Shoalhaven Water

Lyrebird Park Nowra
Sewer Pumping Station (SPS 2) Upgrade
Review of Environmental Factors

December 2015

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To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *Were limited to the project scope and methodologies specifically detailed in Section 1.2 of this Report;*
- *Did not include field work or testing, with the exception of a site walk over and an Aboriginal Heritage Due Diligence Assessment; and*
- *Was prepared for the purpose of that detailed in Section 1.2 of this Report.*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ('Assumptions'), including (but not limited to):

- *The scope of proposal is limited to that discussed in Section 4.1 of this report; and*
- *It is assumed that there is sufficient existing information regarding all relevant aspects of the proposal contained in the reports and information sources as listed throughout to adequately review environmental impacts relating to the proposal.*

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

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Executive summary

Introduction

Shoalhaven Water is responsible for the collection, treatment and distribution of potable water and wastewater in the Shoalhaven local government area (LGA). The Nowra and Bomaderry wastewater treatment plants (WWTP) and their sewage collection systems which include mains, pumps and power supplies, currently manage the disposal and treatment of sewage for Nowra and Bomaderry. Shoalhaven Water hold environment protection licences (EPLs) under the Protection of the Environment Operations Act 1999 (POEO Act) to operate the WWTPs, EPL No.'s 1734 and 1735 for Nowra and Bomaderry WWTPs respectively.

A sewage pumping station (SPS) located within Lyrebird Park, Nowra (SPS2) pumps sewage to the Nowra WWTP and has been identified as not having sufficient capacity to meet existing and forecast demands, particularly during periods of wet weather. During and immediately following heavy rainfall events, the Lyrebird Park sewage pumping station overflows. Blockages have been occurring approximately every eight weeks causing diluted sewage to discharge from the overflow point directly into a drainage channel to the north of the site, ultimately draining to both the Shoalhaven River and Crookhaven Creek.

Objectives

The pumping station located at Lyrebird Park has insufficient storage and has limited pump capacity. Therefore the objective of the proposal is upgrade the emergency overflow storage and pumping capacity of SPS 2 to improve the performance and reliability of the infrastructure, to reduce the maintenance requirements and also to reduce the overflow impacts on the surrounding environment.

Description of the proposal

The proposal would include the following key features:

- Construction of a 12 m diameter concrete emergency overflow storage tank.
- Construction of a 5.2 diameter wet well.
- Installation of a new valve pit.
- Installation of new switchroom building.
- Installation of a new DN1200 inlet manhole directly west of the proposed wet well location.
- Installation of a sewage pipeline connecting the proposed emergency storage tank to a new inlet manhole to the north. Installation of a pipeline connecting the pre-existing sewer to the north to the new manhole and also the new manhole to the new wet well located directly east.
- Installation of a new 300 mm rising main pipeline approximately 20 m in length extending from the proposed wet well through the proposed valve pit and to the existing rising main located north-east of the site.

Planning process

Shoalhaven Water is classified as a public authority as it is a business unit of Shoalhaven City Council and is therefore the proponent and the determining authority for the proposal as prescribed under Section 110B of the *Environment Planning and Assessment Act 1979* (EP&A Act).

An REF is required if the determining authority considers that the proposal is unlikely to have a significant impact on the environment. If a determining authority decides the proposal would be likely to significantly affect the environment it must obtain and consider an environmental impact statement. Furthermore, if the proposal were to be carried out on land that is critical habitat, or if the determining authority decides the proposal would be likely to significantly affect a threatened species, population or ecological community or its habitat then it must obtain and consider a species impact statement.

As the Lyrebird Park SPS 2 Upgrade proposal is unlikely to have a significant impact on the environment, a REF has been prepared. No species impact statement is required as the proposal would not be carried out on land that is critical habitat and would not significantly affect a threatened species, population or ecological community or its habitat.

Summary of environmental impacts

During construction, there may be minor short-term adverse impacts associated with construction of the proposal. The main issues would be associated with:

- Noise, air quality, traffic and visual impacts due to the operation of machinery and equipment.
- Soil and water impacts associated with ground excavation and the associated potential for erosion and sedimentation and accidental spills of fuels and other chemicals during the construction phase.
- Soil and water impacts from the potential disturbance of acid sulphate soils.
- Potential impacts on parking and ongoing recreational use of the immediate area associated with Lyrebird Park.
- Soil and water impacts from the potential disturbance of acid sulphate soils.
- The management of groundwater during the construction phase associated with ground excavation.

It is considered that the potential environmental impacts listed above would be minimal due to the short-term nature of construction and the confinement of works to the immediate vicinity of the existing Lyrebird Park SPS site. Impacts would be further mitigated through the implementation of mitigation measures.

Operational impacts of the proposal would be minimal and are expected to be improved as a result of the proposal, particularly those associated with the uncontrolled release of dilute wastewater to the surrounding environment and subsequent impacts on downstream water quality. Long term adverse visual impacts due to the construction are anticipated to be minor and only include new fencing and a new switchboard building within the site area. These impacts are unlikely to significantly degrade the quality of the environment, and the overall impact would be minimised through appropriate mitigation measures during design and construction.

The proposal is unlikely to have a significant environmental impact provided the mitigation measures outlined in this REF are implemented.

Environmental management

The contractor would prepare a construction environmental management plan (CEMP) prior to the commencement of construction. The CEMP would incorporate the mitigation measures and requirements outlined in this REF.

Recommendation to proceed

The proposal is considered to benefit the community and the environment by improving the performance and reliability of the infrastructure.

Overall, potential impacts associated with the proposal are considered to be minor and can be adequately managed by implementing the mitigation measures outlined in Section 7 of this REF. The proposal is unlikely to have a significant impact on the environment.

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1. Introduction

1.1 Background to the proposal

Shoalhaven Water is responsible for the collection, treatment and distribution of potable water and wastewater in the Shoalhaven local government area (LGA). The Nowra wastewater treatment plant (WWTP) and the sewage collection system (including mains, pumps and power supplies) currently manage the disposal and treatment of sewage for the main catchments within Nowra. Shoalhaven Water hold an environment protection licences (EPL), EPL No. 1734, under the Protection of the Environment Operations Act 1999 (POEO Act) to operate the Nowra WWTP.

A sewage pumping station (SPS) located within Nowra sewage collection system (SPS 2) pumps wastewater to the Nowra WWTP and has been identified as having insufficient capacity to meet existing and forecast demands, particularly during periods of wet weather. This results in release of untreated wastewater during and immediately following heavy rainfall. Blockages have been occurring approximately every eight weeks causing diluted sewage to discharge from the overflow point directly into a drainage channel to the north of the site, ultimately draining to both the Shoalhaven River and Crookhaven Creek.

1.1.1 Lyrebird Park Pumping Station

SPS 2 is located between sporting fields in Lyrebird Park, Nowra. The site is located within a fenced compound with a sealed hardstand area on property owned by Shoalhaven City Council - Lot 1 DP 1127303. Access to the site is via Lyrebird Place, a sealed road off St Anns Street, Nowra. The existing SPS consists of a wet well with an approximate 6.9 m internal diameter, surrounding a dry well of approximate 2.7 m internal diameter.

During periods of heavy rainfall the volumes of transported sewage in the sewage supply network can greatly increase due to infiltration caused by pipe cracks, tree root damage and illegal sewage pipe connections. This increased sewage flow places a spike in demand on the Lyrebird Park pumping station and as a result, when the system's pumping capacity is exceeded by supply, an overflow occurs and untreated wastewater is discharged directly into the drainage channel running parallel to the sports grounds at the park.

Shoalhaven Water proposes to upgrade the Lyrebird Park pumping station to improve the performance and reliability of the infrastructure, and to reduce the sewage overflow impacts on the surrounding environment. This would ensure a reduction of localised sewage discharge events.

1.2 Purpose of this REF

Shoalhaven Water has engaged GHD Pty Ltd (GHD) to prepare this Review of Environmental Factors (REF) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the proposed upgrade of the Lyre Bird Park SPS2 pumping station (the proposal).

Shoalhaven Water is classified as a public authority under Section 4 of the EP&A Act, and is also the determining authority for the proposal under Part 5 of the Act. Under Section 111 of the EP&A Act, Shoalhaven Water is responsible for assessing all matters affecting or likely to affect the environment from the proposal.

This REF assesses the potential environmental impacts associated with the proposal. It uses the Department of Planning and Infrastructure (DPI) guideline (DPI, 1999) to determine the following:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for further approval under the EP&A Act.
- The significance of any impact on threatened species as defined by the TSC Act, in Section 5A of the EP&A Act and therefore the requirement for a species impact statement.
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environmental Protection and Biodiversity Conservation Act 1999 (*EPBC Act).

For the purposes of this REF, the following definitions are employed:

- The 'proposal' refers to the proposed upgrades to the Lyrebird Park Nowra Sewage Pumping Station 2 (SPS2), as described in Section 2.1.
- The 'proposal site' is located off Lyrebird Place, and to the immediate south of the Lyrebird Sports Park. The proposal site, or site refers to Lot 1 DP 1127303 owned by Shoalhaven City Council which includes the existing sewage pumping station and associated infrastructure, the existing overflow outlet into a drainage channel located to the north, the proposed site of the emergency storage tank and associated infrastructure (refer to Figure 1-1 for the proposal site location and Appendix B for concept design plans).
- The 'study area' is defined as the proposal site and the surrounding area generally within 50 m of the proposal site for which environmental constraints have been identified and assessed.

The potential impacts of the proposal have been considered against the matters listed in Clause 228 of the EP&A Regulation 2000 and are summarised in Appendix A. This REF also specifies the measures that need to be implemented to avoid or minimise potential environmental impacts from the proposal.

1.3 Scope and limitations

This report has been prepared by GHD in response to a specific request by Shoalhaven Water. This report is intended for the sole use of Shoalhaven Water. It has been prepared in accordance with the Terms of Engagement for the commission and on the basis of specific instructions and information provided by Shoalhaven Water.

Assessment of the proposal was based on observations during the site inspection/s and review of relevant documents. Reasonable efforts were made to obtain information relevant to the scope of the review. The accuracy with which specific issues have been identified depends on the information available and the quality of information reviewed. Evidence of environmental issues is not always obvious by visual inspection, and such issues may not have been manifested at the time of the inspection/s.

The contents and conclusion of this report may be inappropriate for any third party in the context of that third party's particular purposes and circumstances. Any party other than those above should obtain its own independent information or advice and no responsibility is accepted and no duty of care is assumed by GHD to any third party who may use or rely on the whole or any part of the content of this document.

This document does not purport to provide legal advice and any conclusions or recommendations herein must not be relied upon as a substitute for such advice.

This report should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances which arise from the issue of the report which has been modified other than by GHD.

Legend

- Property Boundary
- Intersection
- Railway
- Road
- Waterways
- Pump Station
- Rising Main
- Surcharge Main
- Study Area
- Current SPS2 Area

1:2,000 (at A4)

0 10 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Shoalhaven Water
Lyrebird Park SPS2 Nowra

Site locality and waterways

Job Number 23-14266-02
Revision A
Date 18 Jun 2015

Figure 1-1

N:\AU\Nowra\Projects\23\1426651\GIS\Working\23-1426651_Site Locality and waterways.mxd 2/57 Graham Street Nowra NSW 2541 Australia T 61 2 4424 4900 F 61 2 4424 4999 E noamail@ghd.com W www.ghd.com

Data source: ShoalWater (Water & Wastewater data, Cadastre & planning, Aerial Image). Created by:jcurran

2. Description of the proposal and activities

2.1 Site location

The proposal site is located at the northern end of Lyrebird Drive, Nowra within the Shoalhaven City LGA (refer to Figure 1). The existing pump station is located on Lot 1 of DP 1127303. Lyrebird Sports Park borders the proposal site to the north and a drainage channel is located adjacent to the east of the proposal site.

Nowra is typified by low density residential properties, with retail businesses concentrated in the city centre (approximately 1 km north-west of the site) and at South Nowra (approximately 3.5 km south of the site).

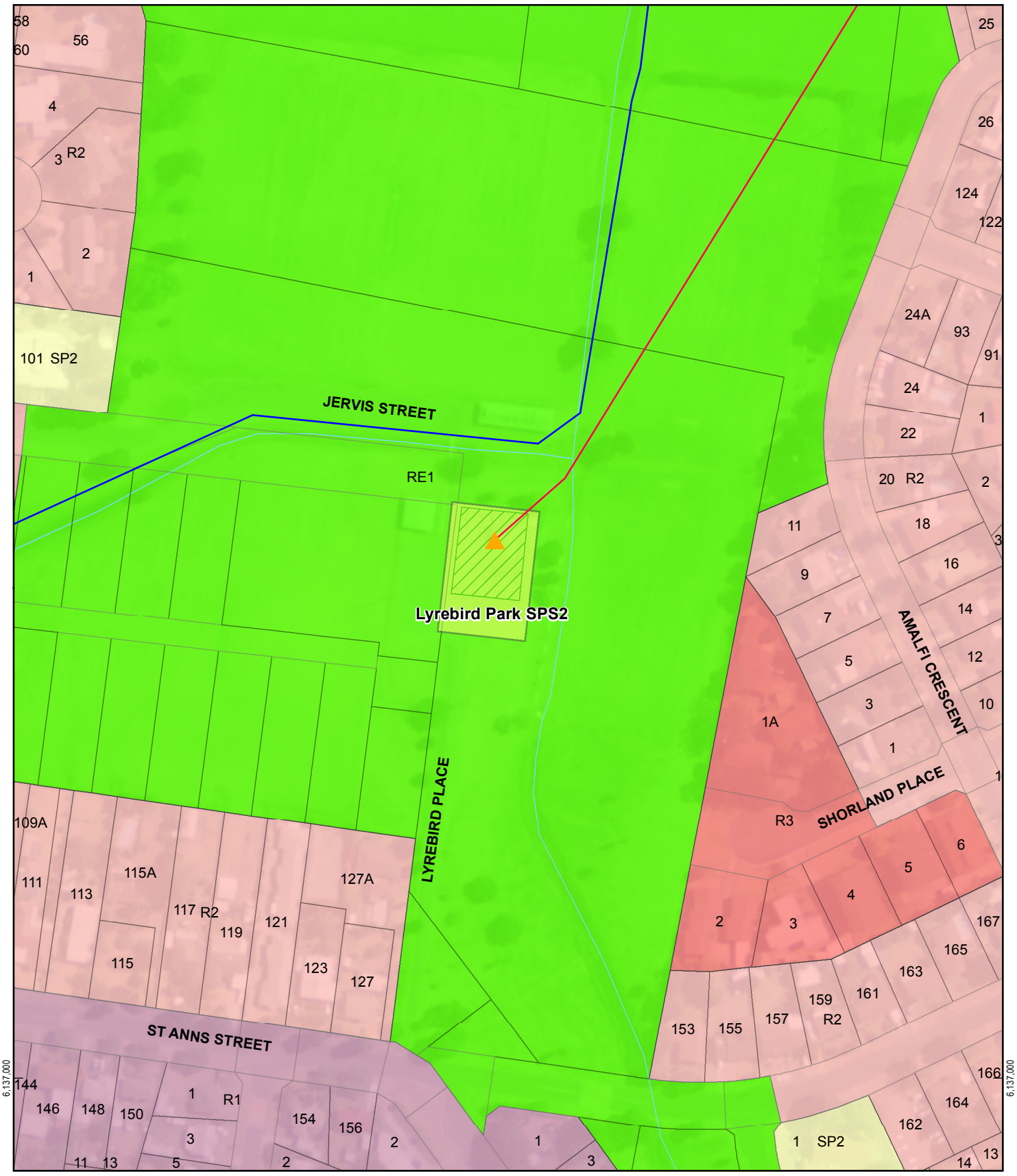
Under the *Shoalhaven Local Environmental Plan 2014* (the 'Shoalhaven LEP'), the proposal site is located within an area zoned RE1, Public Recreation as shown in Figure 2-1.

2.2 Scope of work

The proposed works primarily involve the construction of a larger emergency wastewater storage tank and a new wet well. This will improve the operation and efficiency of the pump system and the wider sewerage network as described in Section 4.2, *Objectives of the proposal.*

The key features of the proposed works are shown in the concept design plans (Appendix B) and include the following:

- Compound extension to the south by approximately 15 m.
- New emergency storage tank with approximate external diameter of 12 m and depth of 4.5 m.
- New wet well with an approximate external diameter of 5.2 m and depth of 7.2 m.
- New valve pit with approximate dimensions of 3.3 m wide, 4 m long and 2.3 m deep.
- New air valve on the new section of rising main.
- New 225 mm diameter vent shaft approximately 6.0 m high.
- New switch room building approximately 5.5 m by 4m
- New 300 mm rising main approximately 20 m in length extending northeast from the eastern side of the compound and new sewer main connections within the site.
- New internal access road / pavement layout to allow 3-point turning of site vehicles.



Legend

- Pump Station
- Rising Main
- Surcharge Main
- Study Area
- Current SPS2 Area
- Waterways

Zoning

- R1, General Residential
- R2, Low Density Residential
- R3, Medium Density Residential
- RE1, Public Recreation
- SP2, Infrastructure

1:2,000 (at A4)

0 10 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Shoalhaven Water
Lyrebird Park SPS2 Nowra

Land Zoning

Job Number	23-14266-02
Revision	A
Date	18 Jun 2015

Figure 2-1

N:\AU\Nowra\Projects\23\1426651\GIS\Working\23-1426651_Land Zoning1.mxd 2/57 Graham Street Nowra NSW 2541 Australia T 61 2 4424 4900 F 61 2 4424 4999 E noamail@ghd.com W www.ghd.com

Data source: ShoalWater (Water & Wastewater data, Cadastre & planning, Aerial Image). Created by:jcurran

2.3 Proposed pre-construction and construction activities

2.3.1 Pre-construction activities

In general, the following pre-construction activities would be required to be completed at the proposal site:

- Notifying relevant authorities and stakeholders, including potentially affected community and nearby residents, of the commencement of work.
- Installing environmental controls in accordance with the construction environmental management plan (CEMP) which is to be prepared by the nominated contractor following contract award.
- Establishing a site compound suitable for stockpiling of excavated soil and imported materials, laydown of pipes, storage of plant and equipment and site amenities. The site compound would be fenced and secured.
- Locating services using both Dial Before You Dig (DBYD) enquiries and onsite service location.
- Clearing and grubbing of construction footprint area, as required. Clearing of any vegetation would be avoided with the exception of the vegetation detailed in Section 6.3. If required, any additional vegetation removal or root removal would be in consultation with Shoalhaven City Council and would be undertaken in accordance with Shoalhaven City Council's tree removal guidelines.

2.3.2 Excavation requirements

Excavation for the proposal at the proposal site would involve the following:

- Excavation for the construction and / or installation of the new emergency storage tank, the new wet well and the associated valve pit. The dimensions of these structures are detailed above in Section 2.2 and are provided in the concept design drawings, included as Appendix B. It should be noted that the excavation dimensions will be up to 25% - 30% larger than the dimension of the structures as shown in the concept design plans to allow for safe access and general excavation safety measures including benching and shoring if required.
- Removal of existing surface and sub-surface materials to approximately 300 mm to 400 mm below ground level (bgl) for the installation of the new access road.
- Trench excavation of up to approximately 1.2 m wide, 20 m long and to depths between 1.0 m and 5.5 m bgl for the installation of a new rising main from the new wet well to the existing rising main.
- Trench excavation of approximately 1.0 m wide, 12 m long and a depth of 3.8 m bgl for the installation of the connecting sewer main pipeline from the proposed storage tank to the new DN1200 manhole.
- Trench excavation of approximately 0.6 m wide, 20.0 m long and 1.0 deep for the connecting sewer between the new wet well and the new emergency storage tank.

2.3.3 Pipeline construction

The general construction sequencing for pipework installation and connection is as follows:

- Removal and stockpiling of topsoil for later reinstatement.

- Pipe trench excavation and stockpiling on the up-gradient side of the trench where possible.
- Placement of bedding material (clean sand or similar) in the trench to the nominal depth.
- Placement of the pipelines into the trench using backhoes, slings or similar. The pipes would be laid out 'end to end' adjacent to the excavation to enable easy placement within the trench.
- Connection of the pipeline lengths to the various tank structures, the manhole or existing sewer pipeline as required.
- Placements of trench fill to a minimum cover to the top of pipe of 450 mm. This would comprise the excavated subsoil materials.
- Reinstatement of topsoil and surface materials.
- Rehabilitation and re-vegetation, including seeding and ground stabilisation as required.

2.3.4 Fill material

The extended and improved access road at the proposal site would be constructed above the existing ground level using a suitable sub-base material such as a medium sized stone aggregate or similar. The road construction would require compaction of this material and be finished with an asphalt surface.

In addition, importation of suitable material (bedding sand or similar) would be required for the installation of the new tanks and connecting pipelines.

2.3.5 Dewatering

First priority would be to avoid the need for any dewatering of excavations. In the event that groundwater is encountered at volumes requiring dewatering, any captured ground water would be pumped into adjoining sections of the active excavation (trenches for pipelines and pit for tank installations) for groundwater recharge back into the vicinity from which it originated.

Where dewatering is required and the disposal of water cannot be managed within the excavated area, the water would be controlled and treated (sediment removal) before being released into the downstream receiving environment. The discharge point would be determined during construction planning with suitable control measures detailed in the CEMP that would be prepared by the nominated contractor. Consideration of licensing, permits and consultation should be detailed within the CEMP and considered by the Contractor during the construction planning phase. Refer to Section 3.4.5 for further detail with regards to permits and licensing associated with groundwater dewatering.

Where sediment removal cannot be managed on site, or the water is potentially contaminated, a licenced liquid waste removal contractor would be engaged and all water would be taken from site and disposed at a suitably licensed waste management facility.

2.3.6 Fence installation

During the construction phase of the project, temporary fencing would be installed in the form of portable fencing panels or similar. The purpose of the construction fencing would be to discourage unauthorised entry and to increase security on site.

As part of the proposal, permanent security fencing would be provided around the perimeter of the proposal site to protect the infrastructure from vandalism and to discourage the entry of unauthorised persons and animals. The style and type of fencing would be in line with Shoalhaven Water guidelines and would reflect the fencing style of the existing compound.

2.3.7 Restoration and rehabilitation works

Disturbed areas would be rehabilitated using the following principles:

- Stockpiled surface debris, turf and retained vegetation would be returned to the excavated areas (where applicable) immediately following backfilling to minimise the exposure of bare soil.
- Backfilling and compaction of excavated areas (where applicable) using the stored stockpiles so that the soil profile is restored in the correct order.
- Provision of appropriate hydro mulching, planting of vegetation and other landscaping works (consistent with the character of the surrounding environment) to stabilise exposed ground and ensure that the resultant structures are as visually unobtrusive as practicable.

2.4 Materials and equipment

Plant and equipment for the proposal would be determined during the construction planning phase. An indicative list of plant and equipment likely to be used for the proposal includes:

- Front-end loaders.
- Excavators.
- Back hoes.
- Concrete agitator trucks.
- Mobile cranes.
- Diesel generators.
- Flat-bed delivery vehicles.
- Semi-trailer (or truck and dog).
- Site personnel vehicles.
- Water cart.
- Street sweeper.

2.5 Worksites, site access and vehicle movement

2.5.1 Construction compound

A construction compound site would be established at Lot 1 DP 1127303. The exact location and layout of the compound sites would be determined by the construction contractor and would be detailed on a location plan prepared as part of the construction contractor's CEMP. The CEMP would be approved by Shoalhaven Water prior to construction commencing. Where possible, the temporary compound would be located away from any creek-lines / watercourses and within an area previously cleared of vegetation.

The site compound would be used to stockpile inert materials, store plant and equipment and to provide for construction staff parking, toilets and amenities. Chemicals and fuels for construction would not be stored at the compound site.

2.5.2 Property access

The site would be accessed via the existing Lyrebird Place off St Anns Street. The site would not require access to private property during construction.

2.5.3 Vehicle movements

It is anticipated that during the peak construction period for the works (during the concrete pour associated with the construction of the emergency storage tank) up to 15 heavy vehicles would be using the site access daily. This equates to an additional 30 traffic movements of heavy vehicles. With regards to light vehicles, it is anticipated that the site work force would peak at approximately 5 - 8 site personnel at any one time and therefore the traffic generated from this would equate to an additional 10 - 16 light vehicle traffic movements per day.

Site personnel vehicles would be parked within designated parking areas within the site compound and areas immediately adjacent. Any areas required for on-site vehicle parking should be identified in the Contractor's CEMP for approval by Shoalhaven Water prior to the commencement of construction.

2.6 Workforce and timeframe

The construction workforce would vary according to the contractor's equipment and techniques. As indicated above, indicative average site personnel numbers during construction would be in the order of 5 – 8 personnel and would probably peak during the construction of the emergency storage tank on site.

These numbers would vary and would be dependent on the nature of the works being undertaken on the site. Work is proposed to commence early 2016 with a total construction period of approximately 6 months.

Construction activities would occur during the standard hours set out in the *Interim Construction Noise Guideline* (DECC, 2009):

- Mondays to Fridays between 7 am and 6 pm;
- Saturdays between 8 am and 1 pm; and
- No work would occur on Sundays or public holidays.

There is potential that work would be required outside the standard hours. In the event out of hours work is required, the Contractor would request permission from Shoalhaven Water to undertake work outside standard hours. The Contractor would determine whether any additional mitigation measures would be required. This may include the need to notify surrounding residents and implement additional measures to manage potential impacts.

The contractor would notify the NSW Environmental Protection Authority (EPA) in the event that out of hours work was required.

Local residents would be informed of the timing and duration of the work likely to affect their locality prior to commencement.

2.7 Changes to the scope of work

If the scope of work or construction methods described in this REF change during the detailed design or construction, the Project Manager must consult Shoalhaven Water to determine whether additional environmental assessment is needed. Additional consultation may also be required should the scope of works change.

2.8 Operation of the system

Once operational, the new infrastructure at the proposal site would be operated and managed by Shoalhaven Water in accordance with the procedures applied to the remainder of the sewerage system. Routine maintenance at the site would consist of works that are already in place, as well as the maintenance of the new storage tank, wet well and valve pit.

Maintenance requirements of the proposal would be on an as required basis with an anticipated maintenance staff attendance rate of less than 1 day per week (accumulative) at the site. Remote monitoring would occur 24 hours per day and 7 days per week.

3. Statutory planning context

3.1 Environmental Planning and Assessment Act 1979

Development in NSW is assessed in accordance with the provisions of the EP&A Act and the EP&A Regulation. The EP&A Act institutes a system for environmental assessment, including approvals and environmental impact assessment for proposed developments. The EP&A Act contains three parts that impose requirements for planning approval:

- Part 4 provides for control of 'local development' that requires development consent from the local Council. State significant development, is also assessed under Part 4 (Division 4.1).
- Part 5 provides for control of 'activities' that do not require approval or development consent under Part 4.
- Part 5.1 provides for control of State significant infrastructure.

The need or otherwise for development control is set out in environmental planning instruments – State Environmental Planning Policies (SEPPs), Regional Environmental Plans that are now deemed SEPPs, or Local Environmental Plans (LEPs).

As outlined in Section 3.3.1, the proposal is permissible without consent and therefore has been assessed under Part 5 of the EP&A Act.

3.1.1 Part 5 of the EP&A Act

Under Part 5 of the EP&A Act, a determining authority is defined as:

'a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out'.

Shoalhaven Water is classified as a public authority and is therefore the proponent and the determining authority for the proposal as prescribed under Section 110B of the EP&A Act.

A REF is required if the determining authority considers that the proposal is unlikely to have a significant impact on the environment. If a determining authority decides the proposal would be likely to significantly affect the environment it must obtain and consider an EIS. Furthermore, if the proposal were to be carried out on land that is critical habitat, or if the determining authority decides the proposal would be likely to significantly affect a threatened species, population or ecological community or its habitat, then the determining authority must obtain and consider a species impact statement.

As the proposal is unlikely to have a significant impact on the environment, a REF has been prepared. No species impact statement is required as the proposal would not be carried out on land that is critical habitat and would not significantly affect a threatened species, population or ecological community or its habitat (refer to Section 6.3).

Factors that need to be taken into account when considering the likely impact of an activity on the environment are outlined in Clause 228 of the EP&A Regulation and are discussed in Appendix A.

3.2 Local environmental plan

3.2.1 Shoalhaven Local Environmental Plan 2014 (LEP)

Shoalhaven Local Environmental Plan 2014

The proposal site is located within the Shoalhaven City LGA and therefore the Shoalhaven LEP applies. The proposal site is located within an area zoned RE1, Public Recreation (refer to Figure 2-1).

The provisions of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) override any development consent requirements of the Shoalhaven LEP (refer to Section 3.3.1). Therefore the proposal would not require development consent from Council and Shoalhaven Water would be the determining authority.

3.3 State Environmental Planning Policies

3.3.1 State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)

The ISEPP includes provisions which permit the proposal to be undertaken without development consent, thereby enabling it to be assessed under Part 5 of the EP&A Act.

The proposal would be defined as a sewerage system under the ISEPP which includes sewerage reticulation systems. Under Clause 105 a sewerage reticulation system is defined as:

Sewage reticulation system *means a facility for the collection and transfer of sewage to a sewage treatment plant or water recycling facility for treatment, or transfer of the treated water for use or disposal, including associated:*

(a) Pipelines and tunnels

(b) Pumping stations

(c) Dosing facilities

(d) Odour control works

(e) Sewage overflow structures

(f) Vent stacks

Under Division 18 Clause 106(3), development for the following purposes may be carried out:

*(g) Development for the purpose of sewage reticulation systems may be carried out by or on behalf of a public authority or any person licensed under the '*Water Industry Competition Act 2006*' without consent on any land.*

The proposal involves upgrading a sewage reticulation systems through an increase of the emergency storage capacity and pumping efficiency at the proposal site by Shoalhaven Water, a public authority. Therefore the proposal can be carried out without development consent under the ISEPP.

3.3.2 State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44)

SEPP No. 44 encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free-living populations would be maintained over their present range across 107 LGAs. Schedule 1 identifies Shoalhaven as a LGA to which SEPP 44 applies.

Local councils cannot approve development in an area affected by the policy without an investigation of core koala habitat. The policy provides the state-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of koalas and their habitat. SEPP 44 aims to identify areas of potential and core Koala habitat. These are described as follows:

- Potential Koala Habitat is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and
- Core Koala Habitat is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

The proposal site is not associated with potential or core koala habitat due to the absence of native vegetation at the site.

3.3.3 State Environmental Planning Policy No 71 – Coastal Protection

State Environmental Planning Policy No. 71 – Coastal Protection (SEPP 71) controls development within the Coastal Zone (as defined under the Coastal Protection Act 1979). As the proposal is located in close proximity to the Shoalhaven River (and tributaries), the proposal is considered to be located within the coastal zone.

SEPP No. 71 – Coastal Protection however, does not apply to the proposal because it is able to be undertaken without consent due to the application of Clause 106 of the Infrastructure SEPP. Never-the-less, the matters for consideration listed in Clause 8 of SEPP 71 should be considered when assessing the potential impacts.

The aims of SEPP 71 have been met for the proposal as demonstrated below in Table 3-1.

Table 3-1 SEPP71 (Coastal Protection) – Aims and proposal implications for the Coastal Zone

SEPP No. 71 Aims		Implications of the proposal
A	To protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast.	The undertaking of the proposal would have no adverse impacts upon the natural, cultural, recreational or economic values of the coast. The aim of the proposal is to improve the hydraulic capacity within the Nowra sewerage system.
B	To protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore.	The undertaking of the proposal would have no adverse impact upon public access to and along the coastal foreshore.
C	To ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore.	The proposal is not associated with any opportunities for public access to and along the coastal foreshore. This aim is therefore not relevant to this proposal.
D	To protect and preserve Aboriginal cultural heritage, and Aboriginal	A review of Aboriginal heritage has been undertaken for this proposal and specific mitigation

SEPP No. 71 Aims		Implications of the proposal
	places, values, customs, beliefs and traditional knowledge.	measures have been nominated to minimise impacts to Aboriginal heritage (refer to Section 6.7). It was concluded that provided that the appropriate mitigation measures and controls are implemented as per Section 6.7.3, potential impacts to Aboriginal heritage would be negligible.
E	To ensure that the visual amenity of the coast is protected.	The proposal is not likely to adversely impact the visual amenity of the coast. The proposal involves the upgrade of an existing operating sewage pumping station away from any coastal features and major coastal tributaries.
F	To protect and preserve beach environments and beach amenity.	Beach environments and beach amenity would not be impacted by the proposal.
G	To protect and preserve native coastal vegetation.	This proposal would not impact upon any native coastal vegetation.
H	To protect and preserve the marine environment of New South Wales.	This proposal would not result in the degradation of the adjacent marine environment.
I	To protect and preserve rock platforms.	This activity would have no impact on rock platforms.
J	To manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the *Protection of the Environment Administration Act 1991*).	The undertaking of the proposal would not compromise the principles of ecologically sustainable development.
K	To ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area.	The size and scale of the proposal has been strategically designed to ensure the requirement of the system can adequately cope with the receiving loads and demands. The size and scale of the proposal is considered appropriate for the location, and impact on the natural scenic quality of the surrounding area is expected to be negligible provided appropriate landscaping and sensitive design is implemented.
L	To encourage a strategic approach to coastal management.	The proposal is consistent with the overall strategic approach to coastal management, providing necessary infrastructure to meet the demands of the growing population whilst minimising impact on the environment.

3.3.4 Illawarra Regional Environmental Plan No. 1

The Illawarra Regional Environmental Plan No. 1 applies to land within the Shoalhaven LGA. It provides objectives and specific controls for certain types of development within the Illawarra region.

There are no specific development control provisions that relate to the proposal.

3.4 Other NSW legislative considerations

3.4.1 Heritage Act 1977

The *Heritage Act 1977* is concerned with all aspects of conservation ranging from the most basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.

Heritage places and items of particular importance to the people of NSW are listed on the NSW State Heritage Register. There are no State heritage items listed on the register for the proposal site.

Section 139 of the *Heritage Act 1977* prohibits a person from disturbing or excavating any land on which the person has discovered or exposed a relic, except in accordance with an excavation permit or a notification granting exception for the permit.

As discussed in Section 6.8, the proposal would not impact on any non-Aboriginal heritage items providing the mitigation measures in this REF are implemented.

3.4.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides the statutory framework for biota of conservation significance in NSW. The TSC Act aims to, among other things, 'conserve biological diversity and promote ecologically sustainable development'. It provides for:

- The listing of threatened species, populations and ecological communities, with endangered species, populations and communities listed under Schedule 1, critically endangered species and communities listed under Schedule 1A, vulnerable species and communities listed under Schedule 2.
- The listing of Key Threatening Processes under Schedule 3.
- The preparation and implementation of Recovery Plans and Threat Abatement Plans.
- Requirements or otherwise for the preparation of a Species Impact Statement.

The TSC Act has been addressed in this REF through:

- Desktop review to determine the threatened species, populations or ecological communities that have been previously recorded close to the study area and consequently could occur within the proposal site.
- Identifying and assessing endangered ecological communities listed under the Act.
- Identifying impact mitigation and environmental management measures to be implemented, where required.
- Assessing the potential significance of impacts on threatened biota, in accordance with section 5A of the EP&A Act.

This assessment concluded that the proposal is unlikely to significantly impact on any threatened species, populations or communities listed under the TSC Act (refer to Section 6.3).

3.4.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for the legal protection and management of Aboriginal sites and objects in NSW. The implementation of the Aboriginal heritage provisions in the Act is the responsibility of the NSW Office of Environment and Heritage (OEH). The NPW Act was amended in 2010 with the major changes relating to due diligence and liability associated with impacts on items of Aboriginal heritage significance.

Section 86 states that:

(1) A person must not harm or desecrate an object that the person knows is an Aboriginal object.

(2) A person must not harm an Aboriginal object.

(4) A person must not harm or desecrate an Aboriginal place.

(5) The offences under subsections (2) and (4) are offences of strict liability and the defence of honest and reasonable mistake of fact applies'.

Section 87 prescribes defences available under the NPW Act which include:

- The harm or desecration was authorised by an Aboriginal Heritage Impact Permit (AHIP) (Section 87(1)(a)).
- The defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed (Section 87(2)).
- That the act or omission constituting the alleged offence is prescribed by the regulations as a low impact act or omission (Section 87(4)).

The strict liability offence of harming Aboriginal objects has a number of defences, including the statutory defence of due diligence, which can include compliance with an adopted industry code of practice. The need to follow a due diligence process is removed if the proponent is carrying out a low impact activity as defined in the *National Parks and Wildlife Regulation 2009*.

The Department of Environment, Climate Change and Water's (DECCW) *Due Diligence Code of Practice* (DECCW, 2010a) assists individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for consent in the form of an AHIP.

As part of the Aboriginal heritage due diligence assessment (Artefact Heritage, 2015) an inspection of the study area was undertaken on foot by Artefact Heritage archaeologists Alexander Timms and Andrew Crisp on 27 March 2015. Graham Smith from the Nowra Local Aboriginal Land Council (NLALC) also attended the site inspection. Based on this background information, data from nearby archaeological investigations, known levels of disturbance at the proposal site, and position on a landform of low archaeological sensitivity; it is considered that the study area has low potential to contain Aboriginal objects or buried archaeological deposits.

The main aims of the inspection were to identify any Aboriginal sites within the study area and assess archaeological potential. Further details regarding the process, findings and recommendations of the Aboriginal heritage due diligence assessment are provided in Section 6.7. Provided the recommended mitigation measures are implemented, the proposal is unlikely to impact on any known items of Aboriginal heritage significance and can proceed with caution.

3.4.4 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the NV Act. Excluded land under Schedule 1 of

the NV Act includes National Parks and other conservation areas, State forests and reserves, and urban areas. Specifically, urban areas, which are excluded, include areas zoned residential (but not rural residential), village, township, industrial or business.

Under Clause 25, the NV Act provides that "This Act does not apply to the following types of clearing of native vegetation:

(g) any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the EP&A Act if the determining authority has complied with that Part.

The clearing of vegetation is to be minimised where possible during the detailed design and construction planning phases. Regardless, approval under the NV Act is not required to clear native vegetation because the proposal would be carried out by a determining authority within the meaning of Part 5 of the EP&A Act.

3.4.5 Water Management Act 2000

The *Water Management Act 2000* (WM Act) controls the extraction of and use of water, the construction of works such as dams and weirs, and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined very broadly and include any river, lake, estuary or place where water occurs naturally on or below the surface of the ground, and NSW coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the WM Act (Section 91E). Under the WM Act, 'waterfront land' is defined as land within 40 m of a river, lake, estuary or shoreline. A river includes 'any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and any tributary, branch or other watercourse into or from which a watercourse (as described above) flows'.

The proposal would involve works within 40 m of a man-made minor drainage channel and therefore it is not considered to trigger the need for a controlled activity approval under Section 91 of the WM Act. Regardless of this interpretation of the definition of the adjacent drainage channel, pursuant to Clause 38 of the *Water Management (General) Regulation 2004*, public authorities are exempt from the requirements of Section 91 of the WM Act. As Shoalhaven Water is a public authority, approval is not required under Section 91 of the WM Act providing the works are undertaken by Shoalhaven Water or on behalf of Shoalhaven Water.

An aquifer interference approval may however be required for any works that involve:

a. The penetration of an aquifer.

b. The interference with water in an aquifer.

c. The obstruction of the flow of water in an aquifer.

d. The taking of water from an aquifer in the course of carrying out mining, or any other activity prescribed by the regulations.

e. the disposal of water from an aquifer as referred to in paragraph (d).

The proposal site is located on the Shoalhaven River floodplain, which experiences a high degree of natural variation in groundwater levels. It is likely that given the depth of excavation required (in excess of 5 m for some locations), groundwater interception is likely, particularly after periods of heavy rainfall.

The Project may therefore be considered an "aquifer interference activity" under a strict interpretation of the WM Act. An aquifer interference approval would therefore be required under section 91 of the WM Act.

When determining whether an aquifer interference approval is required, the NSW Office of Water has published two documents that must be considered:

a. The NSW Aquifer Interference Policy; and

b. The "Aquifer Interference Assessment Framework - assessing a proposal against the NSW Aquifer Interference Policy - step by step guide".

The Aquifer Interference Policy states that its purpose is to explain the role and requirements of the Minister in administering the WM Act in the water licensing and assessment processes for aquifer interference activities under the WM Act. The Aquifer Interference Policy further provides that it "clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation." Similarly, the Aquifer Assessment Framework states that it outlines "the basic framework which the NSW Office of Water uses to assess project proposals against the NSW Aquifer Interference Policy".

Section 3.3 of the Aquifer Policy provides a list of "defined minimal impact aquifer interference activities" that are considered as having a minimal impact on water-dependent assets, including (relevantly):

- Trenching and costeaning.
- Construction and ongoing use of waste liquid/ effluent storage and irrigation reuse schemes providing these are carried out in accordance with their planning and other approvals.

The Aquifer Assessment Framework provides that if an activity is a defined minimal impact aquifer interference activity according to section 3.3 of the Aquifer Policy, then "no further assessment against this policy is required."

As the Project relates to works which may intercept or interfere with an aquifer in relation to excavation works associated with the construction of waste liquid storage infrastructure and further assessment is not required against the Aquifer Interference Policy or Aquifer Assessment Framework, an aquifer interference activity approval is not considered to be required under the WM Act in relation to the proposal.

A water licence is also typically required (unless an exemption applies or water is being taken under basic landholder right) where an aquifer interference activity causes the removal of water from a water source or the transfer of water from one water source to another. Approvals may also be required for both the construction of a water supply work and the use of water from a water source.

However, there is no specific exemption to remove the need for a licence for water take under Section 60A (1) and (2) for any water that needs to be dewatered from the construction zone.

The Project is not anticipated to intercept significant groundwater resources and any impacts would be limited to a discontinuous perched aquifer. Many public authorities have agreements in place with the NSW Office of Water (NOW) for small scale dewatering associated with construction activities and NOW typically do not require a licence for construction activities requiring dewatering of less than 3 ML. If water cannot be managed within the existing open trench or pit within the SPS site, then the need for a Licence will need to be discussed with the NSW Office of Water. The contractor will need to calculate anticipated groundwater ingress and preferred management strategy in considering the need for a licence.

3.4.6 Protection of the Environmental Operations Act 1997

The *Protection of Environment Operations Act 1997* (POEO Act) focuses on protecting, restoring and enhancing the environment within New South Wales and through the use of

various mechanisms, reduce potential risks to human health and the environment. It aims to provide opportunity for increased public involvement and access to information regarding environmental protection.

The proposal does not meet the definition of a scheduled activity under the Schedule 1 of the POEO Act and therefore a construction licence would not be obtained. The proposal would be operated as part of the Nowra sewage system which has an environment protection license (EPL No. 1734). EPL conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice. The proposal would operate under the conditions of the licence.

3.5 Commonwealth legislation

3.5.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities, and heritage items. The EPBC Act applies to all land, waters, seabed and airspace in, under or above Australia.

Approval under the EPBC Act is required for an:

- Action which has, would have or is likely to have a significant impact on 'matters of national environmental significance' (MNES).
- Action by the Commonwealth or a Commonwealth agency which has, would have or is likely to have a significant impact on the environment.
- Action on Commonwealth land which has, would have or is likely to have a significant impact on the environment.
- Action, which has, would have, or is likely to have, a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

Where the proponent considers that an action would have or is likely to have a significant impact on MNES, or on Commonwealth land, a referral is made to the Commonwealth Department of the Environment.

If it is determined through the referral process by the Department for the Environment that a proposal is likely to have a significant impact on a MNES, or on Commonwealth land, then the proposal is a controlled action and approval from the Commonwealth Minister for the Environment would be required.

Matters of National Environmental Significance

The protected matters search tool was searched on 7th May 2015. The search was completed for the local Nowra postcode 2541 which the proposal site falls under. The results for the site listed the following matters for consideration (Table 3-2).

Table 3-2 Matters of National Environmental Significance

	Proposal site
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Threatened Ecological Communities	1
Threatened Species	59
Migratory Species	58

An assessment of the proposal against the MNES is located in Section 6.3 and concludes that the proposal would be unlikely to result in a significant impact on these MNES. Therefore the proposal has not been referred to Department for the Environment under the EPBC Act.

4. Options assessment and justification for the proposal

4.1 Proposal need

Shoalhaven Water is responsible for the collection, treatment and distribution of potable water and sewage in the Shoalhaven LGA. The Nowra WWTP and associated infrastructure currently manage the treatment and disposal of sewage for the town of Nowra. During periods of heavy rainfall the volumes of transported sewage in the sewage collection system can greatly increase due to infiltration caused by pipe cracks, tree root damage and illegal sewerage pipe connections. This increased sewage flow places a spike in demand on the Lyrebird Park pumping station and as a result, when the system's pumping capacity is exceeded by supply, an overflow occurs and untreated wastewater is discharged directly into a the drainage channel running parallel to the sports grounds at the park.

In summary, under existing operational conditions, SPS 2 has had the following issues detailed below:

- Inadequate emergency storage causing untreated diluted sewage to overflow during periods of wet weather / high rainfall and power outages;
- Operational issues which require the pumps to be constantly unblocked approximately every eight weeks. The pumps are housed within a dry well that is approximately eight metres deep and requires confined space entry to access.

4.2 Objectives of the proposal

The overall objective of the proposal is to improve the performance and reliability of the sewage management infrastructure, and to increase pump rates to prevent ongoing overflows. The proposal would:

- Reduce sewage overflows that discharge into a drainage channel that runs parallel to sporting fields.
- Increase the emergency storage capacity of the pumping station to ensure there is capacity for future urban expansion.
- Increase the pumping efficiency of the sewage pumping station and stop blockages occurring approximately every eight weeks.

4.3 Development and assessment of options

4.3.1 Overview of upgrade requirements

Under the current operational conditions the Lyrebird Park pumping station is being placed under operational stress during periods of heavy rainfall and subsequent wet weather. As a result sewage overflow events discharge to the adjoining drainage channel.

Therefore the 'do nothing' approach is not a favourable option as this would result in the continuation of the wet weather overflows at the current rates and volumes with a potential to increase with time due to growing populations and subsequent increased demands on the sewage system.

With regards to the SPS 2 upgrades, the need for the upgrades and the specific upgrade requirements are addressed in the *Lyrebird Park Nowra SPS 2 Upgrade – Investigation/Options*

Report (GHD, 2014). The specific upgrade requirements detailed in the report form the basis of the proposal and key components of the works have been previously addressed in Section 2.2.

4.4 Selection of the preferred option

As per the *Lyrebird Park Nowra SPS 2 Upgrade – Investigation/Options Report* (GHD, 2014), two options were assessed based on the existing rising main, pump requirements and emergency storage requirements. Option 1 consisted of converting the existing dry well into a wet well and option 2 consisted of a new wet well with the old wet well converted to an emergency storage tank. A comparison of the two options is presented below in Table 4-1.

Table 4-1 Options comparison

Advantages	Disadvantages
Option 1 - Convert existing dry well to wet well	
• Reduces civil works • Less modification required to incoming gravity main	• Relying on structure that is over 40 years old and may require rehabilitation in the short to medium term • Clearances around pumps less than preferred. • Bypass pumping required during installation of pumps and discharge pipework. • Modifications required to existing pump station roof for access covers. • Construction requires deep excavation (approx. 5 m).
Option 2 – New wet well with old well as emergency storage	
• Minimises bypass pumping during construction. • Provides new pump station structure.	• Construction requires deep excavation (approx. 7 m).

Both options presented above involve significant civil works to the south of the existing SPS. Given the depth of the excavation for both options, it was expected that installation of the proposed new infrastructure would require a similar construction methodology. Geotechnical investigations had not been completed at the options assessment stage however it was considered that there was the possibility of acid sulphate soils and high groundwater levels at the proposal site. The ground conditions present equal risks for both options and may increase the construction cost. The depth and volume of excavation would be higher for Option 2.

It was considered that there would be a higher construction risk associated with option 1 as this option involves additional modifications to the existing SPS to install the new pumps. Adoption of Option 2 would minimise bypass pumping during construction and would provide the operational advantages of a new SPS. Based on this and the above options assessment, it was recommended that the concept design proceeds with the adoption of Option 2 as the preferred option.

During the concept design phase, a further opportunity was identified to minimise both construction and operational risk of the proposal. This involved the decommissioning of the existing wet well rather than conversion of the wet well for additional emergency storage. Therefore, the overall preferred option taken forward to detailed design was a modified Option 2.

Following determination of infrastructure requirements and in order to achieve the short-term goals, site layout of the proposed infrastructure was based on minimising environmental impact whilst ensuring future works (pump station upgrades) would not be compromised by the location of the infrastructure as part of this proposal.

4.5 Ecologically sustainable development

The proposal has been assessed against the following four principles of ecologically sustainable development listed in the *Protection of the Environment Administration Act 1991*:

- The precautionary principle.
- The principle of inter-generational equity.
- The principle of biological diversity and ecological integrity.
- The principle of improved valuation of environmental resources.

An assessment of compliance of the proposal with these principles is provided below.

4.5.1 Precautionary principle

The precautionary principle states that:

> *'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
>
> *(ii) an assessment of the risk-weighted consequences of various options'*

A range of environmental assessments have been undertaken during the preparation of this REF to ensure that the potential environmental impacts can be understood with a high degree of certainty. There are not considered to be any threats of serious or irreversible environmental damage.

The proposal has and would continue to evolve to avoid environmental impact where possible and mitigation measures would be implemented to minimise impacts. The proposal is therefore considered to be consistent with the precautionary principle.

4.5.2 Principle of inter-generational equity

The principle of inter-generational equity states that:

> *'the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'*

The proposal site is an existing sewage pumping station site and has already undergone previous development and land disturbance. The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by an overall reduction in the occurrence of sewage overflows to the receiving environment and may potentially contribute to improving water quality moving offsite within the drainage channel.

The proposal is therefore considered to be consistent with the principle of inter-generational equity.

4.5.3 Principle of biological diversity and ecological integrity

The principle of biological diversity and ecological integrity states that:

> *'conservation of biological diversity and ecological integrity should be a fundamental consideration.'*

During the detailed design phase, impacts on vegetated areas would be minimised as the proposal would be positioned within the existing cleared areas where practicable with minimum impact on flora, fauna and potential habitat. Impacts on flora and fauna are assessed in Section 6.3 and are unlikely to be significant.

The proposal is therefore considered to be consistent with the principle of biological-diversity and ecological integrity.

4.5.4 Improved valuation of environmental resources

The principle of improved valuation of environmental resources states that:

'environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.'

The sewage pumping station infrastructure at the proposal site currently has insufficient emergency storage capacity which result in overflows of sewage, particularly during wet weather, and insufficient pump infrastructure. The proposal is expected to reduce the frequency and volume of sewage overflows and has the potential to reduce risks to public health and potentially contribute to an improvement in water quality downstream of the overflow point to the drainage channel. As the proposal is expected to improve environmental conditions, these outcomes are consistent with the improved valuation of environmental resources.

The cost of environmental resources includes the costs incurred to protect the environment. The safeguards imposed to minimise adverse impacts would result in economic costs to the construction and operation of the proposal. This indicates the valuation of environmental resources has been assigned.

The proposal has been designed to minimise adverse impacts on the environment by confining works to a defined area and implementing appropriate mitigation measures when impacts are expected.

The proposal is therefore considered to be consistent with the principle of improved valuation of environmental resources.

4.6 Justification of the proposal

The proposal would provide an improved reticulated sewage service to the community reliant on the Lyrebird Park pumping station.

The proposal is therefore justified and would result in a reduction of discharge volume of untreated sewage into the environment, in particular the drainage channel located to the east of the site. This would result in the following:

- Reduce risk to public health.
- Improve public amenity.

- Provide for environmental improvement.
- Provide increased capacity of the overall sewerage pumping station and the ability to better service the increasing demands of the surrounding area.
- Increase in emergency storage to reduce overflow events

5. Consultation

5.1 Government and stakeholder consultation

Following the drafting of this REF, the REF will be placed on public exhibition at Council's Administration Centre in Nowra. In addition, an electronic version will be made available for download from the Documents on Exhibition page from Council's website.

An advertisement will be placed in local media (such as South Coast Register newspaper) advertising that the REF is on public display and community members would be invited to comment on the proposal during the exhibition period.

A copy of the first revision of the REF will also be provided to government departments for comment. Government departments to be consulted would likely include:

- Shoalhaven City Council.
- NSW Environment Protection Authority (EPA).
- NSW Office of Water (NOW).

A summary of submissions will be provided in and responses where relevant will be provided in as an appendix, and a response to submissions will be summarised in Table 5-1.

Table 5-1 Summary of issues raised by government agencies and stakeholders

Government Authority/ Stakeholder	Comments Provided	REF Reference
	Table to be completed following consultation	

5.2 Consultation with Aboriginal Groups

In March 2015 Artefact Heritage Pty Ltd completed an Aboriginal heritage due diligence assessment for the proposal. The due diligence Aboriginal heritage assessment satisfied the requirements of the Office of Environment and Heritage (OEH) 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales, and includes recommendations as to whether further archaeological investigation may be required in relation to the proposal.

As part of the field investigation phase of the assessment, a representative from the Nowra Local Aboriginal Land Council (NLALC), Graham Smith, attended the site inspection. Refer to Section 6.7 for further detail with regards to the Aboriginal heritage due diligence assessment and Appendix C for a copy of the assessment report.

6. Existing environment, impacts and mitigation measures

6.1 Topography, geology, soils and contaminated land

6.1.1 Existing environment

Topography

The proposal site is located within the Shoalhaven River alluvial floodplain system area which is characterised by gently undulating rises to low hills and is prone to flooding. The topography of the site has likely been altered during initial construction of the pumping station through ground surface levelling and placing fill materials. The area immediately surrounding the proposal site is relatively flat and consists of an access road (Jervis Street) and playing fields (Lyrebird Sports Park).

Geology

The 1:100,000 Shoalhaven Coastal Quaternary Geology Map indicates the geology of the proposal site is comprised of Holocene backswamp material belonging to the Alluvial Plain System (Troedson & Hashimoto 2013). The Holocene backswamp consists of organic mud, peat, silt and clay material.

Soils

The proposal site is located within the Shoalhaven soil landscape: characterised by level to gently undulating present river bed and banks, active floodplain with levees and backwater swamps on alluvium. This soil landscape is associated with scour or sheet and rill erosion during floods, and minor stream bank erosion (Hazelton, 1992).

Contamination

A search of the OEH contaminated Lands Register was undertaken on 6 November 2015. No contamination notices have been issued for the proposal site or any other site in the immediate vicinity of the proposal, with the nearest registered site being Nowra Mobil Service Station located on Kalandar Street, Nowra East, approximately 480 m south of the proposal site (refer to Appendix E for a copy of the search results).

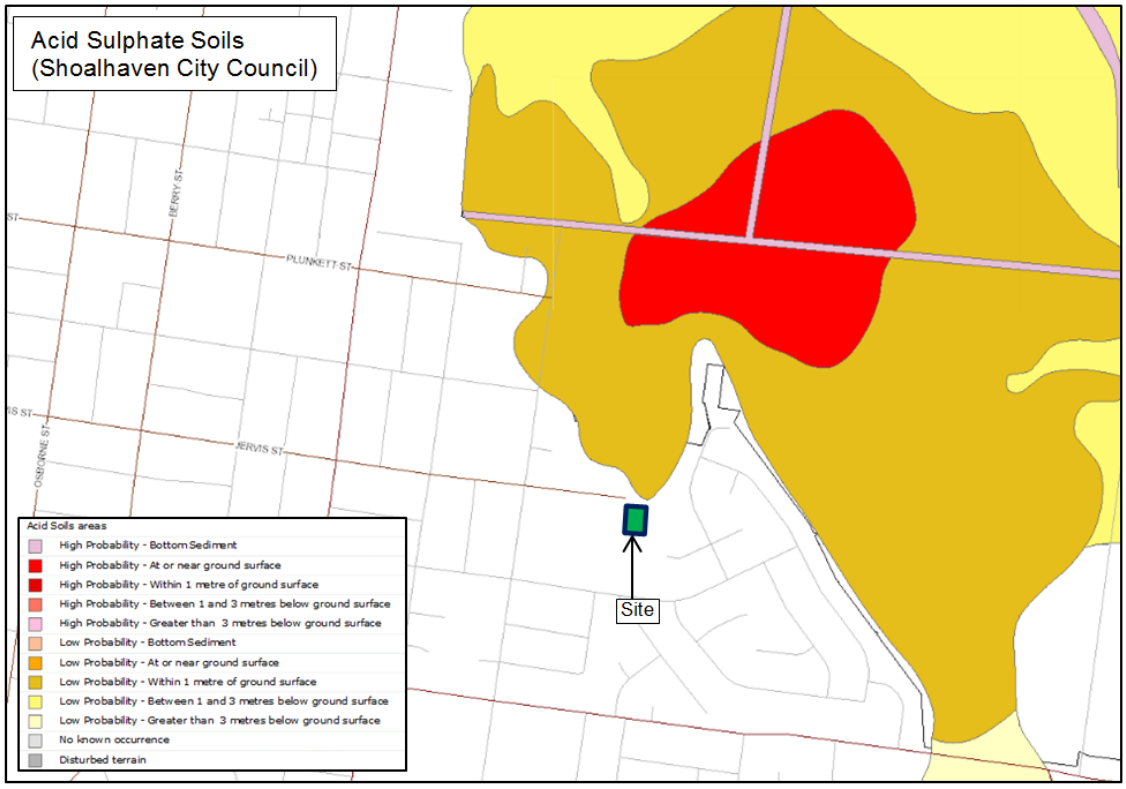
The existing sewage pumping station at the proposal site is operational and has been for approximately 40 years (GHD, 2014) and therefore there is the potential for ground contamination associated with sewage management and / or plant maintenance.

Acid Sulphate Soils

Acid sulphate soils (ASS) is the common name given to sediment and soil containing iron sulfides (principally containing iron pyrite or iron di-sulfide). The exposure of pyrite in these soils to oxygen by excavation or drainage, leads to the generation of sulfuric acid, which can potentially drain to nearby waterways if not managed appropriately. ASS which have oxidised (generally through exposure to air) are called ‘actual acid sulphate soils’ and tend to have a pH of 4.5 or less as they are generating acid from the oxidation of iron sulfide minerals in the soil. Soils that contain iron sulphide minerals that have not been exposed to air are called ‘potential acid sulphate soils’. These soils have the potential for future oxidation of pyrite and the generation of acid (ASSMAC, 1998).

ASS mapping by Council indicates that the proposal is located to the immediate south of an area having a low probability of acid sulphate soils being located within one metre of the ground surface. Figure 6-1 below shows a screen shot taken from the Shoalhaven City Council's online web maps for acid sulphate soils.

Figure 6-1 Acid Sulphate Soil Mapping (Shoalhaven City Council)



6.1.2 Potential impacts

Construction

Construction activities at the proposal site would disturb the ground surface through the following activities:

- Excavation and trenching for pipe construction, installation of the emergency overflow storage tank and wet well.
- Establishment of soil stockpiling and a compound site.
- Removal of old fencing and installation of new fencing at the southern end of the site.
- Clearing and grubbing of the construction footprint area.
- Construction vehicle access and equipment movement.

The installation of the emergency overflow storage tank would disturb the existing local topography outside of the current compound boundary and installation of the wet well will disturb existing topography within the current site boundary. These impacts are considered to be low significance, since the site topography has previously been disturbed by the construction of the existing pumping station components. Other structures would not impact the local topography as they would be installed below ground level and trenches would be backfilled to match the existing ground level upon completion of work.

Due to the ground disturbance activities the following soil impacts could occur as a result of the proposed construction activities:

- Erosion and sedimentation associated with exposed soil and stockpiled materials;
- Generation of dust from excavation works and vehicle movement in exposed soil areas;
- Increase in wind and water erosion in areas of ground disturbance due to inclement weather, resulting in an increase in sediment loads entering the drainage channel; and
- Disturbance of contaminated land during excavation within existing fill materials.
- Potential disturbance of ASS.

These impacts are considered to be minor as exposure of soil and stockpiling of spoil would be temporary and short-term. It is expected that the majority of spoil would be used as backfill for the trenches. Excess spoil not required for backfilling would be stockpiled in a suitable location away from any drainage lines prior to being removed from the site and disposed of at an appropriately licensed facility (refer to Section 6.6).

Erosion, sedimentation and contaminated land impacts would be minimised by implementing the mitigation measures outlined in Section 6.1.3.

Given that the existing sewage pumping station at the proposal site has been operational for approximately 40 years (GHD, 2014), there is the potential for ground contamination associated with historical operational use and practices at the time of construction. Excavation within and adjacent to the proposal site has the potential to intercept ground contamination if present.

There is the potential to disturb / expose potential acid sulphate soils, given the site's close proximity to a potential source of acid sulphate soils (refer to Figure 6-1). As mentioned previously, the site has previously been disturbed with the installation of tanks and sub-surface wastewater infrastructure which further reduces the potential for natural materials (acid sulphate soils) to be present. In the even that potential acid sulphate soils are intercepted, with the implementation of the appropriate mitigation measures and controls as detailed in Section 6.1.3, environmental impacts associated with acid sulphate soils are expected to be minimal.

Accidental spills of fuels and oils from construction vehicles have the potential to contaminate soils at the construction site. In addition, incorrect wash-down of concrete trucks may result in additional soil contamination, which may elevate soil pH. Soil contamination resulting from spills and other soil contamination would be minimised by implementing the mitigation measures outlined in 6.1.3.

Operation

Adverse impacts to landscape, geology, and soil are unlikely during the operation of the proposal with the exception of minor potential impacts associated with the ground disturbance that would be required in the event of emergency repairs, breakdown or failure of the pipeline and also the potential erosion associated with discharge during an overflow event into the drainage channel via the upgraded discharge structure.

6.1.3 Mitigation measures

The following mitigation measures are applicable unless stated otherwise.

Construction

Erosion and sedimentation

- An erosion and sedimentation (ERSED) control plan would be developed and incorporated into the CEMP for the works and would be prepared and implemented by the nominated contractor. The plan would include control measures outlined in this section and relevant guidelines including *Managing urban stormwater: Soils and construction Volume 1 (Blue Book) 4th Edition* (Landcom, 2006) and *Managing Urban*

Stormwater – Soils and Construction Volume 2A Installation of Services (Department of Environment and Climate Change, 2008). The plan would identify areas requiring management measures; include inspection frequencies and responsibilities and checklist sheets.

- Sediment and erosion controls as per the ERSED control plan would be inspected weekly and after rainfall events (>10mm in a 24 hour period) to ensure that they are suitably maintained, are in effective working order, and sediment would be cleared from behind barriers as required. In addition, the areas adjacent to the construction works would be inspected to determine if erosion attributed to the proposal is occurring. Records would be kept of these inspections.
- Clean water diversions would be constructed up-gradient of construction activities where practicable, to divert clean water away from exposed or potentially contaminated areas.
- Any discharge from the construction site would comply with Section 120 of the POEO Act – Prohibition of pollution of waters.
- During periods of heavy rainfall work should cease when there is a risk of sediment loss off-site or ground disturbance due to water logged conditions.
- Exposed stockpile of materials and excess material would be covered where appropriate or other measures applied to ensure erosion/runoff is minimised.
- Vegetation clearance and soil disturbance would be minimised by delineating work areas and vegetation clearance would be restricted to that as described in Section 6.3.2. If required, any vegetation or root removal would be in consultation with Shoalhaven Water / Shoalhaven City Council and in accordance with relevant tree removal guidelines.
- Where possible, topsoil would be removed and stockpiled for later reinstatement during the restoration phase of the works.
- Stockpiles would not be placed in or adjacent to high water flow areas such as drainage lines. Stockpiles would be protected by sediment control barriers and diversion drains as required by the relevant CEMP (and ERSED control plan). Where material stockpiles are to be present on site and inactive for a period of greater than 1 week, they would be seeded or covered to reduce potential for wind and water erosion.
- Maximise the reuse of excavated material on site where possible and minimise the need for off-site disposal.
- Vehicle and equipment movement would be confined to established designated roads including access road Lyrebird Place. Where possible, vehicle movement are to utilise the footprint of the proposed access road alignments to avoid unnecessary ground disturbance.
- Dust suppressant techniques, such as spraying exposed surfaces (stockpiles, dry material for haulage, and general areas) with water, would be undertaken as required to minimise dust generation. If dust suppression methods fail to manage the impacts and the dust generation is creating a safety or unacceptable nuisance hazard, works would be altered or cease.

Contaminated land

- The CEMP for the works is to detail management procedures for any disturbance to contaminated material that is encountered. The CEMP is also to detail the management of any unexpected finds of asbestos. All asbestos must be managed, handled and disposed of in accordance with NSW WorkCover Guidelines.

- Any spoil to be removed from site is to be disposed of at an appropriately licensed waste management facility and is to be managed in accordance with the EPA Waste Classification Guidelines (EPA, 2014).
- An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid and manage spillages of fuels, chemicals, and fluids onto any surfaces and an emergency response procedure.
- Should a spill occur during construction, the emergency response plan would be implemented, and the Shoalhaven Water Environmental Officer contacted. The EPA would also be notified as required in accordance with Part 5.7 of the POEO Act.
- Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.
- Machinery would be checked daily to ensure there are no oils, fuels or other liquids leaking from the machinery.
- All fuels, chemicals, and liquids would be stored within an impervious bunded area within the compound site.
- The refuelling of plant and maintenance of machinery would be undertaken offsite or in impervious bunded areas in the compound area.
- The management and disposal requirements of potential contamination are detailed in Section 6.6 – *Waste management*.

Acid sulphate soils

- The CEMP for the works is to detail management procedures for the disturbance to actual or potential acid sulphate soils, including routine visual and olfactory (smell) monitoring.
- The CEMP is to detail management and disposal requirements of actual or potential acid sulphate soils, including treatment bund requirements, neutralising requirements (addition of agricultural lime), and disposal / reuse requirements, in accordance with the EPA Waste Classification Guidelines (EPA, 2014).

Site rehabilitation

- Progressive rehabilitation would be undertaken as soon as possible following completion of construction.
- The final landform produced above the trenched and excavated areas would be stabilised to minimise erosion and would be consistent with the existing landscape.
- Stored topsoil would be reinstated on the surface of the impacted area where appropriate.
- Erosion and sedimentation controls would remain in place and be regularly inspected until rehabilitation measures are stabilised.

Operation

- Detailed design is to ensure that adequate energy dissipation and erosion mitigation control measures are incorporated into the design of the upgraded discharge structures.
- All disturbed land would be rehabilitated and returned to its existing condition.

6.2 Water quality and drainage

6.2.1 Existing environment

Surface water

The proposal site is located within relatively flat land within the Shoalhaven River floodplain. The Shoalhaven River is a major waterway which rises in the Southern Tablelands of NSW and flows through the coastal floodplains near Nowra to discharge into the Tasman Sea or Pacific Ocean near Culburra. The Shoalhaven River system has a catchment area of 6920 km^2 and is regulated by Tallowa Dam, located in the upper catchment at the confluence of the Shoalhaven and Kangaroo Rivers and forms part of the Sydney and Illawarra drinking water systems.

The area immediately surrounding the site is maintained and used for public recreational activities. The proposal site is bordered by unnamed drainage channels approximately 20 m to the north and east of the site. The drainage channels intersect north-east of the site and flow in a northerly direction through low-lying agricultural paddocks interspersed with a number of drainage channels. The channel in question likely joins to the channel traveling past the Nowra WWTP and eventually to the Shoalhaven River.

The drainage channels are therefore classified as category 3 waterways which are defined as follows:

"Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats."

Groundwater

No groundwater bores have been located within the study area of the proposal. The nearest borehole was completed during geotechnical investigation associated with the upgrade of the Nowra WWTP, borehole reference BHN101 located approximately 1.3 km north of the site. Groundwater within the borehole was intercepted at approximately 0.7 m below the ground surface (GHD, 2014a).

The location of the proposal site is located on the Shoalhaven River flood plain and therefore groundwater is likely to be located at relatively shallow depths below the ground's surface and is likely to be intercepted during the works.

Water quality

No water quality data is available for the drainage channels adjacent to the site. However, numerous water quality issues are associated with the watercourses within the greater Shoalhaven catchment due to past and present land-use practices including elevated nutrient levels, heavy metal contamination, suspended sediment from erosion, low dissolved oxygen, bacterial pollution and drainage of acid sulphate soils (EPA, 1997).

Given the location of the site, existing water quality of the channels are likely to have experienced impacts from stormwater runoff from existing developed urban areas, sewage overflows (from the current operations of the pump station) and impacts from nearby residential development such as increased sediment and nutrient loads.

Flooding

The proposal site is located within the Shoalhaven River floodplain which would experience flooding during heavy rainfall. The site is identified as being of high hazard flood storage

according the Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011).

6.2.2 Potential impacts

Construction

During construction, potential impacts at the proposal site would primarily consist of erosion and sedimentation associated with trenching and excavation activities. Erosion and sedimentation, if uncontrolled, could potentially increase the amount of sediment and organic matter entering waterways resulting in a decline in water quality. Section 6.1.3 outlines mitigation measures for the management of sediment and erosion during construction.

Water quality impacts could also potentially occur as a result of contamination by fuel, chemical spills from construction vehicles or through the poor management of contaminated ground material if encountered. In addition, incorrect wash-down of concrete trucks may result in additional soil contamination, which may include runoff of high pH (alkaline) water. Water quality impacts resulting from spills and other contamination would be minimised by implementing the mitigation measures outlined in Section 6.2.3.

As the proposal site is located within a flood zone, construction activities could potentially be impacted by flooding. Although flood impacts to construction is considered unlikely due to the elevation of the site above the surrounding playing fields, flood implications are required to be taken into consideration during the detailed design phase. Impacts from potential flooding would be minimised by implementing mitigation measures outlined in Section 6.2.3.

Although there is no data with regards to groundwater depth in the immediate vicinity of the proposal site, interception of groundwater during construction is possible. Mitigation measures for the management of intercepted groundwater is provided in Section 6.2.3.

Operation

During wet weather or periods of high rainfall, there is the potential for discharge of untreated diluted sewage from the site into a drainage channel in a wet-weather overflow event. The system's emergency storage capacity and efficiency would be increased following construction of the proposal, therefore reducing the frequency and volume of overflow discharge. This has the potential to improve the quality of the surface water within the drainage channel to the north of the site and downstream compared to the water quality under the existing operational conditions.

The outlet structure for the existing sewage overflow point will be modified as part of the works to allow more effective discharge when required during the combination of an overflow event and high flood water levels. The proposed outlet structures/arrangements are similar to the existing and are therefore not anticipated to have any additional operational impacts associated with flooding.

6.2.3 Mitigation measures

Surface water

- It is Shoalhaven Water's policy that Shoalhaven Water be notified of any pollution incident that may result in material harm to the environment so that appropriate actions, investigations and preventative measures are implemented.
- Shoalhaven Water and its Contractors are required to comply with environmental legislation and regulations, and in accordance with the POEO Act, should inform the

appropriate regulatory authority of any pollution incident that may result in material harm to the environment.

- All site personnel would undertake a site induction prior to commencement of work on site. This should include awareness of relevant legislation and associated penalties for water pollution, an awareness of environmental controls for surface water management, and the importance of maintaining and managing the controls.
- Weather forecasts are to be monitored during construction to provide a look-ahead with regard to predicted rainfall.
- Construction activities are to be minimised during and following periods of rainfall to ensure minimal disturbance of the ground surface.
- In the event of forecast heavy rain, plant and machinery are to be removed from potential flood affected areas and relocated to an area not likely to be impacted by flood water.
- Construction activities and storage of materials, plant and equipment would ensure that the flood risk of the area is not increased. This will include storage of plant and materials away from major drainage lines, ensuring that any existing drainage lines or drains remain open at all times.
- Disturbed areas are to be rehabilitated as soon as practicable. This includes the backfilling and surface reinstatement of excavations / trenches.

Groundwater

- If minor groundwater ingress occurs during construction it can be managed through pumping to an area immediately adjacent to the open excavation for areas within a rural setting or back into the section of open trench (for rural and other areas if required), which would be considered to still be a part of the groundwater system.
- Any groundwater that cannot be managed within the existing excavation area would be treated prior to discharge to receiving waters to ensure removal of total suspended solids (TSS <10 mg/L) and to ensure suitable pH (6.5 – 8.5). A licensed discharge point may need to be considered for discharge of groundwater to the environment and as such would require consultation with the EPA to obtain an Environment Protection License (EPL).
- The discharge point would be identified in the CEMP with provision of adequate discharge controls to ensure minimal erosion and sedimentation impacts.
- Where pollutants cannot be adequately removed on-site, the water would be removed from site by a suitably licenced contractor and treated / disposed of off-site at a suitably licenced waste facility. Should active dewatering be required from the site (for total predicted volumes in excess of 3 ML), consultation with the NSW Department of Primary Industries - Water should be undertaken to ascertain the need to obtain a dewatering licence under the *Water Management Act 2000* prior to commencement of the dewatering activities.

Spill management

Spill management and incident management mitigation measures include the following:

- An Emergency and Incident Management Response Plan would be developed and incorporated into the CEMP. This plan would include measures to be implemented to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent waterways.

- A spill response kit would be located in a readily accessible location. Should a spill occur, absorbent material would be used to soak up the spill, and the material would be removed from the site and disposed of in accordance with the EPA Waste Classification Guideline (EPA 2014).
- All site personnel would be inducted into the Emergency and Incident Management Response Plan and would be made aware of the location of where the emergency spill response kits are kept. Should a spill occur during construction, the site manager would be informed, and the Emergency and Incident Management Response Plan implemented.
- Fuels and chemicals are not to be stored on site. Should vehicles be required to carry fuel for re-fuelling purposes, the fuel is to be stored in a suitably bunded vessel (double-skinned or similar) and all refuelling on site is to be undertaken away from drainage lines.
- Any major servicing / maintenance requirements on plant and machinery is to be undertaken off-site.

6.3 Flora and fauna

6.3.1 Existing environment

A desktop assessment was undertaken on 14 December 2015 to identify threatened ecological communities and threatened flora and fauna that have the potential to occur in the study area (refer to Appendix E for search results). The following databases were searched:

- NSW Wildlife Atlas database (10 km buffer of the site).
- Protected Matters Online Search Tool (1 km buffer).

The desktop assessment identified threatened biota that have been predicted to occur within the nominated buffer (as detailed above) of the proposal site, including:

- 17 endangered ecological community listed under the TSC Act (within 10km of site).
- 6 endangered fauna species (two of which are critically endangered) under the TSC Act (within 10 km of the site).
- 8 endangered flora species (one of which is critically endangered) under the TSC Act (Within 10 km of the site).
- 34 threatened species listed under the EPBC Act.
- 13 migratory species listed under the EPBC Act.

No other MNES (World Heritage Properties, National Heritage Places, Wetlands of International Significance (Ramsar sites) or Commonwealth Marine Areas) were indicated as potentially occurring within the proposal site.

In addition, GIS data layers containing threatened vegetation, threatened ecological communities and NPWS flora and fauna sightings were used to identify flora and fauna that may be impacted and was used to produce Figure 6-2 overleaf. The figure indicates that there are no threatened or endangered species within the vicinity of the site and there are two threatened vegetation communities (*Coastal sand swamp forest* and *Floodplain swamp forest*) located approximately 250 m northwest of the site.

Legend

- Property Boundary
- Intersection
- Railway
- Road
- Waterways
- Pump Station
- Rising Main
- Surcharge Main
- Site area

Threatened Vegetation Communities

- COASTAL SAND SWAMP FOREST
- FLOODPLAIN SWAMP FOREST

1:3,000 (at A4)

0 20 40 80 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Shoalhaven Water
Lyrebird Park SPS2 Nowra

Flora and Fauna

Job Number	23-14266-02
Revision	A
Date	12 May 2015

Figure 6-2

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2/57 Graham Street Nowra NSW 2541 Australia **T** 61 2 4424 4900 **F** 61 2 4424 4999 **E** noamail@ghd.com **W** www.ghd.com

Data source: ShoalWater (Water & Wastewater data, Cadastre & planning, Aerial Image). Created by:jcurran

Based on field observations (refer to Photo 1, 2, 3 and 4) and Figure 6-2, the site is highly modified as a result of the current land use including the pumping station site and the recreational sports fields in the immediate vicinity of the site. Vegetation on the site consists primarily of small to medium sized planted native species including *Lomandra longifolia, Callistemon sp.* (Bottlebrush), and *Acacia sp.* (Wattle).

In addition, there are several planted exotic and native species located on the outside of the existing SPS compound fence. These include *Conifer* species to the immediate northeast of the compound and *Conifer* and *Melaleuca* species located along the eastern side of an access road located approximately 10 m to the east of the compound fence.

The photos below show the nature of the vegetation both within and adjacent to the proposal site.

Photo 1: View north from the main compound entrance showing the wet ancillary building and vent pipe.

Photo 2: View towards the north-eastern corner of the proposal site showing *Lomandra* grasses within the existing compound and *Conifer* trees outside the compound.

Photo 3: View from the north-eastern corner of the proposal site looking south.

Photo 4: View from the south-eastern corner of the proposal site looking north. Photo shows the native and exotic trees external to the existing compound.

6.3.2 Potential impacts

Direct impact on flora and fauna and potential habitat

Trenching and general excavation required for the installation of the new wet well, the new emergency storage tank and associated connecting pipework and infrastructure (refer to Section 2) would temporarily disturb the ground and vegetation within the proposal site and the south of the compound site which consists entirely of maintained grass vegetation. In addition, there will be the requirement to install a new rising main extending from midway along the eastern boundary of the site in a north-easterly direction for approximately 15 m – 20 m. These works will require the removal / disturbance of some of the planted vegetation within the existing compound and also the temporary removal / disturbance of the grass vegetation to the immediate south and in parts to the east associated with the construction of the rising main.

The ecological value and habitat potential of the vegetation to be removed is considered to be low and providing the mitigation measures detailed further in Section 6.3.3 are implemented, environmental impacts associated with flora and fauna impact in the vicinity of SPS 2 is expected to be minimal.

The proposal will not impact on any of the identified threatened vegetation communities, nor will it impact on any potential habitats associated with the drainage line and established tree vegetation located to the north and east of the proposal site.

Erosion/sedimentation

There is the potential for pollutants and seeds of exotic species to be transported from the construction area to the adjacent vegetation and watercourse. Sedimentation can prevent growth of many groundcover species by preventing leaf photosynthesis, and result in

detrimental impacts on water quality and aquatic habitat. Furthermore, in areas where sediment loads are high, sprouting of new seedlings may be prevented due to the layer of sediment.

Mitigation measures are proposed in Section 6.3.3 to minimise the likelihood of the indirect impacts resulting from erosion and sedimentation.

Operation

There is unlikely to be any impact on local biodiversity values resulting from operation of the proposal.

6.3.3 Mitigation measures

The following mitigation measures are applicable to the proposal site.

Construction

- Ensure all workers are provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the site and measures to be implemented to protect biodiversity.
- The CEMP prepared by the nominated contractor is to include flora and fauna management measures and controls.
- The removal of vegetation would be avoided at all times where practicable. If vegetation is required to be removed that is additional to that assessed in this REF, further assessment is to be undertaken in consultation with Shoalhaven Water to determine impacts and identify mitigation measures.
- Construction vehicles would be washed prior to coming on site to minimise the spread of weeds and diseases.
- Visual barrier fencing or similar is to be installed along the eastern boundary of the access road to the east of the proposal site to avoid inadvertent damage to the established tree vegetation. The locations and extent of fencing would be detailed in the CEMP.
- Stockpiles of construction materials and fill would be restricted to existing cleared areas and would not be located within areas of adjoining native vegetation.
- Open sections of excavation would be covered at night to prevent fauna becoming trapped. The trench must be inspected each morning for fauna, and any fauna present must be relocated to an adjacent area as soon as possible.
- Should any wildlife become trapped or injured during the construction works, the nominated contactor is to notify Wildlife Rescue South Coast (http://www.wildlife-rescue.org.au – Phone 0418 427 214) and notify Shoalhaven Water.

Operation

- As there is unlikely to be any impact on local biodiversity values resulting from operation of the proposal, there are no mitigation measures applicable to the operational phase of the proposal.

6.4 Air Quality

6.4.1 Existing environment

As stated in the Shoalhaven City Council *Statement of the Environment Report* (SCC, 2008/2012), the air quality in the Shoalhaven City area is generally considered to be very good.

Shoalhaven has comparatively little heavy industry and most townships are located far enough south of Sydney and Wollongong to avoid any adverse air quality impact from these sources.

The main contributors to air pollution in the Shoalhaven City area include vehicle (car) emissions and smoke and ash from bushfires, particularly during the hotter months. In addition, during winter months some areas may experience temporary and relatively minor adverse effects from smoke emissions from solid fuel heaters together with fire management burns by private land holders and the NSW Rural Fire Service.

The proposal site is located within grass playing fields that are surrounded by low to medium residential dwellings and agricultural land to the north, and the air quality immediately surrounding the proposal is considered to be typical of this environment. The local air quality is impacted upon by vehicles travelling on the local road network and farm animals that could potentially be located within the agricultural land area. In addition, the local air quality is impacted by the operation of the existing sewage pumping station, with sewer odours detectable within the vicinity of the site.

A search of the National Pollutant Inventory was undertaken on 12 May 2015 using available information for the 2013 / 2014 dataset (latest available) for the Shoalhaven LGA area (refer to Appendix E). The search identified 14 emission facilities within the area during the 2013-2014 reporting period. The closest facility to the site is the Nowra WWTP located approximately 1.3 km north of the proposal site.

Table 6-1 presents the location and distance of the closest residential dwellings to the site. The nearest residential dwellings are those located directly south on Lyrebird Place (70 m from the site) and those located east / southeast on Shorland Place and Amalfi Crescent (80 m from the site).

Table 6-1 Residential dwellings in proximity to site

Resident location (Nowra)	Location of nearest dwelling from site
Lyrebird Place	70 m south
Shorland Place	80 m east and southeast
Amalfi Crescent	80 m east
St Anns Street	90 m southwest and 150 m southeast
Jervis Street	140 m west-northwest
De Mestre Place	150 m northwest
Wallace Street	200 m northwest

A summary of the annual wind speed and direction information for the suburb of Nowra (average from 1955 to 2000) has been sourced from the Australian Bureau of Meteorology and is included in Appendix E.

The data indicates that during the morning monitoring period (9 am), the predominant wind direction is from the northwest and west (approximately 45% of the time, collectively) at speeds typically between 1 and 30 km/h and at times gusting in excess of 30 km/h.

The data from the afternoon monitoring period (3 pm) indicates a more diverse wind direction with the predominant direction being from the east (approximately 20% of the time), closely followed by wind from the southeast (17% of the time), south and west (both approximately 15% of the time) and from the northeast (approximately 14% of the time). Recorded average wind

speeds for the afternoon monitoring period are typically in the order of 10 – 20 km/hr with wind speeds exceeding 30 km/hr predominantly from the west.

6.4.2 Potential Impacts

The following potential impacts are applicable to the proposal site.

Construction

The following construction activities are likely to have an air quality impact on the surrounding area:

- Dust generated during the excavation of soil material, handling of soils, and general earthworks.
- Dust generated during the passage of construction and other vehicles over unsealed sections of road or localised unconsolidated soil surfaces.
- Dust generated from wind erosion of unstable/uncovered surfaces and stockpiles and other unconsolidated surfaces.
- Exhaust emissions from the operation of construction plant and equipment.
- Elevated odour emissions associated with the connection works and access into the existing wet-well and associated structures.

The nearest sensitive receivers are residential dwellings located approximately 70 m south on Lyrebird Place followed by those on Shorland Place, Amalfi Crescent and St Anns Street as indicated above in Table 6-1. Taking the wind speed and directions into consideration, the most likely receivers of air quality impacts would be those located to the east and southeast in the mornings (Shorland Place and Amalfi Crescent) and those to the west, east and northwest in the afternoons (Jervis Street, Wallace Street, De Mestre Place, Shorland Place and Amalfi Crescent).

Air quality impacts due to the generation of dust, exhaust emissions and odour generation would be short term and temporary and would be minimised by implementing the mitigation measures outlined in Section 6.4.3.

Operation

Given that the proposal would increase the emergency storage capacity to reduce the frequency and volume of untreated sewage overflow discharges, the proposal is likely to also reduce odour impacts associated with operating the pumping stations. Furthermore, both the wet well and the emergency storage facilities proposed to be constructed at the site are sealed and unlikely to generate odour at discernible levels.

Other odour and air quality impacts may be experienced as a result of maintenance and repair activities, in particular odour emissions associated with opening the sewage system (pump station / pipes / emergency storage tanks) for whatever reason and also vehicular/machinery emissions. These impacts would be short term and unlikely to impact on the amenity of the surrounding area.

6.4.3 Mitigation measures

The following mitigation measures are applicable to the proposal site.

Construction

- The Site Manager would review daily weather forecasts and factor into the daily work plan. This may include restricted excavation activities due to dry or windy conditions, or an increase in the use of a water-cart during windy conditions.
- Construction activities that generate high dust levels would be avoided during high wind periods.
- All trucks entering and leaving the site would have their loads covered.
- Appropriate speed limits would be set for construction traffic to limit dust generation. The appropriate construction site speed limit is to be determined by the contractor and is likely to be about 20 km per hour, commencing at the turn-off from St Anns Street onto Lyrebird Place. The determined construction site speed limit is to be included in the contractor's CEMP and induction material.
- All construction vehicles, mobile plant and machinery would be maintained and operated in accordance with the manufacturer's specifications to minimise exhaust emissions.
- Unused equipment would be shut down or the engine load reduced in order to reduce exhaust emissions.
- The extent of exposed surface areas through excavation activities and the like, are to be minimised where ever possible through planning and management of construction staging;
- Dust suppression techniques, such as spraying exposed surfaces with water (eg stockpiles, dry material for haulage, and general areas), would be undertaken as required to minimise dust generation. If dust suppression methods fail to manage the impacts and the dust generation is creating a safety or unacceptable nuisance hazard, works would be altered or ceased.
- Stockpiles would not exceed two metres in height and would be placed in areas protected from the wind where possible and covered during periods of heavy rainfall. Where soil stockpiles are to be present on site for prolonged periods (i.e. topsoil stockpile), they would be stabilised with a cover or similar.
- Rehabilitation of disturbed surfaces would be undertaken as soon as practicable following the completion of works in each location.
- With regards to odour control, the connection works into the existing sewage pump station is to be undertaken during a period of no rainfall and if practicable, consideration would be given to undertaking the connection during a period of low daily sewerage flow.

Operation

- Equipment used on the site would be appropriately operated and maintained to ensure that air pollutant emissions are minimised.

6.5 Noise and vibration

6.5.1 Existing environment

The existing acoustic environment within the study area of the proposal site is influenced by the surrounding urban and recreational environment including traffic on nearby streets (Jervis Street, St Anns Street, Wallace Street, Lyrebird Place, Amalfi Crescent and adjoining roads) and sporting and recreational events undertaken in the Lyrebird Sports Park.

Typical of a low density residential area, background noise sources include local traffic, domestic noises (including lawn mowers and other domestic machinery), weather conditions and fauna contributions.

Sensitive receivers to the proposal site include the residential receivers as detailed in Table 6-1 in Section 6.4.1 and users of the Lyrebird Sports Park.

6.5.2 Potential impacts

Construction noise

The use of machinery for excavation and pipe installation, and vehicles transporting construction materials to and from the site may generate short-term and localised noise impacts for local residents. Construction of the proposal would include the following potential noise and vibration sources:

- Small scale site preparation including topsoil removal and minor clearing.
- Delivery of plant and materials, including but not limited to the delivery of precast tanks and pits, pipe lengths, road base material, and pre-mix concrete via agitator truck.
- Removal of excess spoil from site via tip truck or similar.
- Set-up and movement of construction vehicles and equipment.
- Civil works including excavation of the pipeline trench and installation of pipe, as well as excavation for the placement of the emergency overflow storage tanks, wet well and valve pit.
- Personnel vehicle movements.
- General site activity and personnel noise.

The potential noise impacts associated with these activities are considered to be intermittent and minor as they would be temporary, lasting for the duration of the construction phase (approximately 6 months – refer to Section 2.6) and would occur during standard construction hours. Vibration impacts are expected to be negligible with a potential for minor vibrations being generated from road compaction activities.

Operation and maintenance noise

Operational noise would be limited to the pumping station and associated infrastructure, and occasional vehicle traffic movement associated with maintenance of equipment. The noise levels generated from the operation of the proposal are not anticipated to be any different from the current operations. The pumping station is currently enclosed and all new additions will meet the NSW Industrial Noise Policy Guidelines (EPA, 2000). Any maintenance activities are likely to be short term, localised and undertaken on an irregular and reactive basis.

6.5.3 Mitigation measures

The following mitigation measures are applicable to the proposal site:

Construction

- Construction activities would be limited to the standard construction hours as follows:
  - Mondays to Fridays between 7 am and 6 pm;
  - Saturdays between 8 am and 1 pm; and
  - No work would occur on Sundays or public holidays.

- All construction plant on site would be maintained in accordance with manufacturer's requirements and, where applicable, fitted with suitable noise suppressing equipment to limit engine noise emissions.
- Plant items would be shut down or at least throttled down where possible when not in use. This would minimise prolonged periods of engine idling.
- Vehicle movements and speeds would be minimised to limit noise emissions.
- Reversing alarm noise emissions would be minimised, but would achieve occupational health and safety requirements (consideration is to be given to the use of non-tonal reversing alarms).
- Potentially affected residents would be contacted prior to the commencement of works and would be informed of the proposed works, working hours, and the period of construction. Residents would also be provided with a contact name and number should they wish to register a complaint or discuss any queries.

Operation

- Scheduled maintenance operations would be undertaken during standard construction working hours.

6.6 Waste management

6.6.1 Potential impacts

Under the POEO Act, it is an offence to "without lawful authority, wilfully or negligently dispose of waste in a manner which harms or is likely to harm the environment". Accordingly, the requirements of the POEO Act would be met during the proposal.

Construction

The proposal would involve civil works associated with the installation of various tanks, pits and pipework as well as the extension of the existing boundary fence and modification of access roads and internal layout – further detail regarding the description of the proposal is detailed further in Section 2.

Waste material generated during construction would likely comprise of the following:

- General waste from personnel including putrescible wastes, food scraps, packaging and other domestic type wastes.
- Construction waste including but not limited to concrete, metals and removed bitumen road surface.
- Liquid waste (sewage) from portable toilets.
- Excess excavated soils and possibly rock.

There is also the potential for wastes to be generated during spill clean-up. This includes spills of contaminated materials, and / or soils used in the clean-up process or removed due to contamination.

Operation

Operation of the proposal is not expected to generate waste materials, with the exception of some minor waste associated with general maintenance (consistent with current operations). This waste would be managed in accordance with the mitigation measures detailed for construction. The proposal would provide increased capacity and this would reduce the volume of sewage that overflows to the environment, particularly during wet weather.

6.6.2 Mitigation Measures

The following mitigation measures are applicable to the proposal site.

Construction

- The Resource Management Hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001* would be adopted as follows;
  - Avoid unnecessary resource consumption as a priority;
  - Avoidance is followed by resource recovery (including reuse of materials; reprocessing recycling, and energy recovery; and
  - Disposal is undertaken as a last resort.
- Where possible, any suitable topsoil would be removed from the surface and stockpiled for later reinstatement during the restoration phase. Similarly, any clean excess spoil would be stockpiled and reused on site where possible.
- Construction waste would be recycled and/or reused on site, or else disposed of at an approved recycling facility or licensed landfill in accordance with the *Waste Classification Guidelines* (EPA 2014).
- Green waste from removal of any vegetation would be chipped and stockpiled for later reinstatement at completion of the works, ensuring no weed content in the material.
- Waste from portable toilets must only be removed and emptied by authorised contractors.
- All work areas would be maintained, kept free of rubbish and cleaned up at the end of each working day. Waste materials would be removed daily from the site, particularly food items and other general waste.
- Bins with lids that prevent wind-blown litter and exclude pest and native animal scavenging would be provided on site.
- Burning or incineration of waste would not be permitted on site at any time.
- Waste reduction and purchasing policy reporting would be completed for the total quantity of materials purchased (including the quantity with recycled content) and the total quantity of waste generated and recycled during the proposal.

6.7 Aboriginal heritage

6.7.1 Existing environment

An Aboriginal Heritage Due Diligence Assessment was completed for the Lyrebird Park Pumping Station upgrade by Artefact Heritage in May 2015 (Artefact heritage, 2015; Appendix C).

A search of the *Aboriginal Heritage Information Management System* (AHIMS) for registered Aboriginal sites in the vicinity of the Lyrebird Park study area was completed by Artefact Heritage on 24 March 2015. The closest AHIMS items are located at a distance of greater than 1.5 kilometres to the west of the proposal site. They are located to the south of the Shoalhaven River and in association with Nowra Creek. Six of the aboriginal heritage sites are rock shelters and one is an axe grinding groove.

The proposal was determined to be associated with low archaeological potential due to the extensive disturbance the area has undergone including vegetation clearance and levelling. The pumping station is also located within the low-lying floodplains of the Shoalhaven River which has been shown previously to have low archaeological potential. It is therefore

considered the site has low potential to contain Aboriginal objects or buried archaeological deposits (Artefact Heritage, 2015).

6.7.2 Potential impacts

Construction and operation

Excavation works at the proposal site is required for the installation of storage tanks, pipelines and access roads. As the site has been assessed to be of low archaeological potential, it is unlikely that any intact archaeological deposits associated with Aboriginal occupation would be impacted by the construction activities, or as a result of the operation of the proposal.

6.7.3 Mitigation measures

Construction

- All personnel working on site would be made aware of their responsibilities under the *NSW Heritage Act 1977* via the site induction.
- If changes are made to the development proposal that may result in impacts to areas not covered by this assessment, further archaeological assessment would be required.
- If an Aboriginal object (or suspected object) of heritage significance is discovered during the work, all work in that area would cease and Shoalhaven Water and the OEH would be advised in accordance with section 89A of the NPW Act. Investigations would be undertaken to determine whether an *Aboriginal Heritage Impact Permit* (AHIP) is required prior to works recommencing.
- If human remains are found, work would cease, the site would be secured and the NSW Police, Shoalhaven Water and the OEH would be notified.

6.8 Non-Aboriginal heritage

6.8.1 Existing environment

A search of the Shoalhaven City Council LEP, the State Heritage Register and the Australian Heritage Database was undertaken on 4 December 2015 for the Shoalhaven LGA and the suburb of Nowra respectively (refer to Appendix E). No heritage sites or places were located in the vicinity of the proposal site.

6.8.2 Potential impacts

As there were no identified items or places of non-Aboriginal heritage significance within the vicinity of the proposal site, there are no impacts expected as a result of construction or operation of the proposal.

6.8.3 Mitigation measures

Construction and operation

The mitigation measures for control and management of non-Aboriginal heritage impacts during the construction and operational phase of the proposal include:

- All personnel working on site be made aware of their responsibilities under the *NSW Heritage Act 1977.*
- In the event of finding or impacting an actual or potential cultural heritage item, all works likely to affect the item / place must cease immediately and Shoalhaven Water and the

NSW Heritage Branch would be consulted about the appropriate course of action prior to recommencing work.

6.9 Traffic and access

6.9.1 Existing environment

The proposal site is accessible from Lyrebird Place, Nowra. Lyrebird Place is approximately 180 m in length and extends from St Anns Street to the south to the existing pumping station site and a small unsealed carpark to the north.

Lyrebird Place is sealed along a section nearest to the St Anns Street intersection and then becomes an unsealed access road further north towards the pumping station site and is used primarily for access to one residential property (127A St Anns Street), access to the pumping station site and access to the southern end of the Lyrebird Sports Park.

6.9.2 Potential impacts

Construction

The construction of the proposal would generate vehicle movements associated with the following:

- Construction personnel travelling to and from the construction locations.
- Transportation of pipework, aggregates, sand and soil (as required), concrete and other construction materials to the proposal site.
- Transportation of construction machinery and vehicles to and from the proposal site.
- Transportation of waste materials from the proposal site.

All access to the site would use Lyrebird Place via St Ann's Street. Access on site would be via the existing internal road access arrangements.

It is anticipated that up to a maximum of approximately 15 heavy vehicles per day would be required to access the proposal site via St Anns Street and Lyrebird Drive during peak construction activities This equates to daily heavy vehicle movements of approximately 30 (two way movements). During normal construction periods, the daily heavy vehicle movements are anticipated to be approximately 20 movements in total.

The works would be restricted to the pumping station site and worker vehicles would park within and near the proposal site, ensuring not to obstruct property access. Parking located off Lyrebird Place and to the west of the proposal site that is currently used by people utilising the Lyrebird Sport Park could temporarily be limited while construction is occurring. Access to the Lyrebird Sports Park from the west via Jervis Street would remain open at all times.

Local residents may experience some minor and temporary disruptions to local road use however this is expected to be temporary and short term and is not anticipated to impact on safe operation of the existing road network. Provided the mitigation measures outlined in Section 6.9.3 are implemented, traffic impacts associated with the proposal are expected to be minimal.

Operation

Maintenance vehicles would be required to access the emergency overflow storage tank, wet well, valve pit and other infrastructure for inspections and maintenance periodically. Additional traffic movements related to maintenance activities is not expected to be any greater than the traffic movements currently experienced under current operational conditions.

6.9.3 Mitigation measures

The following mitigation measures are applicable to the proposal site:

Construction

- For the transportation of wide and long loads, the RMS requirements in relation to such loads would be followed.
- Planning for construction traffic/transport movements, would take into consideration;
  - Time of travel.
  - Route of travel.
  - Visibility and road conditions.
- Care is to be taken on unsealed roads in wet weather to ensure safety and minimise damage to the road's surface.
- Vehicle access would be limited during wet weather to reduce the risk of disturbance of soils and subsequent erosion.
- Site vehicles are to remain inside the designated construction site where practicable and under no circumstance is residential access to be blocked by site vehicles.
- The requirements of the *Roads Act 1993* would be followed at all times prior to and during all work (i.e. notice requirements, consultation and consent/concurrence requirements for work within public and classified roads).
- A pre-condition report would be prepared prior to work commencing for all roads in the vicinity of the proposal utilised by construction traffic (expected to be Lyrebird Drive and around the entrance point off St Anns Street). In addition, any internal roads / carparks likely to be impacted should also be included in the pre-condition report. Any damage resulting from construction would be repaired at the Contractor's cost.
- During periods of wet weather, the nominated contractor is to ensure that mud tracking onto the local roadways does not occur.

Operation

- Maintenance vehicles are to remain on the designated access roads wherever possible.
- During emergency repairs and maintenance that require vehicles to access unsealed areas of the site, site personnel are to ensure that mud tracking onto local roadways does not occur and any damage is repaired as soon as practicable.

6.10 Bushfire risk

6.10.1 Existing environment

The typical / average climate in the Shoalhaven Bush Fire Management Committee (BFMC) area is generally mild with average temperatures ranging from 15.5^{o}C in June to 26.5^{o}C in January. Rainfall is more pronounced in Summer/Autumn with average annual rainfalls of 1110 mm in Nowra. The bush fire season generally runs between September and March each year.

Prevailing weather conditions associated with the bush fire season in the Shoalhaven BFMC area are North-westerly winds accompanied by high daytime temperatures and low relative humidity. There are also frequently dry lightning storms occurring during the bush fire season (Shoalhaven BFMC, 2010).

Based on the bushfire prone land mapping information provided by Shoalhaven City Council, the proposal site is not located within bushfire prone land. The site is characterised by short maintained grass cover and planted gardens which has limited fire fuelling potential.

6.10.2 Potential impacts

Construction

Due to the limited vegetation at the site and the nature of the proposed construction activities, the risk of bushfire at the proposal site is low.

The proposal is considered unlikely to result in an increase of the risk of bushfire as work would be undertaken within areas that have largely been cleared and is unlikely to require any hot work which has the potential to ignite nearby vegetation. Impacts from potential bushfire would be minimised by implementing the mitigation measures outlined in Section 6.10.3.

Operation

Maintenance activities at the site would be undertaken periodically and are unlikely to represent a fire risk. Shoalhaven Water would be responsible for the maintenance of the site in accordance with any relevant bushfire management plans.

6.10.3 Mitigation measures

The following mitigation measure is applicable to the proposal site.

Construction

- To assist in management of fire, care would be taken during dry periods, and 'hot-work' activities would not be permitted during times of extreme fire-danger.

6.11 Social and visual

6.11.1 Existing environment

The proposal site is located within land zoned as public recreation (RE1 – Shoalhaven LEP) and forms part of the Lyrebird Sports Park. The sports park contains approximately 5 large sporting fields and supports numerous sporting activities and events throughout the year including but not limited to:

- Soccer matches and gala days (home to the Shoalhaven United Football Club)
- Rugby league matches - home to the Nowra Warriors rugby league club
- Cricket matches
- School soccer gala days
- School fetes / fairs

The location of the nearest residents in relation to the proposal site is presented in Table 6-1. The nearest residential dwellings are those located approximately 70 m south of the proposal site on Lyrebird Place followed by those on Shorland Place, Amalfi Crescent and St Anns Street.

6.11.2 Potential impacts

Construction

The construction activities have the potential to temporarily disrupt the general use of activities / events at the Lyrebird Sports Park, in particular any events located on the southern fields (to the

west of the proposal site) and any users of the small car park located at the northern end of Lyrebird Drive.

While there would be some minor adverse impacts on the community during construction associated with air quality, noise and vibration, traffic and visual amenity, only a small number of residents would be affected for a short time period and works would be confined to the construction site limiting impacts to those who wish to use the park. The impacts likely to affect the social amenity as a result of the proposal have been addressed in the previous sections as follows:

- Section 6.4.2 for air quality (including odour) impacts.
- Section 6.5.2 for noise and vibration impacts.
- Section 6.9.2 for traffic impacts.

In addition, visual impacts associated with the construction phase of the proposal are expected to be temporary, short term and minor.

With the implementation of the appropriate mitigation measures and controls as detailed further in Section 6.11.3, construction impacts on the social and visual amenity of the area is expected to be minimal.

Operation

The long term impacts associated with the operational phase of the proposal will include primarily the visual impacts of the additional infrastructure and the extension of the pumping station compound. These impacts are considered to be relatively consistent with the existing pumping station site, with the majority of the new infrastructure being located underground. The proposal will include site remediation and landscaping at completion of the construction phase and vegetation screening and colour schemes will be consistent with the existing.

With the implementation of the appropriate mitigation measures and controls as detailed further in Section 6.11.3, operational impacts on the social and visual amenity of the area is expected to be minimal.

6.11.3 Mitigation measures

Mitigation measures and controls with regards to social and visual amenity have been previously addressed in the following Sections of this REF document:

- Section 6.4.3 for air quality (including odour) impacts.
- Section 6.5.3 for noise and vibration impacts.
- Section 6.9.3 for traffic impacts.

In addition, the following mitigation measures and controls to minimise visual impacts are to be implemented:

- The removal of vegetation would be avoided to retain any screening vegetation and reduce visual aesthetic impacts;
- Site rehabilitation works would be undertaken immediately following the completion of the construction phase to minimise visual impacts;
- The construction site would be kept tidy and rubbish free;
- Any complaints relating to visual impacts and disruption of utilities would be investigated and responded to with a suitable approach;

- Above ground structures would be painted in a colour consistent with the existing colour scheme and / or sympathetic to the surrounding environment.
- The restoration of the proposal site would include landscaping to provide a visual buffer between residents and the proposal.

6.12 Cumulative impact

Previous sections have reviewed the key aspects and impacts of the proposed works. It is also considered that the cumulative impacts of the proposal within the Shoalhaven LGA will be minimal, as described below.

Works currently proposed for the upgrade of water and sewage infrastructure by Shoalhaven Water.	A number of water and sewer infrastructure upgrade projects have been proposed and/or are being constructed within the Shoalhaven LGA by Shoalhaven Water. Due to the staging of the works over a wide area, the cumulative impact is considered to be minimal.
Other known types of works currently proposed to be undertaken in the surrounding areas (if relevant).	Consultation with Council and general knowledge of development and construction in the general area indicates no other work in the surrounding area. Consultation will continue throughout the construction activities to coordinate works (if appropriate) to minimise impacts.
Any ways the environment may be affected by the cumulative impact of the proposed program of works overall.	Based on the assessment of temporary and permanent impacts, it is considered that, with the implementation of appropriate management controls, there will be no cumulative impact on the environment from the proposed works.

7. Environmental management

7.1 Construction environmental management plans

The construction and operation of the proposal would be undertaken in accordance with a comprehensive suite of environmental mitigation measures and controls, designed to minimise the impact of the proposal on the environment. The measures to be implemented during construction would be documented in a CEMP.

The CEMP would be developed and implemented by Shoalhaven City Council and the nominated construction contractor and would be prepared in accordance with the principles of *AS/NZS ISO 140001 Environmental management systems – specification with guidance for use*.

The key objective of the CEMP would be to ensure all environmental commitments made in this REF and conditions imposed by any licences and approvals are implemented during construction. The CEMP would include the following information:

- Objectives of the CEMP.
- Procedures to educate all personnel on the principles of environmental management for the proposal.
- List of approvals to be obtained before work commences.
- Accountability (roles and responsibility of personnel).
- Management strategies to guide actions to ensure that environmental obligations are met. This would include detailed procedures to facilitate the implementation of appropriate environmental management measures.
- The CEMP is to be prepared by the nominated contractor and would include measures to manage vegetation (including weeds), fauna and erosion and sedimentation. The measures for weed management would be developed in accordance with the DPI *Infrastructure Proposal on Rural Land* guidelines.
- Objectives for each area of potential environmental impact, based on a desirable outcome.
- Actions for meeting environmental objectives based on the mitigation measures identified in this REF and any statutory or regulatory obligations.
- Timing for the implementation of each action.
- Procedures for management of environmental incidents, emergencies and other unforeseen circumstances.
- Consultation (government and community) and complaint handling procedures.
- Monitoring and auditing plan to ascertain environmental performance and compliance with the CEMP.
- Strategies for positive feedback of information from the audit into the environmental objectives, actions and strategies of the CEMP so that experience can be used to improve environmental management practices.
- List of relevant contacts.

7.2 Licencing and approvals

No licences or approvals are required for the construction or operation of the proposal.

As noted in Section 3.4.5, if water cannot be managed within the existing open excavations in the way of ground water table recharge, then the need for a licence under the *Water Management Act 2000* will need to be discussed with the NSW Office of Water.

7.3 Summary of proposed environmental mitigation measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal (pre-construction), during construction, and during operation of the proposal. These mitigation measures would minimise any potential adverse impacts arising from the proposal on the surrounding environment. All mitigation measures described in this REF would be incorporated into the CEMP.

Table 7-1 summarises mitigation measures identified in Section 6 of this REF.

Table 7-1 Environmental Safeguards

Table to be populated following Shoalhaven Water's review of the document.

8. Conclusion

This REF has been prepared in accordance with Part 5 of the EP&A Act and has considered factors that must be taken into account when assessing the impact of an activity on the environment under Clause 228 of the *Environmental Planning and Assessment Regulation 2000.* The REF assesses the potential impacts of the proposal and recommends mitigation measures to manage identified impacts (refer to Section 7.3).

In the short term, there may be minor adverse impacts associated with construction of the proposal. The main issues would be associated with:

- Noise and air quality impacts due to the operation of plant and machinery.
- Traffic impacts associated with the minor increase in traffic movements resulting from plant and material deliveries to and from site and also access to the site by site personnel.
- Soil and water impacts due to erosion and sedimentation and accidental spills of fuels and oils.

The environmental impacts listed above would be minimal due to the short-term nature of construction, the confinement of works to the proposal site, and the low density of the surrounding residential environment. Impacts would be further mitigated by implementing the mitigation measures outlined in Section 7.3

No ecological or Aboriginal heritage impacts are anticipated.

Operational impacts of the proposal would be minimal as disturbed areas would be returned as close as possible to their existing conditions and the site would generally be operated and maintained in a manner consistent with the current operations.

The proposal is considered to benefit the community in the long term as it would:

- Reduce sewage overflows that discharge into a drainage channel that runs parallel to sporting fields.
- Increase the emergency storage capacity at the existing pumping station to ensure there is capacity for future urban expansion.
- Increase wet well and pumping capacity / efficiency of the sewage pumping station and reduce overflows.

Overall, potential adverse impacts associated with the proposal are considered to be minor and able to be adequately managed by implementing the mitigation measures outlined in Section 7.3. The proposal is unlikely to have a significant adverse impact on the environment.

If the scope of work, construction methods or proposal site described in this REF change during the detailed design or construction, the Project Manager must consult Shoalhaven Water to determine whether additional environmental assessment is needed.

9. References

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Shoalhaven Bush Fire Management Committee (BFMC), 2010. *Bush Fire Risk Management Plan.*

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10. Abbreviations and glossary

Abbreviation	Description
ASS	Acid sulphate soils
AHIMS	Aboriginal Heritage Information Management System
CEMP	Construction Environmental Management Plan
DECC	NSW Department of Environment and Climate Change
DECCW	NSW Department of Environment, Climate Change and Water
DPI	Department of Planning and Infrastructure
The proposal site	The proposal site is located at the northern end of Lyrebird Place and in the centre of the Lyrebird Sports Park. The site is located on Lot 1 of DP 1127303 and includes the existing sewage pumping station and associated infrastructure, the proposed site of the emergency storage tank, wet well and associated infrastructure.
The proposal	The works required as part of the Lyrebird Park (SPS2) Pumping Station upgrade works.
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GHD	GHD Pty Ltd
ICNG	Interim Construction Noise Guidelines
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
km	Kilometre
LEP	Local Environmental Plan
LGA	Local Government Area
m	Meter
mm	Millimetre
NPWS Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NV Act	*Native Vegetation Act 2003*
OEH	NSW Office of Environment and Heritage
pH	A measure of the acidity or alkalinity of a solution

Abbreviation	Description
POEO Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors
RMS	Roads and Maritime Service (formerly Roads and Transport Authority)
The 'Report'	This Review of Environmental Factors
SEPP	State Environmental Planning Policy
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
Shoalhaven LEP	*Shoalhaven Local Environmental Plan 2014*
SPS	Sewerage pumping station
The 'study area'	The area over which environmental constraints have been identified and assessed in relation to the site.
TSC Act	*Threatened Species Conservation Act 1995*
WM Act	*Water Management Act 2000*
WWTP	*Waste Water Treatment Plant*

Appendices

Appendix A Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228 matters for consideration

The table below summarises provisions listed under Clause 228 of the *Environmental Planning and Assessment Regulation 2000* which outlines the factors that must be taken into account when considering the impact of an activity on the environment.

Factor	Impacts
(a) Any environmental impact on a community.	
Comments:	
Potential environmental impacts on the community have been considered as part of this REF. It is not envisaged that there would be any significant adverse environmental impacts on the local community as a result of the proposal. There may be temporary impacts due to noise related to construction activities, impacts associated with minor traffic and parking disruptions and impacts to soil and water related to erosion and sedimentation. These impacts would be short term and would be managed by implementing mitigation measures (identified in Section 7.3).	Short term – Minor negative
Permanent changes to the visual environment would occur resulting from minor changes to above structures within the existing operational pumping station site. However these would be minimised by implementing mitigation measures during design and construction.	Long term – Minor negative
The proposal has the potential to be beneficial for the receiving waters (drainage lines and ultimately Shoalhaven River) as it has the potential to improve water quality by reducing the volume and frequency of sewage overflows.	Long term - positive
(b) Any transformation of a locality.	
Comments:	
Surface works for the proposal are limited to the construction phase. There would be a short-term transformation of a locality due to the presence of construction sites. These impacts are considered to be manageable through the implementation of mitigation measures.	Short term – Negative
During operation, the proposal would be predominately underground and existing ground levels would be reinstated where practicable. Minor alterations to above ground structures would result from the proposal however these are unlikely to significant transform the locality as they would be consistent with the existing appearance of the operational sewage pumping station.	Long term – Minor Negative
(c) Any environmental impact on the ecosystems of the locality.	
Comments:	
The proposal would have negligible or no impact on ecosystems of the locality. Detailed design would look to minimise the impacts on ecosystems where possible. Mitigation measures would be implemented to manage impacts on flora and fauna.	Negligible

Factor	Impacts
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality.	
Comments:	
The proposal would result in a short-term reduction in amenity due to construction activities and increased traffic and noise levels.	Short term – Minor negative
Long term adverse impacts of the proposal would be limited to the presence of minor alterations to the appearance of the existing operational sewage pumping station.	Long term – Minor Negative
In the long term, the proposal would reduce the risks to public health, improve public amenity and provide for environmental improvements. There would be no negative long-term effects on aesthetic, recreational, scientific or other environmental qualities of the subsidised service area.	Long term – Positive
(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.	
Comments:	
The proposal would not impact on any items of indigenous or non-indigenous heritage significance. Measures would be implemented to ensure that existing heritage values are maintained for existing and future generations.	Nil
(f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*).	
Comments:	
The potential impacts on threatened and vulnerable fauna species and their habitats have been assessed in this REF and no negative impacts were identified.	Nil
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air.	
Comments:	
No significant effects on flora and fauna would occur as a result of this proposal.	Nil
(h) Any long-term effects on the environment.	
Comments:	
The proposal would result in minor modification to the appearance of the existing operational sewage pumping station, including an extension of the site to the south. These modifications are unlikely to significantly degrade the quality of the environment.	Long term – Minor negative
The proposal has the potential to improve water quality in the receiving waterbodies (drainage lines) and ultimately the water quality of the Shoalhaven River by reducing the frequency and volume of sewage overflows.	Long term – positive

Factor	Impacts
(i) Any degradation of the quality of the environment. *Comments:*	
The proposal would cause a short-term visual reduction in the quality of the environment resulting from construction activities. After construction the area would be restored as near as practicable to their pre-construction condition.	Short term - Minor Negative
The proposal would result in minor changes to above ground structures, with the majority of the proposed structures being constructed at or below the ground level. Any above ground structures would be consistent with the existing visual qualities of the operational sewage pumping station and are unlikely to significantly degrade the quality of the environment.	Long term – Minor negative
(j) Any risk to the safety of the environment. *Comments:*	
The proposal is expected to reduce the risks to public health due to reduction in overflow from the existing systems, and therefore have a positive effect on the safety of the environment.	Long term - positive
(k) Any reduction in the range of beneficial uses of the environment. *Comments:*	
The proposal would not reduce the range of beneficial uses of the environment. The proposal may improve beneficial uses of the environment as it has the potential to improve water quality by reducing discharges of untreated dilute sewage.	Nil
(l) Any pollution of the environment. *Comments:*	
During construction, the proposal has the potential to cause localised soil, water, air and noise pollution. These impacts would be minimised by implementing the mitigation measures outlined in Section 7.	Short term - Minor Negative
The proposal would not result in any long term pollution of the environment. It has the potential to improve water quality in the receiving drainage channels and ultimately an improvement in the water quality of the Shoalhaven River by reducing the frequency and volume of sewage overflows.	Long term - Positive
(m) Any environmental problems associated with the disposal of waste. *Comments:*	
Waste created during the construction period would be removed from the site promptly as required and disposed of at appropriately licensed facilities.	Nil
The proposal would improve the existing sewage management systems at the Lyrebird Park Pumping Station with the operation of the new wet well and with the construction of an emergency storage tank.	
(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply. *Comments:*	
The proposal would not increase the demand on any resources that are or are likely to become in short supply.	Nil

Factor	Impacts
(o) Any cumulative environmental effect with other existing or likely future activities. *Comments:*	
A number of water and sewer infrastructure upgrade projects have been proposed and/or are being constructed within the Shoalhaven LGA by Shoalhaven Water. Due to the staging of the works over a wide area, the cumulative impact is considered to be minimal.	Nil
The works are for an existing operational pumping station and therefore cumulative environmental impacts in the future as a result of the operation of the proposal are not anticipated, and if anything, environmental impacts are expected to be reduced as a result of the sewage pumping station operating more efficiently and through the reduction in overflow events.	Negligible
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions. *Comments:*	
The proposal is located within a coastal area (the proposal site is located within 1 km of the *Coastal Zone* as per SEPP 71, it is not located within the coastal zone – refer to Section 3.3.3 of the REF) and therefore would not result in any impact on costal processes and coastal hazards.	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, the following Matters of National Environmental Significance are required to be considered to assist in determining whether the proposal should be referred to the SEWPaC.

Factor	Impact
a. Any impact on a World Heritage property?	
The proposal would not have any impact on a World Heritage property. There are no World Heritage properties within 10 kilometres of the proposal site.	Nil
b. Any impact on a National Heritage place?	
The proposal would not have any impact on a National Heritage place. There are no National Heritage places located within 10 kilometres of the proposal site.	Nil
c. Any impact on a wetland of international importance?	
The proposal would not have any impact on a wetland of international importance. There are no wetlands of international importance within 10 kilometres of the proposal site.	Nil
d. Any impact on a listed threatened species or communities?	
A total of 28 threatened species and one threatened ecological community were identified within 10 kilometres of the proposal site. Due to limited vegetation at the construction site and the limited scope of works, the proposal is unlikely to impact any threatened species or communities.	Nil
e. Any impacts on listed migratory species?	
A total of 13 migratory species were identified within 10 kilometres of the proposal site. The proposal is unlikely to impact on any listed migratory species.	Nil
f. Any impact on a Commonwealth marine area?	
The proposal would not have any impact on a Commonwealth marine area. No Commonwealth marine areas occur within 10 kilometres of the proposal site.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)?	Nil
The proposal does not involve a nuclear action.	
h. Additionally, any impact (direct or indirect) on Commonwealth land?	
There is no identified Commonwealth land located within the vicinity of the proposal site. The proposal is unlikely to impact Commonwealth land.	Nil
i Any impact on the Great Barrier Reef Marine Park?	
The proposal would not result in any impacts to the Great Barrier Reef Marine Park due to its distance from the park.	Nil

Appendix B Concept design plans

SHOALHAVEN WATER

LYREBIRD PARK NOWRA SPS2 UPGRADE

LOCALITY PLAN
NTS

DRAWING LIST	
DRG. NO.	TITLE
23-1426651-001	COVER SHEET AND LOCALITY PLAN
23-1426651-005	SITE LAYOUT PLAN
23-1426651-006	SITE PLAN - MAINTENANCE VEHICLE TURNING CIRCLE
23-1426651-007	SPS AND EMERGENCY STORAGE LEVELS
23-1426651-008	SPS AND VALVE CHAMBER PIPEWORK PLAN
23-1426651-009	SPS AND VALVE CHAMBER PIPEWORK SECTION
23-1426651-010	EMERGENCY STORAGE TANK PLAN AND SECTION
23-1426651-011	NEW RISING MAIN PLAN AND SECTION
23-1426651-012	NEW GRAVITY MAIN SECTION

PRELIMINARY ISSUE
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No.	REVISION DETAILS		
B	60% DESIGN ISSUE	CW	21.05.15
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CONSULTANT REFERENCE No. 23-1426651-001

Shoalhaven Water
A Group of Shoalhaven City Council

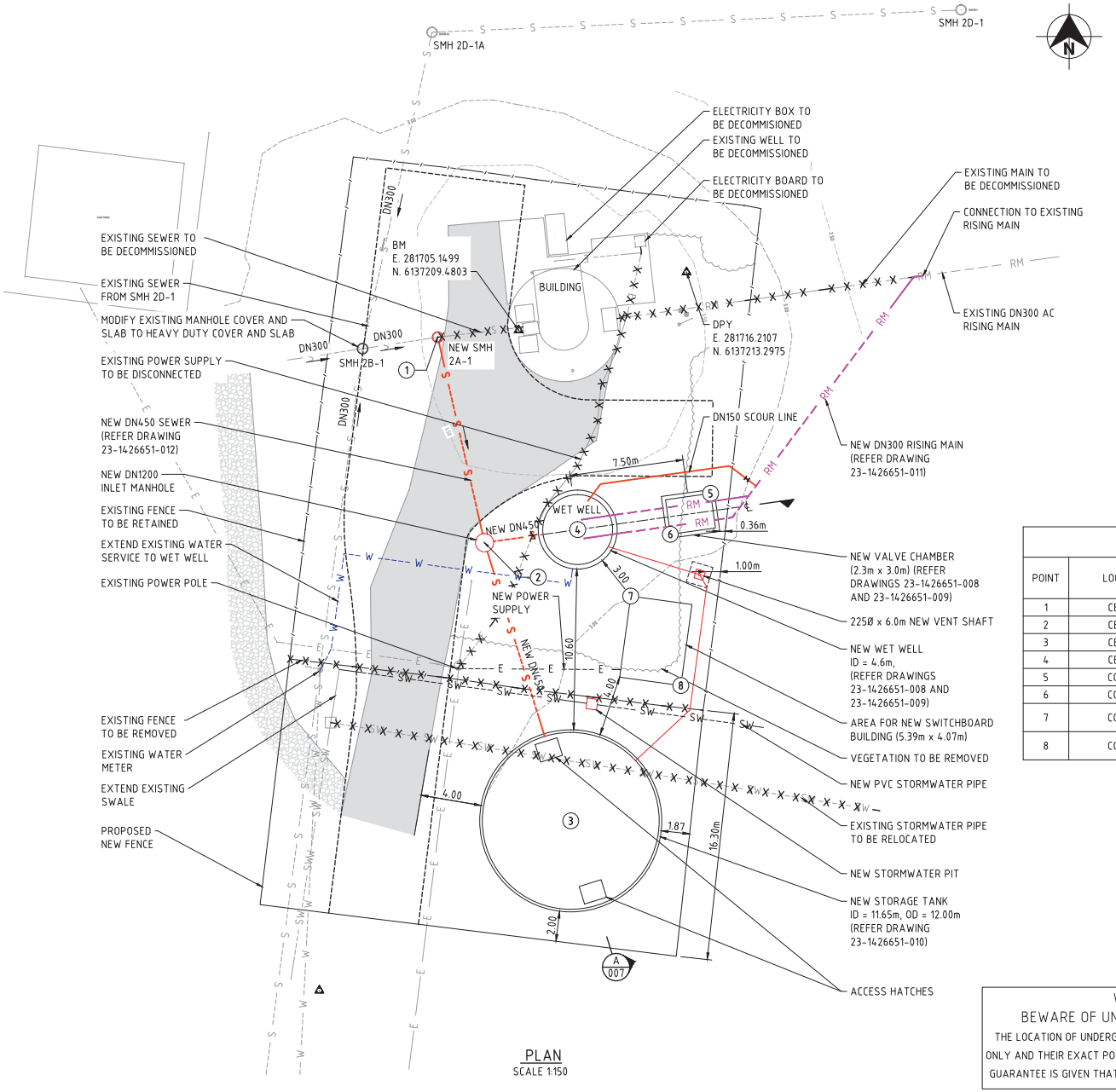
DESIGNED: C. WALLS	DATE: 26.03.15	COMPANY: GHD	
DRAWN: J.CONTRERAS	DATE: 26.03.15	COMPANY: GHD	
CHECKED: S. RANDHAWA	DATE: 20.05.15	COMPANY: GHD	
APPROVED:	DATE:	COMPANY:	

TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

COVER SHEET AND LOCALITY PLAN

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	NTS		23-1426651-001		B

Plot Date: 20/05/15 - 16:31 Cad File: G:\23\1426651\00\CADD\Drawings\23-1426651-001.dwg



PLAN
SCALE 1:150

LEGEND

- EXISTING RISING MAIN
- EXISTING SEWER MAIN
- EXISTING STORM WATER
- EXISTING DRAIN
- EXISTING WATER MAIN
- EXISTING ELECTRICITY BELOW GROUND
- EXISTING ELECTRICITY ABOVE GROUND
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- NEW SEWER MAIN
- NEW STORM WATER
- NEW RISING MAIN
- NEW WATER SERVICE
- EDGE OF NEW ASPHALTIC CONCRETE SURFACE
- EDGE OF VEGETATION
- CONTROL POINTS
- SEWER MANHOLE
- EXISTING GRAVEL TRACK
- EXISTING ASPHALTIC CONCRETE

NOTE:

1. RETAIN EXISTING OVERFLOW LINE FROM SMH 2D-1.

SETOUT POINTS

POINT	LOCATION	EASTING	NORTHING	FINISHED SURFACE LEVEL	COMMENTS
1	CENTRE	281699.816	6137209.019		NEW MANHOLE
2	CENTRE	281702.903	6137195.482	3.270	NEW MANHOLE
3	CENTRE	281708.587	6137177.151	3.550	NEW STORAGE TANK
4	CENTRE	281709.043	6137196.341	3.550	NEW WET WELL
5	CORNER	281717.797	6137198.727	3.550	NEW VALVE CHAMBER
6	CORNER	281715.145	6137196.034	3.550	NEW VALVE CHAMBER
7	CORNER	281712.532	6137191.960		NEW SWITCHBOARD BUILDING
8	CORNER	281715.834	6137186.069		NEW SWITCHBOARD BUILDING

FLOOD EVENT	EXISTING	PROJECTED 2050
FLOOD PLANNING LEVEL	NOT APPLICABLE	5.1m AHD
PROBABLE MAXIMUM FLOOD LEVEL	7.0m AHD	7.0m AHD
1% AEP FLOOD LEVEL	4.6m AHD	4.6m AHD
2% AEP FLOOD LEVEL	3.9m AHD	3.9m AHD
5% AEP FLOOD LEVEL	1.9m AHD	2.1m AHD
10% AEP FLOOD LEVEL	1.7m AHD	1.7m AHD

0 1.5 3 4.5 6 7.5m
SCALE 1:150 AT ORIGINAL SIZE

WARNING
BEWARE OF UNDERGROUND SERVICES
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TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

SITE LAYOUT PLAN

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1 : 150		23-1426651-005		B

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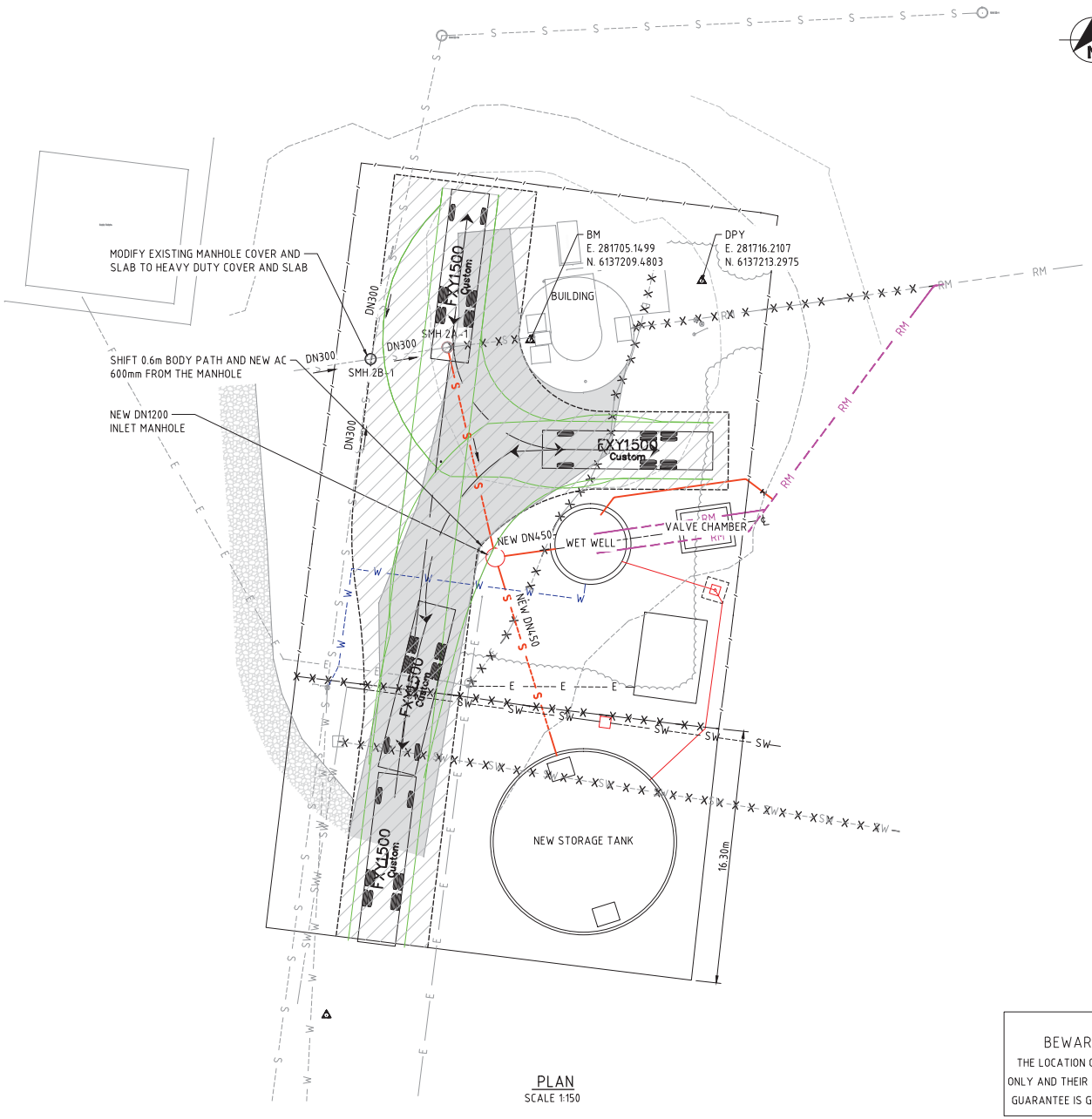

PLAN
SCALE 1:150

LEGEND

- EXISTING RISING MAIN
- EXISTING SEWER MAIN
- EXISTING STORM WATER
- EXISTING DRAIN
- EXISTING WATER MAIN
- EXISTING ELECTRICITY BELOW GROUND
- EXISTING ELECTRICITY ABOVE GROUND
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- NEW SEWER MAIN
- NEW STORM WATER
- NEW RISING MAIN
- NEW WATER SERVICE
- EDGE OF NEW ASPHALTIC CONCRETE SURFACE
- 0.60m BODY PATH OFFSET
- EDGE OF VEGETATION
- CONTROL POINTS
- SEWER MANHOLE
- EXISTING GRAVEL TRACK
- EXISTING ASPHALTIC CONCRETE
- NEW ASPHALTIC CONCRETE

NOTE:

1. AN 11-m LONG RIGID FXY1500 TRUCK HAS BEEN USED FOR DEVELOPING THE TURNING AREA. TRUCK SIZE BASED ON ADVICE RECEIVED FROM SHOALHAVEN WATER.

0 1.5 3 4.5 6 7.5m
SCALE 1:150 AT ORIGINAL SIZE

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APPROVED:	DATE:	COMPANY:	

TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

SITE PLAN - MAINTENANCE VEHICLE TURNING CIRCLE

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1 : 150		23-1426651-006		B

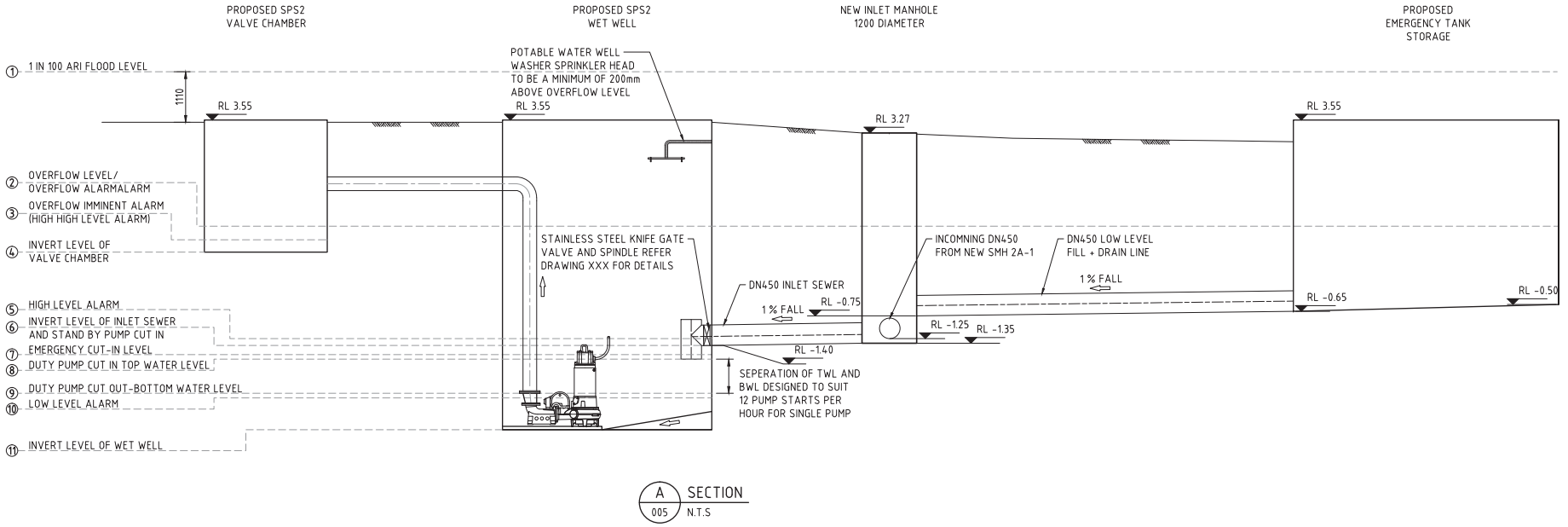
Plot Date: 21/05/15 - 13:06 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-006.dwg

TABULATION OF PUMP STATION LEVELS		
REFERENCE	DESCRIPTION	LEVEL (MAHD)
1	1 IN 100 ARI FLOOD LEVEL	4.60
2	OVERFLOW LEVEL/OVERFLOW ALARM	1.22
3	OVERFLOW IMMINENT ALARM (HIGH HIGH LEVEL ALARM)	0.92
4	INVERT LEVEL OF VALVE CHAMBER	0.65
5	HIGH LEVEL ALARM	-1.25
6	INVERT LEVEL OF INLET SEWER AND STAND BY PUMP CUT IN	-1.40
7	EMERGENCY CUT-IN LEVEL	-1.60
8	DUTY PUMP CUT-IN TOP WATER LEVEL	-1.70
9	DUTY PUMP CUT-OUT BOTTOM WATER LEVEL	-2.45
10	LOW LEVEL ALARM	-2.55
11	INVERT LEVEL OF WET WELL	-3.25

NOTES:

1. DRAWINGS SHALL NOT BE SCALED.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
3. MAINTENANCE HOLE DETAILS TO BE IN ACCORDANCE WITH WSA02-DRAWING SEW-1300.
4. THE TOTAL EMERGENCY STORAGE CAPACITY IS DESIGNED TO BE 8 HRS AT ADWF 2041. EMERGENCY STORAGE VOLUMES ARE MEASURED TO THE OVERFLOW WATER LEVEL.
5. A SURVEY MARK IS TO BE PLACED ON THE TOP SURFACE OF THE PUMP STATION. THE LEVEL IN MAHD TO 3 DECIMAL PLACES IS TO BE ENGRAVED ON A BRASS PLAQUE AND FIXED TO THE TOP SLAB. THE LEVEL IS TO BE RECORDED ON THE AS CONSTRUCTED DRAWINGS.

EMERGENCY STORAGE CAPACITIES REQUIRED VOLUME = 256.3 m^3	
CHAMBER	VOLUME(m^3)
WET WELL	41.0m^3
EMERGENCY STORAGE TANK	189.6m^3
INLET MANHOLE	0.90m^3
UPSTREAM GRAVITY SEWER	XXX



A 005 SECTION N.T.S

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TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

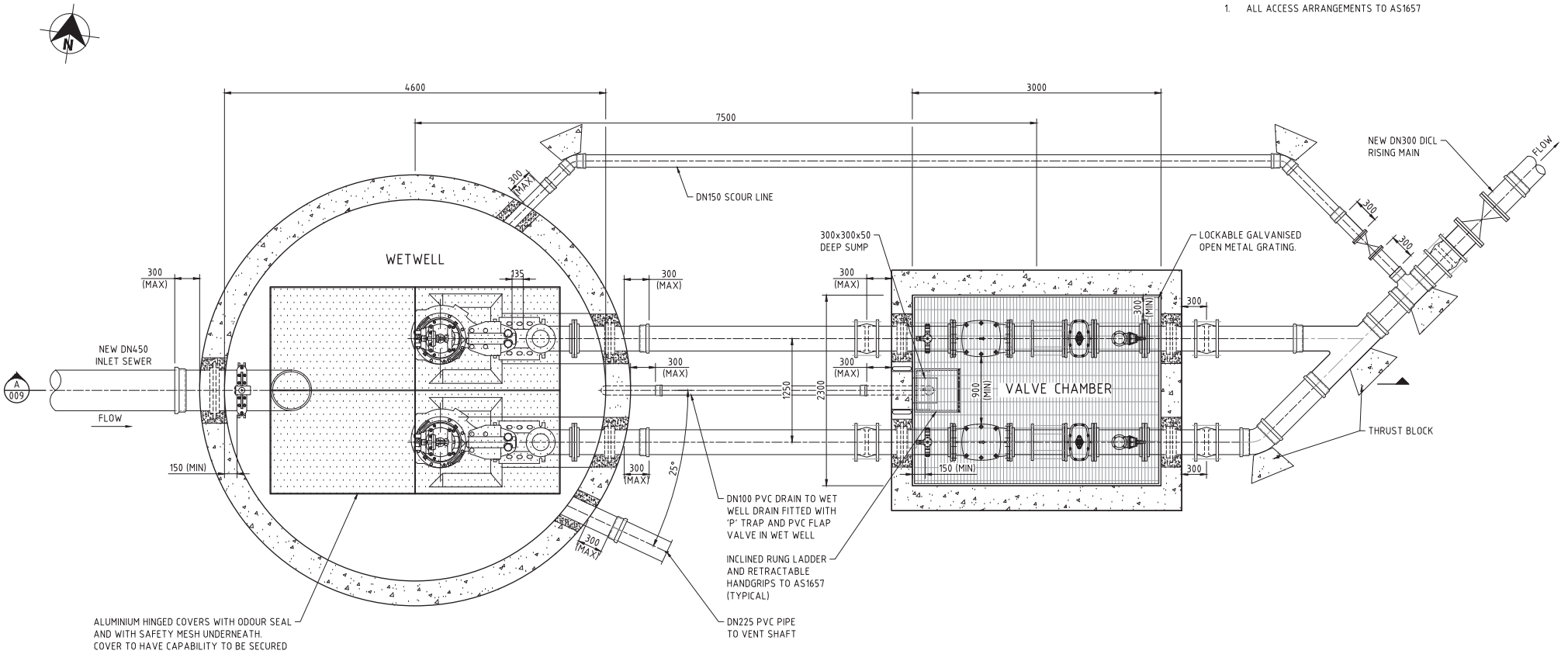
SPS AND EMERGENCY STORAGE LEVELS

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	NTS		23-1426651-007		B

Plot Date: 20/05/15 - 17:03 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-007.dwg

NOTE:

1. ALL ACCESS ARRANGEMENTS TO AS1657



PUMP DATA TABLE	
PUMP TYPE	SUBMERSIBLE
MODEL	NP3231/665 3~480
ARRANGEMENT	DUTY/STANDBY
DUTY	171.10 l/s @ 41.80m
MOTOR RATED SPEED	1480 (l/min)
MOTOR RATED POWER	105kW
DISCHARGE DIAMETER	200mm

PLAN
SCALE 1:25

0 250 500 750 1000 1250mm
SCALE 1:25 AT ORIGINAL SIZE

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CONSULTANT REFERENCE No. 23-1426651-008

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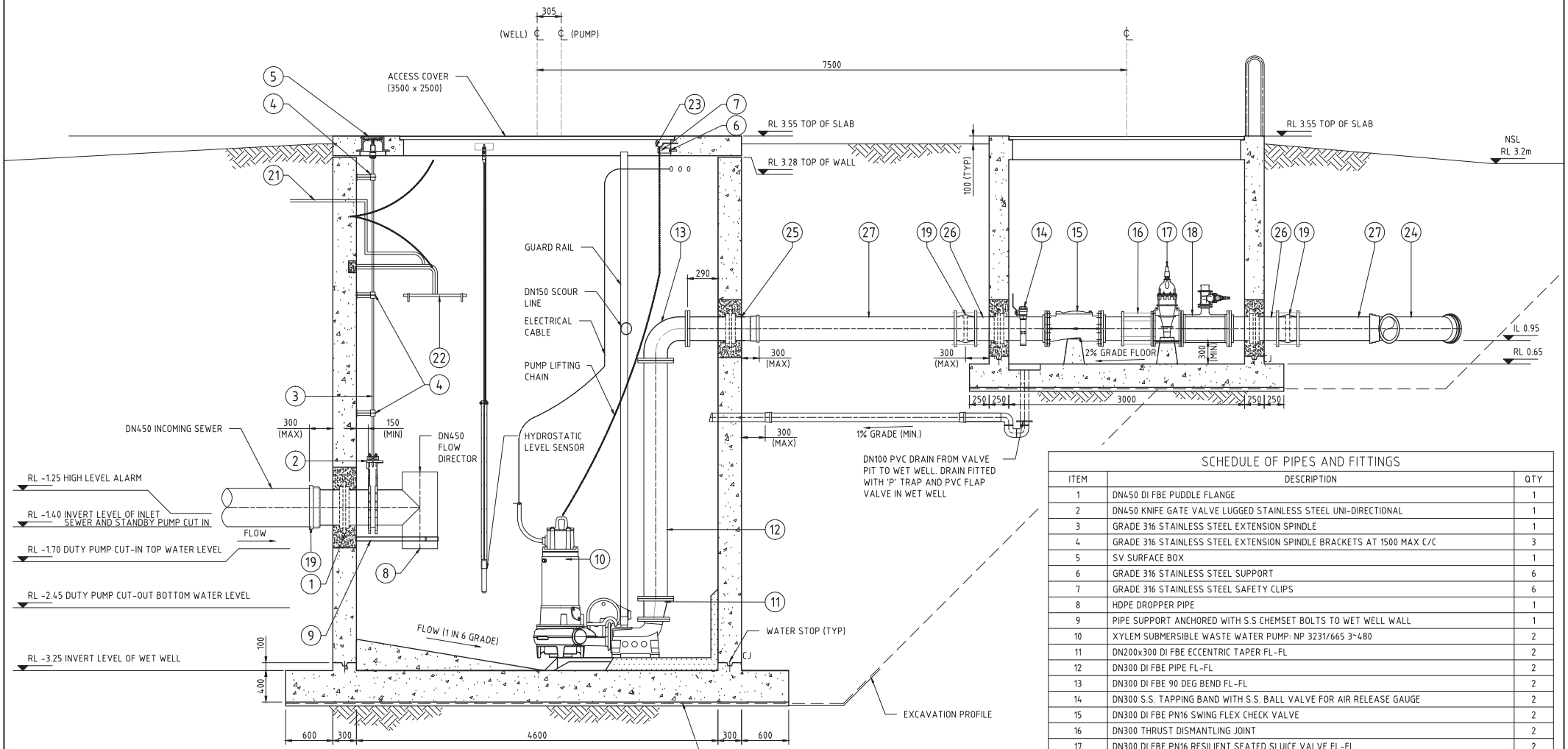
APPROVED:	DATE:	COMPANY:	

TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

SPS AND VALVE CHAMBER PIPEWORK PLAN

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1 : 25		23-1426651-008		B

Plot Date: 20/05/15 - 16:34 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-008.dwg



NOTE:

1. REFER DRG. 23-1426651-008 FOR PUMP DATA INFORMATION

0 250 500 750 1000 1250mm
SCALE 1:25 AT ORIGINAL SIZE

A 008 SECTION
SCALE 1 : 25

SCHEDULE OF PIPES AND FITTINGS

ITEM	DESCRIPTION	QTY
1	DN450 DI FBE PUDDLE FLANGE	1
2	DN450 KNIFE GATE VALVE LUGGED STAINLESS STEEL UNI-DIRECTIONAL	1
3	GRADE 316 STAINLESS STEEL EXTENSION SPINDLE	1
4	GRADE 316 STAINLESS STEEL EXTENSION SPINDLE BRACKETS AT 1500 MAX C/C	3
5	SV SURFACE BOX	1
6	GRADE 316 STAINLESS STEEL SUPPORT	6
7	GRADE 316 STAINLESS STEEL SAFETY CLIPS	6
8	HDPE DROPPER PIPE	1
9	PIPE SUPPORT ANCHORED WITH S.S CHEMSET BOLTS TO WET WELL WALL	1
10	XYLEM SUBMERSIBLE WASTE WATER PUMP: NP 3231/665 3~480	2
11	DN200x300 DI FBE ECCENTRIC TAPER FL-FL	2
12	DN300 DI FBE PIPE FL-FL	2
13	DN300 DI FBE 90 DEG BEND FL-FL	2
14	DN300 S.S. TAPPING BAND WITH S.S. BALL VALVE FOR AIR RELEASE GAUGE	2
15	DN300 DI FBE PN16 SWING FLEX CHECK VALVE	2
16	DN300 THRUST DISMANTLING JOINT	2
17	DN300 DI FBE PN16 RESILIENT SEATED SLUICE VALVE FL-FL	2
18	DN300x100 DI FBE TEE FL WITH DN100 DI FBE SLUICE VALVE AND G316 STAINLESS STEEL MALE CAMLOCK FITTING	2
19	DN300 GIBAULT JOINT	4
20	DN450 DI FBE SPOOL PIECE SO-FL	2
21	DN25 PE100 SDR11 PN16 POTABLE WATER PIPE	1
22	MCBERNS WALL MOUNTED WET WELL WASHER ON 1m EXTENSION	1
23	GRADE 316 STAINLESS STEEL CHAIN HOOK	1
24	DN300x300 Y-BEND SO-SO	1
25	DN300 DICL PIPE FL-SO WITH THRUST FLANGE. LENGTH TO SUIT.	2
26	DN300 DICL PIPE FL-SP WITH THRUST FLANGE. LENGTH TO SUIT.	6
27	DN300 DICL PIPE SP-SP. LENGTH TO SUIT.	4

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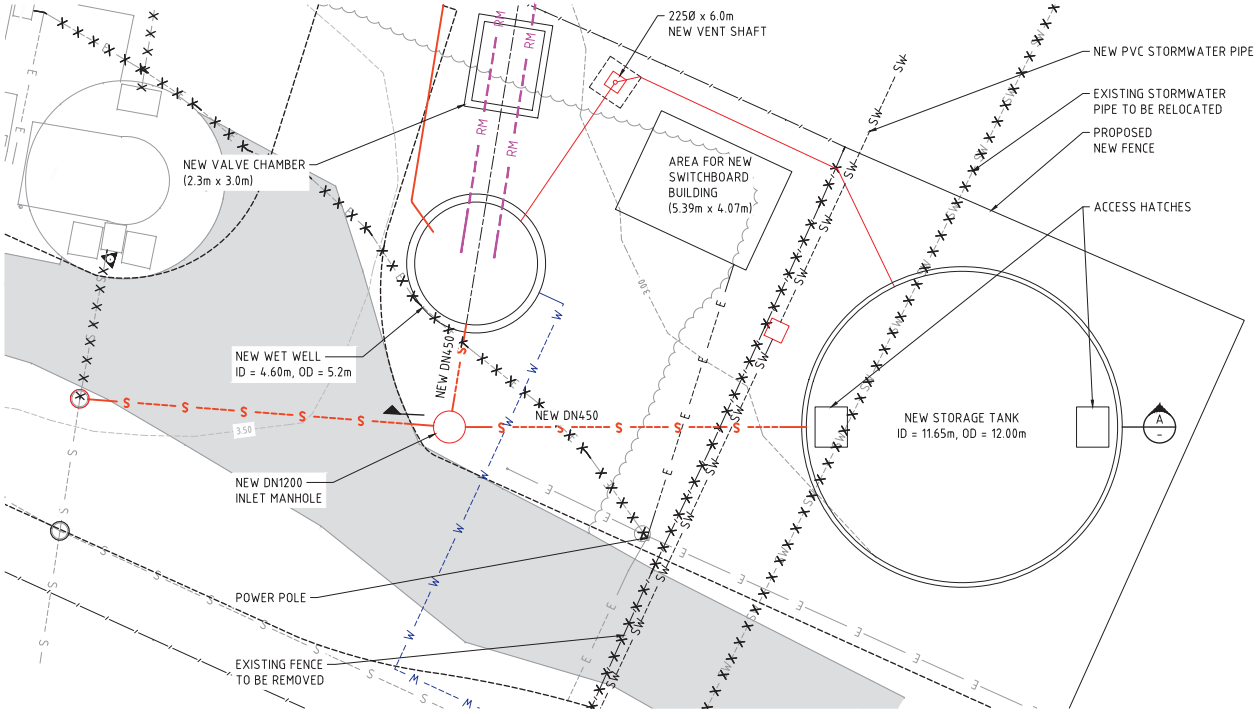
TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

SPS AND VALVE CHAMBER PIPEWORK SECTION

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1 : 25		23-1426651-009		B

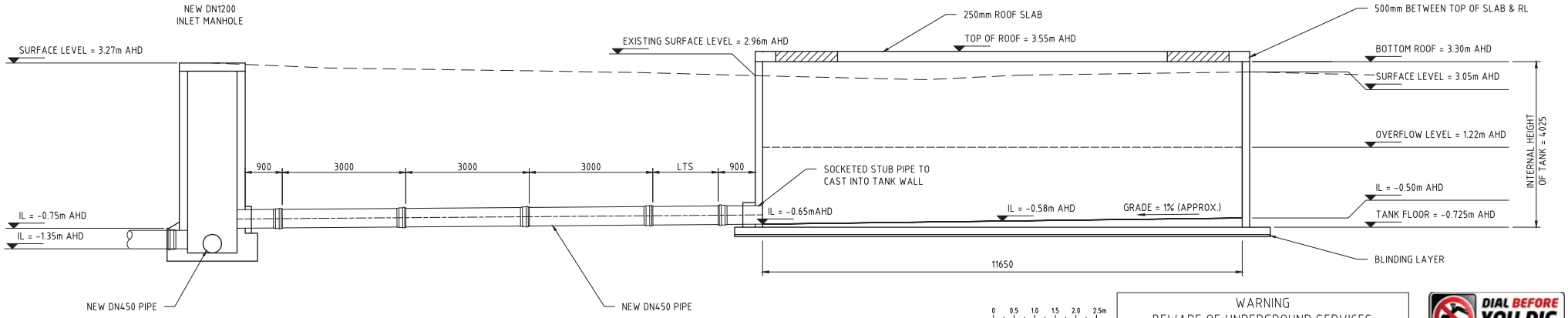
Plot Date: 20/05/15 - 17:05 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-009.dwg



PLAN
SCALE 1:100

LEGEND

- EXISTING RISING MAIN
- EXISTING SEWER MAIN
- EXISTING STORM WATER
- EXISTING DRAIN
- EXISTING WATER MAIN
- EXISTING ELECTRICITY BELOW GROUND
- EXISTING ELECTRICITY ABOVE GROUND
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- NEW SEWER MAIN
- NEW STORM WATER
- NEW RISING MAIN
- NEW WATER SERVICE
- EDGE OF NEW ASPHALTIC CONCRETE SURFACE
- EDGE OF VEGETATION
- CONTROL POINTS
- SEWER MANHOLE
- EXISTING GRAVEL TRACK
- EXISTING ASPHALTIC CONCRETE



A SECTION
SCALE 1 : 50

SCALE 1:50 AT ORIGINAL SIZE

SCALE 1:100 AT ORIGINAL SIZE

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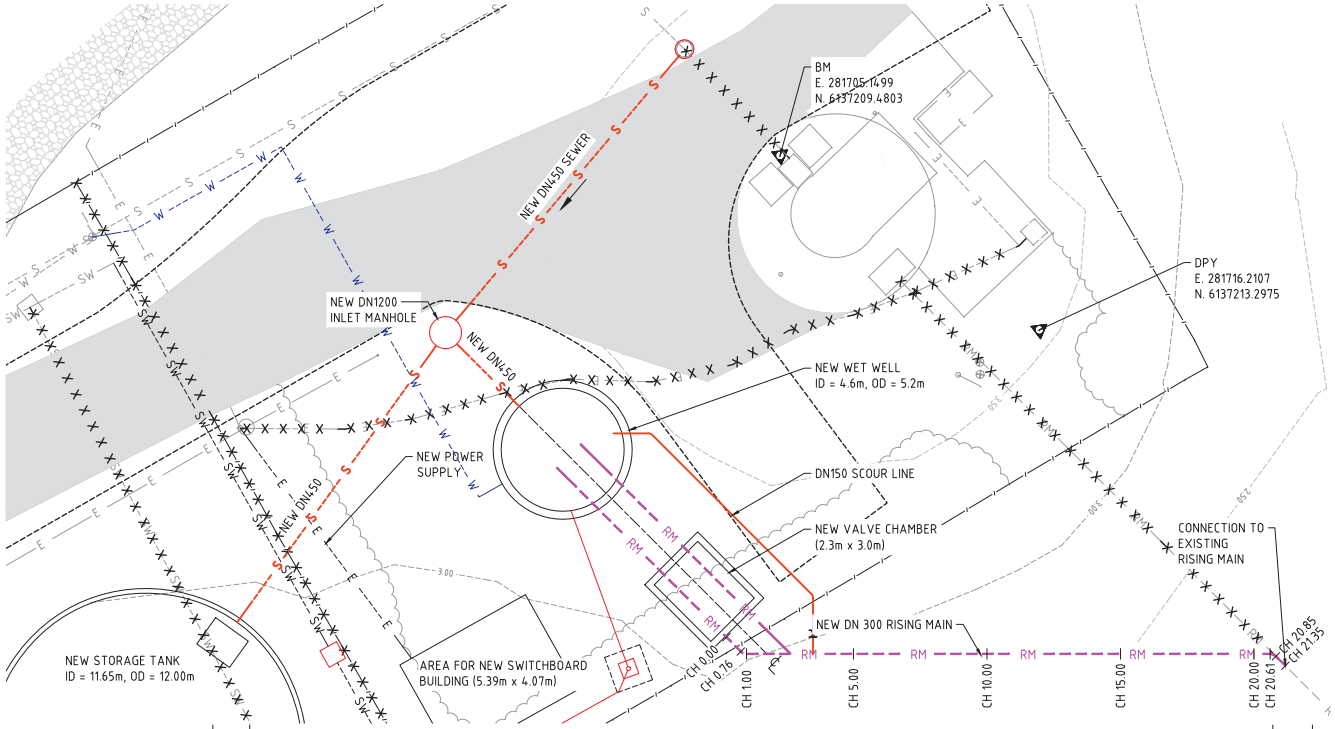
TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

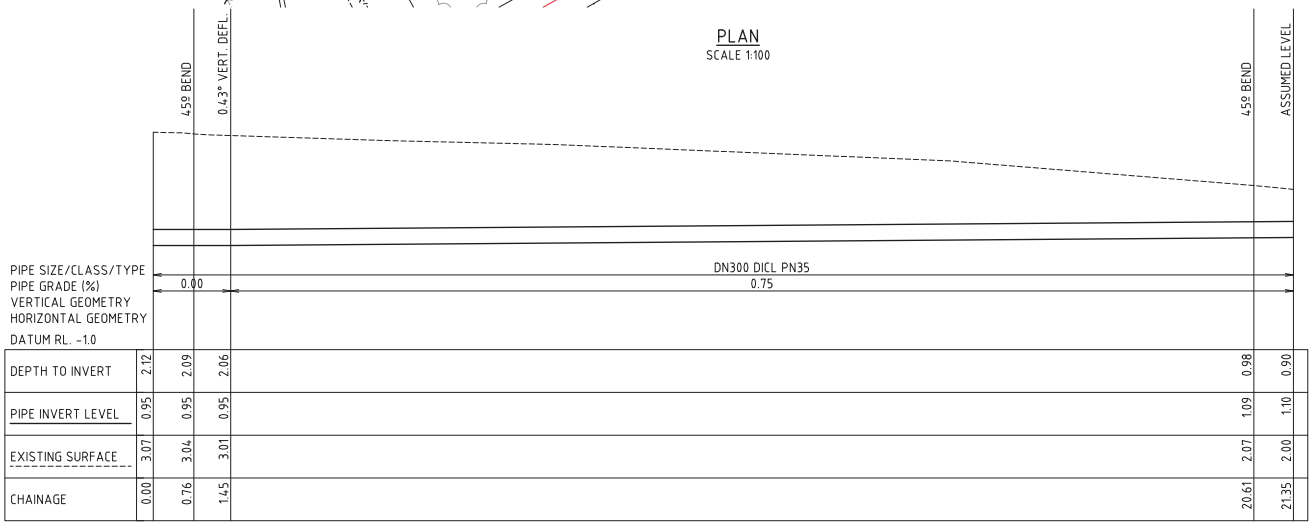
EMERGENCY STORAGE TANK PLAN AND SECTION

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	AS SHOWN		23-1426651-010		B

Plot Date: 21/05/15 - 13:08 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-010.dwg



PLAN
SCALE 1:100



LONGITUDINAL SECTION
SCALE 1:50 H, 1:100V

LEGEND

- EXISTING RISING MAIN
- EXISTING SEWER MAIN
- EXISTING STORM WATER
- EXISTING DRAIN
- EXISTING WATER MAIN
- EXISTING ELECTRICITY BELOW GROUND
- EXISTING ELECTRICITY ABOVE GROUND
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- NEW SEWER MAIN
- NEW STORM WATER
- NEW RISING MAIN
- NEW WATER SERVICE
- EDGE OF NEW ASPHALTIC CONCRETE SURFACE
- EDGE OF VEGETATION
- CONTROL POINTS
- SEWER MANHOLE
- EXISTING GRAVEL TRACK
- EXISTING ASPHALTIC CONCRETE

SCALE 1:50 AT ORIGINAL SIZE

SCALE 1:100 AT ORIGINAL SIZE

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B	60% DESIGN ISSUE	CW	21.05.15
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CONSULTANT DETAILS:
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CONSULTANT REFERENCE No. 23-1426651-011

Shoalhaven Water
A Group of Shoalhaven City Council

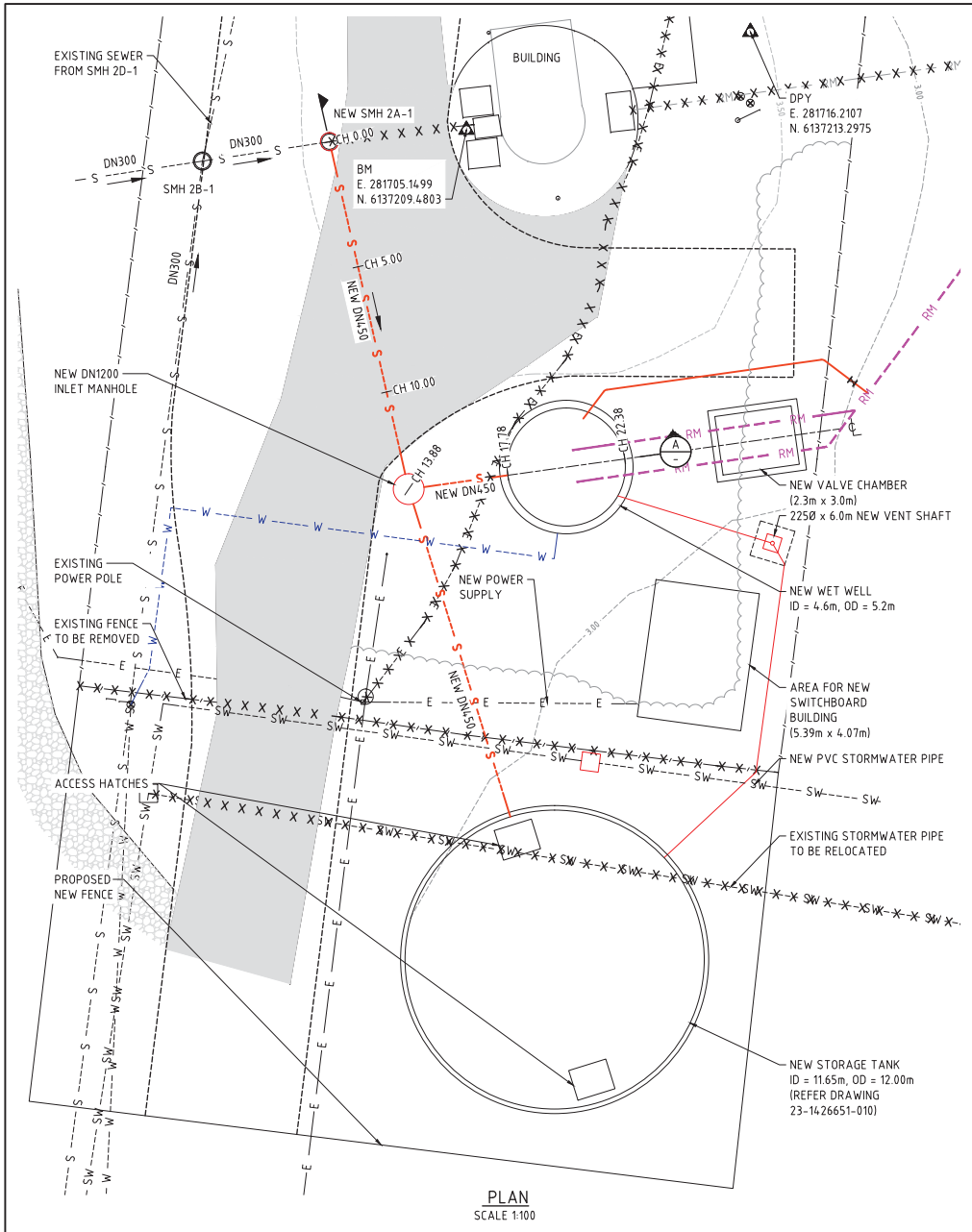
DESIGNED: C. WALLS	DATE: 26.03.15	COMPANY: GHD	
DRAWN: J.CONTRERAS	DATE: 26.03.15	COMPANY: GHD	
CHECKED: S. RANDHAWA	DATE: 20.05.15	COMPANY: GHD	
APPROVED:	DATE:	COMPANY:	

TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

NEW RISING MAIN PLAN AND SECTION

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	AS SHOWN		23-1426651-011		B

Plot Date: 21/05/15 - 13:09 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-011.dwg



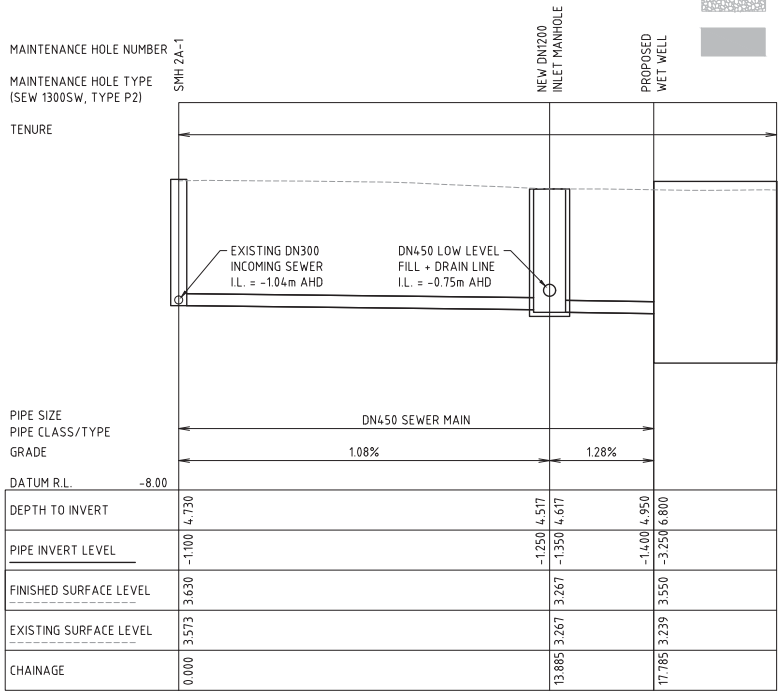
PLAN
SCALE 1:100

NOTES:

1. DRAWINGS SHALL NOT BE SCALED.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
3. MAINTENANCE HOLE DETAILS TO BE IN ACCORDANCE WITH WSA02-DRAWING SEW-1300.
4. 1% AEP FLOOD LEVEL = 4.60m AHD

LEGEND

- EXISTING RISING MAIN
- EXISTING SEWER MAIN
- EXISTING STORM WATER
- EXISTING DRAIN
- EXISTING WATER MAIN
- EXISTING ELECTRICITY BELOW GROUND
- EXISTING ELECTRICITY ABOVE GROUND
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- NEW SEWER MAIN
- NEW STORM WATER
- NEW RISING MAIN
- NEW WATER SERVICE
- EDGE OF NEW ASPHALTIC CONCRETE SURFACE
- EDGE OF VEGETATION
- CONTROL POINTS
- SEWER MANHOLE
- EXISTING GRAVEL TRACK
- EXISTING ASPHALTIC CONCRETE



A SECTION
SCALE 1 : 100H; 1 : 100V

SCALE 1:100 AT ORIGINAL SIZE

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

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PRELIMINARY ISSUE
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No.	REVISION DETAILS		
B	60% DESIGN ISSUE	CW	21.05.15
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CONSULTANT REFERENCE No. 23-1426651-012

Shoalhaven Water
A Group of Shoalhaven City Council

DESIGNED: C. WALLS	DATE: 26.03.15	COMPANY: GHD	
DRAWN: J.CONTRERAS	DATE: 26.03.15	COMPANY: GHD	
CHECKED: S. RANDHAWA	DATE: 20.05.15	COMPANY: GHD	
APPROVED:	DATE:	COMPANY:	

TITLE:
SHOALHAVEN WATER
LYREBIRD PARK NOWRA SPS2 UPGRADE

NEW GRAVITY MAIN SECTION

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:100		23-1426651-012		B

Plot Date: 21/05/15 - 13:09 Cad File: G:\23\142665100\CADD\Drawings\23-1426651-012.dwg

Appendix C Aboriginal heritage due diligence assessment

19 May 2015

Ben Bracken
Senior Environmental Scientist
GHD
Suite 3, Level 3
200 Crown Street
Wollongong NSW 2520

Dear Ben

Re: DRAFT Due Diligence Aboriginal heritage assessment of the proposed Nowra Sewage Pumping Station (SPS) 2 Upgrade, Lyrebird Park, Nowra.

This letter report has been prepared by Artefact Heritage at your request in relation to the proposed upgrade of the Nowra SPS 2 upgrade within Lyrebird Park, Nowra. This report outlines the results of a Due Diligence Aboriginal Heritage Assessment for the study area which meets the requirements of the Office of Environment and Heritage (OEH) 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*.

1.0 Authorship

This report was written by Andrew Crisp (Archaeologist). Dr Sandra Wallace (Principal Archaeologist) provided management input and reviewed the report.

2.0 Legislative Context

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* was introduced in October 2010 by the OEH (formerly the Department of Environment, Climate Change and Water). The aim of the guidelines is to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for consent in the form of an Aboriginal Heritage Impact Permit (AHIP).

A due diligence assessment should take reasonable and practicable steps to ascertain whether there is a likelihood that Aboriginal sites will be disturbed or impacted during the proposed development. If it is assessed that sites exist or have a likelihood of existing within the development area and may be impacted by the proposed development, further archaeological investigations may be required along with an AHIP. If it is found to be unlikely that Aboriginal sites exist within the study area and the due diligence assessment has been conducted according to the Code of Practice, work may proceed without an AHIP.

3.0 Study Area

Nowra SPS 2 is located within Lyrebird Park, Nowra (Figure 1). The SPS is within a fenced compound situated near sporting fields on property owned by Shoalhaven City Council (SCC) – Lot

1 DP 1127303. The study area extends beyond the existing SPS compound to the north, east and west (Figure 1).

Figure 1. Study area map

4.0 The Proposal

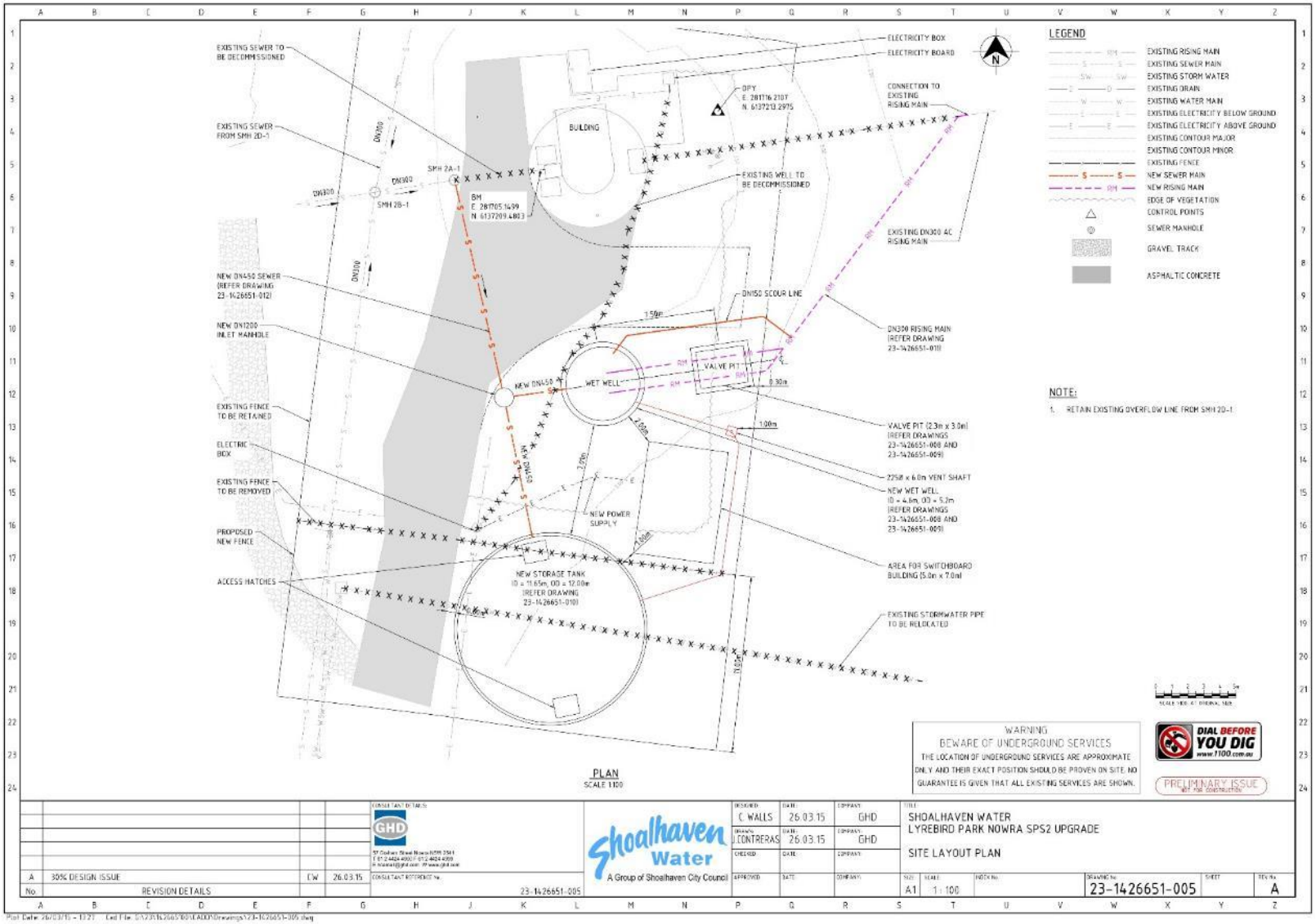
The concept design for Nowra SPS 2 consists of a new wet well to the south of the existing SPS (Figure 2): The proposal will include the following key design features

- New 5 metre diameter well with 9.1 metre diameter integrated emergency storage structure
- New submersible pumps (duty-standby) installed in the new wet well
- New valve chamber to the south east of existing SPS
- New electrical equipment located on or adjacent to new SPS roof slab
- New bypass pumping connection to the west of the existing SPS
- Existing pumps and pipework removed
- Modification to existing SPS internal wall to allow flow to enter the dry well
- Mass concrete benching in existing SPS to convert to emergency structure
- Decommission of existing wet well

Ancillary works associated with the Nowra SPS 2 upgrade would involve:

- Existing compound fence to be removed on south side. Proposed new fence line moved 7 metres to the south to incorporate new storage tank
- Construction of a maintenance turning circle

Figure 2. Site Layout Plan – concept design of the Nowra SPS 2 Upgrade.



5.0 Aboriginal Heritage Information System (AHIMS) search

An extensive search of the Aboriginal Heritage Information System (AHIMS) database was undertaken on the 24 March 2015.

An area of approximately nine kilometres (east-west) by seven kilometres (north-south) was searched in order to gain information on the archaeological context of the study area, and to ascertain whether there are any previously recorded Aboriginal sites within the study area. The details of the AHIMS search parameters are as follows:

GDA 1994 MGA 56	279474 - 288228 6134492 - 6141773
Buffer	200 m
Number of sites	49
AHIMS Search ID	166963

A total of 49 sites were identified by the extensive AHIMS search. The frequency of recorded site types is summarised in Table 1 below. The distribution of recorded sites within the AHIMS search area is shown in Figure 3 below.

The location of Aboriginal sites is considered culturally sensitive information. It is advised that this information, including the AHIMS data appearing on the heritage map for the proposal be removed from this report if it is to enter the public domain.

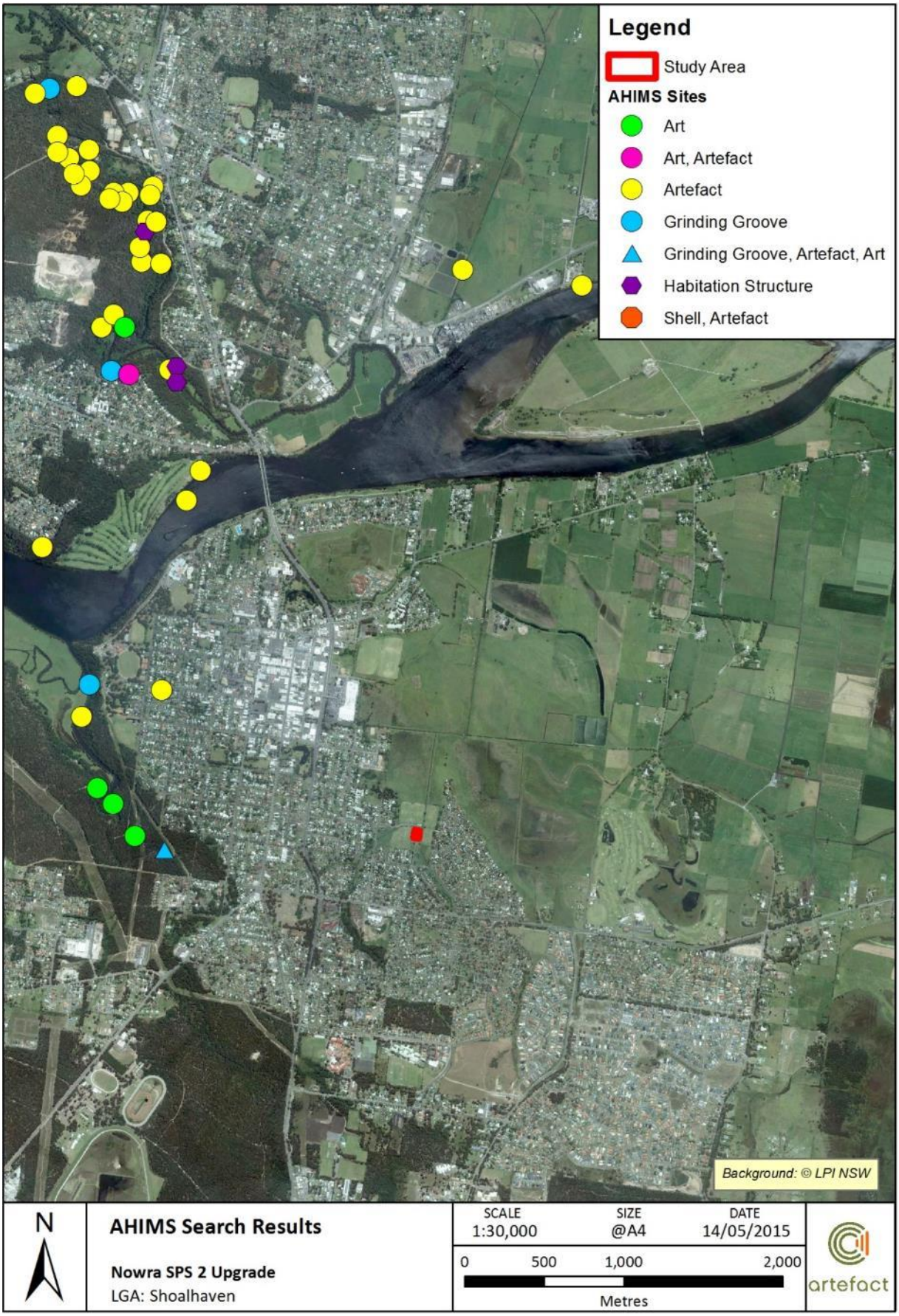
Table 1: Frequency of site features from AHIMS data

Site Feature	Frequency	Percentages
Art (Pigment or Engraved), Artefact	1	2
Grinding Groove, Artefact, Art (Pigment or Engraved)	1	2
Shell, Artefact	1	2
Grinding Groove	3	6
Habitation Structure	3	6
Art (Pigment or Engraved)	4	8
Artefact	36	74

The predominant site type located within the AHIMS search area is artefacts (n=36, 74%), followed by art sites (pigment or engraved) (n=4, 8%), habitation structures (n=3, 6%) and grinding grooves (n=3, 6%).

The seven closest sites to the study area are over one and a half kilometres to the west, located to the south of Shoalhaven River and in association with Nowra Creek. Six of these sites are rock shelters, the seventh being an axe grinding groove.

Figure 3: Distribution of AHIMS sites within extensive search area (detail).



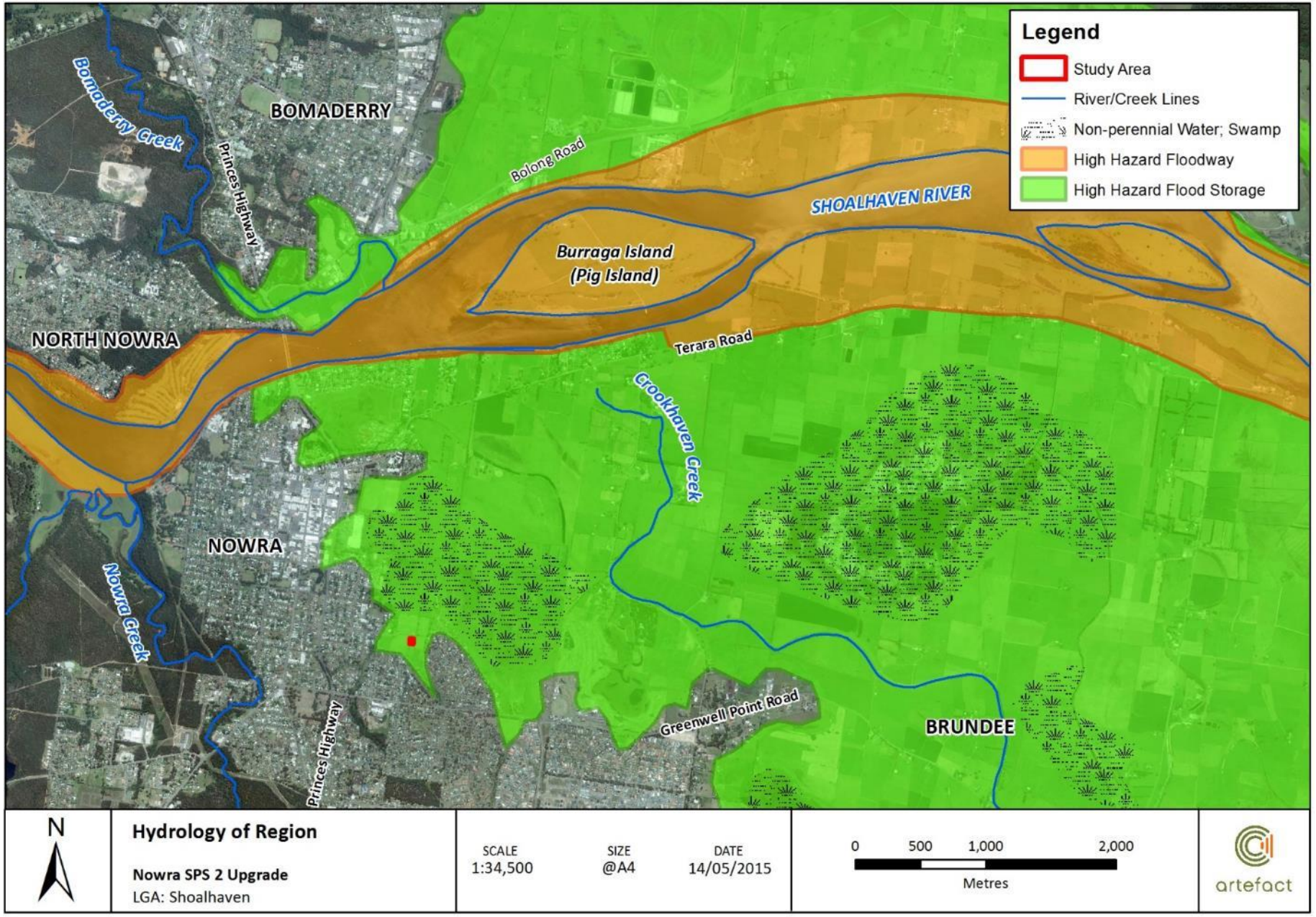
6.0 Environmental Context and Land Use

The study area is located within the floodplains of the Shoalhaven River (Figure 4), in the coastal lowlands of the South Coast of New South Wales (Kuskie 2008:5). The underlying geology of the study area is Holocene alluvium deposits, consisting of gravel, swamp deposits and sand dunes (Rose 1966). The area consists of undulating floodplain with small levees, with primarily brownish black fine sandy loam, overlying brown sandy clay loam (OEH 2015:69).

In 1805 Government surveyor James Meehan recorded that the alluvial flats along the Shoalhaven were comprised of grassland and freshwater swamps and that the area was "*covered with rainforest, brush cedar, softwoods, coachwood, blackbutt, sassafras, flametrees, brushes, palms, ferns, vines, orchids, eucalyptus and casuarinas*" (cited in Bayley 1975:18). The region contained a large abundance of fauna; including wading birds, snails, crabs and a number of fish species. The rainforest to the north would have supported a variety of mammals including swamp wallabies, kangaroos, gliders and bandicoots. The landscape has been drained and vegetation cleared by European settlers, to create adequate pastoral land. As a result of clearing vegetation now consists of pasture grassland with scattered paperbark, swamp oak and various reeds within swamp or river margins (NOHC 1994:5, OEH 2015:68).

A number of open artificial drainage channels transect the study area, these drainage channels and artificial levees have, for the most part, mitigated flooding in the area; however the region is still subject to the occasional large-scale inundation.

Figure 4: Hydrology of Region (Aerial imagery: SIXmaps NSW, Flood Data: Webb et al 2008)



7.0 Archaeological and Historical Context

Aboriginal people have lived in the Shoalhaven area for more than 20,000 years. The archaeological material record, most commonly stone artefacts, provides evidence of this long occupation and of a dynamic culture that has changed through time. The Aboriginal groups occupying the local area are thought to have been the Wandandian and the Murramarang, who were a part of the Dhurga language group. The Dhurga language was spoken in the Shoalhaven area and south to Narooma.

The Wandandian and the Murramurang were most likely part of the Yuin Nation, which occupied the South Coast between the Shoalhaven River and Cape Howe. The Aboriginal population of the Ulladulla region has been estimated to have been around 600 at the time of European settlement. This population rapidly declined as a result of European arrival, in particular the spread of diseases to which the Aboriginal population had not been previously exposed. The European occupation of Aboriginal land also had a detrimental impact on the traditional social structure. The 20th century was a time of social and institutional disenfranchisement for the Aboriginal population on the South Coast, but also of continuing connections to the landscape and the community. Many Aboriginal people were removed from their families and sent to missions and children's homes. Despite the disenfranchisement resulting from European occupation, Aboriginal culture remains strong today. The study area falls within the boundaries of the Nowra Local Aboriginal Land Council (NLALC).

Aboriginal occupation of the South Coast of NSW has been dated to at least 20 000 years ago from evidence found at sites including Burrill Lake (Lampert 1971), Bass Point (Bowdler 1970) and Bulee Brook 2 (Boot 1994). Much of the previously archaeological research in the region has focussed on coastal sites throughout Shoalhaven and Jervis Bay (Antill 1982, Sullivan 1977, Cane 1988 and Blackwell 1982). Such research provides context for the current study area.

Sullivan (1977), Cane (1988) and Blackwell (1982) have conducted archaeological research in the Jervis Bay region. Sullivan's 1997 research concerned middens and stone artefact manufacturing sites on the Bherwerre Peninsula and the spatial relationship between these sites. Sullivan (1977) found that stone artefact manufacturing sites often occurred adjacent to midden sites. Furthermore, the distances between these sites was greater in sites that were located further from the coast. Raw materials used on the Bherwerre Peninsula were predominately silcrete and quartz (Sullivan 1977:9). Cane (1988) recorded fifty sites across the Bherwerre Peninsula and Beecroft Peninsula, predominately middens and rock shelters containing deposits. Cane (1988) found evidence for intermittent early occupation of Beecroft Peninsula, followed by permanent, intense occupation over the last two thousand years (Cane 1988). Blackwell conducted an excavation of a stratified open midden on Bowen Island, off the coast of Jervis Bay in 1982. The dominant species identified in the stratigraphic layers changed over time. Blackwell (1982) noted that gastropods were predominant in the lower layers, while mussels and a more diverse range of fish were evident in the middle and upper layers. Blackwell infers a cultural change from this evidence, postulating that the upper layers may reflect an increase in women undertaking fishing and therefore having less time to gather shell fish (Blackwell 1982:50).

The Shoalhaven Antiquities Committee has recorded numerous sites around Shoalhaven, including rock shelters, art, stone arrangements and artefact scatters (Antill 1982). Stone tools identified by the committee include microliths, unifacial tools, edged flakes, grinding tools, fish hooks, bone needles and hammer stones (Antill 1982).

8.0 Previous Archaeological Assessments

Kuskie 2008:

Kuskie conducted an Aboriginal archaeological impact assessment for proposed upgrades to the Manildra Ethanol Plant. The REMS Option 1 pipeline route that was subject to an earlier assessment by Artefact had been designed to run through the Ethanol Plant. A site inspection of the proposed upgrade areas did not identify any archaeological sites. The area was considered to have very low archaeological potential, as land use modelling by Kuskie (2008:15) concluded that the levee, flats/floodplain areas of Shoalhaven River held low potential for artefactual material.

Kelleher Nightingale Consulting (KNC) 2010:

KNC conducted an Aboriginal heritage assessment for the North Nowra Link Road project; approximately four kilometres north-west of the current study area. The KNC study area was within the Bomaderry Creek Regional Park and within a gully landscape featuring sandstone escarpments and overhangs. The assessment aimed to identify Aboriginal sites and/or places within the study area and assess the impact that development would have on each individual site. The survey and overall assessment identified 28 sites, 20 of which were newly recorded. Within the KNC study area the predominant site type was occupation shelters (or shelters with deposits). Of the 28 sites identified, 21 were assessed as having low archaeological significance and six 'exhibit at least moderate archaeological significance' (KNC 2010: 76).

Artefact Heritage 2012:

Artefact Heritage conducted an Aboriginal and non-Aboriginal heritage assessment for the implementation of the Nowra 33kV feeder Line 7501/1. The feeder line extended along an easement approximately 7.1 kilometres in length and fifteen metres wide. The easement was located approximately two kilometres west of the current study area. The assessment identified four previously recorded Aboriginal sites within the vicinity of the easement. Two of the previously recorded sites were rock shelters. The assessment identified that these sites would not be impacted by the proposed development. The other two previously recorded sites were identified as open artefact sites. The investigation did not relocate these artefacts at the coordinates provided. The assessment recommended that the site areas were cordoned off to mitigate against secondary impacts that may be associated with the feeder line implementation.

Artefact Heritage 2013:

Artefact Heritage completed an Aboriginal heritage due diligence assessment for the St Ann's Street Nowra, and Edwards Avenue, Bomaderry proposed sewage pumping stations. The St Anne's study area constitutes a large portion of the alignment and scope for the current study area. The due diligence assessment did not locate any Aboriginal sites and/or places within the St Ann's Street study area and it was identified that the study area had low archaeological potential. The Edwards Avenue study area identified one isolated find within a disturbed context within close proximity to a creek line along a low lying landform unit. The Edward's Avenue study area was likewise assessed as having low archaeological potential.

Navin Officer Heritage Consultants (NOHC) 2013:

NOHC conducted a test excavation program for the proposed upgrade the Princes Highway between Berry and Bomaderry; approximately four kilometres north of the current study area. The assessment involved the excavations of 16 previously recorded potential archaeological sensitive areas (NOHC 2008). Of the 16 areas tested, 14 contained subsurface artefacts. NOHC developed a site prediction model for the Illawarra coastal plain and escarpment slopes; based on earlier

assessments and the findings of the test excavation program. The model suggested that archaeologically sensitive areas included; spurs, ridges, slopes, sheltered areas, dune systems and proximity to water (NOHC 2013:48). The model also indicates that low-lying wetland basins and alluvial flats are considered to hold low archaeological potential; however well drained, locally elevated areas within or surrounding wetland margins are archaeologically sensitive (NOHC 2013:46).

Artefact Heritage 2014:

In 2014 Artefact Heritage was commissioned by GHD to conduct an Aboriginal heritage assessment of the proposed location for the West Nowra Resource Recovery Park (RRP); approximately five kilometres to the west of the current study area. The assessment confirmed that no previously recorded Aboriginal sites were located within the boundaries of the proposed RRP. The assessment found that the RRP area had low archaeological potential due to areas of previous ground disturbance and considerable distance from fresh water sources.

9.0 Site Inspection

An inspection of the study area was undertaken on foot by Artefact Heritage archaeologists Alexander Timms and Andrew Crisp on 27 March 2015. Graham Smith from the NLALC also attended the site inspection. The main aims of the inspection were to identify any Aboriginal sites within the study area and assess archaeological potential.

Artificial terracing was identified to the north of the SPS compound (Figure 5) and within the north east corner of the compound. The west side of the compound has been impacted by the construction of a footpath and asphalt carpark (Figure 6).

The area to the south of the SPS compound was observed to be disturbed through installation of subsurface services and the construction of an asphalt access way into the SPS compound (Figure 7). To the east of the compound artificial terracing sloping to the east is present as well as a heavily used vehicle track with associated introduced fill (Figure 8).

Within the compound extensive ground disturbance has occurred as a result of construction and upgrade of the current SPS. Specific impacts include construction of the SPS infrastructure, asphalt hardstand, introduction of fill, and landscaping (Figure 9 and Figure 10).

Figure 5: North west corner of Nowra SPS 2 compound. Aspect east.

Figure 6: West side of Nowra SPS 2 compound. Aspect south.

Figure 7: South side of Nowra SPS 2 compound. Aspect east.

Figure 8: East side of Nowra SPS 2 compound. Aspect north.

Figure 9: Within Nowra SPS 2 compound. Aspect west.

Figure 10: Within Nowra SPS 2 compound. Aspect south.

10.0 Assessment of Archaeological Potential

Archaeological potential is closely related to the levels of ground disturbance within a given area. However, other factors are also taken into account when assessing archaeological potential, such as whether artefacts were located on the surface, and whether the area is within a sensitive landform unit according to the predictive statements.

This due diligence assessment has identified that a large portion of the study area has been subject to past ground disturbance. The Code of Practice defines what comprises disturbed land:

> *(4) For the purposes of this clause, land is disturbed if it is has been the subject of human activity that has changed the lands surface, being changes that remain clear and observable.*

This includes disturbed land via:

> *(c) construction of roads, trails and tracks (including fire trails and tracks and walking tracks),*

(d) clearing of vegetation,

(e) construction of buildings and the erection of other structures,

(f) 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),

The study area has been subject to extensive disturbance as defined by the Code of Practice. Disturbance is related to past vegetation clearance and ground works associated with the construction of the original SPS approximately 40 years ago and upgrade works completed approximately 25 years ago (GHD 2014). The land surrounding the current SPS compound within Lyrebird Park has been cleared, levelled and modified (drainage lines created). Overall the study area has moderate-high disturbance levels.

The entire study area falls within a low-lying flood plain which, from previous studies, has been shown have low archaeological sensitivity. Swamps and waterlogged areas would not have been as conducive to Aboriginal occupation when compared to other landforms in the locality.

Based on this background information, data from nearby archaeological investigations, known levels of disturbance at the site, and position on a landform of low archaeological sensitivity; it is considered that the study area has low potential to contain Aboriginal objects or buried archaeological deposits.

11.0 Conclusions and Recommendations

In accordance with the OEH Due Diligence guidelines, this assessment identified that:

- The study area is located within low-lying floodplains. This landform has low potential to contain Aboriginal objects.
- Moderate to high levels of disturbance were identified within the study area associated with the construction of and earlier upgrade of the Nowra SPS 2.
- No Aboriginal sites or areas where Aboriginal objects are likely to occur beneath the ground surface were identified within the study area during the site inspection.

As a result the proposed Nowra SPS 2 Upgrade works would impact areas of previously disturbed land and/or areas of low Aboriginal archaeological potential.

It is therefore recommended that there are no Aboriginal archaeological constraints on the proposed development. No Aboriginal sites or areas of high archaeological potential were identified within the study area therefore an Aboriginal Heritage Impact Permit is not required for the proposed works.

If unforseen Aboriginal objects are uncovered during development, work should cease and an archaeologist, the OEH, and the Nowra Local Aboriginal Land Council (NLALC) should be informed. If human remains are found, work should cease, the site should be secured and the NSW Police and the OEH should be notified. It is an offence under the *National Parks and Wildlife Act 1974* (as amended 2010) to disturb or destroy an Aboriginal object without an Aboriginal Heritage Impact Permit.

If changes are made to the development proposal that may result in impacts to areas not covered by this assessment, further archaeological assessment will be required.

Please do not hesitate to contact me should you require further information regarding the results of this report.

Kind regards,

Andrew Crisp
Archaeologist
Artefact Heritage

andrew.crisp@artefact.net.au

Ph: 9518 8411

12.0 References

Antill, R. 1982. 'Settlement in the South: A Record of the Discovery, Exploration and Settlement of the Shoalhaven River Basin 1803-1982'. Weston & Co, Publishers Pty Ltd: Kiama.

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Appendix D Stakeholder consultation

To be updated following stakeholder consultation

Appendix E Search results

Search Results

109 results found.

Anglican Church of the Good Shepherd 143 Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Badgerys Lookout View	Tallong, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Barren Grounds Nature Reserve Jamberoo Mountain Rd	Jamberoo, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Beecroft Peninsula Currarong Rd	Currarong, NSW, Australia	(Listed place) Commonwealth Heritage List
Beecroft Peninsula (Commonwealth) Currarong Rd	Currarong, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Beecroft Peninsula / Lake Wollumboola Currarong Rd	Currarong, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Belowla Island Nature Res	Kioloa, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Benandarah Area Princes Hwy	Benandarah, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Berry Bank and Post Office Group Queen St	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Berry Courthouse 58 Victoria St	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Berry District Princes Hwy	Berry, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Berry Local History Museum 135 Queen St	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Berry Post Office Queen St	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Berry Soldiers Memorial & Memorial Avenue Alexandra St	Berry, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Birrell & Davis Dam & Quarries	Nerriga, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Black Ash Nature Reserve Berry Mountain Rd	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bomaderry Creek Gorge West Cambewarra Rd	Bomaderry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bomaderry Creek Zieria Baeuerlenii Site West Cambewarra Rd	Bomaderry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bomaderry Creek Zieria Baeuerlenii Site 2 West Cambewarra Rd	Bomaderry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bomaderry Public School (1893 building) 5 Birrilley St	Bomaderry, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)

Boolgatta Farm Group	Princes Hwy	Yatteyyattah via Milton, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Brush Island Nature Reserve		Bawley Point, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Budawang National Park	Budawang Rd	Monga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bundanon Commonwealth Land Area	Illaroo Rd	Nowra, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Bundanon Including Landscape	Illaroo Rd	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bundanon Trust Area	Illaroo Rd	Nowra, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
Bundanon Trust Property	Illaroo Rd	Nowra, NSW, Australia	(Listed place) Commonwealth Heritage List
Cambewarra Mountain Area	Cambewarra Rd	Cambewarra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Church of the Good Shepherd Rectory (former)	Rectory Park Way	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Clyde River	Kings Hwy	Batemans Bay, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Coolangatta Estate	Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Coolangatta Estate Billiards Room (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Blacksmiths Shop (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Coach House (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Coach House (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Community Hall (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Convict Cottage (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Office (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Stables & Coachmans Residence (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate The Cottage Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Coolangatta Estate Tinsmiths Shop & Residence (former) Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Coomonderry Swamp Nature Reserve Proposal Gerroa Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Crocodile Head Area Lighthouse Rd	Currarong, NSW, Australia	(Within Listed Place) Commonwealth Heritage List
Cudmirrah Nature Reserve (1980 boundary)	Berrara, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Cudmirrah Ornithological Area Berrara Rd	Berrara, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Currarong Rockshelters Area Currarong Rd	Currarong, NSW, Australia	(Within Listed Place) Commonwealth Heritage List
Devils Glen Nature Reserve Berry Mountain Rd	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Ettrema / Bundundah Wilderness	Nerriga, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Fitzroy Falls Geological Area Moss Vale Kangaroo Valley Rd	Fitzroy Falls, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Gurumbi Nature Reserve Jervis Bay Rd	Erowal Bay, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Hampden Bridge Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Bawley Point, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Indigenous Place	Burrill Lake, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Currarong, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Currarong, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Durras North, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Kangaroo Valley, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Indigenous Place	Kioloa, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Orient Point, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Indigenous Place	Pebbly Beach via Durras North, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Indigenous Place	Sassafras via Nerriga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Indigenous Place		Termeil, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Indigenous Place		Wandandian, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Jervis Bay Fishing Heritage Area	Lighthouse Rd	Currarong, JBT, Australia	(Nomination now ineligible for PPAL) Commonwealth Heritage List
Jervis Bay and Surrounding Area	Jervis Bay Rd	Jervis Bay, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
Jervis Bay and Surrounds		Jervis Bay, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Kangaroo Valley	Kangaroo Valley Rd	Kangaroo Valley, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Kangaroo Valley Pioneer Settlement	Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Rejected Place) Register of the National Estate (Non-statutory archive)
Kangaroo Valley Police Station & Courthouse (former)	Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Kangaroo Valley Soldiers Memorial	Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Kangaroo and Lower Shoalhaven Rivers	Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Rejected Place) Register of the National Estate (Non-statutory archive)
Kirmington	Princes Hwy	Yatteyattah via Milton, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Meroogal 35 West St	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Mill Bank House and associated buildings Millbank Rd	Terara, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Milton Courthouse 64 Princes Hwy	Milton, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Morton National Park (1980 boundary)	Bundanoon, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Murramarang Area Princes Hwy	Benandarah, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Murramarang National Park (1980 boundary) Durras Rd	Durras, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Narrawallee Inlet Matron Porter Dr	Narrawallee via Mollymook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Narrawallee Inlet and Nature Reserve Lake Conjola Entrance Rd	Lake Conjola, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Narrawilly Princes Hwy	Milton, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
National Bank Queen St	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Nowra Post Office (former) 72 Junction St	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Nowra Road Bridge Princes Hwy	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Nowra Soldiers Memorial Junction St	Nowra, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Nowra South African War Memorial Junction St	Nowra, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Parma Farm and outbuildings Parma Rd	Falls Creek, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Penguin Head Geological Site Penguin Head Rd	Culburra, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Pigeon House Mountain and Surrounding Area Pigeon House Rd	Milton, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Plantation Point Rock Platform Plantation Point Pde	Vincentia, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Plunket Street Precinct Plunket St	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Point Perpendicular Lightstation Lighthouse Rd	Currarong, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Point Perpendicular Lightstation Lighthouse Rd	Currarong, NSW, Australia	(Listed place) Commonwealth Heritage List

Public School 140 Moss Vale Rd	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Red Rocks Nature Reserve Nugents Creek Rd	Kangaroo Valley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Remains of Original Coolangatta Estate Homestead Bolong Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Rock Platform South Pacific Cr	Ulladulla, NSW, Australia	(Rejected Place) Register of the National Estate (Non-statutory archive)
Rock Platforms Ulladulla Harbour	Ulladulla, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
Rodway Nature Reserve Wattamolla Rd	Berry, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
School of Arts (former) 71 Princes Hwy	Milton, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Seven Mile Beach National Park Gerroa Rd	Shoalhaven Heads, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Shoalhaven Historical Society Museum Plunket St	Nowra, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Snapper Point Nursery Beds	Kioloa, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Swan Lake / Cudmirrah Area Sussex Inlet Rd	Sussex Inlet, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Tapalla Point Rock Platforms Nowra St	Huskisson, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Union Church Jervis St	Greenwell Point, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Warden Head Geological Site Deering St	Ulladulla, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Warden Head Lighthouse Deering St	Ulladulla, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Report Produced: Fri Dec 4 14:38:05 2015

Office of Environment & Heritage

Home > Heritage > Search for heritage

Search for NSW heritage

Return to search page where you can refine/broaden your search.

ItemName 0

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search did not return any matching results.

ItemName 0

Section 2. Items listed under the NSW Heritage Act.

Your search returned 2 records.

Item name ▲	Address	Suburb	LGA	SHR
Graham Lodge	Pleasant Way	Nowra	Shoalhaven	01699
Meroogal	35 West Street	Nowra	Shoalhaven	00953

ItemName 0

Section 3. Items listed by Local Government and State Agencies.

Your search returned 26 records.

Item name ▲	Address	Suburb	LGA	Information source
Bundanon and surrounding landscape	Shoalhaven River	Nowra	Shoalhaven	GAZ
Federation Police Residence & Lockup (former)	Kinghorne Street	Nowra	Shoalhaven	LGOV
Hampden Villa		Unknown	Unknown	GAZ
Hampton Villa	Berry Street	Nowra	Shoalhaven	GAZ
Higgins Creek Bridge	Road No. 1	95.9 Km South of Nowra (21.72 Km	Shoalhaven	SGOV

		South Of Milton)		
Mechanics Institute and School of Arts	Berry Street	Nowra	Shoalhaven	GAZ
Mechanics Institute and School of Arts	25 Berry Street	Nowra	Shoalhaven	LGOV
Meroogal House, Servant's wing and stables	35 West Street	Nowra	Shoalhaven	GAZ
Moss Cottage	3 Ferry Lane	Nowra	Shoalhaven	LGOV
Nowra Bridge Over The Shoalhaven River	Princes Highway	Nowra	Shoalhaven	SGOV
Nowra Courthouse	Plunkett Street	Nowra	Shoalhaven	SGOV
Nowra Courthouse	Kinghorne Street	Nowra	Shoalhaven	LGOV
Old Nowra Road Bridge - across Shoalhaven River	Princes Highway	Nowra	Shoalhaven	GAZ
Plunkett Street Conservation Area	Plunkett Street	Nowra	Shoalhaven	LGOV
Plunkett Street Conservation Area	Plunket Street	Nowra	Shoalhaven	GAZ
Police Sergeant's Residence (Former Courthouse)	Plunkett Street	Nowra	Shoalhaven	LGOV
Shoalhaven Bridge	Princes Highway	Nowra	Shoalhaven	LGOV
SHOALHAVEN DISTRICT MEMORIAL HOSPITAL	Shoalhaven Street	Nowra	Shoalhaven	SGOV
St Andrew's Presbyterian Church		Nowra	Shoalhaven	GAZ
Tapitallee Creek Weir	Tapitallee Creek	Nowra	Shoalhaven	SGOV
Victorian Academic Gothic style Church	3 & 5 Kinghorne Street	Nowra	Shoalhaven	LGOV
Victorian Rendered Brick Residence	Plunkett Street	Nowra	Shoalhaven	LGOV
Victorian Rendered Brick School & Grounds	Plunkett Street	Nowra	Shoalhaven	LGOV
Victorian Timber Residence & Outbuildings	35 West Street	Nowra	Shoalhaven	LGOV
Victorian Weatherboard Residence & Stables	110 Berry Street	Nowra	Shoalhaven	LGOV
Wandandian Creek Bridge	Princes Highway	31.5 Km South of Nowra	Shoalhaven	SGOV

There was a total of 28 records matching your search criteria.

Key:
LGA = Local Government Area

GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.
Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

sf SHOALHAVEN

Landscape—level to gently undulating present river bed and banks, active floodplain with levees and backwater swamps on alluvium. Flat to gently undulating terrace surfaces of the Shoalhaven River. Relief <5 m and slopes <3%. Completely cleared.

Soils—moderately deep (50–100 cm) Prairie Soils (Gn4.31) occur on levees. Red Earths (Gn2.11) and Yellow and Red Podzolic Soils (Dy.2.51, Dr2.21) occur on terraces. Alluvial Soils (Uc1.22, Uc1.23) and Gleyed Podzolic (potential Acid Sulphate) Soils (Dg1.41) occur on the floodplain.

Limitations—flood hazard, seasonal waterlogging, permanently high watertable, hardsetting, acid sulphate potential (subsoil), strongly acid, sodicity.

LOCATION

Level to gently undulating active floodplain with small levees, minor depressions and backwater swamps on the Coastal Plain. Flat to gently undulating terrace surfaces of the Shoalhaven River.

LANDSCAPE

Geology

Alluvium—gravel, sand, silt and clay derived mainly from sandstone and shale overlying buried estuarine sediments.

Topography

Level to gently undulating floodplains. Relief <5 m and slopes <3%. Broad active floodplains 6–10 km wide with minor levees <1 m and occasional back plain swamps. Scattered flat to gently undulating narrow terraces with relief <2 m.

Vegetation

Completely cleared except for scattered decorative paperbark (*Melaleuca decora*), swamp oak (*Casuarina glauca*), illawarra flame tree (*Brachychiton acerifolium*) on terraces and various reeds in swamps.

Land Use

Predominantly grazing on improved pastures. Recreation areas include Nowra Golf Course.

Existing Erosion

The floodplain is subject to scour or sheet and rill erosion during floods and may be covered by varying depths of alluvial materials as the water recedes. Minor stream bank erosion is widespread.

SOILS

Dominant Soil Materials

sf1—Hardsetting brownish black fine sandy loam (topsoil)

Colour	brownish black (10YR 2/2) to brown (10YR 4/4)
Texture	fine sandy loam to sandy loam
Structure	apedal massive to weakly pedal, <2 mm crumb peds
Fabric	sandy to rough-faced, porous
pH	4.0
Stones	nil
Roots	few

sf2—Brown weakly pedal light sandy clay loam (subsoil)

Colour	brown (10YR 4/4) to yellowish brown (10YR 5/6)
Texture	light sandy clay loam to sandy clay loam
Structure	weakly pedal, <2 mm crumb peds
Fabric	sandy to rough-faced, porous
pH	4.5–5.5
Stones	nil
Roots	nil

sf3—Dull yellowish brown massive sandy clay (subsoil)

Colour	dull yellowish brown (10YR 5/4)
Texture	sandy clay
Structure	apedal massive
Fabric	dense
pH	5.0
Stones	nil
Roots	nil

sf4—Dull reddish brown moderately pedal light medium clay

Colour	dull reddish brown (5YR 4/4)
Texture	light medium clay to heavy clay
Structure	moderately pedal, 5–10 mm polyhedral peds
Fabric	rough-faced, porous
pH	4.5–5.0
Stones	nil
Roots	nil

Associated Soil Materials

Dark grey (10YR 4/1) apedal massive cat-clay with yellow streaks (5Y 8/4) pH 3.0 (after drainage) occurs near channels but is also scattered throughout the floodplain, probably in prior channels.

Dull reddish brown (5YR 4/4) earthy sandy clay loam occurs on the upper terraces.

Light grey (5Y 8/1) apedal massive silty clay loam to fine sandy clay loam occurs beneath Prairie Soils on levees in a small section north of the Shoalhaven River.[1]

Peats in swamps (localised).

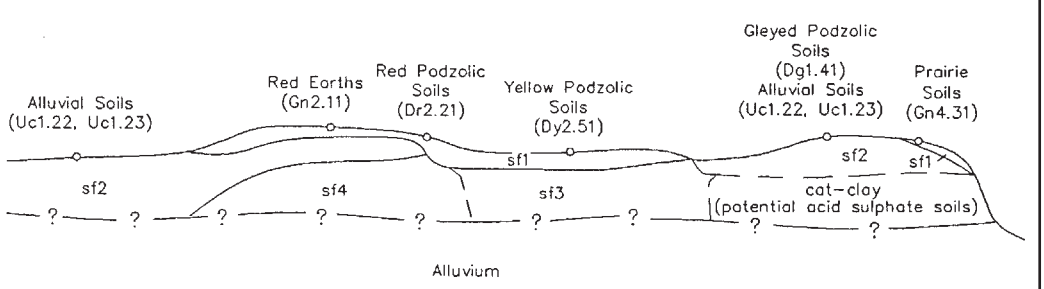
Occurrence and Relationships

A very complex soil pattern occurs on the floodplain. The following soil materials sequences have been described.

Levees. Up to 20 cm hardsetting brownish black fine sandy loam **(sf1)** overlies >50 cm brown weakly pedal sandy clay loam **(sf2)**. Boundary is gradual [Prairie Soils (Gn4.31)]. Total depth is >100 cm.

Lower terraces. Up to 20 cm **sf1** overlies >80 cm dull yellowish brown massive sandy clay **(sf3)**. Boundary is clear [Yellow Podzolic Soils (Dy2.51)]. Total depth is >100 cm.

Upper terraces. Up to 20 cm **sf1** overlies <20 cm **sf2** which overlies 80 cm dull reddish brown moderately pedal light medium clay **(sf4).** Boundaries are clear [Red Podzolic Soils (Dr.2.21)]. Total depth is >150 cm.



■ *Schematic cross-section of Shoalhaven soil landscape illustrating the occurrence and relationship of the dominant soil materials.*

[1] This soil material is probably the buried topsoil of a relict. It forms a hard layer which appears to disperse very slowly.

On higher elevations <20 cm **sf1** overlies >80 cm dull reddish brown sandy clay loam. Boundary is gradual [Red Earths (Gn2.11)]. Total depth is >150 cm.

Floodplain. Up to 100 cm **sf2** has been deposited as point bars [Alluvial Soils (Uc1.22, Uc1.23)]. Up to 30 cm **sf2** is associated with >30 cm dark grey cat-clay with yellow streaks. Boundary is abrupt [Gleyed Podzolic—potential Acid Sulphate—Soils (Dg1.41)]. Total depth is >100 cm.

LIMITATIONS TO DEVELOPMENT

Soil Limitations

sf1 Hardsetting
Very high organic matter
Strongly acid
Sodicity
Low available water-holding capacity

sf2 In combination with associated soil mat-erial, acid sulphate potential
Sodicity
Strongly acid

sf3 Low permeability
Low wet bearing strength
Low available water-holding capacity

sf4 Strongly acid
Low available water-holding capacity
Sodicity

Fertility

General fertility is moderate to low. The soils on the upper terraces **(sf1, sf2, sf4)** are moderately structured and better drained than those of the lower terraces **(sf1, sf3).** Soil materials **sf1, sf2, sf4** are strongly acid with moderate CEC. The presence of acid sulphate soils when exposed would prevent plant growth.

Erodibility

Erodibility of the topsoil is low. The erodibility of the subsoils **(sf2, sf3** and **sf4)** is high.

Erosion Hazard

Erosion hazard for non-concentrated flows is slight. The calculated soil loss for the first 12 months of urban development ranges up to 10 t/ha for topsoils and 10 t/ha for exposed subsoils. The erosion hazard for concentrated flows is low.

Surface Movement Potential

Moderately reactive topsoil **(sf1).** Non-reactive subsoils **(sf2, sf3, sf4).**

Landscape Limitations

Flood hazard
Permanent waterlogging (localised)
Permanently high watertable
Seasonal waterlogging

Urban Capability

Generally high to severe limitations for urban development.

Rural Capability

Generally low to moderate limitations for regular cultivation and grazing. High to severe limitations for cultivation and grazing in flood-prone areas. Drainage may result in highly acid soils.

Healthy Environment, Healthy Community, Healthy Business

Home > Contaminated land > Record of notices

Search results

Your search for:LGA: Shoalhaven City Council

Matched 6 notices relating to 2 sites.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
NOWRA	Lamonds LANE	Former gasworks	2 current and 1 former
NOWRA EAST	Lot 3 Kalander STREET	Mobil Service Station	3 current

Page 1 of 1

6 November 2015

National Pollutant Inventory

- Summary
- Sources
- Emissions
- Transfers
- Download
- Map

- Facility Sources
- Diffuse Sources

2013/2014 data within SHOALHAVEN - All Substances from All Sources

A list of all reporting facilities included in the search results. Click on a Facility Name to view the facility's annual report.

14 items found, displaying all items.

Registered Business Name	Facility Name	Suburb	State
AGL ENERGY SERVICES PTY LIMITED	AGL Shoalhaven Landfill	Nowra	NSW
JEMENA EASTERN GAS PIPELINE (1) PTY LTD	Bomaderry Main Line Valve and Meter Station	Bomaderry	NSW
JEMENA EASTERN GAS PIPELINE (1) PTY LTD	Nowra Main Line Valve and Meter Station	South Nowra	NSW
MINOVA AUSTRALIA PYT LTD	Orica Australia Pty Ltd Ground Support Manufacturing Australia Nowra Plant	Nowra	NSW
NOWRA CHEMICAL MANUFACTURERS PTY LTD	Nowra Chemical Manufacturers Pty Ltd	Nowra	NSW
PAPER AUSTRALIA PTY LTD	Australian Paper Shoalhaven Mill	Bomaderry	NSW
RAIL CORPORATION NEW SOUTH WALES	Sydney Trains Bomaderry Refuelling Facility	Bomaderry	NSW
SHOALHAVEN CITY COUNCIL	Bamarang Water Treatment Plant	Bamarang	NSW
SHOALHAVEN CITY COUNCIL	Bomaderry Wastewater Treatment Plant	Bomaderry	NSW
SHOALHAVEN CITY COUNCIL	Nowra Sewage Treatment Plant	Terara	NSW
SHOALHAVEN CITY COUNCIL	Sussex Inlet Sewage Treatment Works	Sussex Inlet	NSW
SHOALHAVEN CITY COUNCIL	Ulladulla Sewage Treatment Plant	Ulladulla	NSW
SHOALHAVEN STARCHES PTY LTD	Shoalhaven Starches Bomaderry	Bomaderry	NSW
WESFARMERS KLEENHEAT GAS PTY LTD	KHG Nowra	South Nowra	NSW

14 items found, displaying all items.

Export to: CSV

Records per page: 20

- NPI Database Search

Search Criteria

- Source Type = All
- Include subthreshold facility data = Yes
- Reporting year = 2013/2014
- State = National
- LGA = SHOALHAVEN
- Substance = All
- Destination type = All

Edit Criteria

Key

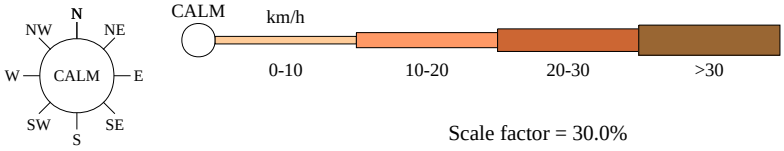
Links to an another web site
Opens a pop-up window

Display time: 0.088s

WIND FREQUENCY ANALYSIS (in km/h)

NOWRA RAN AIR STATION STATION NUMBER 068076

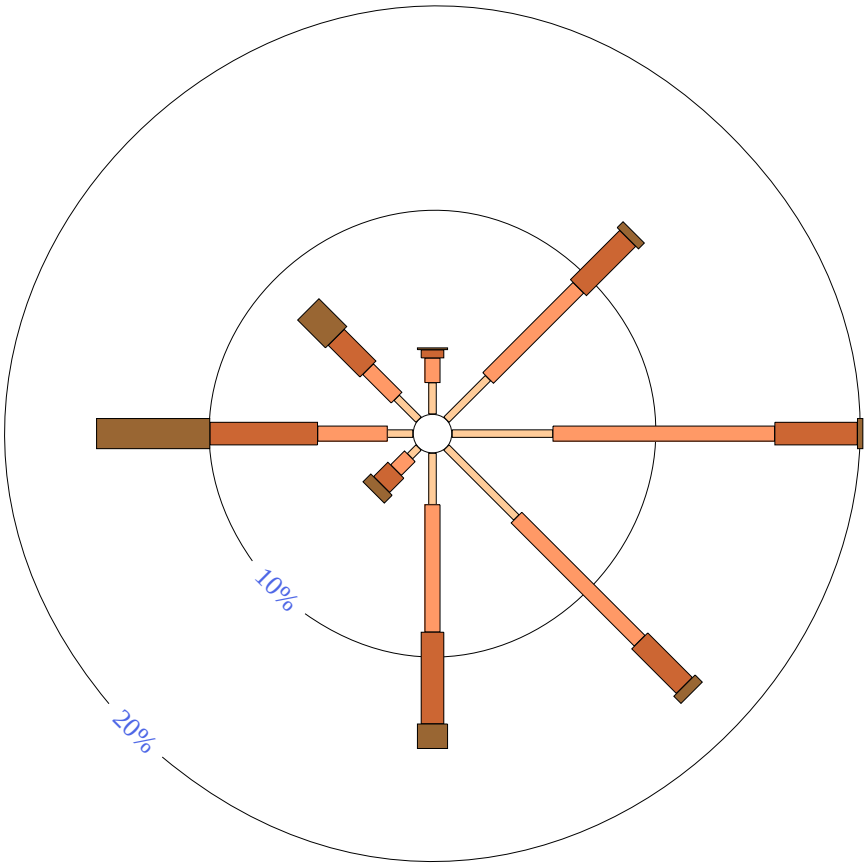
Latitude: -34.94 ° Longitude: 150.54 °



Scale factor = 30.0%

3 pm
15992 Total Observations (1955 to 2000)

Calm 5%

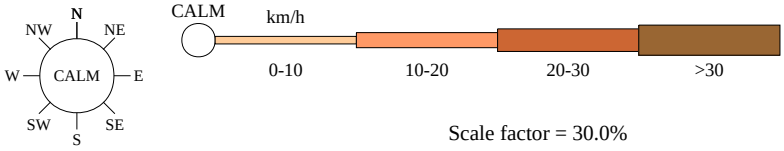


Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.

WIND FREQUENCY ANALYSIS (in km/h)

NOWRA RAN AIR STATION STATION NUMBER 068076

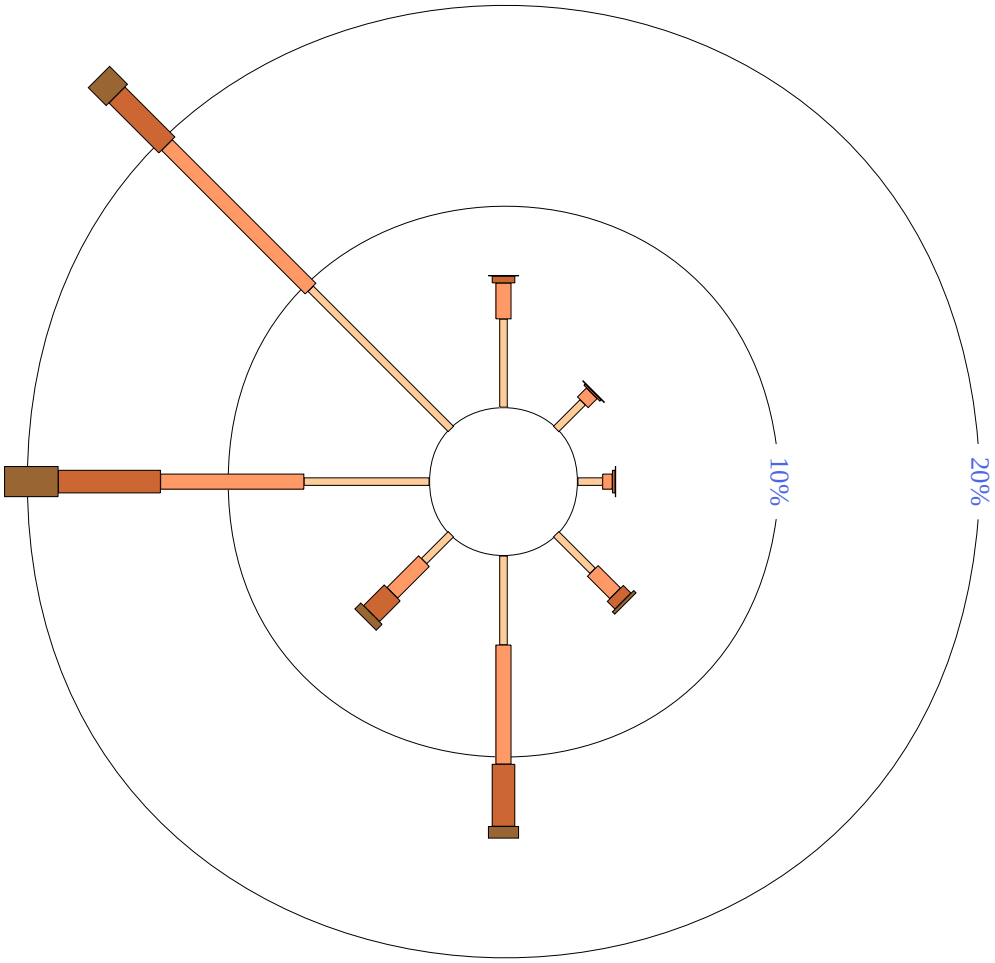
Latitude: -34.94 ° Longitude: 150.54 °



Scale factor = 30.0%

9 am
15993 Total Observations (1955 to 2000)

Calm 18%



Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.

Australian Government
Department of the Environment

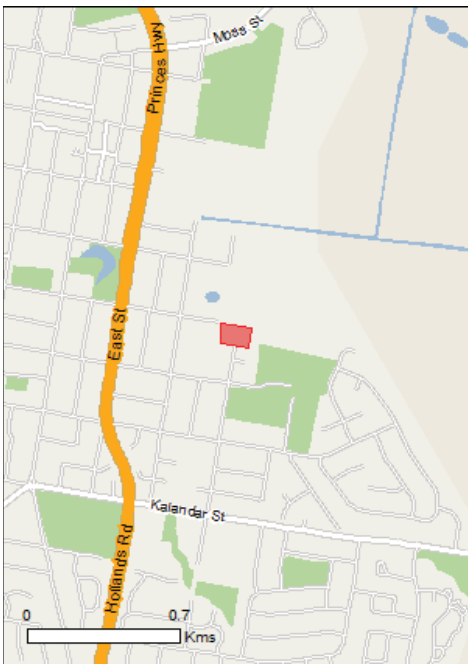
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

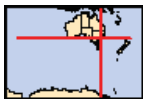
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 14/12/15 18:57:23



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	34
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	45
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		

Name	Status	Type of Presence
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat likely to occur within area
Pterostylis vernalis Halbury Rustyhood [84711]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Rhizanthella slateri		
Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Triplarina nowraensis		
Nowra Heath-myrtle [64544]	Endangered	Species or species habitat likely to occur within area
Zieria baeuerlenii		
Bomaderry Zieria, Bomaderry Creek Zieria [56781]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Hoplocephalus bungaroides		
Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Defence - Suite 18, Holt Centre

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Southern RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.881545 150.608334,-34.881699 150.609648,-34.882403 150.609514,-34.882227 150.608334,-34.881567 150.60836,-34.881567 150.60836,-34.881545 150.608334

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

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Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) ,Commonwealth listed ,Protected ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -34.83 West: 150.56 East: 150.66 South: -34.93] returned a total of
Report generated on 14/12/2015 6:10 PM

Kingdom	Class	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Amphibia	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	353
Animalia	Aves	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	6
Animalia	Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		2
Animalia	Aves	*Rostratula australis*	Australian Painted Snipe	E1,P	E	1
Plantae	Flora	*Hibbertia stricta subsp. furcatula*		E1,P		18
Plantae	Flora	*Syzygium paniculatum*	Magenta Lilly Pilly	E1,P	V	1
Plantae	Flora	*Triplarina nowraensis*	Nowra Heath Myrtle	E1,P	E	213
Plantae	Flora	*Zieria baeuerlenii*	Bomaderry Zieria	E1,P	E	117
Plantae	Flora	*Solanum celatum*		E1,P		1
Plantae	Flora	*^Genoplesium baueri*	Bauer's Midge Orchid	E1,P,2	E	17
Plantae	Flora	*^Pterostylis gibbosa*	Illawarra Greenhood	E1,P,2	E	76
Plantae	Flora	*Eucalyptus langleyi*	Eucalyptus langleyi population north of the Shoalhaven River in the Shoalhaven local government area	E2,V,P	V	8
Animalia	Aves	*Thinornis rubricollis*	Hooded Plover	E4A,P	V	1
Animalia	Aves	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	1
Plantae	Flora	*^Pterostylis vernalis*		E4A,P,2	CE	20
Animalia	Aves	*Hirundapus caudacutus*	White-throated Needletail	P	C,J,K	2
Animalia	Aves	*Ardenna pacificus*	Wedge-tailed Shearwater	P	J	1
Animalia	Aves	*Ardea ibis*	Cattle Egret	P	C,J	43
Animalia	Aves	*Plegadis falcinellus*	Glossy Ibis	P	C	3
Animalia	Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	P	C	11
Animalia	Aves	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	1
Animalia	Aves	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	3
Animalia	Aves	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	2
Animalia	Aves	*Numenius phaeopus*	Whimbrel	P	C,J,K	1
Animalia	Aves	*Hydroprogne caspia*	Caspian Tern	P	C,J	2
Animalia	Aves	*Merops ornatus*	Rainbow Bee-eater	P	J	4
Animalia	Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V,P	V	3
Animalia	Aves	*Stictonetta naevosa*	Freckled Duck	V,P		3
Animalia	Aves	*Ixobrychus flavicollis*	Black Bittern	V,P		4

Animalia	Aves	*Circus assimilis*	Spotted Harrier	V,P		1
Animalia	Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		1
Animalia	Aves	*Falco subniger*	Black Falcon	V,P		1
Animalia	Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		1
Animalia	Aves	*Epthianura albifrons*	White-fronted Chat	V,P		3
Animalia	Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		4
Animalia	Aves	*Petroica boodang*	Scarlet Robin	V,P		3
Animalia	Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	2
Animalia	Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	1
Animalia	Mammalia	*Petaurus australis*	Yellow-bellied Glider	V,P		238
Animalia	Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	41
Animalia	Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		4
Animalia	Mammalia	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		5
Animalia	Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	V,P	V	2
Animalia	Mammalia	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		13
Animalia	Mammalia	*Myotis macropus*	Southern Myotis	V,P		2
Animalia	Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		5
Animalia	Mammalia	*Arctocephalus pusillus doriferus*	Australian Fur-seal	V,P		1
Plantae	Flora	*Acacia pubescens*	Downy Wattle	V,P	V	1
Plantae	Flora	*Eucalyptus langleyi*	Albatross Mallee	V,P	V	8
Animalia	Aves	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		172
Plantae	Flora	*^Cryptostylis hunteriana*	Leafless Tongue Orchid	V,P,2	V	1
Animalia	Aves	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3		22
Animalia	Aves	*^^Pandion cristatus*	Eastern Osprey	V,P,3		2
Animalia	Aves	*^^Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		13
Animalia	Aves	*^^Neophema pulchella*	Turquoise Parrot	V,P,3		1
Animalia	Aves	*^^Ninox strenua*	Powerful Owl	V,P,3		16
Animalia	Aves	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		1
Animalia	Aves	*^^Tyto tenebricosa*	Sooty Owl	V,P,3		2

Fauna and Flora Coding Sheet for Atlas of NSW Wildlife Reports

The following tables explain the coding used in the results of searches from the Atlas of NSW Wildlife database for fauna and flora data. Please note that not all fields may be populated in your data supply. This is dependent on both the information supplied by the observer, as well as your user level.

Please see Page 7 for information regarding sensitive species data.

To use this data in GIS, database or spreadsheet software, first open in Notepad (open the zipfile, right-click on the filename and select 'Open with > Notepad') and remove the disclaimer information at the top of the dataset, save and close. This will enable your software to recognise the header row as the field names for the data.

Please be aware Atlas data can exceed the row limit in Excel (65,536 records) which may result in truncation and data loss if you open and/or resave the data. Excel may also reformat some of the fields, such as the dates.

Atlas data can exceed the ArcGIS .dbf file size limit of 2 gigabytes when converting to a shapefile.

If you are renaming the files to use in ArcGIS you should avoid using spaces or non-alphanumeric characters (such as &, $, @, #).

FIELD	DESCRIPTION AND RELEVANT CODING
DatasetName	Refers to the dataset the observation is linked to. The most common type for this field is 'Default Incidental Sightings'.
SightingKey	A unique code automatically assigned to each sighting. If you would like to query a particular record please supply us with this unique identifier.
SpeciesCode	A unique code attributed to an individual species, genus or family.
KingdomName	Refers to whether the organism is flora (FL) or fauna (FA).
ClassName	Refers to the Class name.
FamilyName	Refers to the Family name.
SortOrder	Systematic placement of taxonomic hierarchy.
ScientificName	The internationally recognised Latin name given to an organism, following the International Codes of Botanical and Zoological Nomenclature.
Exotic	Denoted by * for all non-native species.
CommonName	Refers to the common name of an organism.
NSWStatus	This code identifies the Legal Status of the species within NSW under the Threatened Species Conservation Act (TSC Act 1995), the National Parks & Wildlife Act 1974 (NPW Act 1974), the Fisheries Management Act 1994 No. 38 (FM Act 1994) and the Sensitive Species Data Policy (SSDP).

Code	Description	Definition under the NPW Act 1974, the TSC Act 1995, the FM Act 1994 No. 38, or the SSDP.
P	Protected	Refers to fauna not listed in Schedule 11 of the NPW Act 1974.
P 13	Protected Native Plants	Refers to flora listed in Schedule 13 of the NPW Act 1974.
V	Vulnerable	Refers to fauna and flora species that are likely to become endangered unless the circumstances & factors threatening its survival or evolutionary development cease to operate (Schedule 2, TSC Act 1995).
E1	Endangered	Refers to fauna and flora species that are likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction; or, it might already be extinct, but it is not presumed extinct (Schedule 1, part 1, TSC Act 1995).
E2	Endangered Population	Refers to a population where, in the opinion of the Scientific Committee, its numbers have been reduced to such a critical level, or its habitat has been so drastically reduced, that it is in immediate danger of extinction and it is not a population of a species already listed in Schedule 1, and: (a) it is disjunct and at or near the limit of its geographic range, or (b) it is or is likely to be genetically distinct, or (c) it is otherwise of significant conservation value. (Schedule 1, part 2, TSC Act 1995).
E4	Extinct	Refers to fauna and flora species that have not been located in nature during the preceding 50 years despite searching of known and likely habitats of that period (Schedule 1, part 4, TSC Act 1995).
E4A	Critically Endangered Species	Refers to a species that is eligible to be listed as a critically endangered species if, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations. (Schedule 1a, part 1, TSC Act 1995).
FCE	Critically Endangered Fish Species	Refers to fish species that, in the opinion of the Fisheries Scientific Committee, are facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations (Part 1 of Schedule 4A, FM Act 1994).
FE	Endangered Fish Species	Re Refers to fish species that, in the opinion of the Fisheries Scientific Committee: (a) are facing a very high risk of extinction in New South Wales in the near future, as determined in accordance with criteria prescribed by the regulations, and (b) are not eligible to be listed as a critically endangered species (Part 1 of Schedule 4, FM Act 1994).
FP	Protected Fish Species	The regulations may declare that fish of a specified species are protected fish (Part 2, Division 2, Section 19, FM Act 1994).
FV	Vulnerable Fish Species	Refers to fish species that, in the opinion of the Fisheries Scientific Committee: (a) are facing a high risk of extinction in New South Wales in the medium-term future, as determined in accordance

			with criteria prescribed by the regulations, and (b) are not eligible to be listed as an endangered or critically endangered species (Part 1 of Schedule 5, FM Act 1994).
	FX	Extinct Fish	Refers to a species that is eligible to be listed if, in the opinion of the Fisheries Scientific Committee, it has not been recorded in its known or expected habitat in New South Wales, despite targeted surveys, over a time frame appropriate, in the opinion of the Fisheries Scientific Committee, to its life cycle and form (Part 4 of Schedule 4, FM Act 1994).
	FEP	Endangered Population of Fish	Refers to a population that, in the opinion of the Fisheries Scientific Committee, is facing a very high risk of extinction in New South Wales in the near future, as determined in accordance with criteria prescribed by the regulations (Part 2 of Schedule 4, FM Act 1994).
	FKTP	Key Threatening Process of Fish	Refers to a threatening process that, in the opinion of the Fisheries Scientific Committee: (a) adversely affects threatened species, populations or ecological communities, or (b) could cause species, populations or ecological communities that are not threatened to become threatened (Schedule 6, FM Act 1994).
	2	Category 2 sensitive species	Refers to species for which Atlas sightings' coordinates will be supplied denatured to public web applications, and denatured to licensed clients. Such species are classed as highly sensitive, and provision of precise locations would subject the species to high risk from threats such as disturbance and collection.
	3	Category 3 sensitive species	Refers to species for which sightings' coordinates will be supplied denatured to public web applications, but supplied 'as-held' to licensed clients. Current denaturing specifications are set out in Appendix 2. Such species are classed as of medium sensitivity, and provision of precise locations would subject the species to medium risk from threats such as collection/deliberate damage. Data are supplied under the conditions of a written data agreement, usually a Data Licence Agreement.
CommStatus	This code identifies the Legal Status of the species under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act), and Migratory Bird agreements (JAMBA, CAMBA and ROKAMBA).		
	Code	Description	Definition under the EPBC Act 1999, and Migratory Birds agreement.
	C	CAMBA	China-Australia Migratory Bird Agreement: Refers to species listed in the Bilateral Agreement between the Government of Australia and the Government of the People's Republic of China for the protection of Migratory Birds and their Environment (Subdivision A of Division 1 of Part 5, Commonwealth EPBC Act 1999).
	CD	Conservation Dependent	Refers to A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of

			long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
	CE	Critically Endangered	Refers to a native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
	E	Endangered	Refers to a native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (Subdivision A of Division 2 of Part 13, Commonwealth EPBC Act 1999).
	J	JAMBA	Japan-Australia Migratory Bird Agreement: Refers to species listed in the Bilateral Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (Subdivision A of Division 1 of Part 5, Commonwealth EPBC Act 1999).
	K	ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement: Refers to species listed in the Bilateral Agreement between the Government of Australia and the Government of the Republic of Korea for the protection of Migratory Birds and their Environment (Subdivision A of Division 1 of Part 5, Commonwealth EPBC Act 1999).
	KTP	Key Threatening Process	Refers to a key process that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
	V	Vulnerable	Refers to a native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
	X	Extinct	Refers to a native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
	XW	Extinct in the Wild	Refers to a native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form (Subdivision A of Division 1 of Part 13, Commonwealth EPBC Act 1999).
SensitivityClass	Indicates whether a species is listed in the Sensitive Species data policy. Geographic co-ordinates for sensitive species may be denatured, or with-held, depending on user access permissions.		

<table>
<tr><td></td><td>Denatured records will be flagged with:
^^ - coordinates rounded to 0.01°
^ - coordinates rounded to 0.1°

The policy in full including the sensitive species listings can be located at http://www.environment.nsw.gov.au/policiesandguidelines/SensitiveSpeciesPolicy.htm.</td></tr>
<tr><td>DateFirst</td><td>Refers to the date (dd/mm/yyyy) the species was sighted at a particular location. If the date that the species was sighted is uncertain, then First Date will indicate the earliest date on which the sighting may have occurred.</td></tr>
<tr><td>DateLast</td><td>Where the exact date of a sighting is known, DateLast will be equal to DateFirst.
If the date that the species was sighted is uncertain, then Last Date will indicate the latest date on which the sighting may have occurred.</td></tr>
<tr><td>NumberIndividuals</td><td>Refers to the number of individuals recorded.</td></tr>
<tr><td>EstimateTypeCode</td><td>Refers to the accuracy of the NumberIndividuals field.
<table>
<tr><th>Code</th><th>Definition of Code</th></tr>
<tr><td>+</td><td>At least</td></tr>
<tr><td><</td><td>Less than</td></tr>
<tr><td>></td><td>Greater than</td></tr>
<tr><td>E</td><td>Estimate</td></tr>
<tr><td>X</td><td>Exactly</td></tr>
</table></td></tr>
<tr><td>SourceCode</td><td>Refers to the source of the data.
<table>
<tr><th>Code</th><th>Definition of Code</th></tr>
<tr><td>1</td><td>Specimen with Public Museum. Eg. National Herbarium / Australian Museum</td></tr>
<tr><td>2</td><td>Specimen with other collection</td></tr>
<tr><td>3</td><td>Voucher specimen used in identification</td></tr>
<tr><td>4</td><td>Sighting</td></tr>
<tr><td>5</td><td>Sighting – probable ID</td></tr>
<tr><td>6</td><td>Sighting – possible ID</td></tr>
</table></td></tr>
<tr><td>ObservationType</td><td>Refers to the mode of observation. Coding is as follows:
<table>
<tr><th>Code</th><th>Definition of Code</th></tr>
<tr><td>A</td><td>Stranding/Beaching</td></tr>
<tr><td>AR</td><td>Acoustic recording</td></tr>
<tr><td>B</td><td>Burnt</td></tr>
<tr><td>C</td><td>Cat kill</td></tr>
<tr><td>D</td><td>Dog Kill</td></tr>
<tr><td>E</td><td>Nest/Roost</td></tr>
<tr><td>F</td><td>Tracks or scratchings</td></tr>
<tr><td>FB</td><td>Burrow</td></tr>
<tr><td>G</td><td>Crushed Cones</td></tr>
<tr><td>H</td><td>Hair, feathers or skin</td></tr>
<tr><td>I</td><td>Subfossil/Fossil remains</td></tr>
<tr><td>J</td><td>Floristics Record from Systematic Flora Survey</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td>K</td><td>Dead</td></tr>
<tr><td>L</td><td>Flora record</td></tr>
<tr><td>M</td><td>Miscellaneous</td></tr>
<tr><td>N</td><td>Not located</td></tr>
<tr><td>O</td><td>Seen</td></tr>
<tr><td>OW</td><td>Seen and heard</td></tr>
<tr><td>P</td><td>Scat</td></tr>
<tr><td>Q</td><td>Camera</td></tr>
<tr><td>R</td><td>Road kill</td></tr>
<tr><td>S</td><td>Shot</td></tr>
<tr><td>T</td><td>trapped or netted</td></tr>
<tr><td>U</td><td>Ultrasonic recording</td></tr>
<tr><td>V</td><td>Fox kill</td></tr>
<tr><td>W</td><td>Heard call</td></tr>
<tr><td>X</td><td>In scat</td></tr>
<tr><td>Y</td><td>Bone, teeth, shell</td></tr>
<tr><td>Z</td><td>In raptor/owl pellet</td></tr>
</table></td></tr>
<tr><td>LocationKey</td><td>A code automatically assigned to each unique location. If you would like to query a particular location (e.g. co-ordinates do not match the description) please supply us with this unique identifier (provided to licensed clients and OEH staff only).</td></tr>
<tr><td>Description</td><td>Location description as provided by the observer. This data is withheld from public users (provided to licensed clients and OEH staff only).</td></tr>
<tr><td>Latitude_GDA94</td><td>The position South of the Equator, measured in decimal degrees.</td></tr>
<tr><td>Longitude_GDA94</td><td>The position East of the Greenwich meridian, measured in decimal degrees.</td></tr>
<tr><td>Zone</td><td>A 6° band of longitude, divided according to the Universal Transverse Mercator (UTM) coordinate system.
NSW Is divided into 4 Zones;
Zone 56 is 150 ^{o} – 156 ^{o} longitude, which encompasses much of eastern NSW.
Zone 55 is 144 ^{o} – 150 ^{o} longitude.
Zone 54 is 138 ^{o} – 144 ^{o} longitude, encompassing most of Western NSW.
Zone 57 covers Lord Howe Island.
The Zone in Atlas reports has been calculated from the Latitude and Longitude values. Data provided in MGA.</td></tr>
<tr><td>Easting</td><td>The reference in metres, measured east of an arbitrary origin (also referred to as the x-coordinate). The Easting provided in Atlas reports has been calculated from the Latitude and Longitude values. Data provided in MGA.</td></tr>
<tr><td>Northing</td><td>The reference in metres, measured north of an arbitrary origin (also referred to as the y-coordinate). The Northing provided in Atlas reports has been calculated from the Latitude and Longitude values. Data provided in MGA.</td></tr>
<tr><td>Accuracy</td><td>How accurately the coordinates represent the location of the species (in metres). For example a value of 100 would mean that the location is accurate to the nearest 100 metres.</td></tr>
<tr><td>SightingNotes</td><td>Observer comments on sighting (provided to OEH staff and licensed clients only).</td></tr>
<tr><td>LocationNotes</td><td>Additional observer comments on location (provided to OEH staff and licensed clients only).</td></tr>
</table>

Sensitive Species Information

The full Sensitive Species Data policy including the sensitive species listings is located at: http://www.environment.nsw.gov.au/policiesandguidelines/SensitiveSpeciesPolicy.htm

To further protect sensitive species, OEH requests that clients with their own location data for sensitive species consider not publishing precise locations, or detailed location descriptions, for these species.

Please note - the Atlas of NSW Wildlife database is only one of a number of sources of fauna & flora information for NSW. Other sources include the CSIRO and Birds Australia.

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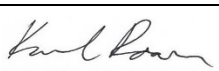
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	B Bracken	Karl Rosen		Anthony Galea		15/12/2015

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