be minimised through maintenance of equipment and turning off equipment that is not required to be used.

#### 5.9.2.2 Construction vibration

For disturbance to human occupants of buildings, NSW EPA's 'Assessing Vibration; a technical guideline' (Department of Environment and Climate Change, 2006) provides the relevant criteria. It is based on the British Standard BS 6472-1992, 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

For damage to structures due to construction generated vibration, vibration limits are established in accordance with the German Standard DIN 4150 Part 3-1999 'Structural Vibration in Buildings – Effects on Structures'.

The vibration levels during construction would vary depending on the type of activity being carried out. Construction equipment most likely to cause significant vibration includes:

- Excavators
- HDD machinery
- Truck traffic

As the PSU and pipelines installations are proposed to be installed within lot boundaries and along residential road verges, the above equipment would be used near residential sensitive receivers during work. In general, the risk of structural damage during construction is generally assessed as being very low with the risk of human disturbance also low. Specific recommendations have been provided to minimise impact to the residences and it is recommended that the previously listed noise and vibration guidelines be consulted in preparation of the CEMP.

#### 5.9.2.3 Operational noise and vibration

Noise and vibration impacts associated with operation and maintenance of the pressure sewer system are anticipated to be negligible, as the use of the associated infrastructure will not be altered. Additionally, the frequency of maintenance activities and their associated noise impacts are likely to be minimal.

### 5.9.3 Mitigation measures

**Table 17: Noise and vibration mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
NV1	Elevated noise and vibration levels during construction	<ul style="list-style-type: none"> <li>Hours of work limited to specified hours (Monday to Friday between 7 a.m. 6 p.m. and Saturday 8 a.m. and 1 p.m., no work on Sunday or public holidays)</li> <li>Vehicles and machinery should not be left idling when not in use</li> <li>Equipment, machinery and vehicles should be regularly maintained (documented).</li> <li>All machinery and equipment to be used will comply with the relevant Australian standard for noise attenuation (e.g. have noise mufflers and be well maintained).</li> <li>Well planned site layout to ensure where practical that noisy plant and machinery and overnight parking locations are located away from nearby residences with reversing also minimised in these locations.</li> <li>Select methods not involving impact where possible.</li> <li>Community consultation and notification for potentially noise and vibration affected residences detailing timing of noisy activities.</li> <li>Mechanism to provide noise complaints using signage and usage of a complaints register with relevant triggers for noise monitoring if required.</li> <li>Where possible, avoid the simultaneous operation of two or more noisy plant items in close vicinity to sensitive noise receivers.</li> <li>Where possible, orientate equipment such that offensive noise carries away from potential receivers.</li> </ul>

## 5.10 Traffic and access

### 5.10.1 Existing environment

The works will be undertaken along ESC road reserves utilised by Akolele residents including Turner Drive, Flower Circuit, Serendip Lane and Wallaga Lake Road. A portion of the work will take place on Bermagui Road which is an approximately 4 km State Arterial Road that runs from the Princes Highway in Tilba Tilba to Akolele where it joins Wallaga Lake Road. Bermagui Road is managed by TfNSW and is primarily utilised by local residents and commuters travelling to and from coastal town such as Akolele, Wallaga Lake, Bermagui and Cuttagee.

### 5.10.2 Impact

#### 5.10.2.1 Construction

Negative impacts on traffic would be restricted to inconveniences associated with traffic control measures during the construction activities and impacts associated with construction noise and increase in construction traffic. While the project is not likely to significantly impact on traffic flow, it is recommended that consultation with TfNSW and ESC be undertaken prior to commencement to determine whether a Road Occupancy Licence under the *Roads Act 1993* will be required. Consultation with ESC and TfNSW should be undertaken prior to works commencing for all impacts proposed within road alignments and verges. Temporary impacts to some residents may occur where the construction works are required to occur close existing dwellings accesses. Notification to individual residents is recommended prior to works.

### 5.10.2.2 Operational

Negligible impacts to traffic will result from regular maintenance and operation of the pressure sewerage system.

### 5.10.3 Mitigation measures

**Table 18 Traffic and access mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
TA1	Increased heavy vehicle traffic may disrupt traffic movement and access on local roads	<ul style="list-style-type: none"> <li>• Ensure that a best practice TMP is prepared prior to works commencing to ensure traffic is safely managed and that residents with local properties continue to have road access during the implementation of the Project.</li> <li>• Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway access unless necessary and only if appropriate notification has been provided.</li> <li>• Ensure all workers adhere to relevant OH&amp;S standards and provide workers compensation insurance.</li> <li>• Construction traffic movements associated with the Project will be kept to the minimum necessary to implement the Project efficiently and safely.</li> <li>• Traffic impacts in association with the Project will be restricted to the hours of construction, which would be undertaken between 7:00 a.m. to 6:00 p.m. Monday to Friday and Saturday 8:00 a.m. to 1:00 p.m. with no work on Sundays or public holidays.</li> <li>• Consultation with residents regarding access, closures and work scheduling 7 days prior to works commencing.</li> </ul>

## 5.11 Visual amenity and landscape

### 5.11.1 Existing environment

The study area and surrounds are within a residential and rural landscape with scenic values typical of much of the coastal area in the Eurobodalla Shire.

### 5.11.2 Impact

#### 5.11.2.1 Construction

The project has the potential to present a minor temporary reduction in the visual amenity of the study area due to the presence of construction plant and materials and any construction compound areas that will be required. Untidy work practices, haphazard storage of machinery and areas of bare earth all contribute to a reduction in visual amenity. However, it is considered unlikely that the decline in visual amenity at the site-specific scale would extend to a decline in the broader landscape.

Additionally, no permanent vegetation clearance will be required for the project and the works will predominantly involve impacts that do not extend beyond those that are existing on site. Areas where the ground surface has been disturbed to install elements of the PSUs and pipelines will be appropriately stabilised and re-grassed following completion of works.

Views and vistas for residents surrounding the works will also not be impacted in the long term and any reduction to the visual quality of the area will be temporary.

### 5.11.2.2 Operational

Negligible impacts to visual amenity will result from maintenance and operation of the pressure sewer system.

### 5.11.3 Mitigation measures

**Table 19: Visual amenity and landscape mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
VAL1	Construction stage decline in visual amenity	<ul style="list-style-type: none"> <li>Maintain tidy work practices with the site kept clean of general litter. Refer to measures relating to waste management mitigation measures.</li> <li>All disturbed areas shall be rehabilitated and maintained until established.</li> </ul>

## 5.12 Socio economic and human health risk

### 5.12.1 Existing environment

Akolele Village is located within the Eurobodalla LGA and is approximately 11 km north of Bermagui. The population of Akolele as of 2021 was 165. The overall objective of the project is to upgrade sewerage collection and disposal for the benefit of the residents located within Akolele. The proposed installation of a pressure sewerage system to homes within Akolele will be beneficial in reducing the potential for health risks posed by current septic tanks installed at these residences.

### 5.12.2 Impact

#### 5.12.2.1 Construction

Construction activities are unlikely to have a significant negative socio-economic effect on the locality. Potentially, negative impacts will occur to commuters on Bermagui Road and on the local roads of Akolele if temporary road closures are required for any part of the works.

On the contrary, some local expenditure would occur during the construction phase potentially resulting in some economic benefit to the local community. This may be through the contracting and purchasing of local supplies and services as well as ad hoc visitation to local businesses by employees and site personnel.

#### 5.12.2.2 Operational

The works are considered to have a positive impact on the area as they will improve the sewerage infrastructure that is essential to the local community.

### 5.12.3 Mitigation measures

**Table 20: Socio-economic and human health risk**

Reference	Environmental Aspect	Mitigation Measures
SE1	Traffic delays	<ul style="list-style-type: none"> <li>Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels.</li> </ul>
SE2	Community complaints and service disruption	<ul style="list-style-type: none"> <li>Carry out community and stakeholder consultation before works start.</li> <li>Notify Council immediately of any complaints or any accidental damage to property.</li> <li>Locate existing services on a Dial-Before-You-Dig search and peg out no-go areas to avoid service-disruption.</li> </ul>



## 5.13 Energy and Climate Change

### 5.13.1 Impact

During the construction period, energy consumption will occur in association with the use of vehicles, plant, and machinery. This energy use is negligible in the context of the energy use elsewhere in the locality. Despite this, it can be further mitigated by implementing the mitigation measures identified below.

### 5.13.2 Mitigation measures

**Table 21: Energy use and climate change**

Reference	Environmental Aspect	Mitigation Measures
ECC1	Increased energy consumption and production of emissions	<ul style="list-style-type: none"> <li>Vehicles, plant, and machinery should be kept in good working order and used in an efficient manner. Vehicles should not be left idling when not in use.</li> </ul>

## 5.14 Bushfire risk

### 5.14.1 Existing environment

The study area does not contain any vegetation that has been identified by ESC as bush fire prone. The works will take place within land that has been previously cleared and maintained as road verges and residential properties. Despite these factors, the project has the potential to be exposed to bushfire risk from nearby areas of grassland and native woodland vegetation.

### 5.14.2 Impact

#### 5.14.2.1 Construction

The project is located near rural and bushland environments and as such has the potential to be exposed to bushfire risk during the construction phase, particularly if construction is scheduled during the NSW Rural Fire Service Bush Fire Danger Period which runs from 1 October to 31 March. In addition, the risk of a bushfire occurring as a result of the proposed construction works is possible; bushfire risks may arise due to the following:

- Improper use of machinery
- Negligent behaviour such as leaving lit cigarette butts within the study area
- Spillage of flammable materials such as fuels and oils
- Poor storage of flammable materials and poor maintenance practices.

All of the above can lead to a bushfire risk if ignited, however the risk can be managed through the implementation of appropriate mitigation measures.

Firefighting equipment should be located on site and site vehicles should have diesel engines to minimise fire risk. Contractors should be briefed and properly trained in the use of equipment to ensure that they are operated and maintained adequately. Construction activities should also be modified to suit any fire bans.

### 5.14.2.2 Operation

During operation of the pressure sewerage system, the risk of bushfire impacting upon infrastructure will not increase. Infrastructure is largely below ground, therefore the risk of impacts on infrastructure once installed is negligible.

### 5.14.3 Mitigation measures

**Table 22: Bushfire Risk**

Reference	Environmental Aspect	Mitigation Measures
BR1	Inadvertent increase of bushfire risk	<ul style="list-style-type: none"> <li>An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the project area would be kept clean and free of litter, including cigarette butts, at all times.</li> <li>Flammable substances are stored correctly, and only minimal amounts of these substances are to be present onsite.</li> <li>Fire extinguishers should be available at all times on site.</li> <li>No hot works should not occur on days classified with a Fire Danger Rating of Extreme or Catastrophic.</li> <li>Compliance with all activity and equipment restrictions is required during declared Total Fire Ban days.</li> </ul>

## 5.15 Waste management and resource use

### 5.15.1 Existing environment

Existing septic tank decommissioning is required to be undertaken by the individual property owners in accordance with NSW Health Advisory Note 3 — Revised January 2017 Destruction, Removal or Reuse of Septic Tanks, Collection Wells, Aerated Wastewater Treatment Systems (AWTS) and other Sewage Management Facilities (SMF).

### 5.15.2 Impact

#### 5.15.2.1 Construction

The project is not expected to generate a significant volume of waste. However, some may be produced during the construction phase, potentially including:

- Construction packaging materials
- Domestic waste
- Liquid wastes from cleaning, repairing and/or maintaining heavy construction equipment.

#### 5.15.2.2 Operational

No further impact is expected to occur during the operational phase. The pressure sewerage system will ensure efficient waste collection and disposal for the Akolele Village.

### 5.15.3 Mitigation measures

**Table 23: Waste management and resource use**

Reference	Environmental Aspect	Mitigation Measures
WM1	Generation of construction waste	<ul style="list-style-type: none"> <li>• Resource management options for the project must be considered against a hierarchy of the following order embodied in the <i>Waste Avoidance and Resource Recovery Act 2001</i>. <ul style="list-style-type: none"> <li>○ Avoid unnecessary resource consumption.</li> <li>○ Recover resources (including reuse, reprocessing, recycling and energy recovery).</li> <li>○ Dispose (as a last resort).</li> </ul> </li> <li>• All wastes must be classified in accordance to the EPA 2014 Waste Classification Guidelines prior to disposal and transported to a licensed waste disposal facility.</li> <li>• All waste must be removed from the site on completion of the works.</li> <li>• Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal.</li> <li>• An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the project area would be kept clean and free of litter, including cigarette butts, at all times.</li> <li>• Plant and equipment must be regularly inspected to ascertain that fitted emission controls are operating efficiently.</li> <li>• Plant and equipment must be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition.</li> <li>• Do not have machinery running while not in use.</li> <li>• Minimise use of machinery for required activity only.</li> <li>• Securely store/cover all wastes to prevent pollutants from escaping.</li> <li>• Any asbestos encountered to be managed in accordance with ESC's <a href="#">Workplace Operations Policy – Asbestos</a>.</li> </ul>

### 5.16 Cumulative impacts

We do not expect any significant adverse cumulative impacts to occur during the proposal. During construction, there may be other minor works in surrounding residential properties or roadways.

ESC will continue to maintain contact with Council's Planning Department and Bega Valley Shire Council to ensure any cumulative impacts are minimised.

## 6. Environmental management

### 6.1 Environmental management plan

A CEMP will be prepared by the construction contractor, to include all the mitigation measures listed in this REF, as well as any relevant conditions under any permits, licenses or other approvals obtained for the project.

### 6.2 Summary of proposed mitigation measures

Environmental mitigation measures relating to each of the aspects considered in this REF are summarised in Table 24: Summary of proposed mitigation measures.

**Table 24: Summary of proposed mitigation measures**

Reference	Environmental Aspect	Mitigation Measures
E1	Pollution	<ul style="list-style-type: none"> <li>• Develop a Construction Environmental Management Plan (CEMP) to address pollution and contamination issues, such as silt control, run-off and oil/fuel/chemical storage/spill management, which could arise during operation of the site.</li> <li>• Sediment and waste runoff control measures (barriers/fences, drainage, dewatering equipment) should be implemented around works to ensure any sediment is contained.</li> <li>• Sewerage/waste leaks should be appropriately contained, corrected and removed to avoid any impact to surrounding ecological communities and waterways.</li> </ul>
E2	Vegetation Protection	<ul style="list-style-type: none"> <li>• The limits of works (impact area) should be clearly marked (for example, using temporary fencing, flagging and/or bunting) to ensure that disturbance occurs only within the designated works areas and is not unnecessarily extended.</li> <li>• Material and equipment storage areas should be restricted to existing disturbed areas.</li> <li>• Vehicle movements should be confined to the impact area.</li> <li>• Pre-works briefing to be undertaken by ESC staff advising of sensitive areas and relevant safeguards for these areas.</li> <li>• Vegetation clearing should be undertaken in a manner to avoid damage to adjacent vegetation.</li> <li>• Excavated areas such as trenches should be checked for any fauna/injured animals at the start of each workday.</li> </ul>
E3	Weed and pathogen spread	<ul style="list-style-type: none"> <li>• Ensure all plant and machinery are washed down before use on site.</li> <li>• Any priority weeds identified on site will be managed in accordance with the South East Regional Strategic Weed Management Plan (2017 – 2022).</li> </ul>
AE1	Indirect impacts on aquatic fauna – decreased water quality	<ul style="list-style-type: none"> <li>• The CEMP to address pollution and contamination issues, such as silt control and oil/fuel/chemical storage/spill management, which could arise during construction entering waterways.</li> <li>• Install sediment fences to prevent fine material from travelling into the waterways along the full length of construction work.</li> <li>• Avoid storing fill and waste material near waterways.</li> </ul>
AH1	Aboriginal Heritage – General Measures and Unexpected Finds	<ul style="list-style-type: none"> <li>• All contractors undertaking works on site should be briefed on the protection of Aboriginal objects and places under the NPW Act 1974, and the penalties for damage to these items.</li> <li>• If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, Heritage NSW must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.</li> <li>• In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, Heritage NSW may also be contacted at this time to assist in determining appropriate management.</li> </ul>

Reference	Environmental Aspect	Mitigation Measures
AH2	Aboriginal Heritage – General Measures	<ul style="list-style-type: none"> <li>The project should be designed to ensure all impacts required to complete the works are contained to areas that have already been disturbed, in order to avoid impacting any soils that may retain intact archaeological deposits.</li> </ul>
NAH1	Previously unidentified heritage sites or places are discovered	<ul style="list-style-type: none"> <li>In accordance with Section 146 of the <i>Heritage Act 1977</i>, if an archaeological relic (such as a deposit or artefact) is uncovered during works, work must cease in the affected area and a qualified archaeologist contacted to assess the find. Further advice and clarification may be sought from the Heritage Council of NSW, or the Heritage Division under delegation regarding assessment and approvals. If any suspected ‘Relics’ or archaeological sites are uncovered during construction, works will cease immediately, and Council’s heritage officer or representative will be notified. Further assessment and investigations may be required, such as a Statement of Heritage Impact (SoHI), in line with Heritage Council guidelines and the requirements of the Heritage Act 1977.</li> </ul>
TGS1	Vehicle movements and excavation may result in increased erosion risk and sedimentation of waterways	<ul style="list-style-type: none"> <li>Erosion and sediment control (ESC) measures are to be implemented prior to any works commencing and remain in place until works are completed.</li> <li>ESC measures to be appropriately maintained at regular intervals and following any rainfall and runoff events and be implemented in accordance with: <ul style="list-style-type: none"> <li>the CEMP</li> <li>the guidelines outlined in the 2004 Landcom publication <i>Managing Urban Stormwater: Soils and Construction</i>, 4th edition (“The Blue Book”) and Volume 2a <i>Installation of Services</i></li> <li>manufacturers specifications</li> </ul> </li> <li>Ensure that any site access is stabilised to reduce tracking of sediment off site with approaches kept free of dust during works.</li> <li>Minimise extent of disturbed area through appropriate staging and completion of works in shortest possible timeframe.</li> <li>Loads of soil and other erodible materials transported to and from the site to be kept covered at all times during transportation and remain covered until unloading for use or disposal at appropriate waste facility.</li> <li>All spills or soil or other erodible material on sealed access routes or roadways to be immediately cleaned up and removed (by manual means where possible).</li> <li>Divert surface runoff away from sensitive areas, stockpiles and erodible materials.</li> <li>Vehicles must be kept in designated areas both when in use and parked.</li> </ul>
TGS2	Rehabilitation of disturbed terrain	<ul style="list-style-type: none"> <li>Rehabilitation works are to be undertaken for disturbed areas at the work sites and the immediate surrounds as soon as practicable on a progressive manner as works are completed.</li> <li>Spoil material should be replaced within the same area from which it was excavated.</li> </ul>
SCASS1	Soil contamination resulting from accidental spills	<ul style="list-style-type: none"> <li>A site-specific emergency spill plan will be developed as part of the CEMP.</li> <li>To control the use, storage, or transport of hazardous substances: <ul style="list-style-type: none"> <li>Petrochemicals or other chemicals must be stored in appropriate transportable storage containers, away from watercourses and drainage lines, flow paths.</li> <li>Follow product label and directions for use.</li> </ul> </li> </ul>

Reference	Environmental Aspect	Mitigation Measures
		<ul style="list-style-type: none"> <li>○ Ensure safety data sheets are available for all substances present on-site</li> <li>○ Ensure spill kit is on-site (including absorptive material, broom, shovel and bags) and staff trained in its use</li> <li>○ Ensure fire extinguisher is on-site</li> <li>○ Any refuelling of plant and equipment to be undertaken away from watercourses and within areas appropriately bunded.</li> <li>● To control substance leak: <ul style="list-style-type: none"> <li>○ Conduct prestart checks</li> <li>○ Do not operate plant if leak is detected</li> <li>○ Inform Project Manager if leak, spill or escape occurs</li> </ul> </li> <li>● Equipment, machinery and vehicles should be regularly maintained (and documented).</li> </ul>
SCASS2	Discovery of contaminated soil	<ul style="list-style-type: none"> <li>● If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Council and/or EPA.</li> </ul>
HWQ1	Erosion and sedimentation	<ul style="list-style-type: none"> <li>● An ESCP will be prepared by the contractor as part of the CEMP. The ESCP will describe the site-specific measures to be implemented for all works areas, in accordance with the guidelines outlined in the 2004 Landcom publication <i>Managing Urban Stormwater: Soils and Construction</i>, 4th edition (“The Blue Book”) and <i>Volume 2a Installation of Services</i>. The ESCP will be site-specific and would need to address the following issues to prevent erosion, sediment loss and water quality impacts: <ul style="list-style-type: none"> <li>○ Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area.</li> <li>○ Identification of site-specific sediment and erosion control measures wherever erosion is likely to occur.</li> <li>○ Identification of any environmentally sensitive areas on or near construction sites to ensure runoff is diverted away from sensitive areas.</li> <li>○ Requirements for vegetation clearing to be kept to a minimum.</li> <li>○ Retention of all surface runoff on-site and where possible stormwater from off site would be diverted around the construction site.</li> <li>○ Location of construction compounds (at least 50 m from any drainage lines).</li> <li>○ Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas.</li> <li>○ All erosion and sediment controls would be regularly inspected, especially when rain is expected and directly after any rain events.</li> </ul> </li> <li>● All areas where ground disturbance has occurred would be stabilised following completion of works to ensure there is no erosion hazard and restored to their preconstruction condition. This would involve, where required, reshaping the ground surface, covering it with topsoil excavated from the site and re-establishing an appropriate vegetation cover.</li> <li>● Any excess spoil would either be spread across the ground in nearby areas in such a manner as to avoid creating an erosion hazard, or removed off site for disposal in accordance with relevant Council and DPE requirements.</li> </ul>

Reference	Environmental Aspect	Mitigation Measures
HWQ3	Water quality protection	<ul style="list-style-type: none"> <li>• Adequate procedures will be established and detailed in the CEMP, including notification requirements to DPE, for incidents that cause material harm to the environment.</li> <li>• A site-specific spill management plan will be prepared and include the following requirements: <ul style="list-style-type: none"> <li>○ Emergency spill kits are to be kept at the site (vehicle kits).</li> <li>○ Refuelling of machinery to be undertaken in a dedicated area within the construction compound appropriately protected as outlined in the spill management plan.</li> <li>○ Any chemicals and fuels are to be stored in a bunded area at least 50 m from any waterway or drainage line.</li> <li>○ Any hazardous materials stored on site will be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there.</li> <li>○ Workers will be trained in the spill management plan and the use of the spill kits.</li> </ul> </li> <li>• Mitigation measures to manage groundwater would be incorporated into the CEMP which is to address the following issues in relation to groundwater: <ul style="list-style-type: none"> <li>○ Dewatering techniques during excavation.</li> <li>○ Measures to ensure groundwater quality is not impacted during construction.</li> <li>○ Techniques to settle, treat or filter groundwater i.e. diverting groundwater through baffle tanks or filter membranes.</li> </ul> </li> <li>• Appropriate on-site treatment and monitoring regimes of groundwater, including disposal of groundwater in such a way as to prevent adverse impacts (such as erosion and water pollution). Groundwater should not be discharged to a waterway during the sewerage upgrade works.</li> </ul>
HWQ4	Flood protection	<ul style="list-style-type: none"> <li>• As part of the CEMP prepare a flood contingency plan documenting procedures and actions to be taken in the event of high flows or flooding during construction works.</li> <li>• In the event of flooding, works in affected areas will cease during flood events and will not commence until floodwaters have receded. Weather forecasts will be checked regularly at a minimum 12 hourly so that equipment and materials in flood areas can be secured prior to heavy rainfall events.</li> </ul>
HWQ5	Hydrostatic testing	<ul style="list-style-type: none"> <li>• All new pipelines will be hydrostatically tested to the maximum operating pressure of the pipeline with potable water prior to commissioning the project.</li> </ul>
AQO1	Construction air quality impacts – transportation	<ul style="list-style-type: none"> <li>• Excavated materials to be covered during transport to minimise dust emissions.</li> </ul> <p>Stabilised and well-maintained site access to reduce tracking of sediment off site and to ensure approaches kept dust free.</p>
AQO2	Odour impacts from sewerage infrastructure	<ul style="list-style-type: none"> <li>• Use of odour neutralising agents during construction and commissioning</li> <li>• Maintain equipment in good working order, comply with the clean air regulations of the Protection of the Environment Operations Act 1997, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.</li> </ul> <p>Odour levels will be monitored in the new wastewater infrastructure during commissioning and operation to assess if further odour mitigation measures are required.</p>



Reference	Environmental Aspect	Mitigation Measures
AQ03	Greenhouse Gas Emissions	<ul style="list-style-type: none"> <li>Equipment will be switched off when not required</li> <li>Vehicles and equipment will be properly maintained</li> </ul> <p>No matter of any kind is to be burnt.</p>
NV1	Elevated noise and vibration levels during construction	<ul style="list-style-type: none"> <li>Hours of work limited to specified hours (Monday to Friday between 7 a.m. 6 p.m. and Saturday 8 a.m. and 1 p.m., no work on Sunday or public holidays)</li> <li>Vehicles and machinery should not be left idling when not in use</li> <li>Equipment, machinery and vehicles should be regularly maintained (documented).</li> <li>All machinery and equipment to be used will comply with the relevant Australian standard for noise attenuation (e.g. have noise mufflers and be well maintained).</li> <li>Well planned site layout to ensure where practical that noisy plant and machinery and overnight parking locations are located away from nearby residences with reversing also minimised in these locations.</li> <li>Select methods not involving impact where possible.</li> <li>Community consultation and notification for potentially noise and vibration affected residences detailing timing of noisy activities.</li> <li>Mechanism to provide noise complaints using signage and usage of a complaints register with relevant triggers for noise monitoring if required.</li> <li>Where possible, avoid the simultaneous operation of two or more noisy plant items in close vicinity to sensitive noise receivers.</li> <li>Where possible, orientate equipment such that offensive noise carries away from potential receivers.</li> </ul>
TA1	Increased heavy vehicle traffic may disrupt traffic movement and access on local roads	<ul style="list-style-type: none"> <li>Ensure that a best practice TMP is prepared prior to works commencing to ensure traffic is safely managed and that residents with local properties continue to have road access during the implementation of the Project.</li> <li>Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway access unless necessary and only if appropriate notification has been provided.</li> <li>Ensure all workers adhere to relevant OH&amp;S standards and provide workers compensation insurance.</li> <li>Construction traffic movements associated with the Project will be kept to the minimum necessary to implement the Project efficiently and safely.</li> <li>Traffic impacts in association with the Project will be restricted to the hours of construction, which would be undertaken between 7:00 a.m. to 6:00 p.m. Monday to Friday and Saturday 8:00 a.m. to 1:00 p.m. with no work on Sundays or public holidays.</li> <li>Consultation with residents regarding access, closures and work scheduling 7 days prior to works commencing.</li> </ul>
VAL1	Construction stage decline in visual amenity	<ul style="list-style-type: none"> <li>Maintain tidy work practices with the site kept clean of general litter. Refer to measures relating to waste management mitigation measures.</li> <li>All disturbed areas shall be rehabilitated and maintained until established.</li> </ul>
SE1	Traffic delays	<ul style="list-style-type: none"> <li>Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels.</li> </ul>

Reference	Environmental Aspect	Mitigation Measures
SE2	Community complaints and service disruption	<ul style="list-style-type: none"> <li>• Carry out community and stakeholder consultation before works start.</li> <li>• Notify Council immediately of any complaints or any accidental damage to property.</li> <li>• Locate existing services on a Dial-Before-You-Dig search and peg out no-go areas to avoid service-disruption.</li> </ul>
ECC1	Increased energy consumption and production of emissions	<ul style="list-style-type: none"> <li>• Vehicles, plant, and machinery should be kept in good working order and used in an efficient manner. Vehicles should not be left idling when not in use.</li> </ul>
BR1	Inadvertent increase of bushfire risk	<ul style="list-style-type: none"> <li>• An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the project area would be kept clean and free of litter, including cigarette butts, at all times.</li> <li>• Flammable substances are stored correctly, and only minimal amounts of these substances are to be present onsite.</li> <li>• Firefighting equipment should be available at all times on site.</li> <li>• Works should not occur on days classified with a Fire Danger Rating of Extreme or Catastrophic.</li> <li>• Compliance with all activity and equipment restrictions is required during declared Total Fire Ban days.</li> </ul>
WM1	Generation of construction waste	<ul style="list-style-type: none"> <li>• Resource management options for the project must be considered against a hierarchy of the following order embodied in the <i>Waste Avoidance and Resource Recovery Act 2001</i>. <ul style="list-style-type: none"> <li>○ Avoid unnecessary resource consumption.</li> <li>○ Recover resources (including reuse, reprocessing, recycling and energy recovery).</li> <li>○ Dispose (as a last resort).</li> </ul> </li> <li>• All wastes must be classified in accordance to the EPA 2014 Waste Classification Guidelines prior to disposal and transported to a licensed waste disposal facility.</li> <li>• All waste must be removed from the site on completion of the works.</li> <li>• Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal.</li> <li>• An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the project area would be kept clean and free of litter, including cigarette butts, at all times.</li> <li>• Plant and equipment must be regularly inspected to ascertain that fitted emission controls are operating efficiently.</li> <li>• Plant and equipment must be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition.</li> <li>• Do not have machinery running while not in use.</li> <li>• Minimise use of machinery for required activity only.</li> <li>• Securely store/cover all wastes to prevent pollutants from escaping.</li> <li>• Any asbestos encountered to be managed in accordance with ESC's <a href="#">Workplace Operations Policy – Asbestos</a>.</li> </ul>

## 7. Conclusion

This REF has identified and assessed the potential environmental impacts of the project to install a pressure sewage collection system to connect 63 lots at Akolele Village to the existing Wallaga Lake Koori Village PSS.

Key considerations for this project include:

- The potential impacts to Aboriginal cultural heritage and historic heritage sites arising from ground disturbance and installation of the project.
- The potential impacts to surface water quality from sediment run off from the construction works, and potential sewage leaks from commissioning of the project particularly considering the proximity of sensitive receiving environments including Wallaga Lake.
- Potential impacts to flora, fauna, and ecological communities from construction of the project.
- Potential traffic impacts arising from construction work particularly along Bermagui Road.
- Potential odour impacts arising from connection and operation of the project.

After consideration of the assumptions made in relation to scope, the outcomes of the desktop investigations and analyses undertaken for this report, the identified impacts of the project are unlikely to have a significant impact on Aboriginal cultural heritage, historic heritage, threatened flora, fauna and ecological communities,

Based on the current scope of works, no permit applications are required.

In conclusion, environmental impacts identified and addressed in this REF will not result in a significant adverse impact if the project is implemented as described in Section 2, and including all mitigation measures as described in Section 6.2. These mitigation measures will be included in the site-specific Construction Environmental Management Plan (CEMP) and associated sub-plans to be developed prior to the commencement of the works.

The project is required to be assessed under Division 5.1 of Part 5 of the EP&A Act. This REF has examined and considered to the fullest extent possible all matters affecting or likely to affect the environment by reason of the project.

The project is not likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. As such it is not necessary for further assessment under section 5.7 of the EP&A Act.

The project is not likely to have a significant impact on any matters of national environmental significance or the environment on Commonwealth land for the purposes of the EPBC and a referral to the Commonwealth Department of Climate Change, Energy, Environment and Water under the EPBC Act is not required.

## 8. REF determination

### 8.1 Assessor declaration



This REF provides a true and fair review of the activity in relation to its likely effects on the environment. It examines and considers to the fullest extent possible all matters affecting or likely to affect the environment by reason of the project and provides sufficient information to determine whether the Project is likely to significantly affect the environment, including threatened species or ecological communities, or their habitats.

I have considered all environmental impacts and safeguards to the best of my knowledge and have sought advice where required.

Project Name	Akolele Sewerage Scheme REF
Project Manager Kathrine Pellowe Eco Logical Australia Canberra ACT	
Project Director Konrad Grinlaubs Eco Logical Australia Newcastle NSW	

### 8.2 Determiner declaration and approval

I have reviewed the document and consider that the Project (including the controls and mitigation measures specified in this REF) is not likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. As such it is not necessary for further assessment under section 5.7 of the EP&A Act.

Project Name	Akolele Sewerage Scheme REF
Role: Water and Sewer Engineer Name: Billy Alves	 3/11/22
Role: BATH COVERED Name: DIVISION MANAGER WATER AND SEWER	 3/11/22

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## Appendix A Consideration of clause 171 factors

### Clause 171 Checklist

The following factors, listed in clause 171 of the *Environmental Planning and Assessment Regulation 2021*, have also been taken into account when assessing the likely impacts of the project on the natural and built environment.

Factor	Impact
<p>a. Any environmental impact on a community?</p> <p>There is the potential for some minor noise, odour, dust and traffic and access impacts during construction. Odour impacts could arise during operation, however these can be managed through mitigation measures.</p>	<p><i>Construction</i> - negative, short term.</p> <p><i>Operation</i> - odour impacts managed through mitigation measures.</p>
<p>b. Any transformation of a locality?</p> <p>The project will be contained within existing disturbed areas of roadsides and residential properties. Impacts to vegetated areas will be temporary and rehabilitated following completion of the works.</p>	<p><i>Construction</i> – negative, short term.</p> <p><i>Operation</i> – no impact expected.</p>
<p>c. Any environmental impact on the ecosystems of the locality?</p> <p>The project will be contained within existing disturbed areas such as roadsides and residential properties. Clearing of native vegetation is not required and significant impact to threatened species or communities is not likely.</p> <p>Minor impacts to areas of exotic vegetation may be required to install the project components. Measures have been proposed to ensure that impacts to ecosystems related to erosion and sedimentation and reduction in water quality are avoided.</p>	<p><i>Construction</i> - no direct impacts expected.</p> <p>Potential indirect impacts, managed through mitigation measures.</p> <p><i>Operation</i> – no impact expected</p>
<p>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>Temporary impacts to aesthetic values would be confined to construction and would be short term. No substantial long-term impacts to the environment are anticipated.</p>	<p><i>Construction</i> – negative, short term.</p> <p><i>Operation</i> - no impact expected.</p>
<p>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>One Aboriginal site was identified within the impact area and two Aboriginal sites were identified in close proximity to the study area.</p> <p>The study areas have been assessed as possessing low archaeological potential, however, it is recommended to confine the works to areas that have already been disturbed. Works in the vicinity of AHIMS site 62-7-0464 must be undertaken in accordance with the conditions of AHIP C0002143.</p> <p>The project has not been identified as having the potential to impact upon any historical heritage items or areas of historical archaeological significance. Whilst the proposed impact area is located within the curtilage of Brauer House, the proposed works will be largely conducted away from the house and are minor, subsurface works for the purpose of inputting essential services. The proposed works will have no significant impact on the visual, aesthetic or historic significance of the house. It is unlikely that there will be any impacts to any archaeological resource within the study area and as such, no further work will be required.</p>	<p><i>Construction</i> - no impact expected, provided works are restricted to areas that have already been disturbed and conditions of AHIP C0002143 are complied with for AHIMS site 62-7-0464.</p> <p><i>Operation</i> – no impact expected.</p>

Factor	Impact
<p>f. Any impact on the habitat of protected animals (within the meaning of the <i>Biodiversity Conservation Act 2016</i>)?</p> <p>Nil. The project will be contained within existing disturbed areas of roadsides and residential properties.</p> <p>No threatened species, populations or ecological communities listed under the BC Act or EPBC Act were likely to occur within the impact area and the project is not likely to have a significant impact on threatened species or their habitat.</p>	<p><i>Construction</i></p> <p>No direct impact expected.</p> <p>Potential indirect impacts – no significant impact likely.</p> <p><i>Operation</i></p> <p>No impact expected</p>
<p>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>Nil.</p> <p>Weed and pathogen introduction and spread has been assessed. It is considered unlikely that the project will result in significant impacts with the effective implementation of the management measures specified in this REF. No species of animal, plant or other form of life, whether living on land, in water or in the air would become endangered because of the project.</p>	<p><i>Construction</i></p> <p>No impact expected.</p> <p><i>Operation</i></p> <p>No impact expected</p>
<p>h. Any long-term effects on the environment?</p> <p>Nil. It is unlikely that the project would cause any no long-term effects on the environment.</p>	<p>No long-term effects on the environment expected.</p>
<p>i. Any degradation of the quality of the environment?</p> <p>Temporary minor degradation may occur during works due to minor excavation, noise, odour and dust emissions. Existing roads will be used for site access.</p>	<p><i>Construction</i> - short term negative, manageable through mitigation measures.</p> <p><i>Operation</i> – no impact expected</p>
<p>j. Any risk to the safety of the environment?</p> <p>The project would pose minimal risk to the safety of the environment provided appropriate mitigation measures are in place to avoid discharge of raw sewage during construction and commissioning of the project. There would be a long-term improvement to safety of the groundwater environment through upgrade of existing sewerage infrastructure.</p>	<p><i>Construction</i> – no, provided mitigation measures are implemented.</p> <p>Long term positive.</p>
<p>k. Any reduction in the range of beneficial uses of the environment?</p> <p>Nil</p>	<p>No</p>
<p>l. Any pollution of the environment?</p> <p>No discharges are anticipated provided appropriate erosion and sediment controls are in place and mitigation measures to avoid discharges of sewage during construction and commissioning of the project.</p>	<p><i>Construction</i> - short term negative, but manageable with mitigation measures.</p> <p><i>Operation</i> – no impact expected</p>
<p>m. Any environmental problems associated with the disposal of waste?</p> <p>The project would generate minimal waste associated with removal of building materials. Removal of vegetation is not required however any noxious weeds will be disposed of at a licence facility.</p>	<p><i>Construction</i> - short term negative, but manageable with mitigation measures.</p> <p><i>Operation</i> – no impact expected</p>
<p>n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>Nil</p>	<p><i>Construction</i> – not expected</p> <p><i>Operation</i> – not expected</p>
<p>o. Any cumulative environmental effect with other existing or likely future activities?</p> <p>There may be construction activities for different projects that occur in parallel (such as the Wallaga Lake Bridge maintenance planned to be undertaken by TfNSW, which could result in additional traffic, noise and vibration, visual and amenity and dust and sedimentation impacts. The project works the subject of this REF will be scheduled to minimise any</p>	<p><i>Construction</i> – short term negative, but manageable with mitigation measures.</p> <p><i>Operation</i> – not expected</p>



Factor	Impact
cumulative effects of separate projects that may be occurring in the area around the same time, in consultation with TfNSW.	
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? Nil.	<i>Construction</i> – not expected <i>Operation</i> – not expected