Appendix P Waste Management Strategy

Waste Management Strategy

AGL Energy Limited

Reference: 503269

Revision: 3

12 July 2019

aurecon

Bringing ideas to life

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 5, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control						
Report title	Waste Management Strategy					
Document ID		**Project number**	503269			
File path	C:\Users\Shaun.Devine\Documents\Work\Tomago\Newcastle_WMS _ 20190712 V10.docx					
Client	AGL Energy Limited					
Client contact		**Client reference**				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
1	15 April 2019	Report draft	M Muller	K Pretorius		S Devine
2	30 May 2019	Incorporate AGL comments	M Muller	S Devine		
3	12 July 2019	Incorporate final AGL comments		S Devine		
Current revision	**3**					

Approval			
Author signature		Approver signature	
Name	M Muller	Name	S Devine
Title	Manager	Title	Manager

Contents

Figures

Tables

1 Introduction

AGL Energy Limited (AGL) have proposed to build a 250 MW Power Station (PS) with the primary role of providing firming capacity of electricity to the National Electricity Market. The location of the PS is shown in Figure 1. The proposed project is consistent with AGL's move towards a renewable energy mix, with peaking power allowing for generation service to be turned on during peak periods or when renewables aren't available.

The proposed PS (the Proposal) consists of the construction and operation of:

- The Newcastle Power Station (NPS) with a nominal capacity of 250 MW comprising of either large reciprocating engine generators or aero-derivate gas turbine generators. The NPS would operate as a "peak load" generation facility supplying electricity at short notice during periods of high electricity demand or low electricity supply.
- Facilities ancillary to the NPS include gas compression facilities, fuel storage tanks and infrastructure including diesel storage and truck unloading facilities, water management facilities and office, administration / amenities areas, workshop / storage facilities.
- Connection of the NPS to the gas supply at the Newcastle Gas Storage Facility (NGSF) with a new gas pipeline(s) and/or connection of the NPS directly to the existing Tomago to Hexham high pressure gas pipeline.
- Connection of the NPS to the existing TransGrid operated Tomago switchyard with a new 132kV transmission line.

This specialist study takes the form of a Waste Management Strategy (WMS) and will be a component of the Environmental Impact Statement (EIS) prepared to satisfy the Planning Secretary's Environmental Assessment Requirements (SEARs) made in accordance with Section 5.16 of the Environmental Planning and Assessment Act, 1979, with regards to Waste Management.

The study addresses the SEARs requirement to identify, quantify and classify the likely waste streams to be generated during construction and operation of the NPS, and describes the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

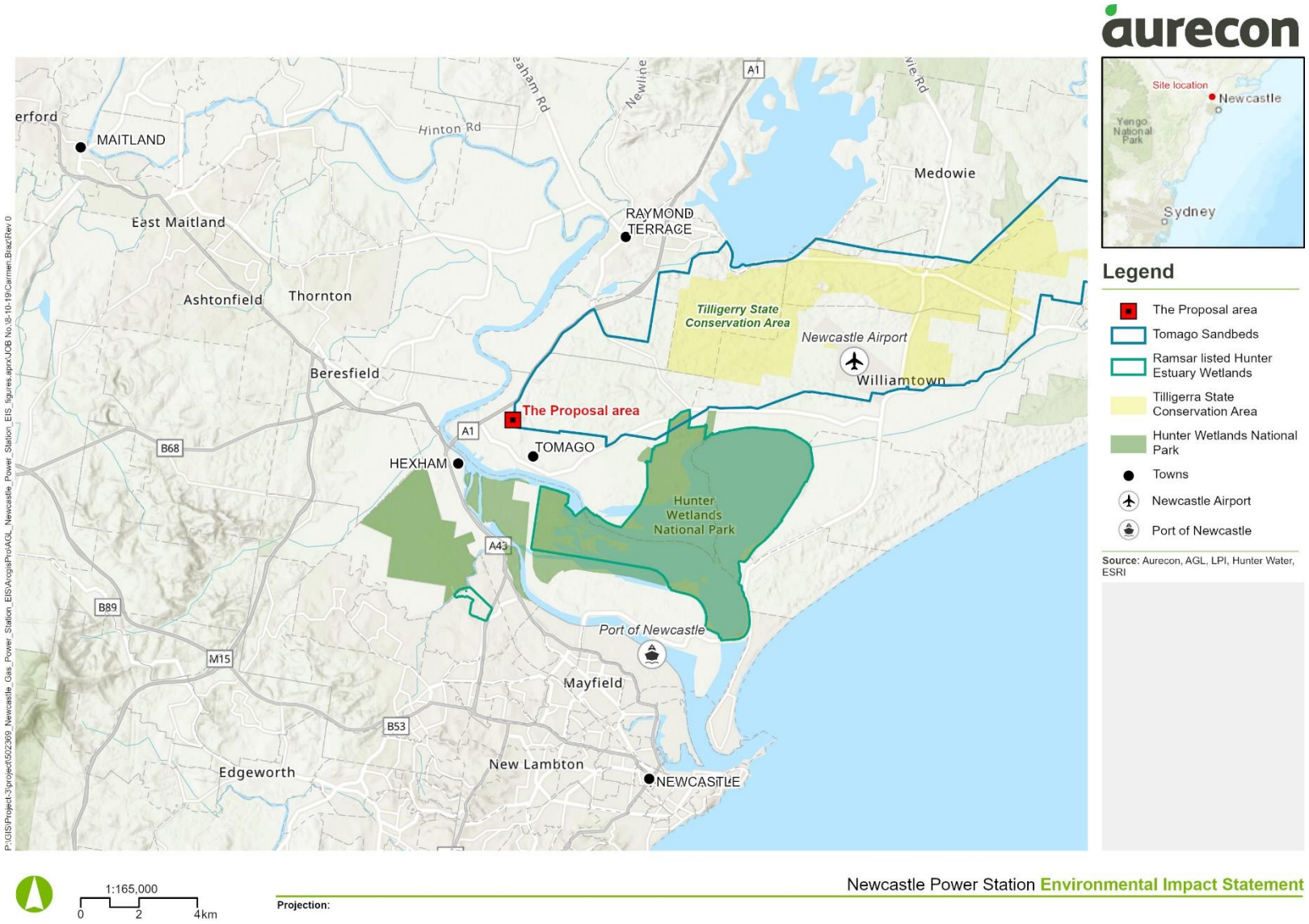


Figure 1 Locality map of the proposed NPS (URS 2001)

2 Project description

2.1 Overview

The Proposal would involve the construction and operation of a power station with a nominal capacity of about 250 MW. The Proposal would supply electricity to the grid at short notice during periods of high electricity demand, particularly during low supply periods from intermittent renewable sources or during supply outages.

The Proposal would also involve the construction and operation of a gas pipeline(s) and an electricity transmission line. The pipeline(s) would supply the proposed power station with gas from the eastern Australia gas transmission pipelines via the Jemena network and the NGSF. A new electricity transmission line would transfer the electricity produced by the proposed power station to the national electricity network via connection to the existing 132kV Tomago switchyard.

The Proposal has a capital investment value of approximately $400 million and is anticipated to be operational in 2022.

The main elements of the Proposal are as follows:

- Power station comprising of either large reciprocating engine generators or aero-derivate gas turbine generators, necessary supporting ancillary equipment and supporting infrastructure. The power station would be capable of operating with diesel fuel, if necessary.
- 132kV electricity transmission line to the existing Tomago switching yard, operated by TransGrid.
- Gas transmission/storage pipeline(s) and receiving station, compressor units, and ancillary infrastructure.
- Storage tanks and laydown areas.
- Water management infrastructure including pond(s), a connection to Hunter Water potable and non-potable service and discharge infrastructure in line with Hunter Water requirements.
- Diesel storage and truck unloading facilities.
- Site access road.
- Office / administration, amenities, workshop / storage areas and carparking.

2.2 Power station

The power station would be a dual fuel power plant, capable of generating about 250 MW of electricity. The proposed power station would either consist of large reciprocating engine generators or aero-derivate gas turbine generators. Generation units would be dual fuel capable, meaning they would be able to be supplied by natural gas and/or liquid fuel.

The decision to install gas turbines or reciprocating technology would be made based on a range of environmental, social, engineering and economic factors that would be considered as the power station design progresses.

Gas Turbine Technology

Electricity would be generated by gas turbine technology through the combustion of natural gas and/or liquid fuel in turbines. With its heritage in the airline industry, aeroderivative gas turbine units consist of a compressor, combustion chamber, turbine and generator. Air is compressed to a high pressure before being admitted into the combustion chamber. Fuel (natural gas or diesel as required) is injected into the combustion chamber where combustion occurs at very high temperatures and the gases expand. The resulting mixture of hot gas is admitted into the turbine causing the turbine to turn, generating power. In an open cycle configuration, hot exhaust gas is vented directly to the atmosphere through an exhaust stack, without heat recovery.

Reciprocating Engine Technology

With its heritage in the shipping industry and a form of internal combustion engine, reciprocating engines used for power generation harness the controlled ignition of gas and/or diesel to drive a piston within a cylinder. A number of pistons move sequentially to rotate a crank shaft which turns the generator.

Ancillary facilities

The power station, regardless of chosen technology, would require supporting ancillary facilities. These would include:

- Natural gas reception yard potentially including gas metering, pressure regulation, compression, heating stations, pigging facilities and provision for flaring.
- Generator circuit breakers, generator step-up transformers and switchyard including overhead line support gantry.
- Water collection and treatment facilities.
- Water storage tanks and ponds.
- Truck loading/unloading facilities.
- Liquid fuel storage tanks.
- Emergency diesel generators with associated fuel storage.
- Closed circuit cooling systems.
- Control room.
- Offices and messing facilities.
- Electrical switch rooms.
- Occupational health and safety systems including an emergency warning and evacuation system.
- Workshop and warehouse.
- Firefighting system.
- Communication systems.
- Security fence, security lighting, stack aviation warning lights (if required) and surveillance system.
- Landscaped areas and staff parking areas.
- Concrete foundations, bitumen roadways, concrete pads in liquid fuel unloading station and gas turbine or engine unit maintenance areas.

- Concrete bunded areas with drains for liquid fuel tanks, liquid chemicals store, oil filled transformers (if installed) and other facilities where contaminated liquids could leak.
- Level construction and laydown area.
- Engineered batters to support and protect the power plant platform.
- Sedimentation pond and associated diversion drain and earth bunding.

2.3 Gas pipeline

Natural gas fuel would originate from the existing Australian gas network and the many facilities that feed it. The nearest supply point in the gas network is the AGL owned Tomago to Hexham high pressure gas pipeline which terminates at the AGL owned and operated NGSF. The NGSF is located about two kilometres north east of the proposed power station site, refer to figure 2.

A new gas pipeline connection to the Tomago to Hexham high pressure gas pipeline (HPP) would supply the power station. This connection would be made just east of Old Punt Road, opposite the south-eastern corner of the proposed power station site. The pipeline would be constructed of approximately 100m of DN 1050 (42") ASME Class 900 pipe.

To augment the proposed gas supply, AGL is considering a new gas pipeline to connect the power station to the gas supply available from the NGSF. The pipeline route would leave the NGSF in the existing HPP easement towards the Pacific Highway before heading southwest to the power station site. AGL would enter negotiations for a pipeline easement in accordance with the Pipelines Act 1967. The pipeline would be constructed of approximately 4.6km of DN 1050 ASME Class 900 pipe.

Gas compression, conditioning, heating and other facilities necessary to transport and store gas are also likely to be required and would be constructed at the proposed power station site.

2.4 Electricity transmission line

A high voltage 132kV electricity transmission line would be required to connect the proposed power station to the TransGrid Tomago 132kV switchyard, approximately 500 metres south east. The switching station would transfer the electricity produced at the power station to the regional electricity transmission system. The transmission line would be located alongside the existing transmission line running northwest from the switchyard before heading west to the power station.

2.5 Water and wastewater

Water would be required to operate the PS. Water would primarily be used for evaporative cooling and for NO_x suppression, if necessary. When used for NO_x suppression water would be injected into the combustion chamber where it would vaporise and discharge through the exhaust stack. Additionally, evaporative cooling would be used on hot dry days to reduce the temperature of the inlet air.

The water for the proposed PS would be sourced from groundwater bores, nearby industry, and/or the Port Stephens municipal water supply system via an extension of the existing water supply infrastructure in Tomago.

Most of the water would be evaporated and discharged to the atmosphere via the exhaust stack. Excess water would be collected and then transported off the site by water tanker to a Hunter Water Corporation discharge point. The discharge point woould be constructed by Hunter Water Corporation and a location yet to be determined.

Other uses for water at the site would include:

- Firefighting water.
- Boosting the power of the PS.
- Water for washing the gas turbine compressor (if installed).
- Potable water for staff amenities.

Clean stormwater from the site would be managed where appropriate. Stormwater may be reused on site or may be discharged to the environment.

2.6 Vehicular access

The area around Tomago is serviced by a road network well suited to heavy haulage vehicles due to the industrial nature of the surrounding land uses. Old Punt Road is a sealed single lane, two-way council owned road. Old Punt Road connects to the Pacific Highway approximately one kilometre to the north of the proposed power station access point.

During construction oversized or heavy items would be transported along the Pacific Highway and Old Punt Road.

During operation, vehicular access to the Proposal would be provided via the newly formed access off Old Punt Road. This access would be used by operational staff. Parking for staff would be provided on site.

2.7 Construction activities and construction staging

The PS is anticipated to be in operation in 2022. Key construction activities for the Proposal would include:

- Clearing of vegetation at the proposed power station site and as required along the electrical transmission and gas pipeline(s) easements.
- Demolition of existing house if not repurposed during construction and operation.
- Installation of gas pipeline(s) and electrical transmission line infrastructure.
- Earthworks to prepare the power station site and construction areas.
- Installation of foundations and underground services.
- Installation of above ground civil, mechanical and electrical plant and equipment.
- Commissioning and testing.

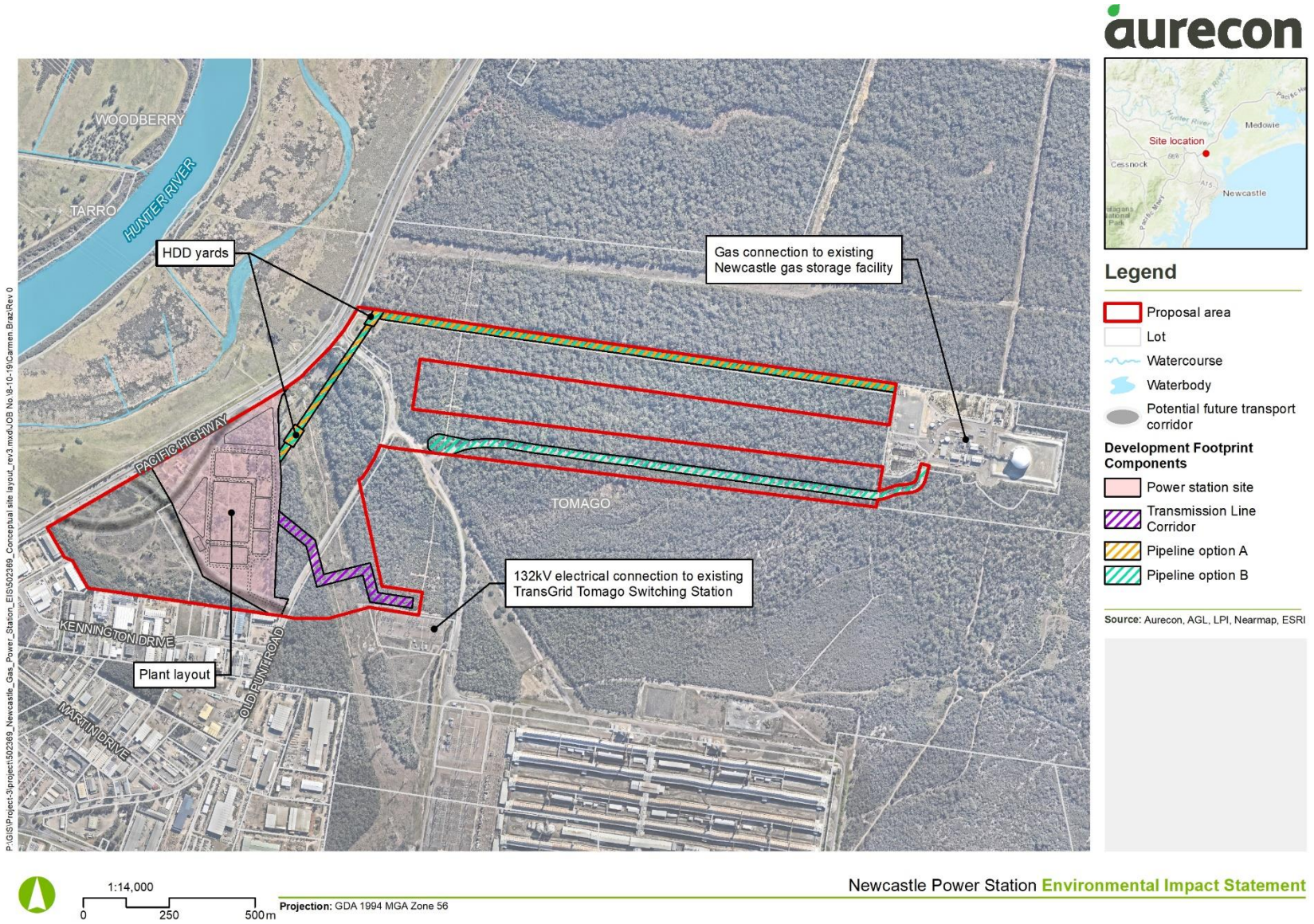


Figure 2 Proposed site layout plan

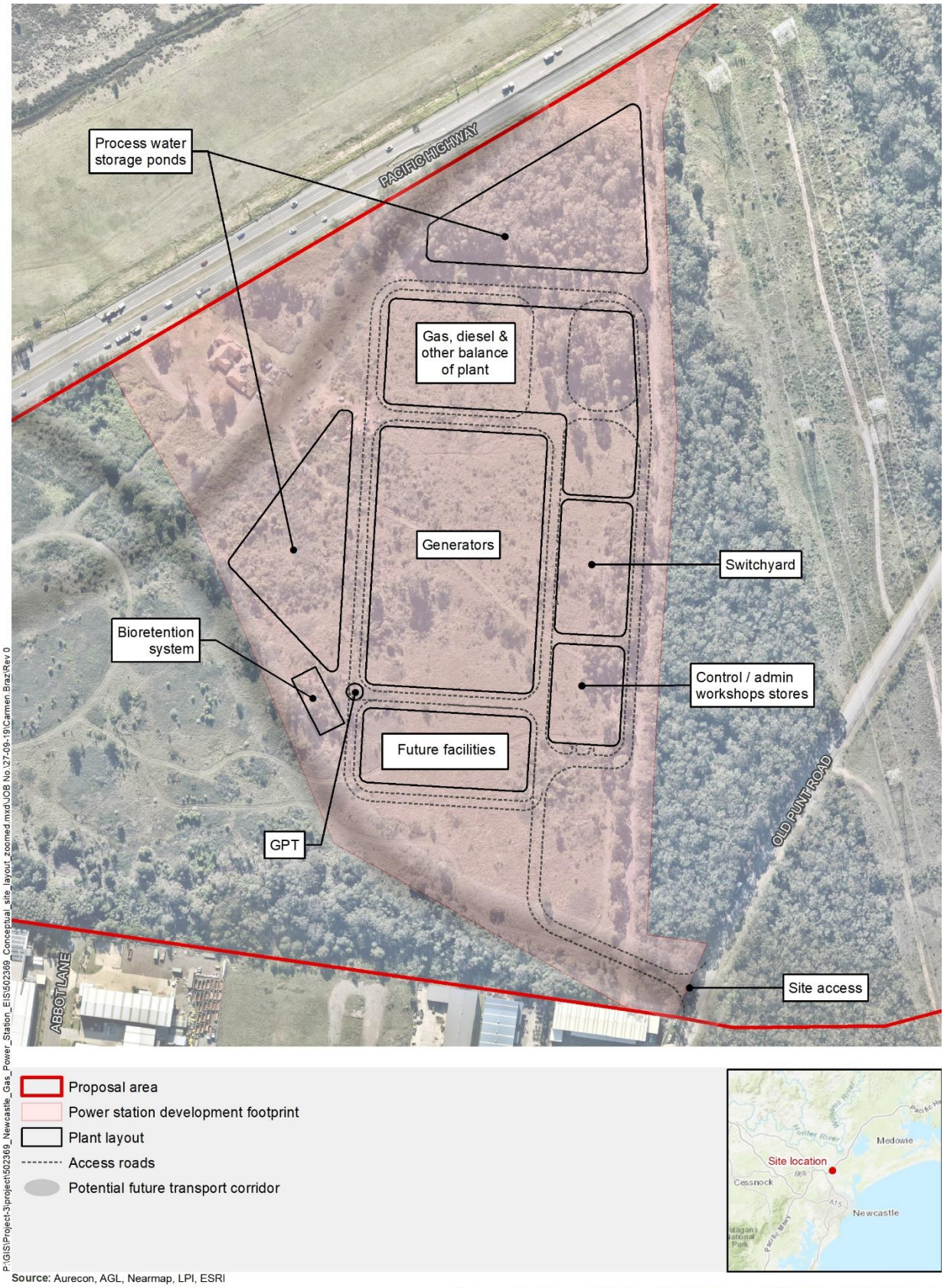


Figure 3 Detailed site layout

3 Existing environment

3.1 Proposed power station area

The proposed PS site is located at 1940 Pacific Highway, Tomago (Lot 3 DP1043561), approximately five kilometres south west of Raymond Terrace and two kilometres north east of Hexham. The site has been used previously for agricultural purposes including grazing and hosts a single storey residential dwelling. The Hunter River is approximately 470 metres north-west. The site retains some isolated trees. Stands of native vegetation are generally confined to the boundaries. The adjacent lot to the west (Lot 2 DP1043561) would be used as a laydown area during construction and for water storage and other ancillary infrastructure during operation.

Both lots are owned by AGL and are zoned industrial under the current Port Stephens Local Environmental Plan (LEP). The site is more than two kilometres from the closest residential zonings. Road access to the site would be provided with a new access road from Old Punt Road.

3.2 Utilities areas

The gas and electricity utilities corridors are proposed to be located in investigation areas shown in Figure 2. The utilities investigation areas would contain a new 132kV transmission line and one or more new gas pipelines.

The investigation area for the proposed high voltage electrical transmission line is located between the proposed power station site and the existing TransGrid Tomago 132kV switchyard. The transmission line would be constructed as an above ground line in a cleared easement up to 40 metres wide. Some underground sections may be required where construction constraints require this approach. Adjustments to the existing transmission line would be required to connect the new transmission line into the switchyard. The existing transmission line and switchyard are outside of the Proposal site.

The investigation area for the proposed gas pipeline consists of a broad corridor of land approximately 1.8 kilometres long and 0.4 kilometres wide that runs between the proposed PS site and the existing NGSF. At publication, there are two optional pipeline routes. Each of these options would be described and assessed in the EIS. The gas pipeline would be constructed below ground and would include a cleared easement up to 25 metres wide. Construction would be undertaken using a combination of trenching and directional drilling.

A secondary gas connection is proposed directly from the existing Tomago to Hexham high pressure gas pipeline (HPP) to the PS site. This would require a connection to be constructed beneath Old Punt Road adjacent to the south east corner of Lot 3 DP1043561.

Land within the utilities investigation areas is zoned industrial under the current Port Stephens LEP. The land is vegetated and contains existing easements for gas pipelines, electrical infrastructure, and roads. Where feasible, AGL intends to use the existing corridors to reduce any impact footprint. There are no dwellings in the investigation areas.

4 Study criteria

This WMS would be a component of the EIS prepared to satisfy the Environment's Secretary's Environmental Assessment Requirements (SEARs) and accompanying agency comments made in accordance with Section 5.16 of the *Environmental Planning and Assessment Act, 1979*.

It addresses the SEARs requirement to identify, quantify and classify the likely waste streams to be generated during construction and operation of the NPS, and describes the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

It conforms to the applicable legislative requirements.

4.1 SEARs

Specific points raised by the NSW Environment Protection Authority (EPA) in its comments on the SEARs (DOC19/66222-2; EF14/502 (SSI 9837) dated 8 February 2019, Attachment A, Section 7) are outlined in Table 1.

Table 1 SEARs requirements and agency comments on waste assessment

Agency comments	Report section
Include a detailed plan for in-situ classification of waste material, including the sampling locations and sampling regime that will be employed to classify the waste, particularly with regards to the identification of contamination hotspots.	Section 6.1
Identify, quantify, characterise and classify all waste that currently exists at the site. Identify the intended end use, for example reuse or disposal, and the end use location(s) for the waste. Also, specify the mechanism under which waste will be reused or disposed, such as a Resource Recovery Exemption. Note: All waste must be classified in accordance with EPA's Classification Guidelines	Section 6.1 Section 8 Section 10
Identify, characterise and classify all waste that will be generated onsite through excavation, demolition or construction activities, including proposed quantities of the waste. Note: All waste must be classified in accordance with EPA's Waste Classification Guidelines.	Section 6.2 Section 6.3
Identify, characterise and classify all waste that is proposed to be disposed of to an offsite location, including proposed quantities of the waste and the disposal locations for the waste. This includes waste that is intended for re-use or recycling. Note: All waste must be classified in accordance with EPA's Classification Guidelines.	Section 8
Include a commitment to retaining all sampling and classification results for the life of the project to demonstrate compliance with EPA's Waste Classification Guidelines.	Section 10

Agency comments	Report section
Provide details of how waste will be handled and managed onsite to minimise pollution, including: ■ Stockpile location and management – Labelling of stockpiles for identification, ensuring that all waste is clearly identified and stockpiled separately from other types of material (especially the separation of any contaminated and non-contaminated waste). – Proposed height limits for all waste to reduce the potential for dust and odour. – Procedures for minimising the movement of waste around the site and double handling. – Measures to minimise leaching from stockpiles into the surrounding environment, such as sediment fencing, geofabric liners etc. ■ Erosion, sediment and leachate control including measures to be implemented to minimise erosion, leachate and sediment mobilisation at the site during works. The EIS should show the location of each measure to be implemented. The Proponent should consider measures such as: – Sediment traps – Diversion banks – Sediment fences – Bunds (earth, hay, mulch) – Geofabric liners – Other control measures as appropriate – The Proponent should also provide details of: – how leachate from stockpiled waste material will be kept separate from stormwater runoff; – treatment of leachate through a wastewater treatment plant (if applicable); and – any proposed transport and disposal of leachate off-site.	Section 8
Provide details of how the waste will be handled and managed during transport to a lawful facility. If the waste possesses hazardous characteristics, the Proponent must provide details of how the waste will be treated or immobilised to render it suitable for transport and disposal.	Section 8
Include details of all procedures and protocols to be implemented to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment.	Section 8 Section 10
Include a statement demonstrating that the Proponent is aware of EPA's requirements with respect to notification and tracking of waste.	Section 4.2
Include a statement demonstrating that the Proponent is aware of the relevant legislative requirements for disposal of the waste, including any relevant Resource Recovery Exemptions, as gazetted by EPA from time to time.	Section 4.2
Outline contingency plans for any event that affects operations at the site that may result in environmental harm, including: excessive stockpiling of waste, volume of leachate generated exceeds the storage capacity available on-site etc.	Section 8

Agency comments	Report section
Include details of the quantity and type of liquid and/or non-liquid waste(s) generated, handled, processed or disposed of at the premises, including: ■ the transportation, assessment and handling of waste arriving at or generated at the site; ■ any stockpiling of wastes or recovered materials at the site; ■ any waste processing related to the facility, including reuse, recycling, reprocessing or treatment both on- and off-site; ■ the method for disposing of all wastes or recovered materials at the facility; ■ the emissions arising from the handling, storage, processing and reprocessing of waste at the facility; ■ the proposed controls for managing the environmental impacts of these activities.	Section 6 Secction 8

4.2 Legislative requirements

The WMS considers and complies with relevant legislation and codes where it is relevant to activities at the NPS. The legislation and codes that may be applicable to waste management at the NPS is described below.

The NSW EPA is the primary regulator of waste and pollution in NSW. The EPA manages the transport and disposal of hazardous waste and works with industry to find sustainable solutions to minimise the amount of waste going to landfill. The EPA provides leadership to ensure NSW has a fair, modern and well-regulated waste industry as well as reducing the impact of waste on the environment. In NSW, acts and regulations govern waste management, supplemented by codes and guidelines. Anyone who handles, stores, transports, processes, recycles or disposes of waste must follow these rules to minimise harm to human health and the environment.

The key legislative instruments administered or implemented by the EPA relevant to this WMS include:

- Protection of the Environment Operations Act 1997.
  - The principal environmental protection legislation for NSW is the Protection of the Environment Operations Act 1997 (POEO Act). The act:
    - defines 'waste' for regulatory purposes.
    - establishes management and licensing requirements for waste.
    - defines offences relating to waste and sets penalties.
    - establishes the ability to set various waste management requirements *via* the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation).
- Protection of the Environment Operations (Waste) Regulation 2014.
  - The Waste Regulation allows the EPA to protect human health and the environment, and provides a platform for a modern and fair waste industry.
  - It includes strict thresholds for environment protection licences and outlines the waste levy system.
- Contaminated Land Management Act 1997.

- The EPA uses its powers under the Contaminated Land Management Act 1997 (CLM Act) to deal with site contamination that is significant enough to warrant regulation under the Act, given the site's current or approved use.
- Local councils deal with other contamination under the planning and development framework, including State Environmental Planning Policy No. 55 - Remediation of Land and the Managing Land Contamination - Planning Guidelines, on sites which, though contaminated, do not pose an unacceptable risk under their current or approved use. In these cases, the planning and development process determines what remediation is needed to make the land suitable for a different use.

- Waste Avoidance and Resource Recovery Act 2001.
  - This Act promotes waste avoidance and resource recovery to achieve a continual reduction in waste generation. The Act provides for the development of a state-wide Waste Strategy and introduces a scheme to promote extended producer responsibility for the life-cycle of a product.
- National Environment Protection Council (New South Wales) Act 1995.
  - This Act provides for the establishment of a National Environment Protection Council that has power to make national environment protection measures. The NSW Government will implement National Environment Protection Measures (NEPMs) in NSW in a variety of ways, including *via* legislation. The EPA is one agency that will administer the implementation of NEPMs in NSW.
  - NEPMs implemented using EPA legislation include those relating to:
    - monitoring of ambient air quality.
    - assessment of site contamination.
    - use of packaging materials.
    - movement of controlled waste.
    - national pollutant inventory.
- Environmentally Hazardous Chemicals Act 1985.
  - This Act sets up the Hazardous Chemicals Advisory Committee. Its functions include advising the EPA on the assessment and control of chemicals that are environmentally hazardous.
  - The EPA may declare substances to be chemical wastes for the purposes of the Act. Examples of substances that have been declared include dioxin contaminated waste materials and polychlorinated biphenyl (PCB) wastes.
  - Chemical control orders.
    - The EPA may make chemical control orders (CCOs) with respect to assessed chemicals or declared chemical wastes. These CCOs may regulate activities such as the manufacture, processing, conveying, buying, selling or disposal of the chemical or declared waste. Chemicals for which a CCO has been made are referred to as environmentally hazardous chemicals.
    - A CCO may prohibit activities in relation to environmentally hazardous chemicals or declared chemical wastes, except under the authority of a licence issued by the EPA.
- Pesticides Act 1999.
  - The EPA regulates the safe and correct use of pesticides in NSW, from the point of sale, under the *Pesticides Act 1999* and the Pesticides Regulation 2017 to protect the environment and community.

- Radiation Control Act 1990.
  - The Environment Protection Authority (EPA) administers the Radiation Control Act 1990 (the Act) and Radiation Control Regulation 2013 (the Regulation).
  - The EPA has certain regulatory powers under the Act and Regulation which include regulating the use, sale, giving away, disposal, storage, possession, transport, installation, maintenance or repair, remediation or clean-up of regulated material (radioactive substances, ionising radiation apparatus, non-ionising radiation apparatus of a kind prescribed by the Regulations and sealed source devices) in NSW.
  - The objects of this Act are as follows:
    - to secure the protection of persons and the environment from exposure to ionising and harmful non-ionising radiation to the maximum extent that is reasonably practicable, taking into account social and economic factors and recognising the need for the use of radiation for beneficial purposes,
    - to protect security enhanced sources from misuse that may result in harm to people or the environment,
    - to promote the radiation protection principles.
- Dangerous Goods (Road and Rail Transport) Act 2008
  - The EPA regulates the transport of dangerous goods in NSW. Dangerous goods are substances and objects that pose acute risks to people, property and the environment due to their chemical or physical characteristics.
    - When transporting dangerous goods, training is required as well as a licence for both the driver and the vehicle.
    - If you are transporting waste, a waste transporter's licence may be needed.
    - All licence holders are listed in the dangerous goods public register.
  - This legislation controls the transport of all dangerous goods except:
    - Class 1 (explosives), regulated under the Explosives Act 2003 and administered by Safework NSW.
    - Class 7 (radioactive substances), regulated under the Radiation Control Act 1990 and administered by the EPA.
    - Dangerous goods are classified under the Australian Dangerous Goods Code (ADG Code) and the United Nations Manual of Tests and Criteria (UN Manual).
- NSW EPA – Waste Classification Guidelines, 2014.
  - The Waste Classification Guidelines covers the classification of wastes into groups that pose similar risks to the environment and human health. These classifications are:
    - special waste.
    - liquid waste.
    - hazardous waste.
    - restricted solid waste.
    - general solid waste (putrescible).
    - general solid waste (non-putrescible).
- NSW Waste Strategy (2019).

The NSW EPA is leading the development of a 20-year Waste Strategy for NSW in partnership with Infrastructure NSW which is expected to be complete by the end of this year (2019). The Strategy will set a 20-year vision for reducing waste, driving sustainable recycling markets and identifying and improving the state and regional waste infrastructure network. The aim of the Strategy is to provide industry with certainty and set goals and incentives, so the right infrastructure investments are made to meet community needs. The 20-year Waste Strategy will create a long-term vision and roadmap for waste and resource recovery in NSW, and will include:

- New long term 20-year goals for waste generation, resource recovery and landfill diversion.
- New policy positions and strategic directions in relation to waste avoidance and resource recovery.
- A plan for new or enhanced policies and programs to improve waste collection and distribution.
- A framework for the delivery of an integrated state infrastructure network.
- An alignment of policy and regulation to achieve long-term strategic objectives.
- A plan to strengthen data quality and access.

The goals of this WMS can take into consideration the NSW 20-year Waste Strategy and can be used to provide guidance in setting targets for waste reduction.

5 Methodology

5.1 Key waste management principles

The overarching aims of this WMS are to:

- Promote an integrated approach to waste management.
- Promote sustainable waste management.
- Estimate types and quantities of waste generated.
- Provide recommendations for management of the waste streams identified.
- Provide guidance on the appropriate storage, collection, transport and disposal of waste.

The WMS does this by following international best practice by moving from traditional waste management practices (hump and dump) to more sustainable solutions to minimise the waste volumes produced by the construction, operation and decommissioning of the NPS.

To reduce the types and quantities of waste produced and improve the environmental, social, and financial outcomes of the project, the strategies proposed in this WMS follow the principles of the waste hierarchy as shown in Figure 4.

Figure 4 The waste hierarchy

5.2 Waste types

The waste types that currently exist at the site, as well as the waste streams that can be expected to be generated during construction, operation and decommissioning of the NPS are anticipated to be amongst the following classes, as classified under the NSW EPS Waste Classification Guidelines, namely:

- **Special waste**
  - ‘Special waste’ is a class of waste that has unique regulatory requirements. The potential environmental impacts of special waste need to be managed to minimise the risk of harm to the environment and human health. Special waste means any of the following:
    - clinical and related waste.
    - asbestos waste.
    - waste tyres.
    - anything classified as special waste under an EPA gazettal notice.
- **Liquid waste**
  - Liquid waste means any waste (other than special waste) that:
    - has an angle of repose of less than 5 degrees above horizontal.
    - becomes free-flowing at or below 60ºC or when it is transported.
    - is generally not capable of being picked up by a spade or shovel.
    - is classified as liquid waste under an EPA gazettal notice.
- **Hazardous waste**
  - The following waste types (other than special waste or liquid waste) have been pre-classified by the EPA as ‘hazardous waste’:
    - containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or a substance to which Division 6.1 of the Transport of Dangerous Goods Code applies, from which residues have not been removed by washing or vacuuming.
    - coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste.
    - lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes).
    - lead paint waste arising otherwise than from residential premises or educational or child care institutions.
    - any mixture of the wastes referred to above.
  - A waste must be classified as ‘hazardous waste’ if it is a dangerous good under any of the following classes or divisions of the Transport of Dangerous Goods Code:
    - Class 1: Explosives.
    - Class 2: Gases (compressed, liquefied or dissolved under pressure).
    - Class 3: Flammable Liquids.
    - Class 4: Flammable Solids.
    - Class 5: Oxidising agents and organic peroxides.
    - Class 6: Toxic substances.
    - Class 7: Radioactive substances.
    - Class 8: Corrosive substances.

- Waste generators must chemically assess their waste to determine the waste's classification. If the waste generator does not undertake chemical assessment of the waste, the waste must be classified as hazardous waste. The chemical assessment process is based on the waste's potential to release chemical contaminants into the environment through contact with liquids, which leads to the production of leachates.

- **General solid waste - putrescible (GSWp)**
  - The following wastes (other than special waste, liquid waste, hazardous waste or restricted solid waste) have been pre-classified by the EPA as 'general solid waste (putrescible) (GSWp)':
    - household waste that contains putrescible organics.
    - waste from litter bins collected by or on behalf of local councils.
    - manure and night soil.
    - disposable nappies, incontinence pads or sanitary napkins.
    - food waste.
    - animal waste.
    - grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids.
    - any mixture of the wastes referred to above.
- **General solid waste - non-putrescible (GSWnp)**
  - The following wastes (other than special waste, liquid waste, hazardous waste, restricted solid waste or GSWp) are pre-classified as 'general solid waste (non-putrescible) (GSWnp)':
    - glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal.
    - paper or cardboard.
    - household waste from municipal clean-up that does not contain food waste.
    - waste collected by, or on behalf of, local councils from street sweepings.
    - grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems, that has been dewatered so that they do not contain free liquids.
    - grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids.
    - garden waste.
    - wood waste.
    - waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions.
    - containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming.
    - drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids.
    - drained motor oil containers that do not contain free liquids.
    - non-putrescible vegetative waste from agriculture, silviculture or horticulture.

- building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions and direct contact synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste.
- virgin excavated natural material.
- building and demolition waste.
- asphalt waste (including asphalt resulting from road construction and waterproofing works).
- biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the Biosolids Guidelines (EPA 2000).
- cured concrete waste from a batch plant.
- fully cured and set thermosetting polymers and fibre-reinforcing resins.
- fully cured and dried residues of resins, glues, paints, coatings and inks.
- any mixture of the wastes referred to above.

6 Results

The waste types that currently exist at the site, as well as the wastes that can be expected to be generated during construction, operation and decommissioning of the NPS are identified, quantified (where possible), characterised and classified in this section.

6.1 Existing waste currently on site[1]

The site has been used previously for agricultural purposes, including grazing, and hosts a single storey residential dwelling to be demolished unless repurposed during construction and operation. Should the existing house on Lot 3 require demolition prior to construction of the NPS, the property would be inspected for hazardous materials prior to demolition to ensure that any hazardous building materials are handled and disposed of in accordance with NSW legislation.

There are some isolated trees on the site as well as stands of native vegetation generally confined to the boundaries. These Lots are zoned IN-1 General Industrial under the current Port Stephens Local Environmental Plan (LEP).

Land within the utilities investigation areas is zoned IN-1 General Industrial under the current Port Stephens LEP. The land is vegetated and contains existing easements for gas pipeline(s), electrical infrastructure, and roads. There are no dwellings in these investigation areas.

A site walkover was undertaken by an Aurecon environmental consultant on 25 March 2019. The following observations were made during the site visit:

- A few illegal dumping locations have been identified with discarded items such as fill containing shale, brick and asphalt, cement sheeting, tyres as well as paint cans and car parts.

An intrusive environmental assessment was undertaken by Environmental Strategies in 2018 that found the following:

- AEC 5 (Dumped Waste) - Based on the existing dataset, elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) in soil may pose a potential risk to ecological to human health. Environmental Strategies provided an indicative / conservatively high estimate of 2,100 m3 potentially PAH impacted sol in this area. Concentrations of heavy metals / PAHs in groundwater may not be reflective of background conditions and may impact upon human health (e.g. drinking water) or ecological receptors (e.g. aquatic ecosystems within a nearby creek).

Table 2 summarises the existing wastes identified onsite.

Table 2 Existing waste on site

Waste clasification	Waste identified	Waste description	Estimated quantity
Hazardous	Dumped waste – Paint	Discarded items such as fill containing paint cans.	<100 kg
GSWnp	Dumped waste – Demoliton waste	Discarded items such as fill containing shale, brick and asphalt, cement sheeting, tyres as well as car parts.	~10 tons

[1] Data sourced from: Newcastle Power Station, Soils and Contaminatation Specialist Study, AGL, Ref 503269, Rev 1, 2019-07-10, authored by Aurecon

6.2 Construction waste

The construction of the NPS would generate construction waste, typical construction activities would include:

- Clearing of vegetation at the proposed PS site and as required along the electrical transmission and gas pipeline(s) easements.
- Demolition of existing house if not repurposed during construction and operation.
- Trenching and horizontal directional drilling as required to install gas pipeline(s).
- Installation of gas pipeline(s) and electrical transmission line infrastructure.
- Earthworks to prepare the power station site and construction areas.
- Installation of foundations and underground services.
- Installation of above ground civil, mechanical and electrical plant and equipment.

Typical wastes that can be expected to be generated and their classification are detailed in Table 3.

Table 3 Construction waste

Waste classification	Waste identified	Waste description	Estimated quantity
Special	Asbestos waste	Demolition of existing buildings containing asbestos (if found during assessment)	~6 tons
Hazardous	Fuels, lubricants and chemicals	Containers that previously contained Class 1, 3, 4, 5 or 8 substances used for construction plant	~2 tons
	Waste oils	Used oil from construction plant	~200 kg
GSWnp	Excavated Natural Material (ENM)	Earthworks spoil and drilling mud from trenching and horizontal directional drilling as required to install gas pipeline(s) Earthworks spoil to prepare the power station site and construction areas.	~24,473 tons
	Green waste	Clearing of vegetation at the proposed PS site and as required along the electrical transmission and gas pipeline(s) easements.	~31,223 tons
	Demolition waste	Demolition of existing buildings (not containing asbestos)	~756 tons
	Construction waste	Timber, packaging, metal, asphalt, concrete, glass, plastic, rubber, plasterboard, ceramics, bricks from the iInstallation of foundations and underground services and above ground civil, mechanical and electrical plant and equipment.	~50 tons
	Construction plant waste	Drained oil filters and motor oil containers	~500 kg
	Grit, sediment, litter and gross pollutants	Collected in, and removed from, stormwater treatment devices and/or stormwater management systems	~8 tons
	Hydrocarbon contaminated soils	Oil spills from construction plant	~250 kg
	Site office waste	Paper, cardboard	

Waste classification	Waste identified	Waste description	Estimated quantity
GSWp	Food waste	Generated from worker's lunches	~825 kg / week[2]

6.3 Operational waste

The detailed design of the NPS is currently in the planning stages, the anticipated waste streams that would require management during operation are from the following operational areas, namely:

- The power station.
- Gas compressor units.
- Storage tanks.
- Water management infrastructure including pond(s).
- Diesel storage and truck unloading facilities.
- Office / administration, amenities, workshop / storage areas.

6.3.1 Power station area

The two solid wastes generated by gas- and liquid-fired power stations are the pollutants captured from air pollution environmental controls and chemical waste; including the scale, sludge, and scrapings removed from the generator, tanks, and pipelines. (Solid Waste from the Operation and Decommissioning of Power Plants, ORNL/SPR-2016/774, January 5, 2017).

Typical air pollution environmental controls mechanisms are:

- Catalytic converters.
- Flue gas desulferisation with dry/ wet scrubbers, spray dry scrubbers, dry sorbent injections, or wet scrubbers.
- Particulate matter reduction by electrostatic precipitators, or fabric filters.

Pollutants that can be expected to be emitted and captured to an extent by these air pollution controlsare detailed SO_2, NO_x, and particulte matter ($PM_{2.5}$ and PM_{10}).

6.3.2 Other operational areas

Typical wastes that can be expected to be generated in the other operational areas and their classification are detailed in Table 4.

NOTE: These estimates are HIGHLY subjective and are rough estimate of likely volumes. Once the power station has been fully designed and built, a better calculation of the likely volumes can be undertaken.

[2] The indicative level of site personnel and the duration required for construction (peak, average) for a 65-week construction schedule is an average range of 80-100 personnel, with the peak being approximately 300 personnel. The average waste generation rate is 0.5 kg per person per day (National Waste Report 2013, 7 May 2019).

Assuming 80-100 workers per day and a five-and-a-half-day work week, approximately 220 to 275 kg of General Solid Waste (combined non-putrescible and putrescible) per week would be generated during construction. At peak, this could rise to approximately 825 kg per week.

Table 4 Expected operational waste streams

Activity / area of waste generation	Description of waste	Waste classification	Estimated quantity per year
Workshop	Tyres	Special	~ 2 tons
Workshop	Oil water separator waste, solvents, wash waste, ethylene glycol	Liquid	~ 500 kg
On-site fuel storage / management	Above and underground gas and oil tanks and pipes, fuel spills, pipe leaks	Hazardous	~ 4 tons
Use of equipment / plant	Hydrocarbons, empty cylinders, empty containers	Hazardous	~ 10 tons
Water treatment	Water treatment chemicals, spills, sludge, waste / salts from evaporation ponds	Hazardous	~ 25 tons
Water treatment	Grit and screenings	GSWnp	~ 8 tons
Stormwater controls	Grit, sediment, litter and gross pollutants	GSWnp	~ 8 tons
Workshop	Oils, grease, and fuel containers, acid containers, batteries	Hazardous	~ 600 kg
Workshop	Scrap metal, packaging	GSWnp	~ 1,5 tons
Landscaping	Green waste – grass cuttings etc	GSWnp	~ 40 tons
Power station equipment	Generators, turbines, boilers, precipitators, pumps	Liquid GSWnp	~ 80 tons
Transmission and distribution equipment	Cables, wiring, poles, transmission towers	GSWnp	~ 20 tons
Power electronics	Inverters, transformers	Liquid Hazardous GSWnp	~ 850 kg
Recyclable / salvageable wastes	Steel, copper, brick, concrete	GSWnp	~ 1 ton
Office	Paper, cardboard, plastic, Ewaste, light bulbs, cleaning chemicals	Hazardous GSWnp	~1,820 kg[3]
Office	Food waste	GSWp	

Liquid waste

The majority of on-site liquid waste is expected to be wastewater, the management of which is not included in this investigation or scope and can be found in a separate wastewater management

[3] The indicative personnel level for operation and routine maintenance of the NPS is:

- Reciprocating engine technology plant: two shifts of six hours plus site manager and administration person – 14 personnel in total and an additional 15 personnel for routine maintenance.
- Gas turbine engine technology plant: two shifts of three hours plus site manager and administration person – eight personnel in total and additional 12 personnel for routine maintenance.

Therefore, the anticipated General Solid Waste (combined non-putrescible and putrescible) generation for a maximum of 23 staff during normal operation would be in the order of 35 kg per week (15 for maintenance and 7 on one shift).

report undertaken by other parties. The remainder is non-aqueous and includes waste oils, solvents and the like, generated from operation and maintenance of mechanical systems, plant, and equipment, of which the estimated volumes are presented in Table 4

Hazardous waste

Besides the hazardous wastes generated specifically by the NPS, detailed in Section 6.3.1, and the wastes listed in Table 4; while not hazardous for the purposes of the *Transport of Dangerous Goods Code*, Class 6 materials are considered hazardous at a Federal level. The Commonwealth *Hazardous Waste (Regulation of Exports and Imports) Act 1989* defines hazardous waste as being explosive, flammable, poisonous, toxic, ecotoxic, or infectious.

Table 5 lists those materials likely to be used on site that are hazardous either under the Waste Classification Guidelines or the *Hazardous Waste (Regulation of Exports and Imports) Act 1989.*

Table 5 Potential hazardous waste from chemicals used on site

Waste chemical	Area of waste generation	Classification (Australian Dangerous Goods Code)	Estimated quantity per year
Sulphuric Acid	Demineraliser resin for regeneration and neutralization in the water treatment plant	8	~10 kg
Hydrochloric acid (HCl)	Water treatment plant	8	~10 kg
Caustic (eg NaOH)	Demineraliser resin regeneration and neutralization water treatment plant	8	~10 kg
Turbine Oils	Lubrication of turbines and pumps	6	~10 kg
Hydraulic Fluid	Steam turbine lubrication	6	~10 kg
Diesel	Workshop	6	~ 100 kg
Hydrazine (H_{2N4})	Water treatment plant	6	~10 kg
Ammonia (NH_3)	Water treatment plant	8	~10 kg
Trisodium Phosphate ($Na_3 PO_4$)	Water treatment plant	8	~10 kg
Ethylene Glycol	Workshop	6	~10 kg
Solvents	Water treatment plant	3	~10 kg
Urea	Used to reduce flue gas NO_x levels in reciprocating engines	-	~10 kg

6.4 Decommissioning waste

At decomissioning, it is likely that all PS infrastructure will be removed. A demolition contractor would be engaged to decommission all PS infrastructure and remove debris to a licensed disposal facility permitted to operate under the current and applicable regulations at the time decommissioning occurs.

- Gas turbines / engines would be dismantled and either scrapped or transported to another site for reuse. If not reused, they would be disassembled into smaller components as scrap metal.

- Concrete used for foundations would be sent to a concrete recycling facility, or buried to a suitable level below ground level to allow farming activities to continue.
- Ancillary facilities related to the PS and located on the landowners' property would be removed and repurposed or transported off site for recycling or disposal at a licensed facility.
- Overhead power poles and conductors connecting the NPS farm to the national electricity grid substation would be removed. Control room facilities and equipment not required for the operation of the substation would be removed. As far as practical, materials and components (e.g. steel, conductors, switches, transformers, etc.) would be reused, recycled or removed to licensed waste disposal facilities, and the disturbed area rehabilitated.
- Underground cables would be terminated at the end of the runs, the ends would be capped with appropriate insulation and buried to a depth of approximately one metre below the ground surface and left in place. Land disturbed by these activities would be rehabilitated.
- Underground pipelines will cleaned, terminated below ground and left in place.
- Access tracks and roads would be left in place if landowners consider the tracks to be useful to their activities or otherwise decommissioned, and the area rehabilitated.
- A decommissioning plan would be required for hazardous materials disposal.
- Where possible, all materials from the decommissioning would be reused or recycled to reduce the volume of waste disposed to landfill and conserve the natural resources required for their production.

7 Impact assessment

Potential impacts to the existing environment may result from excessive waste generation from the inefficient use of resources or from the improper management of wastes generated during the construction, operation and decommissioning of the NPS. The potential impacts are presented in Table 6.

Table 6 Potential impacts

Source of potential impact	Classification	Impact
Land clearing and landscaping	GSWnp	Generation of green waste requiring treatment or disposal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Construction and demolition	GSWnp	Generation of inert construction and demolition wastes requiring treatment or dispoal; Reduction on local landfill airpsace; Excessive use of natural resources; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
General excavation and earthworks	GSWnp	Generation of VENM requiring reuse or dispoal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Chemical wastes from construciton (Coolants, paints, solvents, lubricants, chemicals, etc.)	Hazardous	Generation of hazardous liquid wastes requiring treatment or disposal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Oil and fuel and chemical spills associated with machinery	GSWnp	Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Oily wastes from construction plant and workshops (absorbent materials, containers, filters, rags, etc.)	GSWnp	Generation of oily wastes requiring treatment or disposal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Workshop liquid wastes (oily water, solvents, wash waste)	Liquid	Generation of liquid wastes requiring treatment or disposal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Offices	GSWnp GSWp	Generation of general office type recyclable materials requiring treatment or dispoal; Generation of putresible waste requiring treatment or dispoal; Increase in vermin and pests; Reduction on local landfill airpsace; Excessive use of natural resources; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.

Source of potential impact	Classification	Impact
Workshops	Special	Generation of tyres requiring dispoal; Reduction on local landfill airpsace.
Air pollution environmental controls filters	Hazardous	Generation of hadardous materials requiring treatment or dispoal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Maintenance wastes	Hazardous	Generation of maintenance wates (scale, sludge, and scrapings removed from the generator, tanks, and pipelines) requiring treatment or dispoal; Reduction on local landfill airpsace; Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.

8 Mitigation

A hierarchical approach to waste management would be used, from the most preferable (reduce, reuse or recycle wastes) to the least preferable (disposal), to prioritise waste management strategies to avoid waste generation.

Measures would be taken to ensure that as much solid waste as possible would be recycled or reused to prevent waste disposal to landfill during both the construction and operational phases. This would be undertaken by using this WMS to generate separate Construction and Operation Waste Management plans for the site, which would include measures to promote the use of materials with minimal packaging requirements, removal of packaging off site by suppliers and fabrication of parts off site.

Where waste cannot be avoided, waste materials would be segregated by type for collection and removal (for processing or disposal) by licensed contractors. The mitigation measures listed in in this Section would be implemented to minimise and manage waste generated from the NPS.

A list of mitigation strategies for the avoidance, recycling and disposal of NPS waste is detailed in Table 7.

Table 7 Mitigation strategies for NPS wastes

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Green waste from land clearing and landscaping	GSWnp	Where practical minimise disturbance and clearing required	Reuse green waste in rehabilitation areas; Or deliver to licensed waste facility for recycling	Not preferred
Construction and demolition waste (concrete, asphalt, ceramics, bricks)	GSWnp	Precisely specify material needs to avoid over estimating requirements; Source reliable, good quality materials to minimise defects and inappropriate material; Repurpose existing buildings where practical	Crushed concrete, asphalt, ceramics and bricks may be used as aggregate for fill, footings, construction pads or road base	Where recycling is not viable on site, surplus material may be delivered to licensed waste facility for recycling or disposal
Virgin Excavated Natural Material (soil, rock and topsoil)	GSWnp	Where practical minimise disturbance footprint	Reuse on-site; Direct placement of topsoil is preferred to stockpiling; Excavated material may be used as aggregate for fill, footings, construction pads or road base	Not preferred

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Coolants, paints, solvents, lubricants, chemicals, etc.	Hazardous	Maintain detailed inventories of products to minimise over-stocking and wastage; Keep Material Safety Data Sheets available on-site to identify correct and safe means of disposal; Ensure correct storage and handling to minimise leaks and spills.	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Hydrocarbon contaminated soils	GSWnp	Avoid spills through implementation of standard operating procedures; If spills occur, investigate and put in place controls to prevent future occurrence.	Where remediation is viable and practicable, collect in appropriately bunded and covered area	Licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained
Oily wastes from construction plant and workshops (absorbent materials, containers, filters, rags, etc.)	GSWnp	Avoid spills through implementation of standard operating procedures; Ensure adequate training of staff for correct use of equipment; Ensure rags and filters are used appropriately for their lifespan.	Segregate and store in suitable containers with appropriate signage; Consider alternative uses e.g. reuse of drums or containers for temporary storage of wastes on-site; If on-site treatment is not viable, licensed transporters to remove waste for recycling at a licensed waste facility.	If reprocessing / recovery not viable, licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Workshop liquid wastes (oily water, solvents, wash waste)	Liquid	Avoid excessive wash-down in oil contaminated areas; Provide extra care and attention to avoid spillages of oil where possible; Prioritise alternative clean-up methods for spills other than water use	Collect for pre-treatment by an oil water separator; If on-site treatment is not viable, licensed transporters to remove waste for recycling at a licensed waste facility.	If reprocessing not viable, licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained
General office type recyclable materials from construction and operation (aluminium, cardboard, paper, glass, rigid plastics, etc)	GSWnp	Buy in bulk to minimise packaging waste.	Segregate and store in suitable containers with appropriate signage; Licensed transporters to remove recyclable materials for recycling at a licensed waste facility.	Not preferred
Scrap metal	GSWnp	Precisely specify material needs to avoid over estimating requirements; Source reliable, good quality materials to minimise defects and inappropriate material	Where practicable, salvage reusable metal including stakes, drums and wire; Store on-site in designated areas for removal by licensed transporter for recycling at licensed facilities.	Not preferred
Timber (pallets, formwork, etc)	GSWnp	Precisely specify material needs to avoid over estimating requirements; Source reliable, good quality materials to minimise defects and inappropriate material	Reuse or re-purpose for applications on site; Store on-site in designated areas for removal by licensed transporter for recycling at licensed facilities	Not preferred
Tyres	Special	Ensure adequate training of staff members to maximise lifespan of tyres	Store on-site in designated areas for removal by licensed transporter for recycling at licensed facilities	Not preferred

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Waste oil	Hazardous	Ensure adequate training of staff members to understand when oil becomes waste oil	Store in suitable containers with appropriate signage; Licensed transporters to remove recyclable materials for recycling at a licensed waste facility	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Air pollution environmental controls filters (catalytic converters, scrubbers, electrostatic precipitators, or fabric filters)	Hazardous	Ensure adequate training of staff for correct use of equipment; Source reliable, good quality materials to minimise defects and inappropriate material; Ensure filters are used appropriately for their lifespan	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Maintenance wastes (scale, sludge, and scrapings removed from the generator, tanks, and pipelines)	Hazardous	Ensure proper operation of equipment to minimise maintenance requirements	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Water treatment wastes (chemicals, sludges, spills)	Hazardous	Avoid spills through implementation of standard operating procedures; Ensure adequate training of staff for correct use of equipment; Source reliable, good quality materials to minimise defects and inappropriate material; Maintain detailed inventories of products to minimise over-stocking and wastage	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Stormwater management wastes	GSWnp	Ensure proper operation of equipment to minimise maintenance requirements	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Food waste from offices	GSWp	Minimise packaging waste	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained

8.1 Separation at source and recycling

A system of colour-coded waste storage containers is proposed to ensure that segregation of waste types is affected as far as possible. The waste segregation process consists of separating the waste into hazardous / non-hazardous and recyclables / non-recyclables and is described as follows:

- General solid waste - recyclable waste (putrescible and non-putrescible): plastic, paper, cardboard, aluminum cans.

- General solid waste - non-recyclable (putrescible and non-putrescible): polystyrene, food waste, tissues, wax paper.
- Hazardous waste - recyclable: used oil, empty chemicals drums and aerosols, electronic material, batteries.
- Hazardous waste - non-recyclable: oily rags and gloves, chemical absorbents, expired chemicals, hydrocarbon spills.
- Bulky waste that is too large to be accepted by the regular waste collection, such as redundant appliances, furniture etc. If needed, this can be stored and removed separately.

8.2 Storage of waste

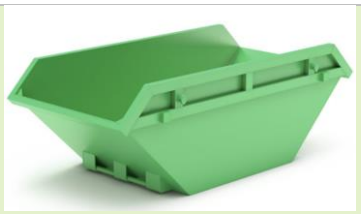
8.2.1 Waste receptacles

- General solid waste and hazardous waste would be segregated and temporarily stored in different receptacle types at various generation points, e.g. workshops, laboratory, offices, open spaces, etc. See Table 9.
- The receptacles for the various waste types will be colour coded and properly labelled to avoid comingling of waste and potential cross contamination. General and hazardous waste would also be stored separately to avoid the risk of incorrect disposal of hazardous waste.
- All liquid waste would be stored in receptacles with secondary containment bunds to catch any spills and labeled accordingly.
- Oily rags / gloves, contaminated soil, and used oil filters would also be stored in receptacles with secondary containment.
- All receptacles containing hazardous wastes would be labeled using HAZMAT symbols.
- All receptacles would be serviced regularly to avoid pests and vermin.

Typical types of receptacles are described in Table 8.

Table 8 Typical receptacle types for waste storage

Bin size (litres)	Detail	Examples
80 / 240	Red lid bin - General waste Yellow lid bin - recyclable plastics, metals and glass Green lid bin - green organic waste	
240	Hazardous waste container	

240	Hazardous waste container - Contaminated soil spills – equipment such as shovels and absorbent materials to be kept on site	
240 / 100	Spill kit example	
10 to 205	Liquid waste container	
6 m^3 / 11 m^3 / 22 m^3	Bins for oily rags / construction waste	 

8.2.2 Temporary waste storage areas

Waste would be consolidated and temporarily stored in designated areas for collection, as shown in Figure 5, and indicative receptacle types and sizes in Table 9.

Table 9 Waste generation areas and required receptacle types and quantities

Area	Bins required
Diesel area / fuel	240 l or 6 m^3 skips for contaminated soil in case of spillages
Roads	240 l or 6 m^3 skips for contaminated soil
Used oil	Drums
Workshop	6 m^3 skip bins for metal, oily rags, empty containers
Plant	240 l bin for spills
Store	Bins for recycling
Chemical store	Hazardous waste containers for redundant chemicals
Office	Bins for recycling
Site landscaping	6 m^3 skips for green waste

Figure 5 **Proposed waste storage areas and routing**

8.3 Waste collection, handling, treatment and disposal

8.3.1 Waste collection

A licensed service provider would be appointed to collect general solid waste and hazardous waste during construction and operation. The hazardous waste operator would be notified when receptacles of hazardous waste are full and require removal. These waste streams would be stored in the designated waste storage area until collected by the service provider. The proposed collection points and routing is shown in Figure 5.

A summary of the anticipated waste streams and their storage and collection management is shown in Table 10.

Table 10 Anticipated waste streams storage and collection management

Waste stream	Storage requirements	Removal protocol
Green waste from land clearing and landscaping	Separate skip bins or 240 l bins for green waste	Call when required
Construction and demolition waste (concrete, asphalt, ceramics, bricks)	6 m^3 skip bins	Call when required as this will be for construction phase only
Scrap metal	6 m^3 or 11 m^3 skip	Call when required
General solid waste (p and np)	240 l bins	Regular removal
General office type recyclable materials from construction and operation (aluminium, cardboard, paper, glass, rigid plastics, etc)	Separate 240 l bins, labelled according to waste stream	Regular removal
Recyclable materials - hazardous	Separate 240 l or 100 l containers, labelled according to waste stream	Call when required
Coolants, paints, solvents, lubricants, chemicals, etc.	240 l bins in bunded area	Call when required
Hydrocarbon contaminated soils	240 l bins	Call when required (usually in the case of a spillage)
Oily wastes from construction plant and workshops (absorbent materials, containers, filters, rags, etc.)	240 l or 6 m^3 skip in bunded area	Regular removal
Oily water, waste oil	1000 l container or 240 l / 100 l drums in bunded area with appropriate signage	Call when required
Stormwater management wastes	Evaporation pond	To be determined
Timber (pallets, formwork)	6 m^3 or 11 m^3 skip	Call when required
Tyres	6 m^3 skip or segregate and store on-site in designated areas	Call when required
Chemicals	210 l drum	Call when required

8.3.2 Handling

Each waste type would be classified for transport to ensure correct handling. Hazard groups for each waste type would be identified. If the waste possesses hazardous characteristics, details of how the waste would be treated or immobilised to render it suitable for transport and disposal would be provided.

Details of all procedures and protocols would be recorded to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment.

8.3.3 Treatment and disposal

Any waste that cannot be recovered or recycled would need to go to a licensed treatment or disposal facility where it would will be treated and disposed of according to its classification. Options to treat waste at the facility to render it less hazardous would be considered.

Details of the existing solid waste management facilities in proximity to the NPS that have potential to accept solid waste from the NPS are listed in Table 11. Available and permissible annual capacity would be confirmed in consultation with the relevant operator once the actual location and timing for development of the NPS are confirmed.

Table 11 NSW EPA licensed waste management facilities

Facility	Owner	Waste types able to receive
Summerhill Waste Management Centre	City of Newcastle	General Solid Wastes (np and p) Special Wastes Green waste processing to mulch
Newline Road Waste Facility	SUEZ	General Solid Wastes (np and p) Special Wastes Green waste processing to mulch
OneSteel Recycling Hexam	OneSteel Recycling	Metal recycling
Tomago recycling centre	Bingo	General recyclables
Kooragang Industrial waste services	Cleanaway	Hazardous waste Liquid waste
Boral Kooragang Island	Boral	Recycled concrete and brick

A record of the types, quantities and destination of all waste materials taken off-site during both the construction and operational phase of the proposed PS would be retained to monitor and manage the waste streams. Any Safe Disposal Certificates issued would be kept on file.

9 Residual impact

Some wastes, which cannot be reused or recycled, would be disposed within appropriately licensed landfills. It has been shown in Table 11 that there are several facilities licensed to accept these residual wastes within an economical haulage distance to the NPS.

10 Monitoring requirements

Compliance audits would be conducted in accordance with the requirements of this WMP as well as construction procedures, relevant legislation, license and permit conditions as well as industry standards. The following auditing regime would be implemented, in accordance with the AGL Health and Safety Environmental Management System (HSEMS):

- During the construction phase, internal audits would be undertaken at regular intervals to verify that all work is proceeding in accordance with this WMS and the HSEMS.
- During the operational phase of the NPS, internal audits of environmental compliance against statutory approvals would be undertaken on a regular basis.

Monitoring activities associated with the management of waste would include:

- Construction phase.
  - The quantities of waste being sent for reuse, recycling and disposal would be recorded by the construction contractor.
  - Storage areas for waste, reusable materials and recyclable materials would be monitored by the construction contractor to ensure materials are removed as required and to minimise potential for cross contamination of materials.
  - Regular assessment of waste generation, segregation, storage and collection practices to see whether improved practices can be implemented.
- Operation.
  - Volumes and types of waste being sent off site for reuse, recycling and disposal would be monitored and recorded.
  - Waste materials and reusable and recyclable materials storage areas would be monitored to ensure appropriate disposal contractors are engaged and to ensure materials are removed as required to minimise potential for cross contamination of materials.
  - Regular assessment of contractor treatment and disposal services to ensure compliance.
  - Regular assessment of waste generation, segregation, storage and collection practices to see whether improved practices can be implemented.

11 Conclusion

This WMS lists the types and quantities of waste that can be expected to be generated at the NPS during construction, operation and demolition. It describes the impacts these wastes could have on the environment and proposes effective mitigation measures to reduce any identified potential impacts

It provides monitoring and auditing requirements to ensure adherence to the WMS. The regular monitoring requirements also allow for ‘route correcting’ should situations change on site.

The WMS has been compiled using available information (as of May 2019) as data from the NPS cannot yet be obtained until it is operational. Once the PS is constructed and operational, the types and volumes waste generated can be accurately measured and this WMS can be revised to take this data into account.

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873

Level 5, 116 Military Road
Neutral Bay NSW 2089

PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

aurecon

Bringing ideas to life

Aurecon offices are located in:
Angola, Australia, Botswana, China,
Ghana, Hong Kong, Indonesia, Kenya,
Lesotho, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Qatar, Rwanda, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam, Zambia,