Port Kembla Gas Terminal

Submissions Report

February 2019

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1. Introduction

1.1 Background

Australian Industrial Energy (AIE) proposes to develop the Port Kembla Gas Terminal (the project). The project involves the development of a liquefied natural gas (LNG) import terminal at Port Kembla south of Wollongong in NSW. The project would be the first of its kind in NSW and would provide a simple and flexible solution to the state's gas supply challenges.

The project would involve the following four key components:

- LNG carrier ships which would transport LNG cargoes from Australian and global production facilities to Port Kembla
- A maritime vessel known as a floating storage and regasification unit (FSRU) moored at Berth 101 in the Inner Harbour
- Berth and wharf facilities to transfer natural gas from the FSRU to the underground gas pipeline
- A short gas pipeline connecting to the east coast gas transmission network at Cringilla

In June 2018, the NSW Minister for Planning declared the Port Kembla Gas Terminal to be Critical State Significant Infrastructure (CSSI) under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) on the basis that it is essential to NSW on social, economic and/or economic grounds.

The project was described and assessed in detail in the Port Kembla Gas Terminal Environmental Impact Statement (EIS). The EIS was submitted to the NSW Department of Planning and Environment (DPE) in November 2018. It was then placed on public exhibition between 14 November and 14 December 2018. During that time a total of 23 submissions were received from government agencies, interest groups, corporations and individuals.

1.2 Purpose and structure

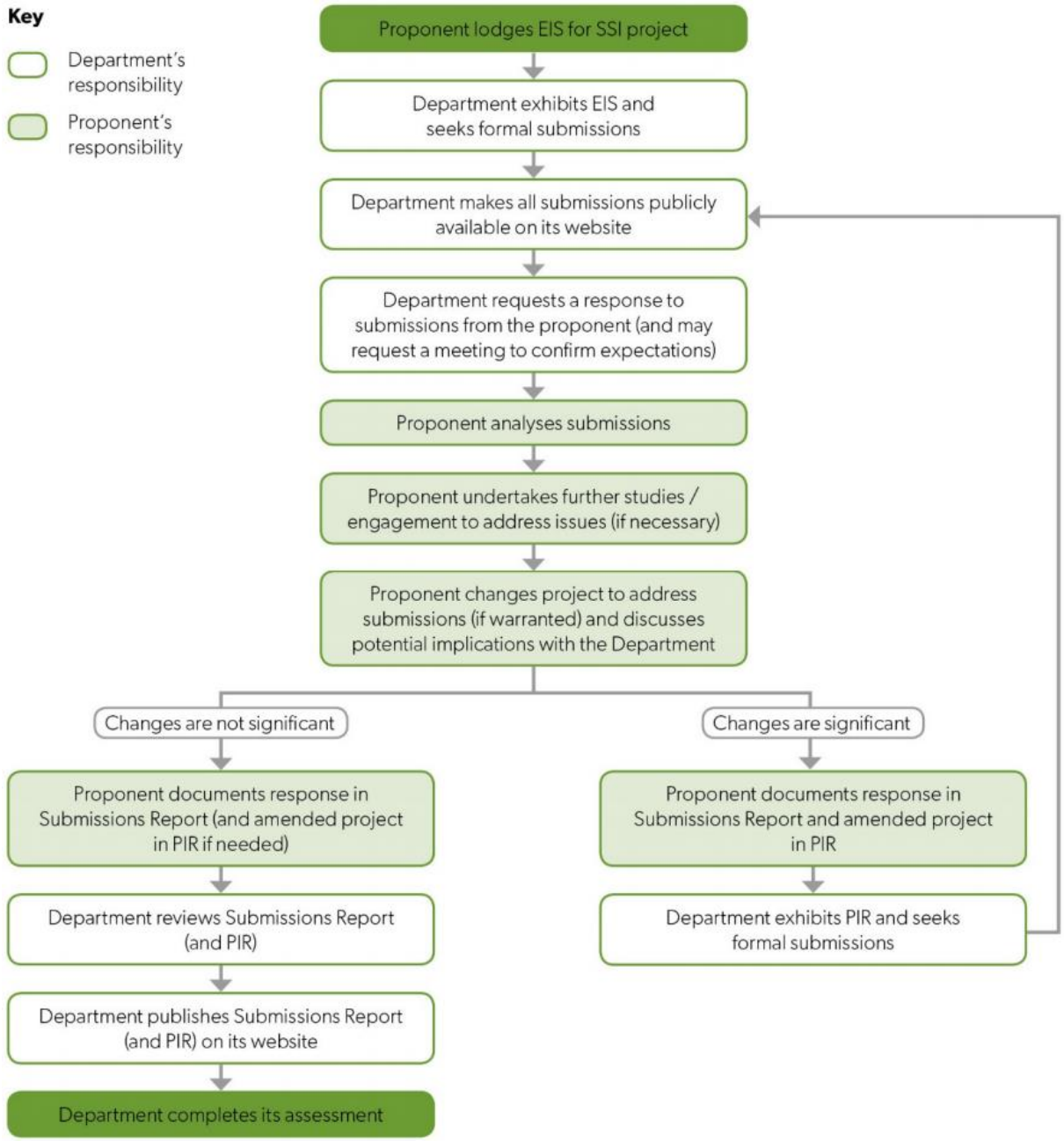
This report has been prepared in accordance with the requirements under the *Environmental Planning and Assessment Act 1979* and the guideline *Responding to Submissions* (DPE 2017)

This submissions report summarises the submissions made during public exhibition of the EIS, identifies the issues raised across the submissions and responds to those issues. It also provides an overview of amendments to the project description, additional assessment information and environmental management measures that have been made in response to the issues raised.

The submissions report in the broader context of the assessment of the project by the NSW Department of Planning and Environment (DP&E) is shown in Figure 1-1.

The structure of this submissions report is as follows:

- Chapter 1 provides an overview of the submissions report
- Chapter 2 summarises the submissions from government agencies and stakeholders
- Chapter 3 documents changes to the project description presented in the EIS
- Chapter 4 provides a detailed response to issues raised in submissions
- Chapter 5 provides an updated conclusion for the project as a whole.



Source: NSW Department of Planning and Environment (2017)

Figure 1-1 Process for responding to submissions

1.3 Ongoing engagement

The EIS was publicly exhibited from Wednesday 14 November 2018 to Friday 14 December 2018. An electronic copy of the EIS was available for viewing on the NSW Department of Planning and Environment's (DP&E) Major Projects website. Hardcopies were also available for viewing at the following locations;-

- Wollongong City Council – 41 Burelli Street, Wollongong
- Warrawong District Library – Level1, 61-67 King Street, Warrawong
- Department of Planning and Environment – Level 30, 320 Pitt Street, Sydney
- Nature Conservation Council – Level 14, 338 Pitt Street, Sydney

In addition, AIE provided numerous links to the EIS from multiple locations on its website. During the public exhibition period of the EIS, these links received 113 clicks from various visitors. Overall, during the exhibition period the AIE website received 531 visitors, including 442 that were new to the website, and 2227 page views.

The 1800 public information line also continued to operate and received one call from a community member. Details of this enquiry and other engagement activities which occurred since submission of the EIS are summarised in Table 1.1.

Table 1.1 Ongoing engagement

Category	Engagement activities
Advertising	2 November 2018 — A public notice was placed in the Illawarra Mercury newspaper advising the EIS would be available for comment on the DP&E website. The notice included website addresses of the major projects website and AIE project website. 14,400 of these papers were distributed throughout the Illawarra.
	7 November 2018 — The same public notice was placed in the free local publication The Advertiser/Lakes Times, delivered to homes in the Illawarra with an average readership of about 42,000 persons per issue.
Website	14 November 2018 — The AIE project website was updated to coincide with the public exhibition of the EIS. The updates included: • Website banner advising of public exhibition and linking to the EIS • Updated news page advising of public exhibition and linking to the EIS • Updated frequently ask questions relating to public exhibition All subscribers that had signed up for updates on the project website, totalling 78 subscribers, were emailed copies of the public notice.
	27 November 2018 — The AIE project website was updated again including an updated news page and frequently asked questions advising the locations where the EIS could be viewed during public exhibition.
	29 November 2018 — The AIE community newsletter was published on the AIE project website. The newsletter included details of how to view the EIS during public exhibition, including locations where hard copies could be viewed, and instructions for how to make a submission on the EIS.

Category	Engagement activities
	All subscribers that had signed up for updates on the project website, totalling 78 subscribers, were emailed a link to the newsletter.
Local stakeholders and community	13 November 2018 — An email was sent to key business, political and community stakeholders advising that the EIS would soon be on public exhibition. The email included information on the period of public exhibition, a link to view the EIS, locations where hard copies could be viewed, and instructions for how to make a submission on the EIS.
	27 November 2018 — Illawarra Innovative Industry Network, an Illawarra business group, distributed information about the EIS to its members.
	29 November 2018 — The AIE community newsletter was emailed to all key stakeholders. The newsletter included details of how to view the EIS during public exhibition, including locations where hard copies could be viewed, and instructions for how to make a submission on the EIS.
	4–5 December 2018 — The AIE community newsletter was letterbox dropped to 17,000 homes in the vicinity of the project.
	11 December 2018 — Enquiry to the 1800 Community Information Line seeking clarity in relation to horizontal drilling. Information was provided and the enquirer indicated she was satisfied with the information.
Additional stakeholders	16 November 2018 — Consultation with SafeWork NSW regarding potential hazard and risks and the use of odourant specifically.
	23 November 2018 — Consultation with the NSW DP&E regarding potential hazards and risks.
	3 December 2018 — Site visit with NSW Environment Protection Authority (EPA) Office of Environment and Heritage (OEH) and representatives from AIE, GHD and NSW Ports to inform submissions.
	10-12 December 2018 — Consultation with NSW DP&E and SafeWork NSW regarding design details.
	11 December 2018 – Consultation with Endeavour Energy regarding potential project interactions with Endeavour Energy assets.
	Ongoing – Consultation with EPA and NSW DP&E regarding comments raised in agency submissions
	Ongoing — Consultation with QT Holdings regarding interaction of the project and other developments in the vicinity.
	Ongoing — Consultation with Port Kembla Coal Terminal regarding preferred approach to minimising impacts on coal terminal operations.

1.4 Overview of the project

1.4.1 Development described in EIS

The project described in the EIS comprised the following four key components.

- LNG carrier vessels — there are hundreds of these in operation globally transporting LNG from production facilities all around the world to demand centres
    - Floating Storage and Regasification Unit (FSRU) — a cape-class ocean-going vessel which would be moored at Berth 101 in Port Kembla
    - Berth and wharf facilities – including landside offloading facilities to transfer natural gas from the FSRU into a natural gas pipeline located on shore
    - Gas pipeline – a Class 900 carbon steel high-pressure pipeline connection from the berth to the existing gas transmission network at Cringila.

The FSRU is a double-hulled vessel of approximately 300 metres in length and 50 metres in breadth with a storage capacity of around 170,000 cubic metres or about four petajoules of gas. The LNG is stored within a cargo area comprising separate cargo tanks suitable for carrying LNG at low temperatures (about minus 161 degrees Celsius) and at atmospheric pressure.

The FSRU would receive LNG from regularly scheduled LNG carriers from external suppliers. It is anticipated that in the order of 24 LNG carriers would visit Port Kembla in any one year during project operations. The LNG carriers will tether alongside the FSRU for around 24–36 hours while they transfer their LNG cargo into the cargo holds of the FSRU.

Berth and wharf facilities are proposed to be located at Berth 101 within the Inner Harbour of Port Kembla. The berth and wharf facilities will incorporate a quay wall configuration to provide the necessary space for the FSRU and LNG carriers to be configured side-by-side without limiting the existing navigability of the Inner Harbour.

Excavation and dredging will be required in order to establish the berth and wharf facilities. It is estimated that about 600,000 cubic metres of material would be excavated and dredged for the construction of berth and wharf facilities. Allowing for typical bulking factors, this volume would equate to about 720,000 cubic metres, which will be disposed of in the Outer Harbour as part of the Outer Harbour reclamation works.

A short gas pipeline would connect the FSRU to a tie-in point at Cringila, which in turn is connected to the existing Eastern Gas Pipeline (EGP). The gas pipeline would be a DN450 carbon steel pipeline about 45 centimetres (18 inches) in diameter and about 6.3 kilometres in length.

Subject to approvals, construction is expected to take around 10 to 12 months. Construction of the project will involve a capital investment of about $200–$250 million and employ about 150 workers at its peak.

The project is expected to have a design life of 10 to 15 years. The design life could be extended subject to sufficient ongoing gas demand. Once fully operational, the project is expected to employ about 40–50 personnel.

1.4.2 Preferred infrastructure

The project will remain predominantly as described in the EIS, but will incorporate a number of minor amendments to the design and construction methodology for the project. The amendments have been developed to address issues raised in submissions from government authorities and community stakeholders and as part of the ongoing design and land acquisition activities being undertaken as part of the development of the project.

The key changes to the project include:

- Refined pipeline alignment and tie in facility to the EGP spurline as shown on Figure 1-2.
- Selection of the preferred FSRU for the project.
- Refinement of the dredging and disposal methodology.
- Removal of the proposed landscape embankment on the eastern side of the Berth 101 site.

A description of the proposed amendments and consideration of the potential environmental implications of the proposed design changes are presented in Section 3 of this Submissions Report.

The project is considered to remain substantially the same development, as described in the original development application, the proposed amendments fall within the assessment parameters and achieve equivalent or improved environmental outcomes to those described in the original EIS.

Some of these improvements are outlined below and discussed in greater detail in the body of the report.

The revised location of the tie in facility will increase the distance between the gas pipeline and the nearest residential receivers, reducing the potential exposure to noise and dust during construction activities and safety risks during the operation of the pipeline.

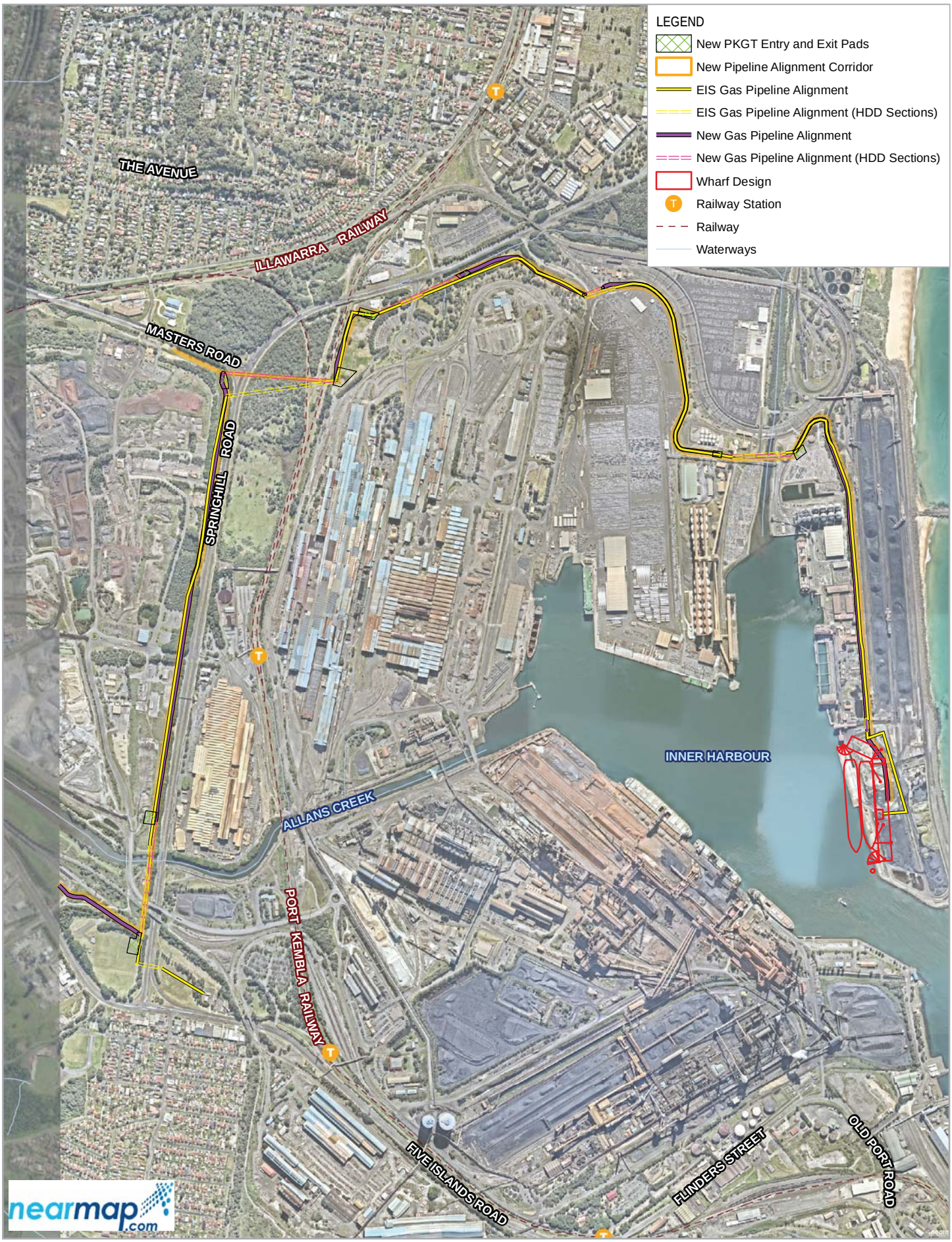
Selection of the preferred FSRU uses the latest available technology and achieves improved environmental performance through consumption of 17% less fuel and improved dispersion for sea-water discharges.

Further detailed water quality investigations have been undertaken and demonstrate that discharges from the marine growth protection system comply with all relevant water quality objectives at the edge of a small mixing zone and are not expected to have a detrimental effect on water quality or marine ecology within the Inner or Outer Harbour of Port Kembla.

The final selected FSRU is more fuel efficient, reducing the total amount of fuel consumed to meet the maximum gas send out rate, reducing emissions and safety risks and providing in-built redundancy to reduce the potential for non-standard operations such as operating in MDO mode.

The dredging and disposal methodology has been refined to provide additional details on the likely sequencing and environmental management and monitoring requirements for dredge and sediment placement operations. The material transfer of sediments to the Outer Harbour disposal area has also been refined with a commitment to transfer between 50 and 90% of excavated material by barge. This will have a corresponding 50 to 90% in potential truck movements associated with road haulage of spoil on the local road network. Daily vehicle movements will continue to fall well within the capacity of the road network.

The proposed landscape embankment to the east of the proposed berthing infrastructure has also been removed from the project following feedback in a number of submissions.



Paper Size ISO A4

0 250 500

Metres

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

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GHD

Australian Industrial Energy
Port Kembla Gas Terminal

Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Gas Pipeline Comparison

Figure 1-2

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparisonOverall.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy

2. Submissions

2.1 Overview

A total of 23 submissions were received during public exhibition of the EIS, including 9 from government agencies, 5 from interest groups, 3 from corporations and 6 from individuals. A total of 13 submissions made comment on the project, 7 submissions expressed support for the project and 3 submissions raised objections to the project as outlined in Table 2.1

Table 2.1 Overview of submissions

Submitter	Type	Position
Environment Protection Authority	Government agency	Comment
Office of Environment & Heritage	Government agency	Comment
Roads and Maritime Services	Government agency	Comment
Wollongong City Council	Government agency	Comment
NSW Fisheries	Government agency	Comment
SafeWork NSW	Government agency	Comment
Port Authority of NSW	Government agency	Comment
Fire & Rescue NSW	Government agency	Comment
NSW Police	Government agency	Comment
Illawarra Business Chamber	Interest group	Support
Illawarra Innovative Industry Network	Interest group	Support
NSW Business Chamber	Interest group	Support
Regional Development Australia — Illawarra	Interest group	Support
The Australian Industry Group	Interest group	Comment
Endeavour Energy	Corporation	Comment
NSW Ports	Corporation	Support
Park Pty Ltd	Corporation	Comment
Submitter 301267	Individual	Object
Submitter 297580	Individual	Support
Submitter 297826	Individual	Support
Submitter 301263	Individual	Object
Submitter 301279	Individual	Comment
Submitter 301259	Individual	Object

2.2 Government agencies

The submissions from government agencies generally made comment on the project and its assessment rather than expressing support or raising objections to the project.

Key issues raised included the potential impacts of dredging and excavation in the Inner Harbour and placement of material in the Outer Harbour and how those impacts would be avoided, mitigate and managed through the proposed dredging management plan. Operation of the marine growth protection system, including the temperature and residual chlorine content in sea water released back to the harbour, was also considered a key issue. Other issues raised included potential impacts on vegetation and offsets, Aboriginal and non-Aboriginal heritage, and the management of potential hazards and risks identified in the preliminary hazard analysis.

The issues raised in submissions from government agencies are listed in detail in Table 2.2. Section references to responses to the issues raised are also provided in Table 2.2.

Table 2.2 Government agencies

Government agency	Comment/issue	Section reference
Environment Protection Authority	**Level of protection for Port Kembla Harbour** The submission notes the considerable work of the community, government and industry over the past decades to improve the quality of the marine environment in Port Kembla and queries the level of protection adopted as part of the water quality assessment in the EIS. The submission makes reference to the adoption of 80% of the species protection criteria in the Australian Water Quality Guidelines for Fresh and Marine Water Quality in the EIS, which was not considered appropriate for assessing potential water quality impacts of the project. The submission recommended a revised assessment be completed using applicable trigger levels for the following criteria: Construction — 90% of species protection criteria (95% for bioaccumulating substances) Operation — 95% of species protection criteria (99% for bioaccumulating substances)	Section 4.2.1
	Chlorine discharge criteria The submission queries the assessment and adoption of the appropriate criteria to assess the levels of chlorine discharge and other by-products from the marine growth protection system during operation of the FSRU. The submission states that the use of the adopted criterion from the IFC World Bank Guidelines for chlorine of 200 micrograms per litre was not appropriate for assessing potential environmental impacts. It stated the assessment should be revised to align with the adopted NSW water quality objectives that align with the Australian and New Zealand Environment and Conservation Council water quality guidelines. It also makes reference to the US EPA guidance for acute risk to marine waters at 13 micrograms per litre and chronic risk at 7.5 micrograms per litre. It notes that a discharge at 200 micrograms per litre would be significantly above those criteria at the point of release.	Section 4.2.1

Government agency	Comment/issue	Section reference
	Mixing zone analysis The submission made reference to the mixing zone analysis for discharges of seawater with chlorine or other by-products in the EIS. It noted that it was the policy of the NSW EPA that water quality objectives be met at the edge of the area where initial or near field mixing occurs. Near field mixing relates to the initial mixing zone where characteristics of momentum flux, buoyancy flux and outfall geometry influence plume trajectory and mixing, whereas far field mixing relates to buoyant spreading motion and passive diffusion due to ambient conditions.	Section 4.2.2
	Mixing zone principles The submission stated the mixing zone should have been developed and assessed in accordance with several mixing zone principles, which were that mixing zones should: • be of limited area or volume • not interfere with other uses or aquatic life • have a simple configuration that is easy to locate • not impinge on biologically important areas of features • not be adjacent to the shore • have reversible impacts • not have bio accumulating chemicals • not be used to manage the biostimulant impacts of nutrients • not cause acute toxic impacts.	Section 4.2.2

Government agency	Comment/issue	Section reference
	Chlorine by-products The submission made reference to the marine growth prevention system on the FSRU and the associated discharges of seawater with chlorine or other by-products. It stated the by-products would include those produced by the chlorine in reaction to seawater including chlorine gas, hypochlorous acid, hypochlorite, hypobromous acid, hypobromite and bromate. The submission requested further assessment of the by-products including relevant acute and chronic water quality criteria, cumulative effects and determination of whether criteria would be met at the edge of a near field mixing zone.	Section 4.2.2
	Cold seawater The submission made reference to the planned release of cold seawater into the Inner Harbour and the predicted decrease in temperature by 0.1 to 0.2°C. It queried whether the predicted decrease in temperature included the existing warm water industrial releases. It stated the Australian and New Zealand Environment and Conservation Council water quality guidelines state that median temperature should not be permitted to fall below the twentieth percentile temperature from a seasonable distribution of temperature data. The submission requests further consideration if that criterion is met in the near field mixing zone.	Section 4.2.2
	Thermal plume charts The submission made reference to the thermal plume charts presented in the EIS. It stated the resolution of the charts was limited. It noted the minimum temperature was expressed as “less than 16.5°C” and stated a full range of temperatures including minimums should be presented.	Section 4.2.2
	Alternative management measures The submission recommended additional measures be considered if there are acute impacts in the mixing zone or water quality objectives are not met at the edge of the near field mixing zone.	Section 4.2.2

Government agency	Comment/issue	Section reference
	Excavation and dredging The submissions sought further information on the staging of excavation, dredging and disposal, including the balance of material to be hauled by truck or transported by barge.	Section 4.2.3
	Port Kembla Outer Harbour Development The submission stated that the proponent should confirm that dredged and excavation material to be disposed in the disposal area would be compatible with the planned Port Kembla Outer Harbour Development. It noted the potential for the concept plan for the Port Kembla Outer Harbour Development to change with the potential for sediments to be disturbed again.	Section 4.2.3
	Disposal alternatives The submission stated that alternative options to disposal in the disposal area should be considered including options to remove contaminations from Port Kembla as a permanent solution, the use of Commonwealth sea dumping permits, offsite treatment or offsite disposal.	Section 4.2.3
	Coal terminal disposal The submission noted the option identified in the EIS to construct a long-term landscaped embankment from dredged and excavation material at the eastern stockyard of the coal terminal adjacent to Berth 101. It stated the potential impacts of this option including contaminant leaching or windblown dust were not adequately assessed. It stated the embankment would require further assessment.	Section 3.5
	Disposal area structure The submission sought further information on the structure of the disposal area including bunded and armoured areas that would encapsulate contaminated sediments. It also stated that there was uncertainty regarding how much of the disposal area would be emerged or submerged. It stated the surface of disposed material should be impermeable to prevent mobilisation and that the surface of submerged disposed materials also be adequately armoured.	Section 4.2.3

Government agency	Comment/issue	Section reference
	Haul truck movements The submission made reference to the potential haul truck movements required to transport excavated material from berth and wharf facilities to the disposal area. It stated that the truck movements would need to be clearly justified with consideration to management measures and transport options with fewer environmental impacts including traffic, noise and air quality.	Section 4.2.3 and Section 4.8.1
	Contaminant mobilisation The submission made reference to statements in the EIS that sediment was contaminated by metals and polycyclic aromatic hydrocarbons as well as being potential acid sulphate soil. It stated that further assessment was warranted to quantify the risks associated with this contamination, particularly migration of contaminants from dredging and disposal areas. It also noted there was uncertainty on the balance of material to be hauled by truck or by barge and stated that this would affect the extent of potential migration of contaminants.	Section 4.2.3
	Long-term contaminant mobilisation The submission stated that the disposal area as part of the broader Port Kembla Outer Harbour Development could remain partially completed for an extended period of time. It stated that over time the area could be affected by tides or rainfall that would mobilise contaminants. It stated that the potential impacts of long-term contaminant mobilisation were not adequately assessed.	Section 4.2.3

Government agency	Comment/issue	Section reference
	Bund material The submission stated that slag and dredged material from the Inner Harbour may have been used in the original construction of Berth 101 and may be contaminated. It noted that sampling referred to in the EIS found relatively minor contamination. It stated the potential impacts of the use of that material for bund construction in the Outer Harbour was not adequately assessed. The submission stated additional information should be provided on the suitability of excavated and dredged material for bund construction in the Outer Harbour, including: • acceptability of contaminant level and potential for contaminant hot spots • potential for acute or chronic toxicity including colonisation by marine life • measures to ensure material found to have elevated contaminants including dioxin, benzo(a)pyrene or hydrocarbons are not used for bund construction • the need for stabilisation of contaminants in bund material to minimise potential leaching of contaminants or to neutralise potentially acid forming material	Section 4.2.3
	Water quality management measures The submission stated that the EIS did not contain specific water quality and contamination measures and that it deferred these measures to a dredging management plan. It stated that the potential impacts of the project could not be as readily assessed without additional detail. The submission stated that proposed silt curtains to limited depths would likely have limited potential to control mobilised sediments and contaminants. It recommended additional assessment and identification of measures to control mobilised sediments and contaminants.	Section 4.2.3

Government agency	Comment/issue	Section reference
	Water quality monitoring The submission made reference to the water quality monitoring proposed in the EIS and the proposed objective for suspended sediments of background plus 50 mg/L. It stated that subject to further assessment and the dredging details, the proposed objective may not be adequate to manage the risks associated with potential contaminants. It stated that water quality monitoring should include weekly monitoring of water quality and laboratory testing against specific trigger levels for potential contaminants. It also stated that visual inspections should be incorporated into the water quality monitoring.	Section 4.2.3
	Berth 101 contamination The submission stated Berth 101 contamination was not sufficiently described and requested additional information regarding the analysis of polychlorinated biphenyls, benzo(a)pyrene and groundwater. .	Section 4.3.1
	Benthic marine organisms The submission made reference to statements in the Berth 101 contamination assessment that ecological values at Berth 101 were degraded and would not require further assessment. It stated the risk of contaminants from Berth 101 to benthic marine organisms, from both excavation and dredging in the Inner Harbour and disposal in the Outer Harbour, should be further assessed.	Section 4.3.1
	Stockpiled material The submission stated that the potential risks of people being exposed to contaminants in stockpiled excavated material at Berth 101 should have been assessed.	Section 4.3.3
	Pipeline route contamination The submission stated pipeline route contamination was not sufficiently described and requested additional information on characterisation of contamination, depth of groundwater and contamination risks. .	Section 4.3.2

Government agency	Comment/issue	Section reference
	Emissions from excavation, dredging and disposal The submission stated that the air quality assessment in the EIS did not include a detailed assessment of air quality impacts of bulk earthworks including excavation and dredging. The submission made reference to statements in the EIS that excavated and dredged material would have a high moisture content and therefore limited potential to generate dust. It stated that such material may actually have a low moisture content particularly if it is from landside excavation or is stockpiled and allowed to dry prior to transportation to the disposal area. It stated that in this case there would be potential for particle emissions from the stockpiled or transported material as well as potential for emissions of particle-bound or volatilised contaminants in the material. The submission also commented that bulk earthworks including excavation and dredging should be benchmarked against best practice construction methodologies and air quality management measures.	Section 4.5.2
	Emissions from FSRU The submission stated that the air quality assessment did not account for fugitive emissions from the storage, transfer and processing of liquefied natural gas including on board the FSRU. It stated the air quality assessment should consider fugitive emissions and that a gas leak detection and repair program should be a project commitment.	Section 4.5.1
	Pollution regulations The submission stated that the NSW Environment Protection Authority would consider the FSRU subject to the provisions of the Protection of the Environment Operations Act 1997, including the conditions of an environment protection licence, and the Protection of the Environment Operations (Clean Air) Regulation 2010, including emission limits. It stated the air quality assessment should consider emissions limits under the Protection of the Environment Operations (Clean Air) Regulation 2010 and the proponent should advise of any Commonwealth legislation that may override the application of the Protection of the Environment Operations Act 1997.	Section 4.5.1

Government agency	Comment/issue	Section reference
	Construction noise The submission stated that the construction noise assessment was based on adjusted sound power levels for construction activities that were likely to underestimate construction noise.	Section 4.4.1
	Construction hours The submission requested further justification to conduct construction activities outside of standard construction hours, with reference to section 2.3 of the Interim Construction Noise Guideline. It stated that without sufficient justification standard construction hours would apply.	Section 4.4.1
	Operational noise The submission stated the operation noise assessment may underestimate noise impacts. It also stated that it was not clear whether annoying sound characteristics had been considered. The submission stated mitigation measures may be required if noise impacts were underestimated.	Section 4.4.2
Office and Environment and Heritage	**Vegetation clearing** The submission noted that the project would involve clearing of a small area of native vegetation attributed to plant community type 1326. It supported proposed offsets for the vegetation.	Section 4.6.1
	Green and golden bell frog The submission noted that the project would involve removal of some constructed detention ponds that could provide habitat for green and golden bell frog. It noted this would classify as a prescribed impact that would not strictly require an offset but may nonetheless be taken into account in determining offsets under the Biodiversity Conservation Act 2016. It recommended that offsets be calculated and provided for all affected habitat for green and golden bell frog.	Section 4.6.1

Government agency	Comment/issue	Section reference
	Southern myotis The submission stated that the project would involve removal of some potential habitat for southern myotis. It stated the biodiversity assessment did not assess impacts on southern myotis. It requested the assessment be updated to include southern myotis.	Section 4.6.1
	Aboriginal cultural heritage The submission stated that the proponent must ensure that the construction of the project does not cause impacts on any recorded Aboriginal cultural heritage sites or archaeological deposits. It stated an updated assessment would be required if the construction footprint changes.	Section 4.7.1
	Aboriginal cultural heritage sites The submission stated that the recorded site 52-2-3618 should be updated on the Aboriginal Heritage Information Management System from the findings of the assessment.	Section 4.7.1
	Unexpected finds protocol The submission supported the proposed unexpected finds protocol. It stated the unexpected finds protocol must be developed prior to any ground disturbance occurring.	Section 4.7.1
	Consultation requirements The submission noted that the gas pipeline was realigned to avoid recorded Aboriginal cultural heritage sites and areas of potential archaeological deposits. It stated if the alignment changed and impacts were predicted, or if unexpected finds were encountered, that full consultation with the Aboriginal community would be required in accordance with Aboriginal cultural heritage consultation requirements for proponents 2010 and the National Parks and Wildlife Act 1974.	Section 4.7.1

Government agency	Comment/issue	Section reference
	Coastal hazards The submission stated the EIS did not consider how climate change could influence coastal hazards and the impacts of those hazards on the project. It noted the climate change risk assessment found that those hazards would be unlikely but have potential consequences including damage and disruption to infrastructure and the environment. It stated that further information should be provided on how the design of the project would include measures to mitigate significant risks to life, infrastructure or the environment from those risks.	Section 4.15.1
	Dredging management plan The submission stated that EIS did not contain sufficient information on the management measures, monitoring and performance criteria that would be in place to address potential impacts of dredging on the marine environment. It noted the EIS included a commitment to prepare a dredging management plan and made reference to default water quality parameters but stated that it was not clear how these would be applied during the project. It stated a more detailed description of elements of proposed management plans should be provided including environmental monitoring and reporting methodologies and specific water quality criteria.	Section 4.2.3
	Potential impacts on flooding The submission noted that the gas pipeline would be buried and therefore have no impact on flood patterns and storage. It stated any changes to the design of the project would require consideration and management of potential impacts on flood patterns and storage.	Section 4.2.4
Roads and Maritime Services	**Roads Act 1993** The submission stated that prior to commencing works or issuing of a construction certificate the proponent must apply for consent under section 138 of the Roads Act 1993.	Section 4.8.2
	Contractor qualifications The submission stated that all road works and traffic control facilities must be implemented by contractor that has been pre-qualified by Roads and Maritime Services.	Noted

Government agency	Comment/issue	Section reference
	Gas pipeline depth The submission stated that the depth of the gas pipeline beneath Springhill Road and Five Islands Roads must be supported by an appropriate engineering report and to the satisfaction of Roads and Maritime Services. It stated that gas pipeline must not be compromised by vehicle loadings on the roads or compromise road operation, maintenance or future widening.	Section 4.8.2
	Road occupancy licence The submission stated that prior to commencing works that affect a state road the proponent must apply to Roads and Maritime Services for a road occupancy licence. It stated that the application for a road occupancy licence must be accompanied by a traffic management plan. It also stated that any change in speed limit would require a separate speed zone authorisation.	Section 4.8.2
Wollongong City Council	**Consultation with Department of Primary Industry** The submission states the project would cross Lot 2 on DP 837554 that is owned by the State of NSW. The submission states that it is not apparent whether the proponent has consulted with the lands division of the Department of Primary Industry regarding this land.	Noted
	Gas pipeline determination The submission notes that the project is declared as Critical State Significant Infrastructure in schedule 5 of the State Environmental Planning Policy (State and Regional Development) 2011. It notes that the declaration states that the development is to be carried out on land in the port of Port Kembla as well as the suburbs of Cringila, Port Kembla and Spring Hill. The submission states that the gas pipeline would be outside of the areas in the declaration and may require additional approvals.	Section 4.11.1

Government agency	Comment/issue	Section reference
	Dredging management plan The submission states that the proposed strategy for managing dredged and excavated material is not adequately detailed and contains water quality criteria that are not correct.	Section 4.2.3
	Embankment The submission makes reference to the potential reuse of dredged and excavated material to construct a long-term landscaped embankment to the east of Berth 101. It states that the EIS does not provide further details of the embankment including in the landscape and visual assessment. The submission states that details of the embankment must be provided including the proposed remediation of the dredged and excavated material. It states that the use of contaminated material to construct such an embankment would not be supported.	Section 3.5
	State Environmental Planning Policy (Coastal Management) 2018 The submission notes State Environmental Planning Policy (Coastal Management) 2018 does not apply on land to which State Environmental Planning Policy (Three Ports) 2013 applies. The submission states that development on Lot 2 on DP 570107 would be located outside the land to which State Environmental Planning Policy (Three Ports) 2013 applies and would be subject to State Environmental Planning Policy (Coastal Management) 2018 where it is defined as Coastal Environment and part of the Coastal Use area that would require consideration.	Section 4.11.4

Government agency	Comment/issue	Section reference
	Historic heritage The submission recommended that NSW Heritage Council be consulted regarding the potential for the project to impact on matters protected under the Heritage Act 1977. The submission states that the gas pipeline is likely to have an impact on the site of the former Springhill House, which is considered to have heritage value. It states that the area of historic archaeological potential for Springhill House presented in the historic heritage assessment is not well justified and may require extension given the historic evidence in the assessment. It states that construction of the gas pipeline in the area of historic archaeological potential would trigger further archaeological work in accordance with the recommendations of the historic heritage assessment as well as the requirements under the Heritage Act 1977. It stated that an updated historic heritage report should be produced that clarifies the extent of the area of historic archaeological potential given the historic evidence in the assessment.	Section 4.7.2
	Aboriginal cultural heritage consultation The submission notes the Aboriginal heritage assessment in the EIS was informed by consultation with the Illawarra Local Aboriginal Land Council and NSW Office of Environment and Heritage. It requests details of the recommendations made by these stakeholders. It stated that the local Aboriginal community should be notified about the project for comment to ensure the cultural significance of the area is properly considered.	Section 4.7.1
	AHIMS sites The submission noted that AHIMS Site 52-2-3618 was mapped in two locations in the Aboriginal heritage assessment in the EIS. It sought clarification about the sites including provision of the relevant coordinates, descriptions and site cards. It noted that one of the mapped locations of AHIMS Site 52-2-3618 was on the gas pipeline route. It sought clarification whether the site would be impacted and stated an Aboriginal heritage impact permit may be required.	Section 4.7.1

Government agency	Comment/issue	Section reference
	Aboriginal archaeological potential The submission stated that the due diligence approach adopted in the Aboriginal heritage assessment in the EIS was not sufficient for areas of Aboriginal archaeological potential. It recommended that NSW Office of Environment and Heritage be consulted on the matter. It made reference to the area of high Aboriginal archaeological potential mapped near Springhill Road in the Aboriginal heritage assessment in the EIS. It stated that archaeological testing should be undertaken to establish the extent of the area either side of Springhill Road. The submission also stated it was not clear that directional drilling to two metres depth beneath areas of Aboriginal archaeological potential would be sufficient to avoid harm to unknown Aboriginal objects. It stated further archaeological investigations and/or consideration of potential impacts would be required to assess these potential impacts adequately. It stated that a formal Aboriginal Cultural Heritage Assessment should be carried out, including consultation with the Aboriginal community in line with Aboriginal cultural heritage consultation requirements for proponents 2010, and be informed by further archaeological investigations and testing, in order to further assess the potential impacts to unknown Aboriginal objects.	Section 4.7.1
	Gas pipeline maintenance The submission stated that gas pipeline maintenance in areas of Aboriginal archaeological potential would have the potential to cause impacts. It stated that those potential impacts would need to be dealt with through the formal Aboriginal heritage impact permit process.	Section 4.7.1
	Fig trees The submission stated that it supported the retention of culturally significant fig trees.	Section 4.7.2
NSW Fisheries	**Potential impacts on fishing activity** The submission stated the impact of the project on fishing activity should be assessed.	Section 4.13.1

Government agency	Comment/issue	Section reference
	Sodium hypochlorite The submission stated that potential impacts of discharges of sodium hypochlorite and associated by-products should be reduced as far as possible and contained to the port. It sought further information on how the volume and concentration of discharges would be managed during operation and other potential measures to manage this issue. It stated the management plans for the project should include monitoring and mitigation measures.	Section 4.2.2
	Excavation and dredging The submission sought clarification on the staging of excavation, dredging and disposal. It stated that it was important that bunds be established in the disposal area in advance. It also stated the timing of dredging of potential acid sulfate soils would require consideration to ensure they are appropriately managed and disposed of in an appropriate sequence.	Section 4.2.3
	Disposal area bunds The submission sought clarification on the design and composition of the proposed bunds at the disposal area, including their ability to withstand strong wave conditions and capacity to contain potentially contaminated sediments over the long term. It also sought confirmation of measures to ensure the material used to construct the bunds would not be contaminated.	Section 4.2.3
	Silt curtains The submission sought clarification on the length and configuration of silt curtains. It also sought clarification on how barges would operate around the silt curtains during dredging and disposal.	Section 4.2.3
	Landscape embankment The submission sought information on how potentially contaminated material or leachate would be contained during any short or long term disposal of excavated or dredged material at the eastern stockyard of the coal terminal adjacent to Berth 101.	Section 3.5

Government agency	Comment/issue	Section reference
	Contaminated sediment The submission stated that the existence of contaminated sediments throughout the Inner Harbour and Outer Harbour would not justify poor dredging practices. It stated that dredging and associated containment of contaminated sediments should aim to reduce impacts to marine life.	Section 4.2.3
	Dredging management plan The submission stated that dredging activities and resuspension of sediments within the harbour should be minimised and there should be no impact to water outside the harbour. It stated the dredging management plan should include trigger levels for water quality including contaminants and turbidity and outline response measures to modify dredging operations.	Section 4.2.3
	Disposal area The submission sought clarification on the layout of the disposal area in relation to the Port Kembla Outer Harbour Development. It stated the disposal area was in a different configuration to the Port Kembla Outer Harbour Development. It sought clarification on whether an approval is in place for the different configuration. It also sought clarification of whether it was intended to reconfigure the disposed material at a later time and recommended that this not occur.	Section 4.2.3

Government agency	Comment/issue	Section reference
	Environment management plans The submission requested that NSW Fisheries be given the opportunity to provide comment on the following environmental management plans prior to implementation: • Construction environmental management plan • Operation environmental management plan • Dredging management plan • Water quality management plan • Erosion and sediment control plan • Acid sulphate soil management plan.	Noted

Government agency	Comment/issue	Section reference
Fire and Rescue NSW	**Fire safety study** The submission requested that a fire safety study be prepared in accordance with the Hazardous Industry Planning Advisory Paper No 2 Fire Safety Study Guidelines. It stated the study should include further details of safety measures including: • safety and computerised maintenance management systems • fire and gas detection systems • process control systems • emergency shutdown and blowdown systems • active and passive fire protection systems • compliance and hazardous area classification requirements It also stated the study should include the consequence contours from the preliminary hazard analysis contained in the EIS to assist in emergency planning including public exclusion zones. It noted the preliminary hazard analysis had identified potential risks to open space and requested that additional safety measures be provided to address these risks. It requested that the study be submitted to Fire & Rescue NSW for consultation.	Section 4.1.3
	Odourant hazards The submission requested that information be provided concerning the safety and operating conditions surrounding the addition of odourant to natural gas following regasification.	Section 4.1.1
	Firefighting tugboats The submission requested that information be provided concerning the firefighting capacity of the Port Kembla firefighting service and the availability of firefighting tugboats.	Section 4.1.3

Government agency	Comment/issue	Section reference
NSW Police	**Counter terrorism consultation** The submission requested the following be included as a condition of consent: Prior to completion of the detailed design of the facility, the proponent must consult with the Terrorism Protection Unit and the Major Hazard Facilities Unit of the Counter Terrorism and Special Tactics Command with the NSW Police Force in relation to the ongoing security of the facility. The proponent must ensure that regard is taken of any advice received from the Terrorism Protection Unit and the Major Hazard Facilities Unit of the Counter Terrorism and Special Tactics Command with the NSW Police Force [as part of this condition of consent].	Section 4.1.4
Port Authority of NSW	**Safety case consultation** The submission noted that a safety case for the project would be required to be produced under the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2017*. It requested the safety case be developed in consultation with the Port Authority of NSW.	Section 4.1.4
	Gas flaring The submission requested confirmation of whether or not flaring would be carried out as a mitigation measure in the event of a breakdown of the regasification unit or other circumstances. It stated a need for additional assessments if flaring was to occur.	Section 4.1.5
	Boil-off gas retention The submission requested clarification of how long the FSRU could store boil-off gas in the event gas could not be transferred to the gas pipeline. It stated that in this event boil-off gas could need to be released to the atmosphere and that this would require moving the FSRU out of Port Kembla. It queried whether connections from the wharf facilities would include automatic break-away devices to allow the FSRU to be moved out of Port Kembla in such an event.	Section 4.1.5
	Harbour master approval The submission stated that works that would disturb the bed of a port would require approval from the harbour master under the Ports and Maritime Administration Regulation 2012.	Section 4.11.2

Government agency	Comment/issue	Section reference
	Management measures The submission stated that the Port Authority of NSW supported the proposed management measures relevant to the Port Authority of NSW and the harbour master.	Noted
SafeWork NSW	**Safety case requirements** The submission made reference to the safety case for the project that would be required to be produced under the Work Health and Safety Act 2011 and Work Health and Safety Regulation 2017. In particular it stated that the safety case would be required to detail the project security arrangements under section 561(2)(e) of the Work Health and Safety Regulation 2017.	Section 4.1.2
	Odourant hazards The submission requested clarification of whether the hazardous properties of odourant had been taken into consideration in the preliminary hazard analysis contained in the EIS.	Section 4.1.1
	Vapour clouds The submission requested clarification of whether the potential for a vapour cloud to ignite at the fire pump house had been taken into consideration in the preliminary hazard analysis in the EIS.	Section 4.1.1
	Pipeline pressure The submission queried whether the FSRU and associated pumps or compressors at the wharf would be rated to provide the necessary pipeline pressure. It noted the pressure of the project gas pipeline was stated to be 12,000 kPa in the preliminary hazard analysis in the EIS whereas the pressure of the eastern gas pipeline is reported to be up to 14,000 kPa or 16,550 kPa.	Section 4.1.1

Government agency	Comment/issue	Section reference
	Hazard analysis software The submission sought justification for the use of the hazard analysis software DNV GL PHAST Risk version 6.7 rather than later versions such as version 8.11. It queried whether adopting a later version of the hazard analysis software could have addressed some of the software limitations discussed in section 6.1.1 of the preliminary hazard analysis in the EIS.	Section 4.1.1
	Transfer hose hazards The submission sought justification for the statement in section 5.5.5 of the preliminary hazard analysis in the EIS that localised overpressure from an LNG transfer hose was not considered significant enough to cause damage to the vessel cargo tanks resulting in loss of containment. It also queried whether the analysis had considered potential pressure surges in the event of a valve closure or pump trip.	Section 4.1.1
	Safety system failures The submission made reference to section 6.4 of the preliminary hazard analysis in the EIS, which discussed gas or fire detection and emergency shutdown systems. The submission stated the failure frequency of these safety systems should have been determined and incorporated in the risk analysis. It stated a source or basis for these values should also have been provided.	Section 4.1.5
	Cargo machinery room The submission made reference to section 7.2.1 of the preliminary hazard analysis in the EIS, which discussed the potential for jet fires and flash fires in the cargo machinery room. It queried whether jet fire impinging on an LNG storage or other area and escalation was considered.	Section 4.1.1

Government agency	Comment/issue	Section reference
	Marine loading arms The submission made reference to section 7.2.2 of the preliminary hazard analysis in the EIS, which discussed marine loading arms. It queries whether the assumption that the marine loading arms are connected once per year was validated against other FSRU hazard analyses. The submission queried whether the risk that breakaway mechanisms on marine loading arms would fail to operate had been considered in the preliminary hazard analysis in the EIS.	Section 4.1.1
	Glycol processes The submission made reference to section 5.1.2 of the preliminary hazard analysis in the EIS, which discussed glycol processes. It requested clarification of whether the glycol/water mix is heated by seawater alone or other processes.	Section 4.1.5
	Gas pipeline concrete The submission made reference to section 10.4.1 of the EIS, which states that the gas pipeline would incorporate safety in design features including concrete slabs above the pipeline where necessary. It requested clarification of the alternative measures that would be put in place in sections of the gas pipeline where concrete slabs would not be installed.	Section 4.1.1
	Control room The submission requested clarification of whether equipment on board the FSRU and at the wharf would be controlled from a single control point or through another arrangement.	Section 4.1.5
	Open space The submission made reference to Table 10-1 in the preliminary hazard analysis in the EIS that identified potential risks to open space. It requested that the consequence contours for heat and overpressure be provided and that additional fire safety measures be developed for this area.	Section 4.1.1

Government agency	Comment/issue	Section reference
	Flag state The submission requested clarification on the flag state of the FSRU and noted that material provided included drawings where this varied between the Marshall Islands and Singapore.	Section 4.1.5
	Safety case consultation The submission provided the following as an indication of a preferred condition of consent: Prior to completion of the detailed design of the Major Hazard Facility, the proponent must consult with the Major Hazards Team of [SafeWork NSW] with regard to the requirements for the preparation of a Safety Case under the [work health and safety legislation] and the safety related controls that should be included in the final design.	Section 4.1.4
	Counter terrorism consultation The submission provided the following as an indication of a preferred condition of consent: Prior to completion of the detailed design of the facility, the proponent must consult with the Terrorism Protection Unit and the Major Hazard Facilities Unit of the Counter Terrorism and Special Tactics Command with the NSW Police Force in relation to the ongoing security of the facility. The proponent must ensure that regard is taken of any advice received from the Terrorism Protection Unit and the Major Hazard Facilities Unit of the Counter Terrorism and Special Tactics Command with the NSW Police Force.	Section 4.1.4

Government agency	Comment/issue	Section reference
	Fire safety study consultation The submission provided the following as an indication of a preferred condition of consent: Prior to completion of the design of the fire protection and response systems, the proponent must consult with the NSW Fire & Rescue officer attached to the Major Hazards Team of [SafeWork NSW] with regard to fire and emergency response related matters that are to be included in the Fire Safety Study and the Emergency Plan that are to be prepared under [the conditions of consent]. Matters to be addressed will include, but not be limited to: • the effectiveness of control measures in mitigating the risks associated with major incidents on site; • isopleth diagrams including radiant heat flux and overpressure distances; • the effectiveness of the proposed Safety Management System and the Computerised Maintenance Management System in ensuring the ongoing integrity of the systems and controls; • outcome of the review of the Port Kembla firefighting service in relation to Berth firefighting capacity and fire fighting tugs.	Section 4.1.4

2.3 Interest groups

The submissions from interest groups generally expressed support for the project and in doing so raised a number of potential benefits including increased security and affordability of gas, improved competitiveness and job security for local business, diversification of the regional economy, expansion and diversification of operations at Port Kembla, attraction of further investment to the region and overall economic growth and employment opportunities.

The issues raised in submissions from interest groups are listed in detail in Table 2.3. Section references to responses to the issues raised are also provided in Table 2.3.

Table 2.3 Interest groups

Interest group	Comment/issue	Section reference
Illawarra Business Chamber	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1
Illawarra Innovative Industry Network	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1
NSW Business Chamber	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1
Regional Development Australia — Illawarra	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1
The Australian Industry Group	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1

2.4 Corporations

The submissions from corporations generally made comment on the project and its interaction with other infrastructure in and around Port Kembla. The submission from NSW Ports stated it also aligned with its strategic objectives to grow port capacity and meet wider market demands.

The issues raised in submissions from corporations are listed in detail in Table 2.4. Section references to responses to the issues raised are also provided in Table 2.4.

Table 2.4 Corporations

Corporation	Comment/issue	Section reference
Endeavour Energy	**Proximity to power assets** The submission noted that the project and the gas pipeline in particular would be in proximity to power assets owned by Endeavour Energy as well as other privately owned power assets. It included some indicative mapping and more detailed description of the particular assets. The submission requested that the proponent confirm the location of these power assets, including dial before you dig, and avoid the need for any relocations as far as possible. It also requested that the project, and the gas pipeline in particular, be sufficiently separated from the power assets to allow for continued safe access for maintenance and to minimise the risk associated with electrical hazards. It made reference to Guidelines for Electrical Hazards produced by the Australian Pipelines and Gas Association to manage these issues.	Section 4.10.1
	Power supply requirements The submission stated that expected power demand of the project had not been communicated to Endeavour Energy but noted that the power demand would not be large and could likely be met by an extension of the existing 11kV distribution network of the Inner Harbour.	Section 4.10.2
NSW Ports	**Strategic justification** The submission stated the project was well suited to Port Kembla and was aligned with the strategic objectives of NSW Ports to grow port capacity and meet wider market demands.	Noted
Park Pty Ltd	**Interaction with other facilities** The submission stated the proposal could have impacts on fuel transport operations at Port Kembla both directly due to the need for relocation of assets and indirectly due to security or access restrictions during construction or operation that may be imposed by the project.	Section 4.10.3

2.5 Individuals

The submissions from individuals varied between making comment on the project, expressing support for the project and raising objections to the project. Submissions that made comment on the project concerned matters such as the sources of gas, dredging and disposal and cold water releases. Submissions that expressed support for the project raised matters such as the need for reliable and affordable gas as well as the potential industry and economic benefits. Submissions that raised objections to the project concerned matters such as the strategic justification of the project with regard to renewables, public exhibition timing and duration, dredging and disposal, seawater discharges, greenhouse gas and social amenity.

Issued raised in submissions from individuals are summarised in Table 2.5. Section references to responses to the issues raised are also provided in Table 2.5.

Table 2.5 Individuals

Individual	Comment/issue	Section reference
Submitter 301267	**Public exhibition timing and duration** The submission stated the timing of public exhibition prior to Christmas was not appropriate as it was a busy time and the duration of public exhibition was not adequate given the complexity of the EIS.	Section 4.12.1
	Greenhouse gas and climate change The submission stated that the project would contribute to climate change through greenhouse gas emissions released by regasification of liquefied natural gas and the burning of gas by end users.	Section 4.14.1
	Potential impacts of excavation, dredging and disposal The submission stated that dredging in the Inner Harbour and disposal in the Outer Harbour would mobilise contaminated sediment that would have impacts on the coastal area and Lake Illawarra.	Section 4.2.3
	Emissions to air The submission stated the project would generate significant emissions to air that would impact residents around Port Kembla.	Section 4.5.1
	Strategic justification The submission stated that predicted gas shortages and/or price rises were the result of a failure to establish a domestic gas reserve and that the project would allow for gas to be sold at inflated prices.	Section 4.9.1
Submitter 297580	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits.	Section 4.9.1

Individual	Comment/issue	Section reference
Submitter 297826	**Strategic justification** The submission reiterated aspects of the strategic justification for the project including the need for reliable and affordable gas, as well as the project's potential industry and economic benefits. It also expressed support for the transmission of gas by the proposed gas pipeline rather than by road.	Section 4.9.1
Submitter 301263	**Dredging and disposal** The submission stated that dredging in the Inner Harbour and disposal in the Outer Harbour would mobilise contaminants and acid sulphate soil and affect the environment including benthic organisms. It stated that disturbance could result in algal blooms including dinoflagellate which is fatal to some fish.	Section 4.2.3
	Construction noise The submission stated that construction noise could affect marine fauna including hearing loss. It made reference to the large number of protected fauna identified in the marine ecology assessment.	Section 4.13.1
	Cold water and chlorine releases The submission stated the project would involve releases of cold water and chlorine to the Inner Harbour that would have potential impacts on marine life.	Section 4.2.2
	The submission stated that the project posed a number of hazards and risks associated with a loss of containment of natural gas as well as potential impacts to the natural environment. It queried whether the project was justified given the degree of risk and the potentially short project lifespan.	Section 4.1.1
	Support for renewable energy The submission stated that natural gas is more emissions intensive than renewables such as solar or wind. It stated the project should demonstrate it would not delay the transition to renewable alternatives.	Section 4.9.1

Individual	Comment/issue	Section reference
	Strategic justification The submission stated that predictions of gas shortages and/or price rises by the Australian Energy Market Operator were contested. It made reference to other studies that found while gas prices may be high there was not likely to be an actual shortage of gas available to the east coast market.	Section 4.9.1
Submitter 301279	**Sources of gas** The submission stated that the project could involve importation from unconventional sources of gas such as shale gas with potential environmental and social impacts. It queried whether a domestic reserve of natural gas could not instead be established. It also queried whether the project would mean other domestic gas projects would no longer need to occur such as the Narrabri Gas Project.	Section 4.9.1
	Dredging and disposal The submission stated that dredging in the Inner Harbour and disposal in the Outer Harbour would mobilise contaminants that could have environmental impacts on the harbour or Lake Illawarra.	Section 4.2.3
	Cold water releases The submission queried whether it could be guaranteed that cold water releases would have no adverse impacts on the Inner Harbour or the Outer Harbour.	Section 4.2.2
Submitter 301259	**Renewable energy** The submission stated that the project and associated transportation of liquefied natural gas was not justified. It stated domestic sources of renewable energy would cost less and produce more jobs.	Section 4.9.1
	Social amenity The submission stated the project was not compatible with the social, cultural, visual and environmental character and future development of Wollongong and surrounds.	Section 4.13.2
	Long term benefits The submission stated that following construction there would be limited long term jobs or benefits.	Section 4.13.3

3. Preferred infrastructure

3.1 Overview

This chapter documents changes to the project subsequent to the public exhibition of the EIS. These changes are termed the preferred infrastructure in line with *Responding to Submissions*. The preferred infrastructure reflects stakeholder feedback and progression of project design.

The project will remain predominantly as described in the EIS and will continue to include the following four key components.

- LNG carrier vessels — there are hundreds of these in operation globally transporting LNG from production facilities all around the world to demand centres
- Floating Storage and Regasification Unit (FSRU) — a cape-class ocean-going vessel which would be moored at Berth 101 in Port Kembla
- Berth and wharf facilities – including landside offloading facilities to transfer natural gas from the FSRU into a natural gas pipeline located on shore
- Gas pipeline – a Class 900 carbon steel high-pressure pipeline connection from the berth to the existing gas transmission network at Cringila.

However, there are a number of minor amendments to the design and construction methodology proposed to implement the project which are described in detail below.

3.2 Gas pipeline alignment

3.2.1 Development described in EIS

The EIS described a short gas pipeline to connect the FSRU to a tie-in point to the existing Eastern Gas Pipeline (EGP) spurline at Cringila. The gas pipeline was described as a DN450 carbon steel pipeline about 45 centimetres (18 inches) in diameter and 6.3 kilometres in length and designed to comply with all current environmental and safety requirements including those required under Australian Standard (AS) 2885.

The tie-in point was described as being located at either the existing metering station at Cringila or a similar facility that could be established nearby along the existing EGP spur line. A custody transfer meter to measure gas transferred from the project into the gas network would be installed at the tie in point or alternatively at a location on the existing Jemena network. The pipeline would be operated and maintained in line with relevant standards and guidelines including AS 2885.3.

The proposed alignment of the gas pipeline was described in detail within the EIS and proposed to be installed through a combination of open trenching and horizontal directional drilling. Directional drilling was proposed to be adopted for key road, rail and waterway crossings and to avoid previously undisturbed areas of biodiversity and heritage value.

3.2.2 Proposed amendments

The alignment of the gas pipeline will remain substantially in accordance with the development described in the EIS. Minor modifications are proposed to address comments during ongoing consultation with land owners and key stakeholders during the detailed design process. A detailed comparison of the proposed design changes is included in Figure 3-1 and described below.

Paper Size ISO A4

0 50 100

Metres

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

N

GHD

Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline Comparison

Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Figure 3-1a

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparison.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy

Paper Size ISO A4

0 50 100

Metres

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

Australian Industrial Energy
Port Kembla Gas Terminal

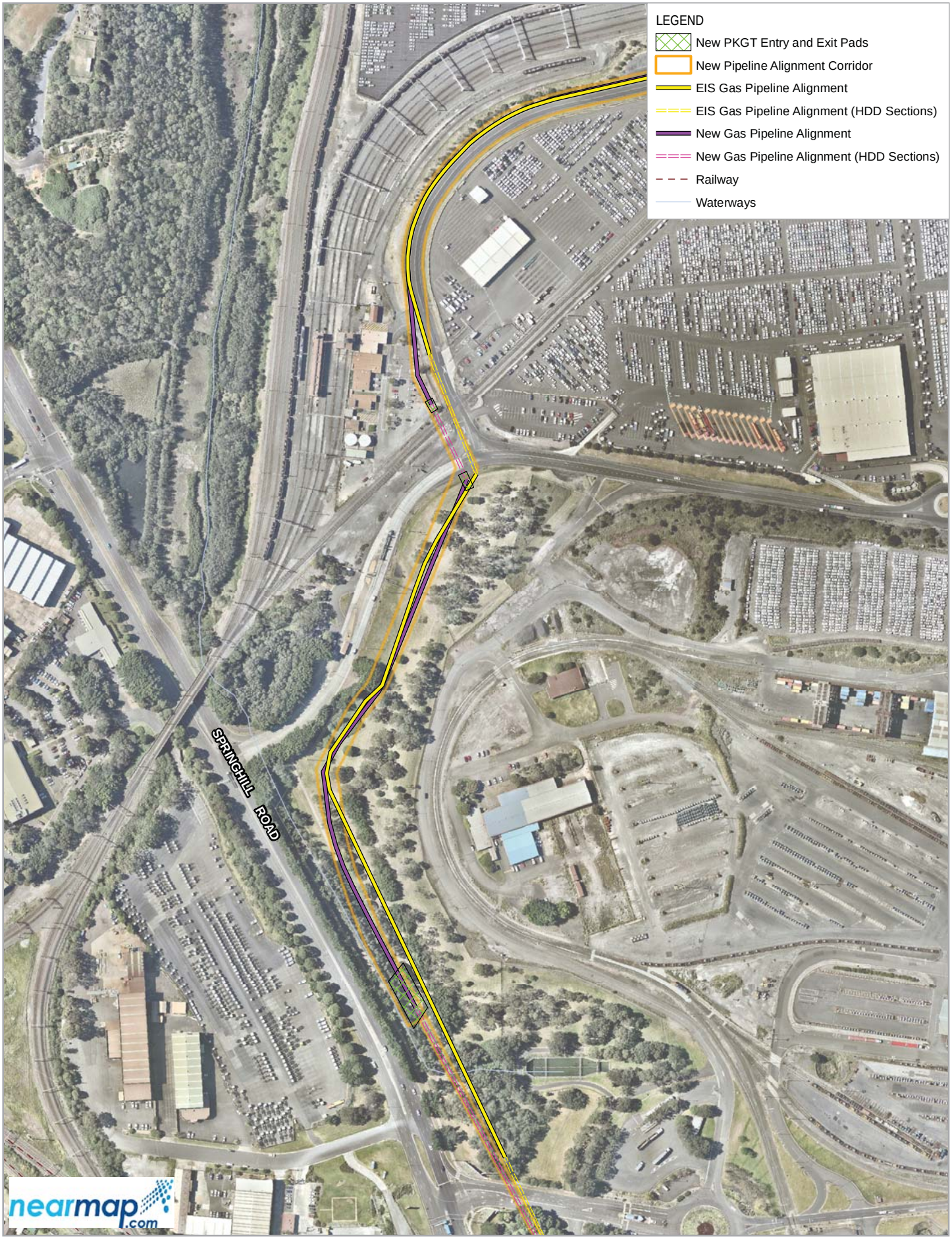
Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Gas Pipeline Comparison

Figure 3-1b

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparison.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



Paper Size ISO A4

0 50 100

Metres

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

N

GHD

Australian Industrial Energy
Port Kembla Gas Terminal

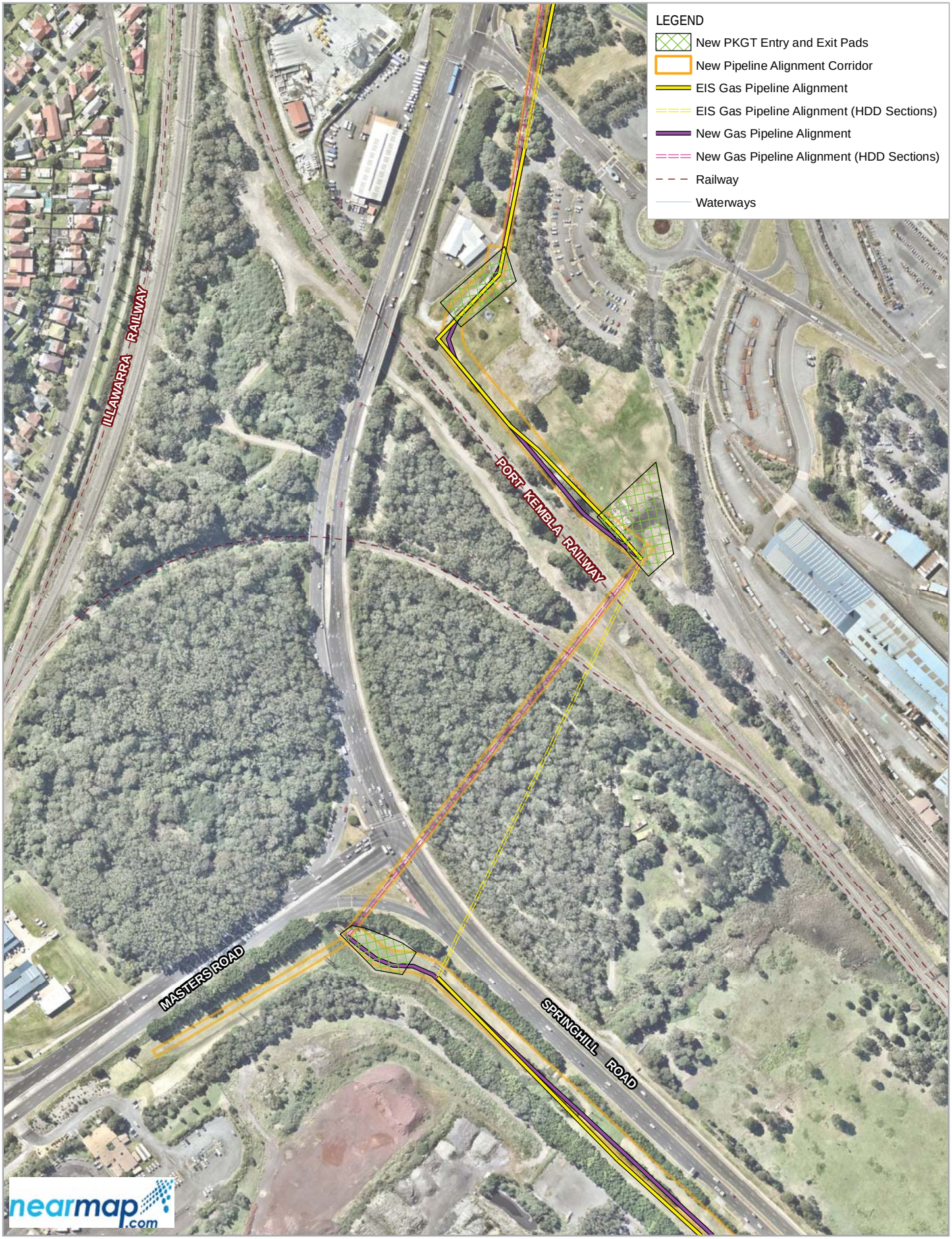
Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Gas Pipeline Comparison

Figure 3-1c

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparison.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



Paper Size ISO A4

0 50 100

Metres

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

Australian Industrial Energy
Port Kembla Gas Terminal

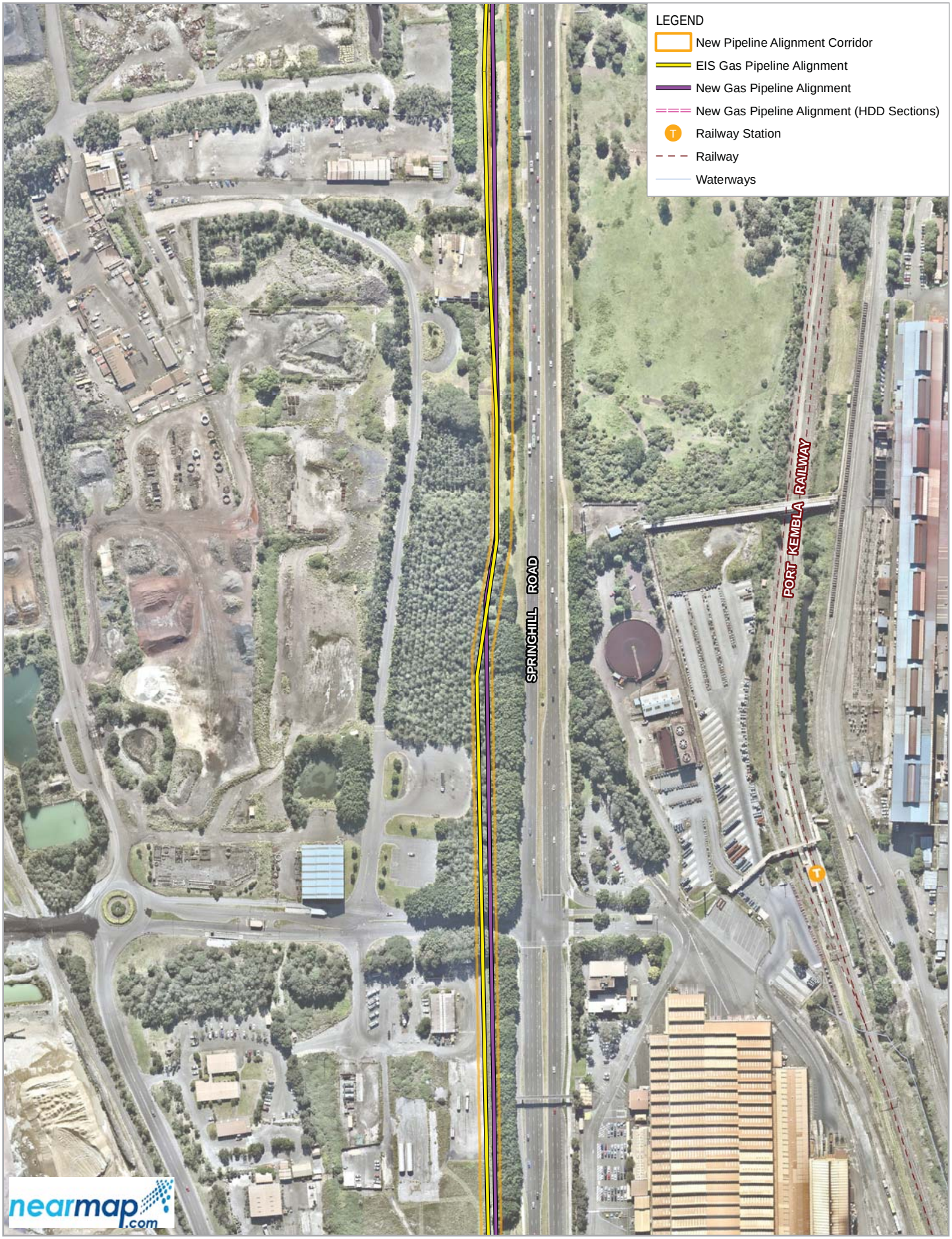
Gas Pipeline Comparison

Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Figure 3-1d

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparison.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



Paper Size ISO A4

0 50 100

Metres

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

N

GHD

Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline Comparison

Project No. 21-27477
Revision No. A
Date 18 Jan 2019

Figure 3-1e

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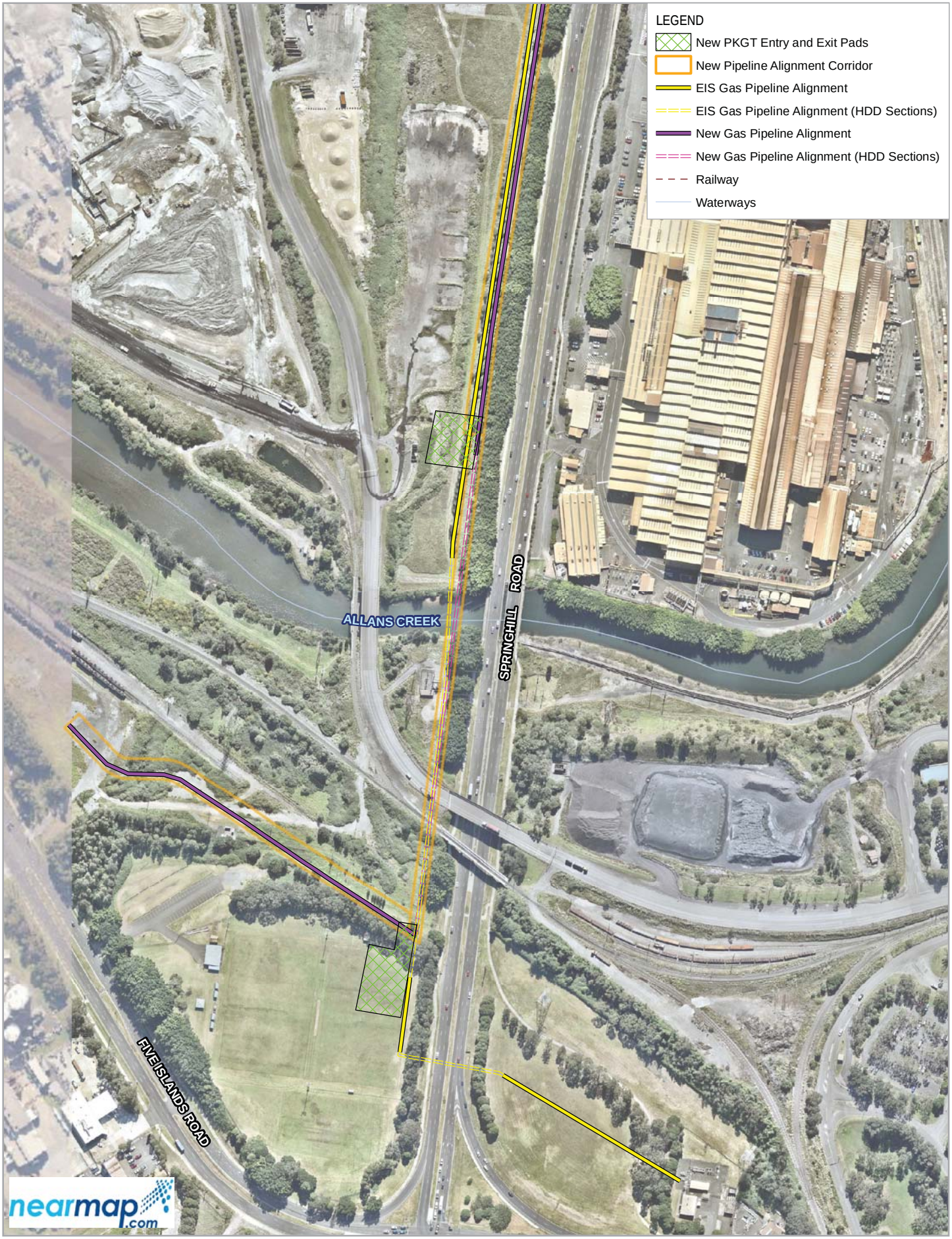
Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



Paper Size ISO A4

0 50 100

Metres

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

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GHD

Australian Industrial Energy
Port Kembla Gas Terminal

Project No. 21-27477
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Gas Pipeline Comparison

Figure 3-1f

G:\21\27477\GIS\Maps\Deliverables\21_27477_Z016_AlignmentComparison.mxd

Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy

Minor amendments to the alignment are proposed within the Berth 101 area to better align with the proposed berthing infrastructure and to avoid services on the road verge adjacent to Road No. 1 within the Port Kembla Coal Terminal.

Refinement to the location and expected footprint of the directional drill entry and exit pads has been developed as part of the detailed design with the likely configuration and construction footprint for all proposed entry and exit pads included on Figure 3-1.

A smaller thrust bore is proposed to be utilised to pass beneath Tom Thumb Road and the Pacific National Railway and a slight realignment of the pipeline within Bluescope Steel land adjacent to the existing shared path has been adopted to avoid steep slopes within the bunded landscaping areas. A slightly longer direction drill has also been proposed to traverse Bluescope's north gate access to avoid a drainage channel extending from the existing water treatment system.

A modification is proposed to the alignment of the major directional drill passing beneath NSW RailCorp's South Coast Line and Springhill Road and the intervening vegetated area. The alignment has been modified to allow a more perpendicular crossing of road and rail infrastructure and to allow the pipeline to be strung within the defined construction corridor adjacent to Masters Road, prior to pulling back through the borehole during pipeline installation. Allowance for pipe stringing within the transmission line corridor adjacent to Masters Road has been explicitly shown within the construction footprint.

Minor revisions to the preferred alignment are proposed within the previously assessed construction corridor running to the south parallel with Springhill Road. A slight extension of the length of directional drill passing beneath Allans Creek has also been proposed.

The EIS described the likely tie in point to the existing gas network to be located at the existing metering station at Cringila or an alternative location along the EGP spurline. An alternative location for the tie in has been identified within cleared land owned by Bluescope and on the existing spurline to the west of Springhill Road as shown on Figure 3-1. This will avoid the need for a final directional drill crossing of Springhill Road and the final approximate 200 m section of pipeline to the metering station.

The project application area for the purpose of the EIS will continue to include a 20 metre corridor (notionally 10 metres either side of the pipeline centre line) where there are no limitations such as road, rail, power lines or other constraints. The disturbance footprint will be limited in key locations to minimise disturbance to adjoining areas with biodiversity or archaeological sensitivity and adjoining land uses. A maximum of 16 metre corridor has been considered for a section of pipeline running through native vegetation west of Springhill Road and the corridor will be narrowed in small sections to avoid swamp or constructed wetland habitat. The construction corridor and likely laydown areas for directional drilling have been included on Figure 3-1. The construction right of way will allow for temporary working areas and micro-siting within the proposed corridor. The final easement width for the pipeline (outside of the road reserve areas) will be 6 metres (3 metres either side of the pipeline centre line).

3.2.3 Assessment considerations

The potential environmental impacts associated with the modified pipeline alignment are predominantly as described within the EIS. The design modifications are minor and will not alter the environmental outcomes described as part of the assessment process.

Directional drilling will continue to be adopted for key road, rail and waterway crossings and to avoid previously undisturbed areas of biodiversity and heritage values. Entry and exit pads for directional drilling are located within previously cleared and disturbed land and appropriate

construction site management will limit the potential for erosion or sediment laden run-off from the work areas.

The alignment remains primarily within the assessment corridor included within the biodiversity and heritage investigations and will continue to avoid areas of known sensitivity including drilling beneath Crown Land located between NSW RailCorp's South Coast Line and Springhill Road. Environmental outcomes are consistent with those described in the EIS.

The revised location of the tie in facility will increase the distance between the gas pipeline and the nearest residential receivers at Cringila. The existing metering station is located at a distance of just over 100 metres from residential receivers while the revised tie in location is more than 450 metres, from residential receivers reducing the potential exposure to noise and dust during construction and hazard risk during the operation of the pipeline.

3.3 Floating Storage Regasification Unit

3.3.1 Development described in EIS

The EIS provided a detailed description of the design and operation of the FSRU, which comprises a cape-class ocean-going vessel approximately 300 metres in length and about 50 metres in breadth. The vessel has a total capacity of about 170,000 cubic metres or equivalent to about 4 PJs of gas and is used to receive and store LNG from carriers and to convert the LNG to high pressure gas for connection to the existing gas network.

The EIS described that the FSRU would be obtained and operated under long-term charter by Höegh LNG, the world's largest and most experienced owner and operator of FSRUs globally. The project maintained an exclusivity agreement on two vessels pending final selection at the time of EIS publication.

Both vessels under consideration within the EIS were purpose-built FSRUs (as opposed to retro-fitted LNG carriers). One is four years old on active service and the other is currently under construction outside of Australia. The FSRUs are designed to comply with comprehensive international safety regulations and standards and a description of the process and indicative plans of the FSRU were included as part of the EIS.

3.3.2 Proposed amendments

The two vessels under consideration for the project during EIS preparation were the Höegh Gallant, which had been in operation for four years and the Höegh Galleon or SN2220, which is currently under construction.

A thorough technical comparison of the two vessels was undertaken and the Höegh Galleon or SN2220, was selected as the preferred vessel for the project. While both vessels are of a comparable size and capacity, it was determined the SN2220, as a brand new vessel will be equipped with the latest technology and has a number of specifications which make it preferable from an operational, safety and environmental standpoint.

3.3.3 Assessment considerations

The description of the FSRU included in the EIS aligns with the preferred vessel and the potential environmental impacts will therefore align with the previous assessment. The following considerations provide further detail specific to the SN2220.

Operations and safety

The location of the regasification module on the FSRU is a key driver for the extent of hazard and risk contours for the project.

On the Gallant, the regasification module is located aft and starboard of the vessel meaning it is situated closer to the coal terminal, which is a permanently manned industrial zone, and also closer to the Inner Harbour turning basin where frequent and time-consuming navigational operations of ships occur.

The regasification module on the SN2220 is better positioned from a safety perspective. It is situated bow and centreline of the vessel, so significantly further from the coal terminal and the turning basin, should a hazardous event occur.

To achieve maximum gas sendout, the Gallant requires all four of its regasification trains to run, whereas the SN2220 can achieve maximum required sendout levels running just two of its three trains. This inbuilt redundancy of the third train reduces operational and safety risks on board the SN2220.

The configuration of the mooring system on the SN2220 is also preferable as it can withstand greater adverse weather conditions, limiting any requirement to leave the berth in these conditions.

Fuel consumption on the SN2220 can be up to 17% less than on the Gallant. This means less of the gas cargo is used to power the ship and more gas can be provided to market.

Water Quality

Seawater from the harbour is taken on board the FSRU, used to warm the LNG and return it to a gas, and is then dispersed back into the harbour.

The Gallant has just one seawater outlet situated towards the aft of the vessel. It is located just below the waterline meaning release of the seawater is likely to generate some foaming on the surface.

In comparison, the location and configuration of the seawater outlets on the SN2220 will provide key benefits to reduce any impacts on the harbour from this dispersal process. The SN2220 has two outlets allowing greater dispersion of the water and the location of the outlets at the bow and close to “The Cut” (the entrance to the Inner Harbour) is preferable, as better water movements due to passing ships and tides will assist dispersion. The water outlets are located about 5 metres below the waterline so foaming will also be avoided.

Further consideration of the impacts to water quality is included in the response to submissions in Section 4.2.2.

3.4 Dredging and disposal methodology

3.4.1 Development described in the EIS

The EIS described that about 600,000 cubic metres of material would be excavated and dredged for the construction of berth and wharf facilities. Allowing for typical bulking factors, this volume would equate to about 720,000 cubic metres.

Excavation and dredging was proposed to be carried out by long reach excavator and backhoe dredger. The long reach excavator would be situated on land and would primarily be used to excavate the existing berth and revetment. The backhoe dredger would be situated in the Inner Harbour adjacent to Berth 101 and would primarily be used to excavate the deeper sediments at Berth 101.

Excavated and dredged material is proposed to be transported to the Outer Harbour disposal area to support land reclamation activities for NSWs Ports approved Outer Harbour Project. The disposal area was to include a combination of emerged and submerged reclamation with

material placed within a stabilising containment bund to prevent placed sediments from spreading outside the emplacement area

The EIS maintained flexibility in the volume of material to be excavated and transported by haul truck versus the volume of material to be dredged by backhoe dredger and transported by barge to allow for variation in the preference and capacity of the selected construction contractor.

It was expected that about 370,000 cubic metres could be excavated by a typical long reach excavator and transported by truck. That volume could be increased to 620,000 cubic metres in the event that a long reach excavator with an extended reach and depth is procured.

It was expected that about 350,000 cubic metres of material could be dredged by backhoe dredger and transported by barge. The EIS noted that the volume could be increased to 720,000 cubic metres if the barges were unloaded by excavators at a temporary berth at the reclamation area.

The EIS stated that actual volumes may comprise any combination of the above methodologies totalling about 720,000 cubic metres. Assessment of potential impacts was based on the maximum potential volume of 720,000 cubic metres for each methodology for the purpose of worst case impact assessment.

3.4.2 Proposed amendments

Overview

A number of submissions requested more definition in regard to the dredging and disposal strategy proposed to be adopted for the project.

The procurement process for selection of the preferred dredging contractor has been progressing throughout the EIS exhibition phase and a number of companies have been shortlisted for construction of the project. Selection of the preferred contractor is unlikely to be finalised until the project achieves financial closure, so there is a need to maintain some flexibility in the dredging and disposal methodology within the consent. This will allow for alternate approaches to sequencing and plant and equipment selection based upon individual contractors' experience and will allow for the latest innovations in dredging methodology and environmental management and monitoring.

It is however recognised that further definition of the approach to dredging and disposal, construction sequencing and the key management and monitoring measures is required in order to make a more informed consideration of the acceptability of the proposed strategy.

An Outline Dredge Environmental Management Plan (DEMP) has therefore been prepared to provide the overall framework the successful contractor will be required to work within and adhere to during all dredging / excavation and disposal operations and is included in Appendix A of this Submissions Report.

The Outline DEMP provides details on the likely sequencing and environmental management and monitoring requirements for dredge and sediment placement operations. It is envisaged a more detailed DEMP will be prepared based upon the selected contractor's final methodology. The commitments outlined in the Outline DEMP will be adhered to in the DEMP, as well as any management measures subsequently agreed with government authorities and stakeholders.

Material transport movements

A review of short-listed contractors execution strategies has been undertaken to provide further refinement on the anticipated volume of material to be excavated using on-shore equipment such as long reach excavators, compared to the volume of material to be removed through the use of backhoe dredging operations.

All contractors preference is to maximise the use of marine based excavation through use of backhoe dredge and transport via barge to the Outer Harbour disposal area. This is the most economical solution and will also minimise vehicle movements on the local road network.

The disposal area comprises a combination of submerged and emergent reclamation. This places limitations on the volume of material that can be transferred directly by barge. It is envisaged that excavated material will be transported by split hopper barge for placement to a depth of approximately RL -4 to RL -3 metres. This will allow sufficient draft clearance of the barge above the reclamation area to allow bottom dumping. Potential strategies including the use of a second material handling barge with excavator, or the construction of a temporary unloading facility with sheet pile retainment, are being considered by alternate contractors, which will increase the volume of excavated material that is possible to be transported by barge. There will still be a need for some transport of material via road transport. This will include crushed concrete and pavement from the initial Berth 101 demolition activities and select fill suitable for capping of armouring of revetments or for construction of a causeway to assist placement within the emerged disposal area.

Based upon a review of all contractor methodologies it is envisaged that transport by barge will be achieved for between 50 and 90% of excavated material equating to 360,000 cubic metres to 650,000 cubic metres. This will have a corresponding 50 to 90% in potential truck movements associated with road haulage of spoil on the local road network and daily vehicle movements will continue to fall well within the capacity of the road network.

3.4.3 Assessment Considerations

The dredging and disposal methodology remains primarily consistent with the development as described in the EIS. More specific details on construction sequencing and environmental management and monitoring requirements have been developed for the project, within the overall framework described as part of the EIS.

Environmental impacts associated with the proposed works are predicted to be largely as described in the EIS. Further analysis of impacts associated with dredging and sediment placement are included in 4.2.3 and the Outline DEMP included in Appendix A.

3.5 Landscape embankment

3.5.1 Development described in the EIS

A portion of the dredged material was initially proposed to be utilised for the establishment of a long-term landscaped embankment on the eastern side of the project application area to separate the project facilities from Sea Wall Road. The landscaped embankment of up to four metres in height would create a visual barrier to publicly accessible areas and require about 70,000 cubic metres of soil material.

3.5.2 Proposed Amendments

A number of submissions queried the need for the embankment as it had potential to sterilise the future use of industrial land at the Port and would result in potential for environmental impacts that were not fully investigated within the EIS.

The proposed landscape embankment is longer proposed to be developed as part of the project.

3.5.3 Assessment Considerations

The landscape embankment has been withdrawn from the DA. All excavated sediments will therefore be disposed of within the Outer Harbour disposal area as described above.

4. Response to submissions

4.1 Hazard and risk

4.1.1 Preliminary hazard analysis

Open space

Submissions requested further information on reducing risk or proposing measures to address exceedances of the individual fatality risk contour for industrial land and/or open space.

The 5e-05 risk contour for industrial land extends beyond the site boundary east of the FSRU stern. This area, whilst outside the current proposed boundary, is not expected to be occupied other than by Port Kembla Coal Terminal trucks accessing the existing truck wash. Exposure to risk greater than 5e-05 by an individual is low due limited exposure durations.

As assessed in the preliminary hazard analysis some limited exposure to the 1e-05 risk contour for open space was predicted at Seawall Road near Berth 101. Seawall Road is a private road which runs along the eastern side of the site and is opened to the public during daylight hours, unless closure is required for operational purposes.

Operational purposes can include weather events, haulage of bulk products, construction/maintenance works and/or other operational requirements. The road has security in the form of security fencing and lockable gates which enable the road to be closed when required. It is not uncommon for the road to be closed 6 – 10 times a year for operational purposes.

The road tends to be used by surfers, rock fishers and occasional on-lookers for unusual events, such as the arrival of a large cruise ship. However, numbers of users are in the dozens, not the hundreds, with the largest crowds seen there for the arrival of the Port's first cruise ship. Subsequent cruise ship arrivals have seen the crowd numbers dwindle. There are a number of vantage points available to the community for viewing ship arrivals other than the Seawall Road area adjacent to the Berth 101 site. These include the Wollongong Head Lighthouse lookout to the north of the site and the Port Kembla Heritage Park to the south of the site.

The Port typically receives 2 to 3 cruise ships a year. The length of time these ships would take to pass through 'the Cut' including passing Berth 101 would typically be about 30 – 40 minutes. In total, it takes less than 1 hour for a cruise ship to navigate into or out of Port Kembla. As such, if required for the abundance of safety, it would be feasible to close Seawall Road for the entry and exit of cruise ships either for the brief periods of time they pass Berth 101 or for a longer period of time as necessary.

Odourant hazards

It is planned that odourant would be injected into gas to assist in leak detection. Odourant would be stored in drums and injected through a specialised skid prior to it entering the gas pipeline.

It is expected that up to 400 kilograms of odourant would be stored in two 200 kilogram drums at Berth 101. Once empty they would be refilled by truck or swapped out with refilled tanks.

The odourant to be used would be a non-toxic liquid. While non-toxic, odourant has the potential to cause eye, skin or respiratory irritation if exposure occurs. As such the odourant would need to be stored and handled appropriately including the use of personal protective equipment.

Given the small volume of odourant stored, and the low pressure at which it is stored, it presents a low on-site and off-site risk. In the unlikely event of a spill the potential impacts to

residential areas would be negligible given the nearest of these areas is in the order of two kilometres from Berth 101.

Odourant is flammable and would be under pressure in the gas pipeline. These potential hazardous characteristics were incorporated in the preliminary hazard analysis and would not result in a material change to the overall risk profile or consequence contours of the project.

Vapour cloud hazards

The potential for a vapour cloud to ignite at the fire pump house would be very limited given the fire pump house would be at the north end of wharf facilities away from potential gas releases.

Cargo machinery room

The consequences of jet fires and flash fires in the cargo machinery room in the FSRU were found to be contained to the cargo machinery room. The cargo machinery room would have forced mechanical ventilation with gas detection point as well as steel walls and roof sections that would prevent escalation of these hazards.

The analysis assumed all leaks within the room led to an explosive atmosphere and did not account for the control systems available. The consequences of a vapor cloud explosion within the machinery room are therefore accounted for in the risk calculations.

Marine loading arms

Marine loading arms would remain permanently connected between the FSRU and wharf facilities and only be disconnected for maintenance or emergency purposes. The frequency of releases from marine loading arms was calculated to be 6.6e-04 per annum, in line with the failure frequency data in the guideline for quantitative risk assessment (purple book), which was greater than the United Kingdom Health and Safety Executive data and therefore considered to be conservative for the purposes of the preliminary hazard analysis. The adopted failure frequency data would incorporate events such as failures of breakaway/emergency release and isolation systems. The berth and FSRU mooring system would also be designed to withstand 1 in 100 year storm surge and infragravity wave events to reduce the likelihood of adverse weather condition resulting in the need to disconnect the MLAs.

Gas pipeline pressure

At the current stage of design the maximum allowable operating pressure of the gas pipeline is about 14.7 MPag but is limited by the maximum supply pressure from the FSRU at 12 MPag. It is noted that submissions referred to pressures in the Eastern Gas Pipeline of up to 14 to 16 MPag, however it is understood that the normal operating pressure is about 8 to 11 MPag. As such, the project is expected to be able to provide gas at a suitable pressure to the pipeline.

Transfer hose hazards

The failure frequencies adopted from the United Kingdom hydrocarbon release database account for design faults, equipment faults, operational faults and procedural or human error and would include releases due to pressure surge. The maximum working pressure of the transfer hoses, including pressure surges, is 10 bar. The transfer hoses would be equipped with double-valved emergency release systems with a minimum burst pressure of 50 bar.

As stated in section 5.5.5 of the preliminary hazard analysis, localised overpressure from loss of containment of LNG into the water could result in rapid phase transition as the cold LNG warms rapidly and flashes to gas. The overpressure generated would attenuate with distance and not be considered sufficient to breach the outer (26 mm) or inner (20 mm) hull of a vessel and therefore would not have the potential to damage the LNG cargo tanks.

Safety system failures

The preliminary hazard analysis was based on industry failure frequency data and did not take into account the function of safety systems, adding a level of conservatism to the assessment.

Hazard analysis software

PHAST 6.7 software was used not the more recent PHAST 8.11. The main difference between versions 6.7 and 8.11 in terms of FSRU modelling is that the latter version produces reduced consequence distances under low wind dispersion conditions. As such the adoption of PHAST 6.7 in the preliminary hazard analysis is conservative and appropriate.

4.1.2 Safety case

Safety case requirements

The safety case would be developed in accordance with relevant laws, regulations and guidelines including the *Work Health and Safety Act 2011*, the *Work Health and Safety Regulation 2017* and guidance material produced by SafeWork NSW.

4.1.3 Fire safety

Requirement for fire safety study

A fire safety study would be developed in line with relevant laws, regulations and guidelines including *Hazardous Industry Planning Advisory Paper No 2 Fire Safety Study Guidelines*.

The fire safety study would include identification of hazards, consequences including isopleth diagrams showing extents of radiant heat, overpressure contours for vapour cloud explosions and dispersion modelling results for unignited vapour clouds.

The fire safety study would also include further details on proposed safety measures including but not limited to fire and gas detection, process control systems, emergency shutdown and blowdown systems, active and passive fire protection systems, hazardous area classification requirements and other ignition controls.

Fire safety measures

Fire safety measures would be incorporated into the project in accordance with relevant Industry and Australian Standards. The fire safety study will document the fire safety measures and assess the adequacy of these measure against identified fire hazards. Specific requirements from *AS 3846—2005 The handling and transport of dangerous cargoes in port areas,* such as the need for a minimum of 2 Class A firefighting tugs, have been identified. It is understood that by the time the FSRU is in operation, the current tug boat operators at Port Kembla will have two firefighting tug boats – the Kiama and the Ruby – which will be above the required standard.

The fire protection requirements for the FSRU will be in accordance with recognised international standards such as IMO/SOLAS and will be verified through the vessel classification process.

Berth and FSRU active fire protection would also be built into the project in accordance with *AS 3846—2005*. This would include a combination of firefighting water monitors, hydrants and extinguishers. Two 1,680 kL firefighting water storage tanks are planned to be provided on the berth. An emergency control room located at the berth is provided and has been located with other fire critical equipment outside the 25 mm jet fire radius of the FSRU and gas pipeline.

4.1.4 Consultation

Safety case consultation

The safety case would be developed in consultation with the relevant authorities and stakeholders including Port Authority of NSW and SafeWork NSW.

Fire safety study consultation

The fire safety study would be developed in consultation with the relevant authorities and stakeholders including Fire and Rescue NSW and SafeWork NSW.

Counter terrorism consultation

The proponent would consult with the relevant units of NSW Police following the project being granted consent under the EP&A Act. It is noted that detailed design of the project is ongoing.

4.1.5 Other clarifications

Gas flaring

There is no flaring from the FSRU or wharf topside facilities.

The proposed wharf topside facilities will include a cold vent only for use in an emergency. The impacts of accidental dispersion and ignition at the cold vent have been assessed as part of the preliminary hazard analysis. The FSRU would also be equipped with a cold vent rather than a flare.

Temporary portable flares may be utilised for depressurisation during such times as pipeline commissioning, decommissioning or major maintenance. The use of such flares would be confirmed during detailed design and assessed accordingly during that stage.

Glycol processes

Glycol used in the regasification system would be heated by seawater. The glycol water system for cofferdams would be heated by steam from the FSRU engine rooms.

Gas pipeline concrete

Based on the current design of the project and safety assessments to date concrete slabs are not currently proposed at any locations along the gas pipeline. Underground gas pipelines are a common occurrence in Australia. The pipeline will be buried, covered by compacted material and the surface rehabilitated, and will be clearly signposted.

Boil-off gas retention

The FSRU would be equipped with a condenser system to handle excess boil-off gas while gas is being sent to the Eastern Gas Pipeline. If gas cannot be sent to the Eastern Gas Pipeline the regasification and condenser systems would be kept offline and remaining boil-off gas would be burned through internal combustion engines or gas combustion units on the FSRU.

The FSRU would nonetheless remain a seaworthy vessel and could navigate from the port in a short space of time in the unlikely event that this would become necessary.

Control room

The FSRU and wharf facilities would each have a control room. Under normal operations the FSRU and wharf facilities would be controlled from the FSRU control room. The two control rooms would be linked so that each room is able to determine the status of the other room.

Flag sate

The flag state of the FSRU is still to be confirmed.

4.2 Water resources

4.2.1 Level of protection for Port Kembla

Adopted guidelines

Submissions queried the assessment approach and the appropriate level of protection and associated trigger values for protection of water quality within Port Kembla harbour.

The EIS included an assessment of potential impacts upon water quality with reference to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) which provide a framework for determining appropriate values or performance criteria to evaluate the results of water quality monitoring programs against defined objectives or values for the receiving waters. For each environmental value, the guidelines identify particular water quality characteristics or 'indicators' that are used to assess whether the condition of the water supports that value.

In the case of Port Kembla Harbour, the relevant values relate to Aquatic Ecosystems and Visual Amenity and it is recognised that community, government and industry have undertaken significant work since the 1970s to reduce the level of pollution and improve water quality within the harbour. The submissions indicated that applicable trigger values for the project include:

- Construction — 90% of species protection criteria (95% for bioaccumulating substances)
- Operation — 95% of species protection criteria (99% for bioaccumulating substances)

The suggested trigger values have been adopted and further detailed assessment has been undertaken to assess the impact of key aspects of the development including dredge and disposal and discharges from the FSRU's marine growth protection system (MGPS). An outline of applicable trigger values is included in Table 4.1.Table 4.1

Table 4.1 Relevant water quality criteria

Water quality parameter	ANZECC/ARMCANZ Guidelines (2000)	NSW water quality objective
Aquatic ecosystems		
Biological		
Frequency of algal blooms	Not listed	No change from natural conditions
Bioaccumulation of contaminants	Not listed	No change from natural conditions
Physico-chemical and Nutrients		
Dissolved oxygen	90-110 % saturation	Not listed
pH	8.0-8.4	Not listed
Turbidity	0.5-10 NTU	0.5-10 NTU
Total Nitrogen	120 µgN/L	<120 µg/L
Total Phosphorous	25 µgP/L	<25 µg/L
Chlorophyll-a	1 µg/L	Not listed

Water quality parameter	ANZECC/ARMCANZ Guidelines (2000)	NSW water quality objective
Toxicants (ANZECC / ARMCANZ Guideline trigger values are at the 95% protection level)		
Cadmium (Cd)	5.5 µg/L	Not listed
Chromium (Cr)	4.4 µg/L	Not listed
Copper (Cu)	1.3 µg/L	<1.3 µg/L
Nickel (Ni)	70 µg/L	Not listed
Lead (Pb)	4.4 µg/L	<4.4 µg/L
Zinc (Zn)	15 µg/L	<15 µg/L
Mercury (Hg) (inorganic)	0.4 µg/L	Not listed
Tributyltin	0.006 µg/L Sn	Not listed

Chlorine

The FSRU's MGPS takes seawater from the surrounding area, uses its natural salts to produce a solution of sodium hypochlorite, which acts as a natural biocide, which is used on-board to ensure all the systems remain free of marine growth. Sodium hypochlorite naturally degrades rapidly and so most of the created solution will be used within the vessel well before the water is ready for re-release. However, some excess sodium hypochlorite is expected to remain prior to discharge within the Inner Harbour.

The EIS notes that the ANZECC guidelines provide a 95% species protection default guideline value (previously known as trigger value) for total residual chlorine within freshwater aquatic environments of 3 µg Cl/L. No equivalent values are provided for the marine environment however the guidelines note that the freshwater value "was adopted as a marine low reliability trigger value, to be used only as an indicative interim working level".

Specific values are provided in the IFC World Bank Group Environmental, Health, and Safety (EHS) Guidelines for Liquefied Natural Gas (LNG) Facilities, which include limits relating to discharges associated with FSRUs. These guidelines stipulate the following in relation to residual sodium hypochlorite in seawater,

"Free chlorine (total residual oxidant in estuarine/marine water) concentration in cooling/cold water discharges (to be sampled at point of discharge) should be maintained below 0.2 parts per million (ppm)." (IFC, 2017).

The submissions request further details of the by-products associated with the breakdown of sodium hypochlorite upon discharge and query whether the IFC World Bank Group EHS Guidelines relate to protection of environmental values or simply accepted international practice. The IFC EHS guidelines are considered applicable to this project as a technical reference document developed to represent good international practice for environmental protection based upon the use of existing technologies available for a specific industry at reasonable cost. It is recognised that the applicability of the guidelines should be tailored to the risks and sensitivity of the local environment. The submission also references US EPA standards for aquatic life ambient water quality criteria for significant risk to marine waters at 13µg/L (acute chlorine criteria) and 7.5 µg/L (chronic chlorine criteria).

The EIS has considered the risk to the marine environment in the context of the NSW policy settings and relevant water quality objectives. It is recognised that there is wide variation within

the policy setting for the identification of trigger values and discharge standards for marine protection including:

- 0.2 parts per million (ppm) or 200 µg/L in the IFC Guidelines
- 13 µg/L (acute chlorine criteria) and 7.5 µg/L (chronic chlorine criteria) in the US EPA Guidelines
- 3 µg/L chlorine for freshwater aquatic environments in the ANZECC guidelines

Further detailed modelling has been undertaken to consider the impacts of the discharges from the MGPS on the marine environment with reference to the above guidelines.

Temperature

The regasification process on board the FSRU relies on the use of seawater extracted from the Inner Harbour to heat the LNG to convert it to gas. The seawater used in the regasification process will then be released back into the Inner Harbour via horizontal discharge outlets located on the side of the FSRU at a depth of around 5 meters below the water line. The maximum rate of discharge is approximately 10,000m^3/hr. When discharged, this water will be up to 7^o Celsius cooler than the ambient sea water temperature at the immediate point of discharge.

Based on nearfield and far field modelling, the EIS predicted that the cooler discharge water would rapidly equilibrate with ambient temperatures upon discharge to the Inner Harbour during summer and winter. The EIS also noted that the discharge of cool water would reduce the impacts associated with existing warm water discharges from industrial activity within the Inner Harbour.

The submissions requested a revised modelling assessment specifically taking into account 20%ile temperature limits over four seasons, with and without existing warm water discharges and additional reporting to clarify the configuration and boundaries of the mixing zone and associated concentrations at the edge of the nearfield mixing zone.

Further detailed modelling has been undertaken to consider the impacts of the cool water discharge on the marine environment with reference to the above scenarios.

4.2.2 Marine growth protection system and heating water discharge

Proposed chlorine discharge

Following receipt of the submissions, further liaison has been undertaken with the FSRU supplier to investigate opportunities to reduce the concentration, rate and impacts of discharge. The potential options considered and adopted are described in Table 4.2.

Table 4.2 Sodium hypochlorite discharge - potential mitigation measures

Option	Description	Required
1	**Discharge to an alternative location** Following consideration of alternative discharge locations such as the stern of the vessel and ocean discharge via the coal loader seawall, it is apparent that the proposed discharge outlets at the bow of the FSRU (southern end of the berth) provide the greatest dilution capacity, minimise the likelihood of shoreline hugging plumes and confine potential impacts to the marine environment of the lowest value. In particular, the tidal velocities through the constriction between the Inner and Outer Harbour known as “the cut” are greater than those at the stern of the FSRU and those encountered at the relatively sheltered ocean shoreline immediately east of the site where the coal loader seawall meets the northern breakwater. Furthermore the marine environments beyond the Outer Harbour have been impacted to a lesser extent by historical activities and are considered of higher value. Consideration was also given to the beneficial reuse of cool water on or off-site. No potential uses for cool seawater were identified on the northern side of the Inner Harbour. Cool seawater was considered to be of value to the existing BlueScope operations on the southern shoreline however the engineering costs associated with transporting the relatively low volume of moderately cooler water through operational port areas rendered this option unfeasible.	No
2	**Alternative MGPS** Investigation into the use of ultrasound transducers as an alternative system to prevent marine growth has been undertaken. Such systems aim to prevent marine growth through the use of ultrasound frequencies to destroy unicellular organisms and prevent the growth of biofilm (an early stage of marine growth). Whilst such systems can be designed to suit the volumes of water and the size of the areas requiring treatment on the FSRU, the cost of an alternate system on this scale renders it unfeasible.	No
3	**Reduction in sodium hypochlorite discharge concentration** The MGPS must achieve a minimum concentration of sodium hypochlorite within the FRSU in order to remain effective. Liaison with the FSRU supplier has confirmed that significant reductions in discharge concentrations are achievable through refinement of the rate of sodium hypochlorite creation to suit changing local conditions in the seawater. Through daily monitoring during the early phases (commissioning) of the project, it would be possible to achieve a residual sodium hypochlorite discharge concentration of 0.02 ppm or 20 ug/l. In order to allow for variability in the input seawater, it is proposed that 20 ug/l be nominated as an 80%ile discharge limit. During normal operations, weekly monitoring would suffice.	Yes
4	**Pre-discharge dilution** The NSW EPA’s mixing zone principles stipulate that mixing zones should not receive concentrations of pollutants that cause acute toxic impacts.	No

Option	Description	Required
	Were concentrations of sodium hypochlorite to remain above levels at which acute toxic impacts could be expected, additional seawater could be pumped into the system to reduce the concentration of the stream at the point of discharge. Given the operational costs and additional greenhouse gas emissions associated with pumping large volumes of seawater, strategies which allow the use of less sodium hypochlorite are considered preferable to those which rely on dilution.	
5	**De-chlorination chemical by use of sodium sulphite** De-chlorination is typically undertaken using sulfur dioxide or sulphite salts such as sodium sulfite, sodium bisulfite, or sodium metabisulfite. This process allows the removal of residual chlorine from disinfected water prior to its release into the marine environment. Due to large amount of sea water and 24/7 operations of the FSRU, de-chlorination would require the manufacture, transport and use of large quantities of sodium sulphite each day. Given the associated financial and environmental costs, this approach is considered less favourable than strategies which allow the use of less sodium hypochlorite.	No
6	**Use of diffusers** Consideration was given to the use of diffusers to improve plume mixing behaviour within the nearfield mixing zone. Given that the nearfield CORMIX model predicts a simple semicircular shape generally in accordance with the NSW EPA's mixing zone principles, the use of diffusers would not significantly improve overall outcomes.	No

Assessment of chlorine discharge

A revised assessment of the sodium hypochlorite discharge was undertaken using the nearfield and far field models described in the EIS to characterise the configuration and boundaries of the near-field mixing zone and to more clearly define the resulting dilution factors and concentrations at the edge of the near-field mixing zone.

The reporting of the nearfield CORMIX model results was adjusted to comply with the EPA's definition of the nearfield as the initial mixing zone where the characteristics of momentum flux, buoyancy flux, and outfall geometry influence the plume trajectory and mixing. These results are summarised below and described in full within Appendix B.

Table 4.3 summarises the plume centreline concentration, average plume concentration, and concentration at the edge of the nearfield mixing zone. The modelling predicts that the near field mixing zone is up to 42.5m (this is the sum of the straight line distance from the centre of the plume when it hits the bed and the plume ½ width as defined by CORMIX).

Assuming a reduced discharge concentration of 0.02ppm or 20 ug/l (refer Option 3, Table 4.2), the sodium hypochlorite concentration at the edge of the plume (at the end of the nearfield mixing zone) is predicted to be up to 1.9 ug/l. The average concentration within the plume is predicted to be 3.0 ug/l, or less.

Consideration has been given to the range of guideline values described in Section 4.2.1 (IFC value of 200ug/l, US EPA value of 7.5-13 ug/l and ANZECC Freshwater value of 3ug/l). The

nearfield modelling indicates that the sodium hypochlorite concentration at the edge of the near field zone is less than 2 ug/l, and therefore is predicted to comply with the most stringent of the available guidelines (ANZECC guidelines for fresh water, a value of 3ug/l).

Table 4.3 Chlorine discharge concentrations

Season	Water Level	Current Speed (m/s)	Centreline Distance to end of nearfield (m)	Plume 1/e vertical thickness (m)	Plume horizontal half width (m)	Mixing Zone Radius (m)	Centre Chlorine Conc [ug/l]	Average Chlorine Conc [ug/l]	Chlorine conc at edge of nearfield mixing zone [ug/l]
Summer	LAT	0	32.84	4.16	4.16	37.0	5.0	2.9	1.8
Summer	LAT	0.05	31.94	4.22	4.22	36.16	4.9	2.9	1.8
Summer	LAT	0.1	30.33	4.43	4.43	34.76	4.3	2.6	1.6
Summer	MSL	0	34.57	4.42	4.42	38.99	4.5	2.7	1.7
Summer	MSL	0.05	33.75	4.49	4.49	38.24	4.3	2.6	1.6
Summer	MSL	0.1	31.95	4.74	4.74	36.69	3.9	2.3	1.4
Summer	MHWS	0	35.85	4.58	4.58	40.43	4.3	2.5	1.6
Summer	MHWS	0.05	34.81	4.67	4.67	39.48	4.1	2.4	1.5
Summer	MHWS	0.1	32.98	4.95	4.95	37.93	3.6	2.1	1.3
Winter	LAT	0	31.23	3.98	3.98	35.21	5.1	3.0	1.9
Winter	LAT	0.05	30.38	4.03	4.03	34.41	5.0	2.9	1.8
Winter	LAT	0.1	29.09	4.21	4.21	33.3	4.4	2.6	1.6
Winter	MSL	0	33.01	4.22	4.22	37.23	4.5	2.7	1.7
Winter	MSL	0.05	32.05	4.29	4.29	36.34	4.4	2.6	1.6
Winter	MSL	0.1	30.62	4.5	4.5	35.12	4.0	2.4	1.5
Winter	MHWS	0	34.02	4.37	4.37	38.39	4.3	2.5	1.6
Winter	MHWS	0.05	33.13	4.45	4.45	37.58	4.2	2.5	1.5
Winter	MHWS	0.1	31.52	4.69	4.69	36.21	3.7	2.2	1.4
Spring	LAT	0	34.38	4.36	4.36	38.74	4.9	2.9	1.8
Spring	LAT	0.05	33.48	4.43	4.43	37.91	4.8	2.8	1.8
Spring	LAT	0.1	31.67	4.66	4.66	36.33	4.3	2.5	1.6
Spring	MSL	0	36.36	4.63	4.63	40.99	4.4	2.6	1.6
Spring	MSL	0.05	35.43	4.72	4.72	40.15	4.3	2.5	1.6
Spring	MSL	0.1	33.46	5	5	38.46	3.8	2.2	1.4
Spring	MHWS	0	37.7	4.8	4.8	42.5	4.2	2.5	1.5
Spring	MHWS	0.05	36.59	4.91	4.91	41.5	4.0	2.4	1.5
Spring	MHWS	0.1	34.73	5.2	5.2	39.93	3.5	2.1	1.3
Autumn	LAT	0	33.42	4.23	4.23	37.65	4.9	2.9	1.8
Autumn	LAT	0.05	32.51	4.3	4.3	36.81	4.8	2.8	1.8
Autumn	LAT	0.1	30.82	4.51	4.51	35.33	4.3	2.6	1.6
Autumn	MSL	0	35.3	4.49	4.49	39.79	4.5	2.7	1.7
Autumn	MSL	0.05	34.27	4.57	4.57	38.84	4.3	2.6	1.6
Autumn	MSL	0.1	32.55	4.83	4.83	37.38	3.8	2.3	1.4
Autumn	MHWS	0	36.51	4.66	4.66	41.17	4.3	2.5	1.6
Autumn	MHWS	0.05	35.46	4.76	4.76	40.22	4.1	2.4	1.5
Autumn	MHWS	0.1	33.6	5.05	5.05	38.65	3.6	2.1	1.3

Far field modelling predicts that the maximum concentration of sodium hypochlorite within the port would be approximately 1.5 ug/l through the upper water column. The maximum concentration is predicted to be slightly larger near the seabed, where concentrations outside of the near field mixing zone are predicted to reach up to 3 ug/l. There is a small area, where the concentration at the seabed is predicted to exceed 3 ug/l, however this is at the point of discharge, and would be considered the near field mixing zone.

It is important to note that sodium hypochlorite has been modelled as a conservative tracer. That is, the model assumes the pollutant does not degrade, and concentrations have been assessed based on mixing and dilution. Consequently, the far-field modelling over estimates the concentration of residual sodium hypochlorite that will be returned to the discharge area over consecutive tidal cycles. In practice, sodium chlorite is very reactive in seawater, reacting with bromine and other elements to form a number of by-products including chloride ions and hypobromous acid (HOBr). The rate at which sodium hypochlorite forms bromine and chlorine residuals, as well as the resulting equilibrium between these different forms is governed by pH, temperature and ionic strength (ANZECC 2000).

Predicted concentrations of sodium hypochlorite should therefore be considered conservative estimates, which will be lower in practice.

Whilst the reactive nature of sodium hypochlorite in seawater leads to reduced concentrations in practice, consideration must also be given to the potential impacts associated with its by-products.

It is for this reason that the ANZECC guidelines stipulate concentrations of total residual chlorine (TRC), which considers the effects of not only sodium hypochlorite but also its by-products in the form of free chlorine (Cl2, HOCl and hypochlorite ion OCl- in equilibrium) and

combined chlorine (N-chlorinated compounds such as chloramines). The aquatic toxicology testing for marine waters where iodide and bromide are present, measured and assessed total residual oxidants as µg Cl per L.

The ANZECC guidelines note that temperature has a significant influence on the toxicity of chlorine, whereby increases in temperature accelerate the breakdown of sodium hypochlorite and its by-products. Cairns et al. (1978) found that temperatures around 25°C resulted in complete loss of measurable residual chlorine from test vessels in 24 hours. Conversely, the rate of reduction is reduced in colder waters. Modelling in Port Kembla, across all four seasons, show concentrations at the edge of the nearfield mixing zone are predicted to meet the relevant guideline limits, even when assessed conservatively as a tracer which does not degrade.

Assessment of temperature

A revised assessment of the cool water discharge was undertaken using the nearfield and far field models described in the EIS to characterise the configuration and boundaries of the near-field mixing zone and to more clearly define the resulting dilution factors and temperatures at the edge of the near-field mixing zone.

Additional modelling scenarios were assessed to quantify the effects of changes in ambient water temperatures within the Inner Harbour over all four seasons and to assess the resulting far field mixing behaviour with and without the existing warm water discharges associated with other nearby industrial discharges to the Inner Harbour.

The reporting of the nearfield CORMIX model results was adjusted to comply with the EPA's definition of the nearfield as the initial mixing zone where the characteristics of momentum flux, buoyancy flux, and outfall geometry influence the plume trajectory and mixing. Results were also reported against 20%ile temperature limits over four seasons as stipulated in the ANZECC guideline limits for cold water discharge.

The results of the additional modelling assessment are summarised below and described in full within Appendix C.

Table 4.4 summarises plume centreline temperature decrease, average temperature decrease, and temperature decrease at the edge of the nearfield mixing zone

Table 4.4 Plume centreline temperatures

Season	Water Level	Current Speed (m/s)	Centreline Distance to end of nearfield (m)	Plume 1/e vertical thickness (m)	Plume horizontal half width (m)	Mixing Zone Radius (m)	Centreline temp Decrease [deg C]	Average Temp Decrease [deg C]	Temp decrease at edge of nearfield mixing zone [deg C]
Summer	LAT	0	32.84	4.16	4.16	37.0	1.75	1.0	0.6
Summer	LAT	0.05	31.94	4.22	4.22	36.16	1.7	1.0	0.6
Summer	LAT	0.1	30.33	4.43	4.43	34.76	1.53	0.9	0.6
Summer	MSL	0	34.57	4.42	4.42	38.99	1.59	0.9	0.6
Summer	MSL	0.05	33.75	4.49	4.49	38.24	1.53	0.9	0.6
Summer	MSL	0.1	31.95	4.74	4.74	36.69	1.36	0.8	0.5
Summer	MHWS	0	35.85	4.58	4.58	40.43	1.48	0.9	0.5
Summer	MHWS	0.05	34.81	4.67	4.67	39.48	1.43	0.8	0.5
Summer	MHWS	0.1	32.98	4.95	4.95	37.93	1.26	0.7	0.5
Winter	LAT	0	31.23	3.98	3.98	35.21	1.78	1.1	0.7
Winter	LAT	0.05	30.38	4.03	4.03	34.41	1.73	1.0	0.6
Winter	LAT	0.1	29.09	4.21	4.21	33.3	1.57	0.9	0.6
Winter	MSL	0	33.01	4.22	4.22	37.23	1.6	0.9	0.6
Winter	MSL	0.05	32.05	4.29	4.29	36.34	1.55	0.9	0.6
Winter	MSL	0.1	30.62	4.5	4.5	35.12	1.4	0.8	0.5
Winter	MHWS	0	34.02	4.37	4.37	38.39	1.5	0.9	0.6
Winter	MHWS	0.05	33.13	4.45	4.45	37.58	1.45	0.9	0.5
Winter	MHWS	0.1	31.52	4.69	4.69	36.21	1.3	0.8	0.5
Spring	LAT	0	34.38	4.36	4.36	38.74	1.72	1.0	0.6
Spring	LAT	0.05	33.48	4.43	4.43	37.91	1.66	1.0	0.6
Spring	LAT	0.1	31.67	4.66	4.66	36.33	1.48	0.9	0.5
Spring	MSL	0	36.36	4.63	4.63	40.99	1.56	0.9	0.6
Spring	MSL	0.05	35.43	4.72	4.72	40.15	1.5	0.9	0.6
Spring	MSL	0.1	33.46	5	5	38.46	1.31	0.8	0.5
Spring	MHWS	0	37.7	4.8	4.8	42.5	1.46	0.9	0.5
Spring	MHWS	0.05	36.59	4.91	4.91	41.5	1.4	0.8	0.5
Spring	MHWS	0.1	34.73	5.2	5.2	39.93	1.22	0.7	0.5
Autumn	LAT	0	33.42	4.23	4.23	37.65	1.74	1.0	0.6
Autumn	LAT	0.05	32.51	4.3	4.3	36.81	1.68	1.0	0.6
Autumn	LAT	0.1	30.82	4.51	4.51	35.33	1.51	0.9	0.6
Autumn	MSL	0	35.3	4.49	4.49	39.79	1.57	0.9	0.6
Autumn	MSL	0.05	34.27	4.57	4.57	38.84	1.52	0.9	0.6
Autumn	MSL	0.1	32.55	4.83	4.83	37.38	1.34	0.8	0.5
Autumn	MHWS	0	36.51	4.66	4.66	41.17	1.48	0.9	0.5
Autumn	MHWS	0.05	35.46	4.76	4.76	40.22	1.42	0.8	0.5
Autumn	MHWS	0.1	33.6	5.05	5.05	38.65	1.24	0.7	0.5

Preliminary modelling results indicate that the median temperatures of the thermal plume are generally above the seasonal 20%ile ambient temperatures and therefore generally comply with the ANZECC requirements. As summarised in Table 4.5 below, cases not complying with the ANZECC requirements are median temperatures at the harbour floor, during Summer and Autumn, when the Bluescope discharge is excluded. Plots showing the extent of the non-complying cases are presented in Figure 4-1 and Figure 4-2 comparing the 50th percentile temperature from the FSRU only (i.e. no BlueScope discharge) simulations to the 20th Percentile ambient conditions.

Table 4.5 Thermal plume compliance summary

Case	Season	Future Discharges	Ambient Discharges	Outcome
1	Summer	FSRU	none	Bed Level: Approx 50m x 100m area near the seabed exceeds ANZECC requirements for Temperature. Mid depth: Complies Surface: Complies
2	Summer	FSRU and BlueScope	none	Bed Level: Complies Mid depth: Complies Surface: Complies
3	Summer	FSRU and BlueScope	BlueScope	Bed Level: Complies Mid depth: Complies Surface: Complies
4	Autumn	FSRU	none	Bed Level: Approx 50m x 100m area near the seabed exceeds ANZECC requirements for Temperature. Mid depth: Complies Surface: Complies
5	Autumn	FSRU and BlueScope	none	Bed Level: Complies Mid depth: Complies Surface: Complies
6	Autumn	FSRU and BlueScope	BlueScope	Bed Level: Complies Mid depth: Complies Surface: Complies
7	Winter	FSRU	none	Bed Level: Complies Mid depth: Complies Surface: Complies
8	Winter	FSRU and BlueScope	none	Bed Level: Complies Mid depth: Complies Surface: Complies
9	Winter	FSRU and BlueScope	BlueScope	Bed Level: Complies Mid depth: Complies Surface: Complies
10	Spring	FSRU	none	Bed Level: Complies Mid depth: Complies Surface: Complies
11	Spring	FSRU and BlueScope	none	Bed Level: Complies Mid depth: Complies Surface: Complies
12	Spring	FSRU and BlueScope	BlueScope	Bed Level: Complies Mid depth: Complies Surface: Complies

Plots showing the extent of the non-complying cases are presented in Figure 4-1 and Figure 4-2 comparing the 50th percentile temperature from the FSRU only (i.e. no BlueScope discharge) simulations to the 20th Percentile ambient conditions. Areas shown in blue are colder than the 20%ile ambient temperatures and are therefore colder than the allowable limits specified in the ANZECC guidelines. From examination of the plots it is apparent that the area predicted to be colder than the allowable limits specified in the ANZECC guidelines is restricted to an area measuring approximately 50m by 100m immediately adjacent to the FSRU. Given that the nearfield mixing zone is predicted to have a radius of up to 42.5m (diameter of approximately 85m area), the predicted zone of non-compliance is considered to be approximately within the nearfield zone given that the far field model resolution is in the order of 30m. For completeness, a plot representing the complying cases for all complying scenarios is presented in Figure 4-3.

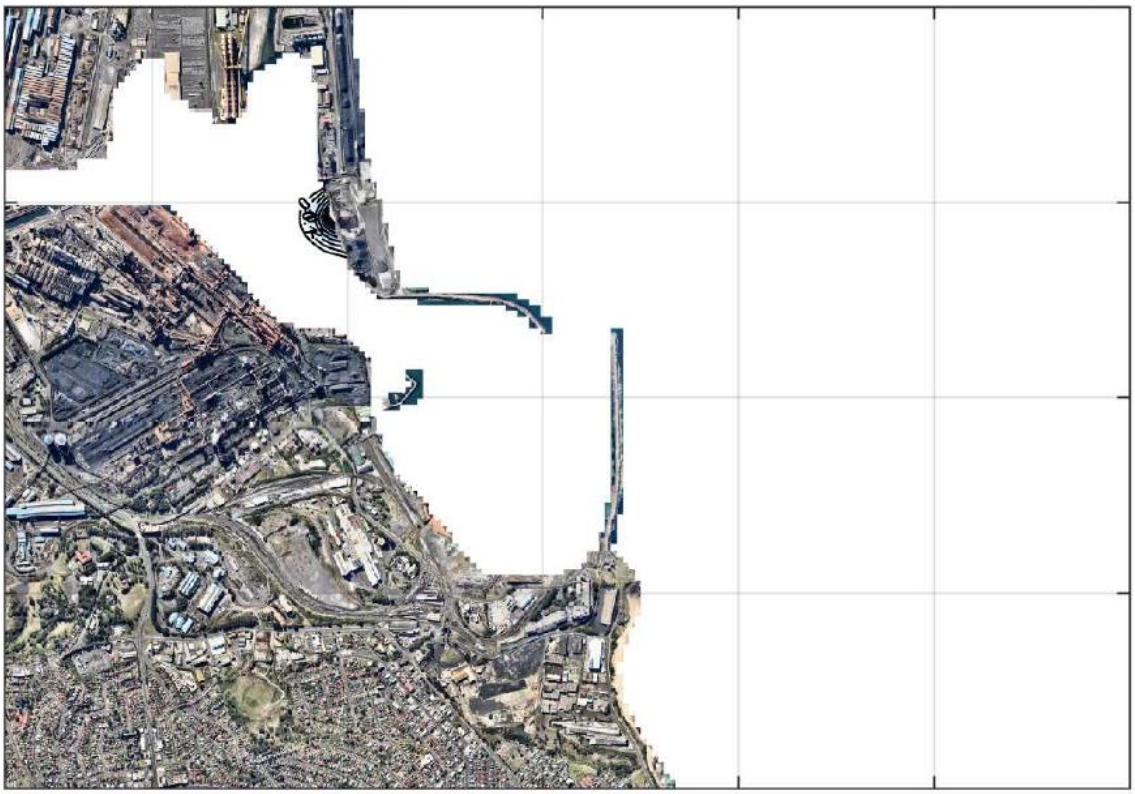

Figure 4-1 Near bed temperature impact – Summer (no BlueScope discharge)

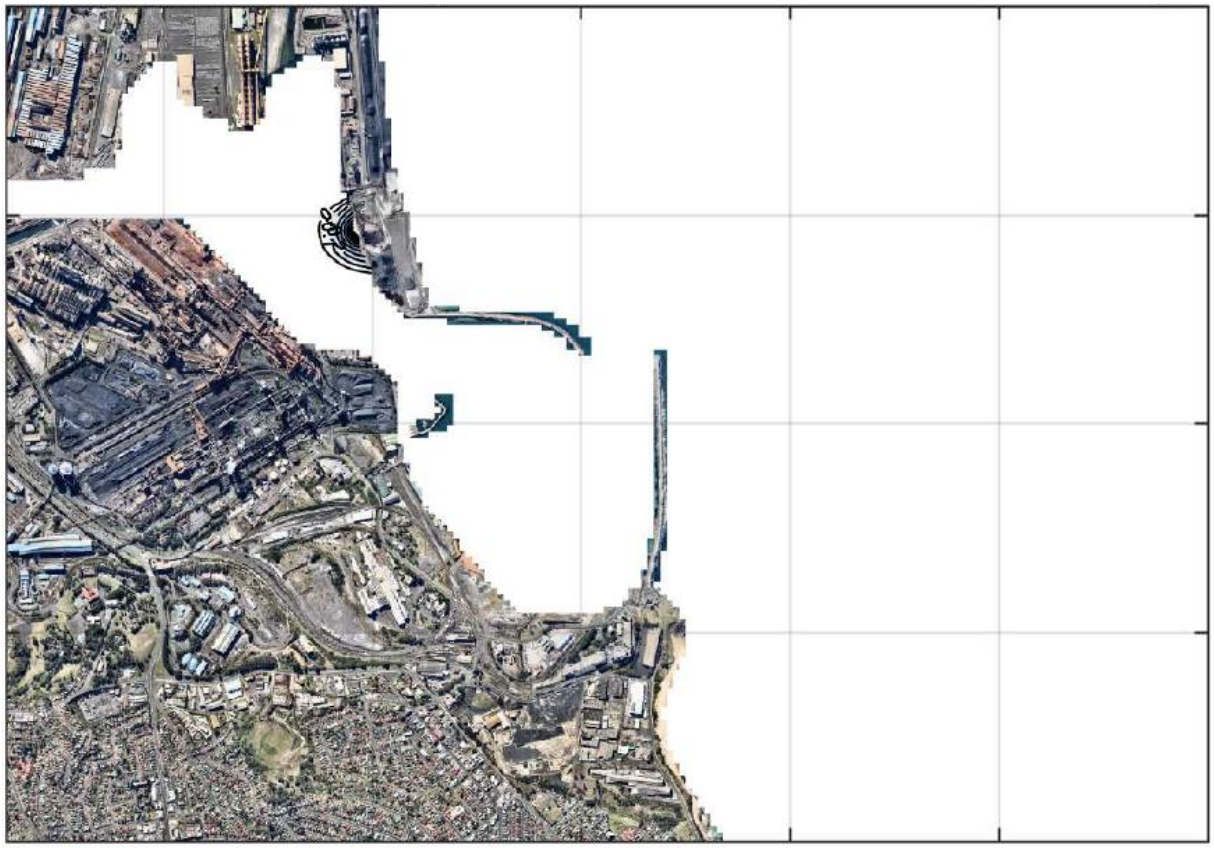

Figure 4-2 Near bed temperature impact – Autumn (no BlueScope discharge)

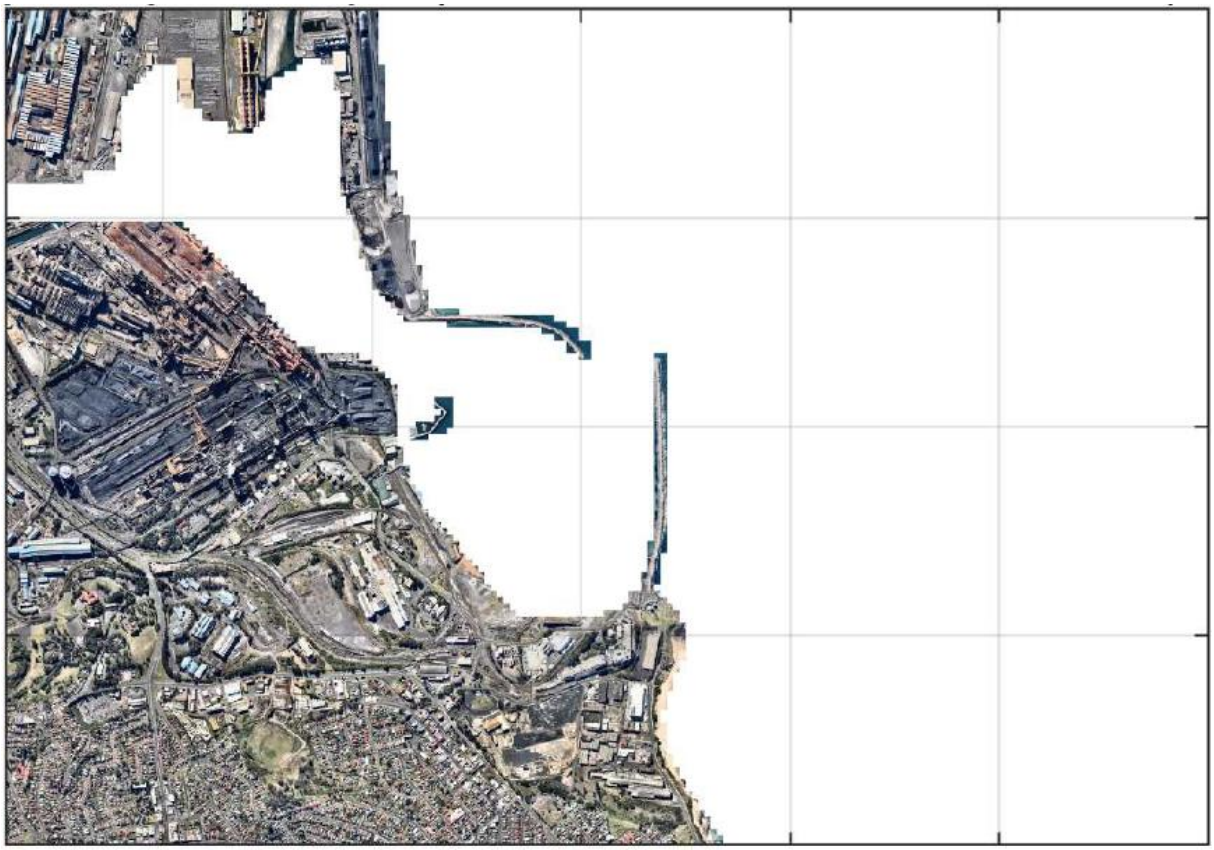

Figure 4-3 Complying temperature impact plot (remaining scenarios)

In the event that BlueScope ceases discharging warm water to the Inner Harbour, adverse marine ecology impacts are expected to be restricted to marine communities over an area of approximately 50m by 100m immediately adjacent to the FSRU. This is likely to include the

biofouling communities, the benthic community immediately under and adjacent to the FSRU and benthic/pelagic fish passing through the plume area. Potential impacts to these communities will vary depending on species, life history and stage, and season. Potential impacts may include avoidance of the area by mobile species, and the inhibition of growth, spawning or larval settlement of sessile organisms. It is noted, that the mixing zone will primarily be restricted to the berth pocket, which will be excavated and dredged during construction of the project which will result in removal of all existing biofouling and benthic communities from the site prior to the commencement of operations.

During the development of the EIS, consideration was given to a number of potential management measures to be implemented in the event that model results predicted a significant impact to marine ecology beyond the nearfield mixing zone. The potential options considered and adopted are described in Table 4.6.

Table 4.6 Cold water discharge - potential mitigation measures

Option	Description	Required
1	**Discharge to an alternative location** Following consideration of alternative discharge locations such as the stern of the vessel and ocean discharge via the coal loader seawall, it is apparent that the proposed discharge outlets at the bow of the FSRU (southern end of the berth) provide the greatest dilution capacity, minimise the likelihood of shoreline hugging plumes and confine potential impacts to the marine environment of the lowest value. In particular, the tidal velocities through the constriction between the Inner and Outer Harbour known as “the cut” are greater than those at the stern of the FSRU and those encountered at the relatively sheltered ocean shoreline immediately east of the site where the coal loader seawall meets the northern breakwater. Furthermore the marine environments beyond the Outer Harbour have been impacted to a lesser extent by historical activities and are considered of higher value. Consideration was also given to the beneficial reuse of cool water on or off-site. No potential uses for cool seawater were identified on the northern side of the Inner Harbour. Cool seawater was considered to be of value to the existing BlueScope operations on the southern shoreline however the engineering costs associated with transporting the relatively low volume of moderately cooler water through operational port areas rendered this option unfeasible.	No
2	**Pre-discharge dilution** The submissions note that the water quality criteria stipulated in the ANZECC guidelines should be achieved at the edge of the near-field mixing zone. In the case of cold water discharge, the median temperature should not be permitted to fall below the seasonal 20%ile temperature value. Were temperatures to remain below the seasonal 20%ile temperature values, additional seawater could be pumped into the system to raise the temperature of the stream at the point of discharge. Given the relatively small extent and seasonality of intermittent impacts, the operational costs and additional greenhouse gas emissions associated with pumping large volumes of seawater are not considered warranted.	No

Option	Description	Required
3	**Use of diffusers** Consideration was given to the use of diffusers to improve plume mixing behaviour within the nearfield mixing zone. Given that the nearfield CORMIX model predicts a simple semicircular shape generally in accordance with the NSW EPA's mixing zone principles, the use of diffusers would not significantly improve overall outcomes	No
4	**Visual inspection and relocation during construction** Management Measure ME1 as proposed in the EIS: Visual inspection and relocation of protected mobile fauna (e.g. Syngnathids).	Yes
5	**Water temperature monitoring program** Management Measure ME3 as proposed in the EIS: Implementation of a water temperature monitoring program to document natural variations in water temperature and the extent of temperature differences and dispersion pathways of the cold water discharge plume.	Yes

Given the relatively small extent and seasonality of intermittent impacts, management measures 4 and 5 in Table 4.6 (ME1 and ME3 as proposed in the EIS) are considered adequate in light of the additional modelling scenarios.

4.2.3 Potential impacts of excavation, dredging and disposal

Level of Detail

A number of submissions questioned the level of detail provided on excavation, dredging and disposal strategy and the level of assessment for these activities.

The EIS included a full description of the project including a strategy for the management, and disposal of excavated and dredged material in the short, medium and long term in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

The project description in the EIS maintained flexibility in the volume of material to be excavated and transported by haul truck versus the volume of material to be dredged by backhoe dredger and transported by barge to allow for variation in the preference and capacity of the selected construction contractor.

The assessment adopted an environmental envelope approach by considering the worst-case impact assessment scenario for any activity subject to ongoing design or construction methodology development. In this way the full extent of potential impacts for the project would be assessed within the EIS and the realised impacts would fall within the extent of the worst-case impact parameters considered as part of the assessment.

The EIS stated that about 370,000 cubic metres could be excavated by a typical long reach excavator and transported by truck and about 350,000 cubic metres of material could be dredged by backhoe dredger and transported by barge. The EIS also stated that actual volumes may comprise any combination of the above methodologies totalling about 720,000 cubic metres. Assessment of potential impacts was based on the maximum potential volume of 720,000 cubic metres for each methodology for the purpose of worst case impact assessment.

A submission questioned the extent of impacts associated with road haulage of spoil to the disposal area and the anticipated 112 truck movements per day to the Outer Harbour disposal

area. The EIS included a detailed traffic impact assessment including an analysis of the predicted truck movements on the local road network.

The traffic assessment found that even when adopting the maximum vehicle movements for peak construction activity, all roads would continue to operate well within their operating capacity, including morning and evening peak periods. The worst-case construction traffic movements were also considered to comply with road traffic noise criteria and have negligible impact upon surrounding communities.

It is also noted that the maximum vehicle haulage for spoil transport would equate to a peak traffic generation of 11 vehicles per hour, which falls well within the maximum construction trucks per hour of 27 approved as part of the Outer Harbour project. NSW Ports have noted that no other major reclamation activities will be undertaken concurrently with the dredging and reclamation activities associated with this project and the maximum vehicle numbers are expected to fall within historical figures.

In addition, based upon a review of all contractor methodologies it is envisaged that transport by barge will be achieved for between 50 and 90% of excavated material equating to 360,000 cubic metres to 650,000 cubic metres. The remaining 10% - 50% of material may be transported by road haulage. This represents a significant decrease in the number of truck movements as described in the EIS with truck haulage reduced to around 17,000 to 30,000 trucks on the local road network and daily vehicle movements will continue to fall well within the capacity of the road network

An Outline DEMP has also been prepared to provide the overall framework the successful contractor will be required to work within and adhere to during all dredging / excavation and disposal operations and is included in Appendix A of this Submissions Report. Further details of potential impacts associated with the dredging and sediment placement activities are described below.

Integration with Outer Harbour development

The Port Kembla Outer Harbour Development received concurrent concept and project approval under Part 3A of the EP&A Act in March 2011. The development of the Outer Harbour was proposed to occur in stages over a relatively long period of time with the ultimate footprint indicated by the yellow outline on Figure 4-4.

Figure 4-4 Disposal footprint in relation to Outer Harbour project

Concept approval was granted for the overall development and project approval was specifically granted to authorise the Stage 1 development. The majority of dredging and land reclamation activities were approved to be undertaken as part of the Stage 1 development and included a number of management procedures developed as part of a dredging environmental management plan.

Dredged sediments and excavated material from the project's modifications to Berth 101 are proposed to be disposed within a 17 hectare disposal area within the Outer Harbour as shown within the red footprint.

The disposal area has been developed in close consultation with NSW Ports to accommodate the latest development plans for redevelopment of the Outer Harbour. The disposal footprint falls predominantly within the approved concept plan footprint for the Outer Harbour Development Project. The disposal area does extend beyond the approved footprint near the southern shoreline of the Outer Harbour as shown on Figure 4-4.

NSW Ports are in the early stages of a design process to consider alternate final layouts for the Outer Harbour port infrastructure. The disposal footprint for the project has been selected to provide the best alignment with the latest development plans for the Outer Harbour and to limit the potential for any reworking of material with ongoing development. The disposal area is intended to lay the platform for subsequent development.

All disposal activities form part of the current development application and have been assessed as part of this EIS. The disposal of sediments will be undertaken to be consistent with the existing management requirements for disposal in the Outer Harbour and will be authorised by approval of this CSSI application.

Alternative placement options

Consideration was given to a number of alternative disposal options for placement of dredged materials. In accordance with the National Assessment Guidelines for Dredging (NAGD, 2009) consideration was given to the following questions:

- Are there opportunities to beneficially use or recycle such materials (land creation, beach nourishment, offshore berms, fill, off-site recycling as construction material)?
- If they have no beneficial use, can they be treated to destroy, reduce or remove the hazardous constituents?
- If hazardous constituents are destroyed, reduced or removed, do the materials have beneficial uses?
- What are the comparative risks to the environment and human health of the alternatives to sea disposal?
- What are the costs and benefits of the alternatives to sea disposal?

In accordance with the decision process outlined in the NADG (2009), the preferred option for disposal of dredged material is beneficial reuse. This approach aims to achieve positive outcomes in order to offset any potential impacts associated with dredging and disposal.

In the case of the PKGT, the nature of the material requiring disposal (salt and moisture content, colour, relatively fine particle size and odour and contaminant levels) renders it unsuitable for beach nourishment, offshore berms or recycling as a construction material.

Despite these properties, liaison with NSW Ports has confirmed that the material is considered suitable for beneficial reuse within the approved Outer Harbour Development. As described above, the proposed development of the Outer Harbour will require large volumes of fill material to be imported via dredging and trucking movements to create the approved 17 hectare reclamation area. The use of locally sourced material from the proposed PKGT development will reduce the ultimate volume of material required to be imported to create the approved Outer Harbour Development.

Whilst alternative disposal options exist to destroy, reduce or remove hazardous constituents or undesirable characteristics, they are typically very slow and expensive, and in many cases are less reliable than simple encapsulation techniques. Consideration was given to the following:

- Destruction of contaminants through techniques such as Indirect Thermal Desorption (ITD)
- Reduction of contaminated material by physically separating the coarser, less contaminated material through the use of hydrocyclones which separate particles according to particle size and specific gravity.
- Removal of contaminants through bioremediation techniques for organic contaminants and leaching of inorganic contaminants using strong acid solutions.
- Immobilising contaminants through mixing with cement, aggregates and activated carbon also known as “mudcreting”.
- Liming, salt leaching and blending with coarse sediments to create top soil or construction materials.

Following review of the cost and timeframe implications of these options, beneficial reuse of dredged sediments within the approved Outer Harbour Development has been identified as the option offering the most favourable cost benefit ratio.

Mobilisation of sediments

The EIS noted that both the proposed berth site and Outer Harbour material disposal sites are highly disturbed areas with evidence of historical contamination.

More specifically, the findings of recent and historical investigations indicate the presence of contaminated sediments within the proposed dredging and disposal areas. Concentrations of contaminants of concern were largely consistent across the two areas, with the primary contaminants of concern including heavy metals, PAH and dioxins at concentrations above the nominated screening levels.

Laboratory analytical results for soil samples taken from the existing Berth 101 landside area indicated that contamination in the fill material within the area to be excavated at Berth 101 is relatively minor, and generally consistent. Further information regarding the levels of contaminants within the landside areas of Berth 101 and the suitability of this material for use in the Outer Harbour bunds is provided in Section 4.3.1.

The submissions request additional information on the proposed dredging, excavation and disposal works as well as the proposed water quality controls to be implemented during construction.

In response to the submissions, further detail has been provided below regarding the staging of the dredging and reclamation works, as well as the environmental controls to be implemented during each phase of the works.

The overall strategy for handling of each material type is presented below:

- Demolition materials, hardstand and fill material will be primarily used for bund and groyne construction (with a portion set aside for covering the proposed tie rods behind the berth face).
- Contaminated silts and harbour muds will be placed at depth within the emplacement area to be capped by clay
- Clay materials will be primarily placed in areas available below RL-3m
- Sands will be primarily placed in areas from RL-3 to +4m

Prior to dredging of contaminated sediments from Berth 101, the Contractor will first commence demolition of the existing wharf and excavation of the Berth 101 landside material (shown to contain relatively minor levels of contamination). This material will be removed using land based plant and equipment before being loaded onto barges for transport to the Outer Harbour. The material will be re-used by bottom dumping from the hopper barges to construct the Outer Harbour perimeter bunds, which will prevent the slumping of the contaminated sediments to be dredged within the upper portion of the existing Berth 101 area. Bunds will be formed using fill and compacted hardstand material, These bunds will be designed and constructed in accordance with the existing Containment Structures and Emplacement Report prepared in 2015 on behalf of NSW Ports for the Berth 103 Stage 2 Dredging Project. Where necessary the design will be customised during the detailed design phase to suit any different material types associated with materials present at Berth 101 or to take advantage of any innovative techniques that offer improved outcomes. Figure 4-5 and Figure 4-6 show indicative staging diagrams for construction of the proposed Inner Harbour berth and Outer Harbour bunds.

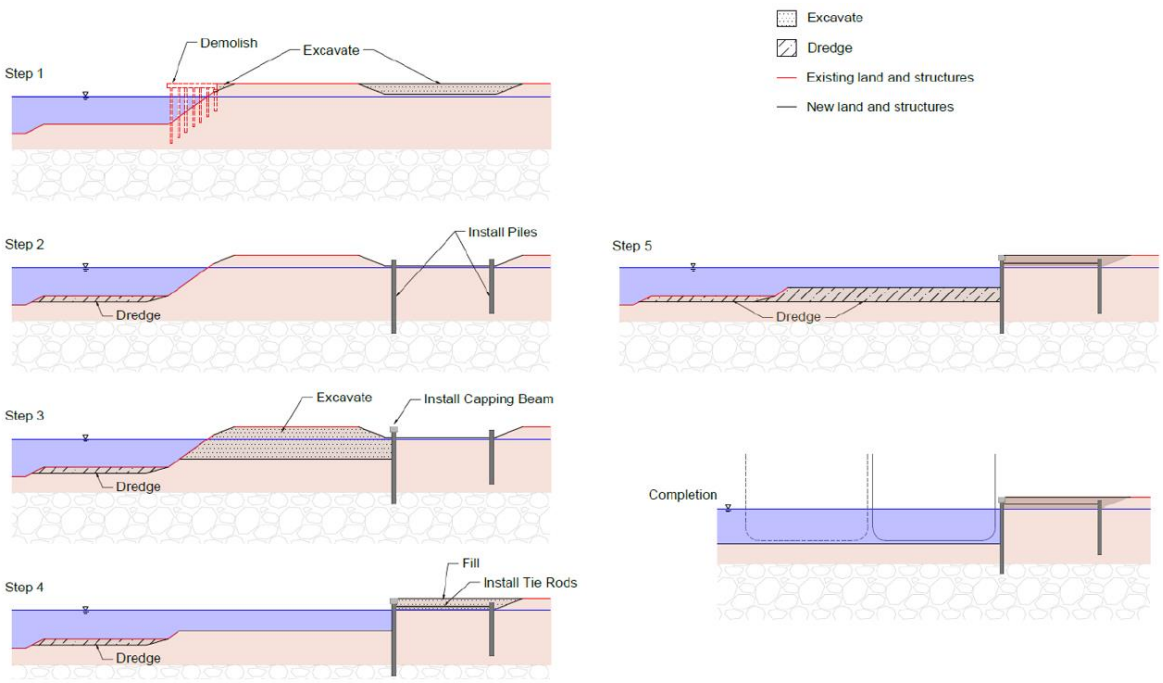

Figure 4-5 Staging of berth dredging and construction

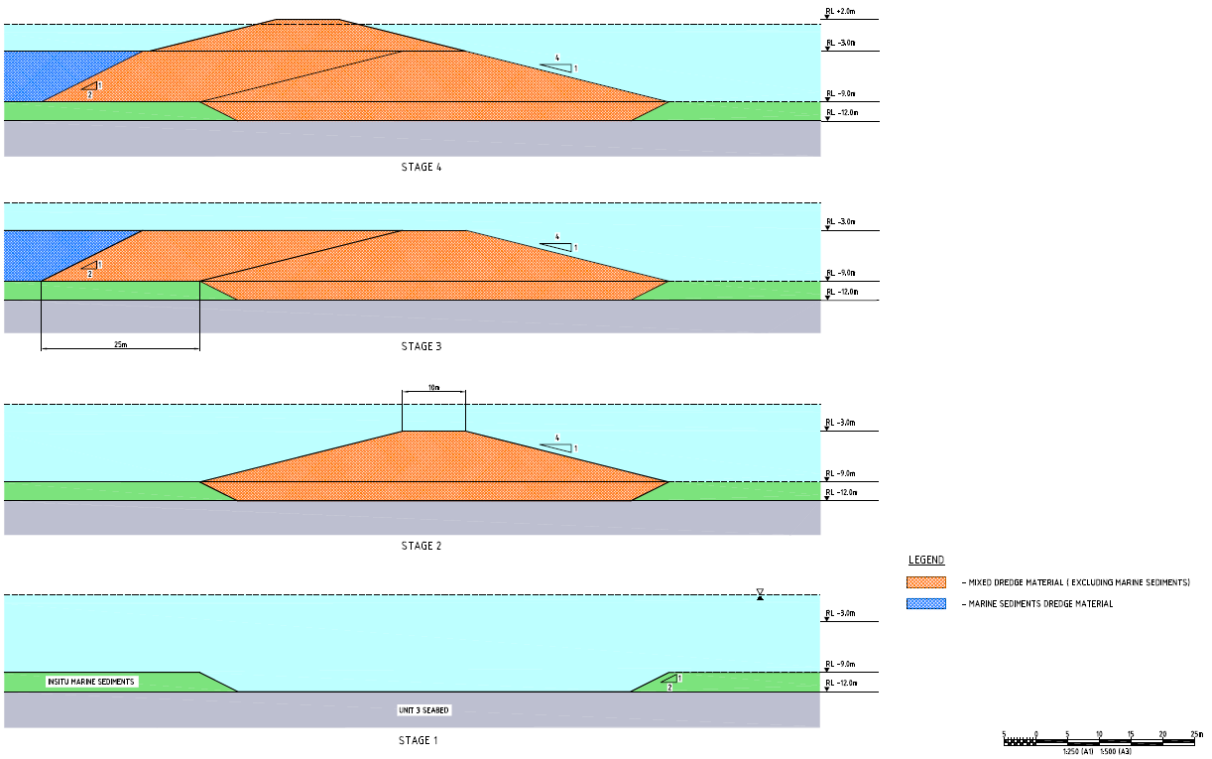

Figure 4-6 Staging of Outer Harbour bunds

Following installation of relevant environmental control provisions such as containment bunds, silt curtains, bubble curtains and associated water quality monitoring equipment, removal of actual and potential acid sulphate soils and the overlying contaminated silts, soft clays and harbour muds will commence from the Berth 101 seabed area. This material will be excavated via mechanical dredging using a backhoe dredge or similar, operating within an area bounded by a silt curtain. Removal via mechanical dredging preserves the dredge material at close to insitu density, thereby minimising the potential for suspended solids and migration of

contaminated sediments. No hydraulic dredging such as the use of a Cutter Suction Dredge is proposed during the works.

Contaminated sediments will be transported to the Outer Harbour via hopper barges for targeted placement at depth within the bunded emplacement area. These bunds will assist in preventing the slumping of sediments and migration of dense plumes of suspended sediment along the seabed. Migration of turbid plumes through the upper portion of the water column will be minimised by enclosing the active disposal area within silt curtains (and if required, bubble curtains to facilitate barge access).

Physical behaviour of sediment during disposal via bottom dumping is well understood, whereby the bulk of sediment falls rapidly and is largely intact when it reaches the seabed. A relatively small fraction of the material remains within the water column and is termed the “advection cloud”. Upon reaching the seabed, the falling material creates an “impact cloud” which is comprised of both falling material and disturbed sediments of the existing seabed.

The EIS noted that Hedge & Knott (2009) found that metal concentrations were lower in the oyster tissues located in the Outer Harbour than the Inner Harbour; however the risk to human health from contaminant exposure through ingesting fish from the Outer Harbour still remains as fish move freely between the Inner and Outer Harbours. Similarly, Knott & Johnston (2007) concluded that the 2007 dredging works within the Inner Harbour affected the recruitment of several sessile invertebrates, likely due to suspended solids and or mobilisation of contaminants. Subsequent studies by Knott & Johnston (2008), found signs of recovery within four months of completion of dredging and concluded that there appeared to be no specific or strong long-term effects of dredging in Port Kembla Harbour on the recruitment of sessile invertebrates.

On this basis, the EIS concluded that the release of contaminants is likely to be localised within the Port Kembla environment and medium-term in nature. The duration of exposure to toxicants are considered to be short in duration while long-term toxic effects are considered unlikely. Nevertheless the EIS stipulated a number of management measures to be documented within a Dredging Environmental Management Plan (DEMP).

A DEMP will be developed in consultation with the relevant government agencies and stakeholders. The plan will also stipulate management actions to be implemented in the event that the above measures are deemed insufficient for preventing migration of contaminated sediments. Such measures may include additional turbidity controls such as the use of environmental clam shells, additional silt curtains and relocation, modification or temporary cessation of dredging and reclamation activities.

An Outline Dredging Environmental Management Plan has been prepared and is provided in Appendix A.

The EIS proposed a number of management measures in relation to water quality and the containment of contaminated sediments. These management measures have been presented in Table 4.7, and where required, have been extended to meet the requirements stipulated in the submissions.

Table 4.7 Management measures for water resources

ID	Issue	Measure	Timing
W1	Water quality and hydrodynamics	• The location of the proposed terminal berth has been refined through navigation simulations to minimise hydrodynamic impacts	Design

ID	Issue	Measure	Timing
		and reduces dredging and disposal volumes as far as possible.	
W4	Water quality and hydrodynamics	• The footprint of the Outer Harbour placement area has been minimised by raising the proposed fill height to include emergent reclamation. This approach minimises the quantity of material to be bottom dumped and thereby reduces the potential for generation of turbid plumes and mobilisation of sediments.	Design
W5	Water Quality	• Preparation of a Construction Environmental Management Plan (CEMP) including specific Dredging Environmental Management Plan to provide a framework for the environmental management of construction activities to minimise the environmental risks to a level that is as low as practically possible for this project.	Construction
W6	Water Quality	• Design and implementation of a Water Quality Monitoring Program (WQMP) to ensure construction works do not cause exceedance of the marine water quality criterion of background plus 50 mg/L of suspended sediment, in accordance with recent Environmental Protection Licences (EPL) for similar activities within Port Kembla such as the Berth 103 Stage 2 Dredging & Spoil Disposal EPL20563). • Visual monitoring would be supplemented by continuous turbidity monitoring undertaken using a series of monitoring buoys to provide impact and background data (turbidity (NTU), pH, temperature). • In order to allow correlation of readily measured NTU to limits expected to be nominated in TSS, a review of the NTU-TSS correlation would be undertaken.	Construction

ID	Issue	Measure	Timing
		Previous EPLs for similar dredging activities within the Inner Harbour have commenced with a starting correlation of 2 NTU equal to 1 mg/l TSS. Through discussion with NSW Ports, we understand that this correlation has been refined during monitoring undertaken for previous dredging projects within the Inner Harbour. Given the sensitivity of such correlations to varying material types, it is proposed to adopt the previously developed correlations as a starting point, which will be reviewed and adjusted following commencement of the works. • Prior to commencement of the dredging works, buoys would be deployed for an agreed period of time to confirm background conditions in the vicinity of the monitoring points. • Consideration would be given to the long term water quality monitoring program implemented within Port Kembla. Consideration would be given to the integration of the proposed monitoring activities with the locations, parameters and reporting of the existing and previous monitoring programs. This is expected to be of benefit to both programs. • Data would be logged and transmitted to an onshore recording station where it would be processed to allow automated comparison of median turbidity levels to a series of green, amber and red trigger levels. When exceeded, an alarm would be triggered, automated email and SMS alerts sent and the agreed procedures implemented. Such procedures may include hand held monitoring to verify readings, reduction in the rate of dredging, relocation of dredging activities or	

ID	Issue	Measure	Timing
		cessation of turbidity generating works until turbidity readings reach acceptable levels. • Daily visual observations would be undertaken during dredging operations to monitor the potential release of oil or grease. • Collection of water samples and laboratory analysis for an agreed set of contaminants would be undertaken on a weekly basis during dredging operations and compared to trigger levels for relevant management actions. • The WQMP would include regular reporting, evaluation and revision where required to ensure the project objectives and approval conditions are achieved. • Information regarding the management actions to be implemented in response to nominated trigger levels is contained within the Outline Dredging Environmental Management Plan presented in Appendix A.	

ID	Issue	Measure	Timing
W7	Water Quality	• Silt curtains would be installed prior to commencement of the works in order to minimise the spread of any sediments entrained within the water column during dredging and disposal operations. • Silt curtains are available in a range of designs and would be provided by the successful Contractor. It is envisaged that the silt curtain would comprise a geocomposite material consisting of a non-woven geotextile sewn to a woven geotextile, which would provide the required filtering capacity and rigidity respectively. Vessel access would be via gated or overlapped curtains and / or through installation of a bubble curtain. The top of the curtain would be supported by a floating boom, whilst the lower portion of the curtain would be anchored or weighted with appropriate ballasting (e.g. bars or chains) to ensure that the full length of the curtain is maintained at all times. The curtain would be anchored or fixed to existing structures as necessary. • In the event water quality monitoring shows the proposed silt curtains do not provide adequate control over the migration of suspended solids, consideration would be given to replacement or duplication with a multiple barrier system.	Construction
W8	Water Quality	• Subaqueous sediment removal would be undertaken using a backhoe dredge. The use of mechanical dredging (rather than hydraulic dredging) ensures that sediments are removed, transported and placed as close to their insitu density as possible. Thereby minimising the suspension and mobilisation of sediments at	Construction

ID	Issue	Measure	Timing
		the dredge and disposal sites. Method statements would be prepared by the contractor to ensure that loading of dredged materials into the hopper barges is undertaken in a manner that reduces spillage and avoids overfilling barges. • In the event water quality monitoring shows that suspended solids are unable to be contained at acceptable levels in the vicinity of the dredge, consideration would be given to the use of an environmental clam shell bucket which would further reduce the amount of sediment put into suspension during dredging operations.	
W9	Water Quality	• A perimeter bund would be constructed within the Outer Harbour placement area to ensure long term stability of dredged materials and to minimise sediment migration during placement.	Construction
W10	Water Quality	• A site specific erosion and sediment control plan (ESCP) will be prepared as part of the CEMP to provide control of all land based excavation and stockpiling requirements. All erosion and sediment control measures shall be designed, implemented and maintained in accordance with 'Managing Urban Stormwater: Soil and Construction Volume 1' (Landcom 2004) ('the Blue Book).	Construction
W11	Water quality, chemical and fuel impacts on flora and fauna	• A site specific emergency spill plan will be developed, and will include spill management measures in accordance relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including	Construction

ID	Issue	Measure	Timing
		Roads and Maritime and EPA officers)	
W12	Water quality, chemical and fuel impacts on flora and fauna	• An emergency spill kit will be kept on site at all times. All staff will be made aware of the location of the spill kit and trained in its use.	Construction
W13	Water quality, chemical and fuel impacts on flora and fauna	• Machinery will be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	Construction
W14	Water Quality	• Prior to re-releasing the seawater back into the surrounding area, the operators of the vessel will aim to match the profile of the discharged water, as close as possible, to the pre-discharge profile and in line with agreed thresholds for residual concentrations of sodium hypochlorite. Changing the profile of the discharge water will be done by modifying the frequency of production and the concentration of sodium hypochlorite produced on-board from the intake of sea water.	Operations
W15	Water Quality	• A stormwater management system would be designed and constructed to control discharges from the import terminal site, including traps and filters where required. • Design would be undertaken in accordance with emergency spill plans and the objectives and development criteria outlined in the Port Kembla Development Code (NSW Ports 2016).	Operations

Long term fate of contaminants

The submission noted that the disposal area as part of the broader Port Kembla Outer Harbour Development could remain partially completed for an extended period of time. Furthermore, concerns were raised that over time, the area could be affected by tides or rainfall that would mobilise contaminants.

A key strategy in minimising the long-term mobilisation of contaminants is the placement of all actual and potential acid sulphate soils and contaminated silts, soft clays and harbour muds at

depth within a designated emplacement facility. These materials of concern would then be capped with a layer of clay followed by sandy materials up to the final fill height. This approach ensures that marine organisms are unable to access the contaminated materials, thereby preventing bioaccumulation of contaminants. Similarly, leaching of contaminants will not be a concern given the lack of hydraulic gradients within the lower portion of the Outer Harbour emplacement area.

Perimeter bunds and submerged disposal areas would be armoured as required to ensure long term stability until such time that the Outer Harbour development is completed and the sediments are covered with additional reclamation materials and hard stand areas suitable for operation of the ultimate container terminal.

Acid sulfate soils

Detailed sampling investigations for ASS were undertaken as part of the EIS. The subsurface conditions within the berth area indicated that there was about 4.0 to 5.0 m of fill above the standing water level and about 10 m to 12 m of reclaimed sands and silty sands with occasional sandy clays (Units 1A and 1B). Given that the majority of the material under Berth 101 was originally dredged from the nearby harbour it was probable that Unit 1A and Unit 1B formed preferentially as a result of settlement of fine and coarse fractions in the water column. This may also account for the high proportion of shell grit found in the samples and the corresponding high acid neutralising capacity (ANC). Below the reclaimed sands are varying layers of estuarine (Unit 2) and alluvial clays and sands and gravels overlying residual soils (Unit 3) and weathered rock (Unit 4). Table 4.8 indicates those stratigraphic units most at risk during excavation and dredging.

Table 4.8: Stratigraphic units at risk during excavation of Berth 101

Unit	Generalised Description	Corresponding Stratigraphic Unit	ASS Risk following Disturbance
Fill	Gravelly sand, sand, silt, black, dark brown, grey, some to trace, silts and cobbles. Foreign materials, coalwash, coal, slag, steel, wood, concrete.	Fill	None
Probable Reclaimed Sands	Sand, brown, pale brown, yellow, orange, fine to coarse grained, trace amounts of shell fragments, fine to coarse gravel, silt bands and layers, clayey sand layers, trace iron stained sand, fine black sand layers (probable heavy mineral sands), rounded to sub-rounded gravel, clay lenses and layers. Foreign materials: charcoal, wood and coal.	1A / 1B	Low High risk ASS are present within pockets and lenses throughout these units.
	Clayey sand, black, dark grey, grey, fine to coarse grained sand, medium to high plasticity clay, trace silt, shell fragments, gravel.	1B	
	Gravelly clay, black, dark grey, grey, low to medium plasticity, fine to coarse grained angular to sub-angular gravel, trace of fine to coarse grained sand.	1B	
Possible Alluvium / Tidal Sands	Sand, brown, pale brown, yellow, orange, fine to coarse grained, trace amounts of shell fragments, fine to coarse gravel, silt bands and layers, clayey sand layers, trace iron stained sand, fine black sand layers (probable heavy mineral sands), rounded to sub-rounded gravel, clay lenses and layers.	1A	Tidal sand units have low net acidity and high ANC indicating some self - neutralising capacity
Estuarine	Clay, brown, grey, high plasticity, trace of fine coarse grained, trace of gravel, rounded cobbles	2	High Net acidity above action criteria with little neutralising capacity
	Silty sand, dark brown, grey, brown, fine to coarse sand, trace of fine gravel, shell fragments	2	
Residual	Sandy clay with lesser amounts of Silty clay, Silty/Clayey sand and clay	3	None
Weathered Rock	Silstone with lesser amounts of sandy siltstone, silty snadstone and sandstone	4	

Construction of the berth pocket will mean that avoiding ASS will not be possible. The general principle for managing the high risk ASS will therefore consist of prevention of oxidation with burial below permanent water table, with neutralisation (liming) as a contingency for low risk ASS if required to be placed above the permanent water table.

The following management principles will apply:

- High risk ASS (Unit 2) sediments will be placed within an anoxic environment within 48 hours of excavation and/or dredging. This will be achieved by placing the saturated sediments on barge hoppers to be transported to the emplacement area where they will be immediately placed below water in a tidal environment (below -1.0m AHD).
- Low risk ASS (Units 1A and 1B) will be placed within an anoxic environment within 48 hours of excavation and/or dredging or may be temporarily stockpiled. Where stockpiling exceeds 2 days these sediments will require daily pH monitoring using the field peroxide test (as per ASSMAC 1998 Appendix 1). Where stockpiling exceeds two weeks these sediments may require neutralisation with lime depending on the results of monitoring. These sediments show high concentrations of shell grit which may provide sufficient self neutralising capacity making liming unnecessary. Further testing would be required to confirm or otherwise the capacity for self neutralisation in the low risk ASS.

Figure 4-7 below shows the intended burial sequencing of the sediments at the emplacement area.

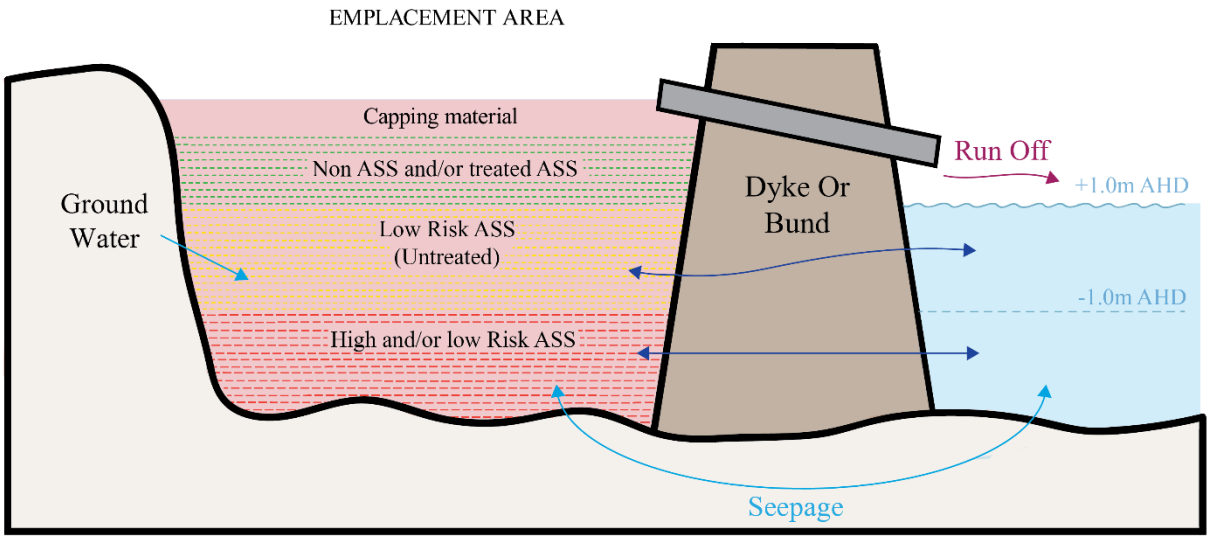

Figure 4-7: Schematic showing final emplacement of sediments at the emplacement area

Dredging impacts on the marine environment and Lake Illawarra

There will be no impacts on Lake Illawarra from the project. All dredging operations will be confined to the Inner and Outer Harbours of Port Kembla.

Dredging to maintain shipping channels, access to wharfs and/or to construct berths is a common occurrence in NSW ports, including capital dredging at Port Kembla. A recent example of this was the major upgrade of Berth 103 which involved the dredging of approximately 120 000 cubic metres of material to increase the existing berth depth and extend the berth capacity, as well as to support the construction of new bulk storage and handling facilities at the berth.

The Berth 103 works are analagous to the proposed works at Berth 101 in that the initial works occurred in the Inner Harbour with the final disposal site for the dredged materials being the Outer Harbour.

Like the 103 works, no marine blasting will form part of the works for the Port Kembla Gas Terminal. As such, a variety of management and mitigations will be utilised, consistent with best practice in the Port, to minimise impacts on the water quality and marine life of the Port during construction as described above.

4.2.4 Potential impacts on flooding

A submission noted that the pipeline will be installed below ground and will not impact upon flow paths or flood storage and that any changes to the proposal should not lead to adverse impacts upon flooding and drainage.

The proposed Outer Harbour disposal area includes emergent reclamation in the vicinity of the Darcy Road Drain. The Outer Harbour Project includes approval for the extension of the Darcy Road Drain through the emplacement area. The new disposal footprint will require a further extension of the Darcy Road Drain through the extended emplacement area along the southern shoreline of the Outer Harbour. The project will ensure appropriate design of channel structures and culverts through the emplacement areas to ensure conveyance of flood waters in a 100 year ARI event in accordance with the existing Outer Harbour consent requirements.

4.3 Soils and contamination

4.3.1 Characterisation of contamination at Berth 101

Risk to benthic marine organisms

Marine sediments within Port Kembla are generally characterised as soft silty clays dominating the surface sediments with an underlying layer of stiff clay.

Metals (arsenic, cadmium, chromium, copper, manganese, mercury, lead, vanadium and zinc), Polycyclic Aromatic hydrocarbons (PAH), dioxins and Tributyltin (TBT) have been recorded within these sediments across the Inner Harbour and Outer Harbour. Contamination is associated with the long industrial history (~100 years), which has significantly altered the former Tom Thumb Lagoon through dredging and land reclamation activities, together with ongoing industrial discharges.

The contamination investigations undertaken as part of the EIS have indicated the presence of contaminated sediments within the proposed dredging and disposal areas and were generally consistent with previous investigations. Concentrations of contaminants of concern were largely consistent across the dredging and disposal areas, with the primary contaminants of concern including heavy metals, PAH, dioxins and TBT.

The impact of contamination on benthic marine organisms was assessed in detail as part of the marine ecology investigations reported in Chapter 13 and Appendix G of the EIS. Decapod burrows are the only indication of benthic organisms present within the Berth 101 dredge footprint. Seagrasses and microalgae were not observed within the footprint. While the benthic community within the Outer Harbour consists only of sparely disturbed macroalgae.

Dredging activities have the potential to impact directly on biofouling and benthic communities through direct removal of the substrate from the environment, and indirectly through generation of turbid plumes that will lead to suspension of sediment, affecting filter feeding organisms (UNEP, 2013). The dredged areas within Berth 101 will eventually be covered with fine layers of silt from the vessel propeller wash, and will be colonised with similar benthic communities from surrounding areas within the Inner Harbour.

Development of the perimeter bund and disposal of the dredged sediment will directly impact on existing benthic communities within the Outer Harbour disposal area through smothering and burial of epibenthic fauna. These Outer Harbour benthic communities have been previously subject to six dredged material disposal campaigns. The construction of the perimeter bund and subsequent dredged sediment disposal will permanently remove benthic habitat and associated benthic communities from the Outer Harbour area, which will be offset by the creation of the reclamation area infrastructure providing new surface for colonisation by biofouling communities.

The impacts to benthic fauna associated with the Inner Harbour are not expected to be permanent. Migration and recolonisation into the disturbed footprint from adjacent soft sediment environments will begin immediately following construction and occur over subsequent weeks and months.

Handling of Berth 101 sediment through dredging and disposal has the potential to cause mobilisation of contaminated sediments into the water column. Release of pollutants such as heavy metals, metalloids, TBT and PAHs into the water column can result in toxic effects on sessile invertebrates. Resuspension of contaminated sediment has also been identified as a driver for the establishment of tolerant invasive species as well as in reducing recruitment of dominant species such as barnacles and polychaetes.

The release of contaminants is predicted by numerical modelling to be localised within the Port Kembla environment and be medium-term in nature. Suspended sediments will be confined within silt curtains at the berth while dredge material will be confined within the perimeter bund at the Outer Harbour to minimise the migration of sediment and contaminants during disposal. The duration of exposure to toxicants are considered to be short in duration while long-term toxic effects are considered unlikely.

PCBs

A submission questioned the extent of investigations into polychlorinated biphenyls (PCBs) to be located in the vicinity of a substation. Douglas Partners (2014) analysed soil samples for PCBs and reported concentrations below assessment criteria. The concentrations reported in eight surface samples were between 0.1 and 0.5 mg/kg, which is well below HIL D of 7 mg/kg (ASC NEPC, 2013). No evidence of contamination such as oil staining or odours were observed to suggest any potential vertical migration of PCB contamination (if present). Douglas Partners (2014) reported TRH concentrations close to or below the LOR in samples that had low level PCBs. Based on observations, confirming no PCB in transformer oil and previous results, the likelihood of PCBs being present at depth above adopted criteria is considered low. Additionally, the source-pathway-receptor linkages indicates the risk of human exposure will be of short duration and can be managed accordingly.

Benzo(a)pyrene TEQ

The submission queried the extent of delineation for Benzo(a)pyrene (BaP) identified within Berth 101. Extensive contamination investigations were undertaken across the Berth 101 area and only two out of 83 samples tested exceeded the adopted criteria, suggesting that BaP impacts are unlikely to be widespread within the excavated area.

The two exceedances were at a depth of between 4 and 5 metres below the surface, but located in different portions of the site with no obvious spatial connection

No other BaP TEQ concentrations were within an order of magnitude of these two results, with the majority of results at LOR. As such the results are considered hot spots and can be managed through the construction process,

The potential risk posed by BaP TEQ to human health is considered to be low; at present the identified contamination is at depth and inaccessible. There will be opportunity for direct contact with the materials during excavation, stockpiling and relocation to the outer harbour for construction workers. This could be managed by:

- Adopting appropriate controls during construction (e.g. minimum personal protective equipment (PPE) requirements) documented in a construction and environmental management plan; and/or
- Carrying out bioavailability testing to test the assumptions inherent in the derivation of the BaP TEQ HIL, which are quite conservative; and/or
- Preparation of a site specific risk assessment. As construction works will be of short duration in nature it is expected that a site specific target level for BaP TEQ would be less conservative than the default HIL.
- In terms of potential environmental impacts in the marine environment, BaP and the other carcinogenic PAHs are typically of very low solubility and hence environmental mobility. This is supported by the low concentrations of BaP obtained from leachability testing by TCLP, which is a much more aggressive test than environmental conditions.
- Recommendations for the management of hot-spots were included as part of the management recommendations in Chapter 11 and 25 of the EIS.

Groundwater

A submission queried the extent of characterisation of the groundwater resource at the site.

Groundwater sampling was undertaken as part of the EIS from six wells including three existing wells installed in 2011 and three additional wells installed during preparation of the EIS in 2018. The wells were located outside the proposed excavation footprint. Given that saturated materials will be removed and disposed in a marine containment cell, groundwater characterisation was considered to be of limited value within the excavation area. However there is no reason to suspect that groundwater conditions in the area to be excavated will not be consistent with those reported; i.e a lens of freshwater perched above saline groundwater in hydraulic, tidal continuity with the harbour.

Groundwater flow direction was discussed in Section 3.3 of the Berth 101 Contamination investigation included as Appendix E1 of the EIS. Groundwater is expected to be encountered at depths of between 3.87 and 6.6 metres below the surface and be tidally influenced with a general flow towards the south west. The potential impacts that elevated heavy metal and ammonia concentrations in the fresh water lens may have on the development and receiving marine water were discussed in detail as part of the assessment. Based on the concentrations of heavy metals and ammonia reported and assessment of source-pathway-receptor linkages, GHD assessed that the proposed development will reduce the overall discharge of contaminated groundwater into the marine environment, as outlined in Section 13.1 of the contamination report (Appendix E1). The source of heavy metals and ammonia in groundwater may be associated with coal and/or coalwash, which has been historically stored at Berth 101 and in adjacent areas. The information obtained from the groundwater assessment is considered adequate to characterise groundwater at the site.

4.3.2 Characterisation of contamination along gas pipeline route

A submission queried the characterisation and delineation of contamination along the pipeline route.

Due to the length of the pipeline and the limited disturbance associated with pipeline installation, it is not considered necessary or appropriate to undertake a detailed site investigation including sampling and analysis along the full length of the alignment.

The purpose of the investigation was therefore to undertake a high level assessment to identify potential contamination risks along the pipeline alignment and to develop appropriate management procedures to ensure appropriate treatment of any contamination encountered along the alignment.

The investigations identified four areas of environmental concern (AEC) including:

- AEC 1 - Fill materials along the entire pipeline alignment including dredged materials, coal and coal by-product, steel production by-product (slag) and possible building demolition materials
- AEC 2 - Spills and surface application of fuels along the entire pipeline alignment, oils and other chemicals associated with current and former industrial land uses
- AEC 3 - Historical impacts associated with former nightsoil depot within PKCT
- AEC 4 - Current and historical impacts associated with use of land adjacent to the alignment as workshops and fuel depots.

Whilst no widespread or gross contamination was identified along the alignment, there is considered to be a moderate potential for contamination based upon the nature of the fill material and the potentially contaminating activities from surrounding industry.

It is noted that the pipeline alignment potentially intersects a former night soil depot, which is located in a poorly defined area within PKCT. Due to the age of the depot and the time since active use the likelihood of residual contamination from this source is considered low. The alignment will also be restricted to the road verge on the edge of Road No. 1 within PKCT and will be primarily restricted to road base material and unlikely to encounter any residual contamination associated with the nightsoil depot.

Preparation and implementation of a CEMP is proposed to include an unexpected finds protocol (UFP) to effectively manage the potential contamination issues identified from both a human health and environmental perspective. This would include the assessment of materials to be disturbed across the site to inform appropriate management strategies.

Trenches would be progressively excavated to a depth of between about 1 and 1.5 metres for the length of the gas pipeline route except where horizontal directional drilling would be employed. Trenches would be progressively backfilled with bedding material, subsoil and then topsoil. The backfilled areas would be progressively restored to their pre-existing landform or land use.

The depth of groundwater is expected to be between 4.5 m and 8.2 m below ground level for the length of the proposed pipeline and is therefore only anticipated to be intercepted during directional drilled sections of the pipeline.

Full laboratory reports were included in Appendix E of the Gas Pipeline contamination assessment presented as Appendix E2 of the EIS.

4.3.3 Potential impacts of stockpiled contaminated material

Submissions raised queries regarding management of excavated materials that may be stockpiled on site.

The EIS stated that a portion of the excavated or dredged material may be utilised for the establishment of a landscaped embankment on the eastern side of the project application area, comprising up to 70,000 cubic metres of soil material.

As described in Section 3.5 of this Submissions Report, the landscape embankment is no longer proposed to be established as part of the project.

Temporary stockpiling of material prior to transport is expected to be required prior to transporting of material to the Outer Harbour disposal area and will be managed in accordance with a CEMP.

4.4 Noise and vibration

4.4.1 Construction noise levels and duration

Construction hours

A submission queried the justification and need for construction outside the recommended standard hours of work as defined in the Interim Construction Noise Guideline (ICNG). The ICNG acknowledges that construction works may be undertaken outside the recommended construction hours based on the following circumstances:

- The delivery of oversized plant, equipment and materials that police or other authorities determine require special arrangements to transport along public roads;
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm;
- Maintenance and repair of public infrastructure where disruption to essential services or considerations of worker safety do not allow work within standard hours;
- Public infrastructure works that shorten the length of the proposal and are supported by the affected community;
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours.

The project has been declared Critical State Significant Infrastructure and thus essential to NSW on social, environmental and/or economic grounds. The project is required to provide an immediate solution to meet projected gas shortages in NSW market and provide considerable economic benefit to both the Illawarra region and NSW. The project will also help put downward pressure on prices and improve overall gas security for NSW.

Construction works outside the standard construction hours would be justified for this project to meet the critical timeframes for gas delivery. This would fall under the final two points listed in the ICNG for consideration of works outside of standard construction hours.

An accelerated construction program is required in order to provide the necessary infrastructure to inject new gas supplies into the tightening NSW gas market as quickly as possible. The proposed gas infrastructure will help support the 33,000 NSW businesses and 500 heavy industrial operations which rely heavily on natural gas for their operations and are estimated to support over 300,000 jobs across NSW. The project is also broadly supported by local Illawarra business groups and stakeholders around Port Kembla.

Detailed noise modelling was undertaken as part of the EIS to consider potential impacts during construction to surrounding community members.

Minor exceedance of the Noise Management Levels (NMLs) outside standard construction hours was predicted by the modelling to be predominantly associated with pipeline construction for residential receivers located within 300 metres of the proposed pipeline alignment. Noise generated during pipeline installation will only affect any individual residence for a small period of time as a result of the linear progression of the pipeline installation and is not predicted to have potential for sleep disturbance impacts.

The highest predicted exceedances during pipeline installation were identified for residential receivers in Noise Catchment Area (NCA) 2, which were located in close proximity to the existing metering station at Cringila. The pipeline alignment has been modified to include an alternative tie-in location on the existing EGP spur line, which will effectively increase the distance to the most affected receivers reducing the potential for noise impacts.

Dredging and berth construction activities are not expected to exceed NMLs in NCA 1 (both during standard and outside of standard construction hours) due to the distance between Berth 101 and residential receivers to the north.

There is potential for minor exceedance of NMLs for residential receivers in NCA2, primarily to residential receivers located immediately to south of the Outer Harbour Placement area in Port Kembla. The predicted noise levels range from 48 to 52 dB at the worst-affected receivers, which is comparable to the existing ambient noise levels (51 dBA day, 49 dBA evening and 50 dBA night) in the area. The predicted noise from construction activities is not expected to be dissimilar to the existing levels of ambient noise in the area and is consistent with 24 hour dredging and disposal practices undertaken as part of the approved Outer Harbour Project.

Best practice noise management and community notification measures will be undertaken as part of the project to minimise potential disruption to the local community.

Noise Predictions

The equipment sound power levels used for the construction noise assessment are considered conservative as:

- All equipment is assumed to operate simultaneously
- All equipment is located in the position which would create maximum noise impacts for each receiver.

A time adjustment has been applied to the construction plant and equipment as it is not considered realistic to model all machinery operating simultaneously at maximum capacity.

This is consistent with recent large industrial and transportation construction noise assessments undertaken in New South Wales. For example, the recently approved Parramatta Light Rail Stage 1 Noise and Vibration Impact Assessment[1] (SLR, 2017) considered similar equipment corrections (Page 50, Part A).

Roads and Maritime provide a similar approach in their current guidelines to for construction noise assessments (refer to the *Construction Noise and Vibration Guideline* Appendix F). This approach considers a 'typical worst case' activity sound power level of a construction scenario which is not equal to the logarithmic sum of all the equipment in that particular activity.

4.4.2 Operation noise levels and duration

Sound power levels and annoying characteristics

A submission queried the adoption of sound power levels and the consistency for equipment used to model the construction and operational phases of the project.

Equipment used in the modelling of construction and operational noise impacts is not consistent as it is required to serve different functions. Clarifications for specific equipment that appears similar for each inventory includes:

[1] Available online at: https://majorprojects.accelo.com/public/b5d07c5d4b92e2b6bf6357749e315467/30.%20Technical_Paper_13_Noise_and_Vibration_Part_A.pdf

- Regas booster pump/sea water pump during operations was based on sound power levels from a diesel water pump. The mud pump used for construction is based on a slurry pump with a slightly higher sound power level.
- Loading arms on the FSRU main deck during operations was based on a sound power level for a 20 tonne crane. The lifting capacity for the operational crane is less than the lifting capacity required for construction (30 tonne to 150 tonne) and (150 tonne to 300 tonne) and therefore adopts a lower sound power level.
- The tugboat used in the operational modelling was based on the equivalent survey/service tug in the construction schedule with a 650 hp engine. A larger tug boat was also included in the construction schedule that has a 1200 hp engine and associated higher sound power level.

A 5 dBA correction has been applied to the source sound power levels of equipment that contain annoying characteristics.

Need for mitigation

The operational noise modelling assessment is considered to have used conservative assumptions and the predicted noise levels are considerably below the predicted noise criteria at surrounding receivers.

Additional modelling and the need to assess feasible and reasonable mitigation is not required as the predicted operational noise levels are considered to be accurate and reflective of the likely emissions during operations.

The operational phase will involve the ship to ship transfer of natural gas, regasification and injection of gas into an onshore pipeline. The majority of this plant and equipment will be located onboard the FSRU. The operational noise levels are expected to be consistent with regular shipping activities in the Port ie the arrival of LNG carriers, unloading of gas using marine hoses, use of tug boats etc.

4.5 Air quality

4.5.1 Project Operation

Fugitive emissions and leak detection and repair

A submission noted the assessment focussed on the primary operational emission sources from the FSRU and LNG Carriers, but did not specifically account for emissions associated with gas losses due to leaks and other working losses.

It is acknowledged that transfer losses, venting and leaks from connectors, flanges, valves and pump seals have the potential to result in fugitive emissions to air. The contribution of fugitive emissions is estimated to be a minor part of total emissions from the operation from the FSRU and LNG carrier and is considered unlikely to significantly alter the results of the assessment that demonstrate the project will be considerably within the relevant criteria at all surrounding receivers.

When considering the potential for fugitive emissions and other smaller emissions sources, it is relevant to note that the characteristics of an FSRU or an LNGC are considerably different than for other vessels in the oil and gas industry used for production and processing of hydrocarbons or onshore processing facilities.

The complexity in terms of operation and the amount of process equipment and potential leak points are much lower on an FSRU, which in practice is equipped with only one single process module for regasification of the LNG. The FSRU is also primarily dealing with cryogenic fluids,

meaning that even smaller leaks of liquids or gases will be easily visible through mist and ice formation at the leakage point. Therefore, such leaks can be quickly discovered and dealt with very early after the initial release, typically by tightening of flanges, replacement of gaskets, etc. The process facilities are also easily surveyable and frequently inspected, meaning that prolonged and undiscovered leaks are much less common than for other oil and gas processing facilities. The amount of flanges in warm gas and/or high pressure gas systems is very limited and in areas with high pressure flanges (manifold area, metering station, etc.) there will be gas detectors installed just next to each potential leakage point.

There is not expected to be any cryogenic leaks from cargo tanks and process infrastructure during normal FSRU operations. The process equipment is of limited size and the philosophy is to reduce the amount of flanged connections and use of welded connections for the cargo valves to minimise potential leak points. Gas detection in the regasification module and across the FSRU (trunk deck, manifold area, cargo compressor room etc.) will detect if a leak should occur and will initiate process shut down.

A leak test is performed for LNG transfers i.e. pressurised with N2 to confirm tight connection prior to starting the cooling down and discharge/loading of LNG.

For some maintenance events, there will be hydrocarbons released to atmosphere. This is in conjunction with inspection/maintenance of cargo tanks where inert gas will be vented, which is required approximately every five years.

When it comes to internal leaks through safety valves, blowdown valves, etc. all such valves in hydrocarbon systems are routed to common vent headers and masts. All these vent masts have gas detection (sampling type) installed to detect internal hydrocarbon leakages from associated systems. With the exception of the regas vent mast, there are very few sources routed into each vent mast, so the source of any leak is easy to localize.

There are also some smaller continuous emissions (through small bore capillary tubing only) from the onboard gas chromatographs, as well as some emissions related to automated purge sequences when starting up the main engines on gas. There is also methane slip from the engines/combustion units in the engine room, and the more operational purging/gas freeing of hoses and associated piping segments in relation to STS operations (during such operations, the hoses are heated by seawater flushing on the outside and LNG inside the hoses is vaporized internally in the system before the hoses are isolated, purged and disconnected, meaning there is no spill/drain of LNG). Emissions from these sources are extremely difficult to quantify and make up an extremely small proportion of total emissions.

The assessment included a range of conservative scenarios for emissions from the FSRU and LNG Carrier and demonstrated compliance with impact assessment criteria at all surrounding sensitive receptors. Control measures to minimise fugitive emissions include:

- The use of best available practices in FSRU/LNG carrier design.
- Conducting leak testing prior to operation
- Implementing a routine monitoring, inspection and maintenance programs
- Establishing a leak detection and repair plan

The implementation of the above mentioned control measures will minimise fugitive emissions to as low as practicable. Fugitive emissions are small in volume and thus not likely to impact nearby sensitive receptors.

PoEO Clean Air Emission standards

A submission requested further details in regard to compliance with PoEO (Clean Air) Regulation together with International Maritime Standards.

The modelled emission concentration and applicable NSW POEO emission limit for gas and liquid fuelled engines are supplied in Table 4.9 and Table 4.10 respectively, with an exceedance to the NSW limit highlighted blue. NO_x emission from the liquid fuelled engines are conservatively assumed to comply with US EPA Tier 2 limits. Emitted NO_x concentrations from the liquid fuelled engines with these assumptions do not comply with NSW POEO (2010) NOx limits.

Emissions of all other pollutants comply with NSW POEO limits.

Table 4.9 Gas fuelled engine NSW emission limit comparison

Pollutant	Exhaust concentration (mg/m^3)	NSW emission limit (mg/m^3)
Particles	8	50
NO_x	155	450
CO	116	125
SO_2	0.1	1000
Benzene	0.2	40*
Formaldehyde	30	40*
PAH	0.0001	N/A

* shown limit is for VOCs as n propane

Table 4.10 Liquid fuelled engine NSW emission limit comparison

Pollutant	Exhaust concentration (mg/m^3)	NSW emission limit (mg/m^3)
PM_{10}	43	50
$PM_{2.5}$	23	50
NO_x	1063	450
CO	508	5880
SO_2	175	1000
Benzene	2.0	1140*
Formaldehyde	0.20	1140*
PAH	0.00003	N/A

* shown limit is for VOCs as n propane

It is AIE's intention to primarily operate both the FSRU and LNG carrier using boil off gas (LNG) as an energy source to benefit from the lower emissions achievable from LNG vs other fossil fuel sources.

The FSRU is equipped with 4 x Wartsila engines (W8L50DF). In normal operating mode (gas mode) the FSRU engines will be fuelled by the LNG on-board making it compliant with NSW clean air regulations.

The engines are however designed to have dual fuel capabilities, meaning they can also run on marine diesel oil (MDO) if there is no LNG available for the engine. Situations where MDO mode would be required would be highly unusual / emergency type situations such as extended idle periods combined with no /low LNG supply on-board, or an engine breakdown, or as a pilot fuel.

The intent of the unit is to ensure there is always gas on-board to keep the ship cool to receive new deliveries and to deliver gas supplies into the pipeline. LNG carrier deliveries are currently anticipated every 2 – 3 weeks.

As an example of the unlikeliness of the above scenarios, a similar FSRU in Lithuania, the Independence, has not had to refill its MDO tanks since it started operating in 2014, using MDO only as pilot fuel.

It should also be noted that a maximum of two engines are needed during normal operations. This provides some additional redundancy, in that should there be a maintenance problem with one engine, there are at least 2 other engines which could be utilised while maintenance works occur, thus avoiding the need for MDO.

In the highly unlikely situation where there is both a long extended period of idleness and no/low LNG supplies on board, one engine would be operated on MDO “hotel load”, which is designed to continue power to accommodation areas and/or deck lighting. In this scenario the exhaust concentration will be below NOx 1063 mg/m3 (1 engine running, on low load). This would be analogous with many large maritime vessels visiting Port Kembla and utilising MDO.

The air quality assessment demonstrates that even if liquid fuelled engines were utilised, under worst-case scenarios the ground level criteria at nearby sensitive receptors will be achieved.

Fugitive emissions and health impacts

The EIS assessment process modelled six potential operating scenarios to determine the potential impact on air quality in the region as described in Section 14.4.2 of the EIS. The assessment process was carried out in accordance with the NSW EPA 2016 Approved Methods for air quality assessments against a range of key criteria.

The results showed there were no predicted exceedances of the EPA assessment criteria during operations when both an LNG carrier and the FSRU are operating side-by-side. This scenario was utilised as a worse case scenario, noting the predominant situation will be the FSRU operating in isolation of an LNG carrier. LNG carriers will only visit the Port about 24 times a year for 24 – 36 hours.

In addition, it should be note that the nearest residential locations are approximately 2 kilometres from the site, allowing for a considerable dispersion zone between the project and residents which further safe-guards human health from air quality impacts. It is also worth noting that the predominant element in natural gas is methane, which is non-toxic.

Lastly, the following design elements of the project further reduce the risk of fugitive emissions/air quality exceedances:

- **Vessel Design** - Modern LNG carriers and FSRUs, powered by natural gas instead of marine diesel or other fossil fuels, are among the most environmentally friendly vessels on the ocean. By comparison to non-LNG fuelled marine vessels, they emit significantly lower levels of carbon dioxide, nitrogen oxides, particulates and almost no sulphur oxides.
- These vessels are also designed to avoid accidental or fugitive emissions of natural gas by capturing the small amount of LNG that continuously seeks to return to its natural gaseous state and re-using it in the vessels engines or reliquefying it and returning it back into the tanks.

- **Pipeline Design** - Only a short pipeline, approx. 6.3 kilometres, is required to link the terminal to the Eastern Gas Pipeline (EGP). It will run entirely underground and largely through industrial land. It will be designed and constructed to Australian Standard 2885, which includes strict requirements around leak detection, repairs and maintenance.

4.5.2 Emissions from excavation, dredging and disposal

Creation of the berth involves excavating, dredging and disposal of material from the existing Berth 101 to allow the establishment of berth pockets to accommodate the FSRU and LNG carrier berthed side by side.

It is estimated that about 600,000 cubic metres of material would be excavated and dredged for the construction of berth and wharf facilities, which equates to about 720,000 cubic metres when allowing for typical bulking factors. The excavation and dredging would occur over an area of about 8 hectares including parts of the existing berth and wharf and carried out by a combination of long reach excavator and backhoe dredger. The long reach excavator would be situated on land and would primarily be used to excavate the existing berth and revetment and the backhoe dredger would excavate the marine sediments.

A submission queried the level of assessment undertaken to characterise potential air emissions from bulk earthworks, dredging and placement operations. The submission queried the potential for material to dry out during handling and stockpiling resulting in particle emissions including particle bound contaminants and the volatisation of air toxics.

Particulate matter impacts

Additional air quality modelling has been undertaken to assess potential particulate matter impacts resultant from the excavating, dredging and disposal of material. Particulate emissions were modelling from the handling of excavated material stockpiles and wind erosion from the stockpiles assuming 24 hour construction and Level 2 Watering (> 2L/m^2/hr) applied to stockpiles.

Dispersion modelling results are shown in Figure 4-8 and Figure 4-9. Exceedances of the assessment criteria are shown as red contours. For both PM_{10} and $PM_{2.5}$ impacts, the exceedances are localised around the stockpile. The particulate matter impacts from excavating, dredging and disposing of Berth 101 sediments are considered minimal, resulting in no impact upon nearby sensitive receptors. In reality, the majority of the excavated and dredged sediments will have a high moisture content and will be transferred directly to the placement area, limiting the potential for stockpiles to dry out resulting in potential for dust emissions. Visual monitoring of emerging dust issues and stockpile watering during dry and windy conditions will limit the potential for any dust impacts associated with the bulk construction activities.

Figure 4-8 Predicted PM_{10} concentrations ($\mu g/m^3$)

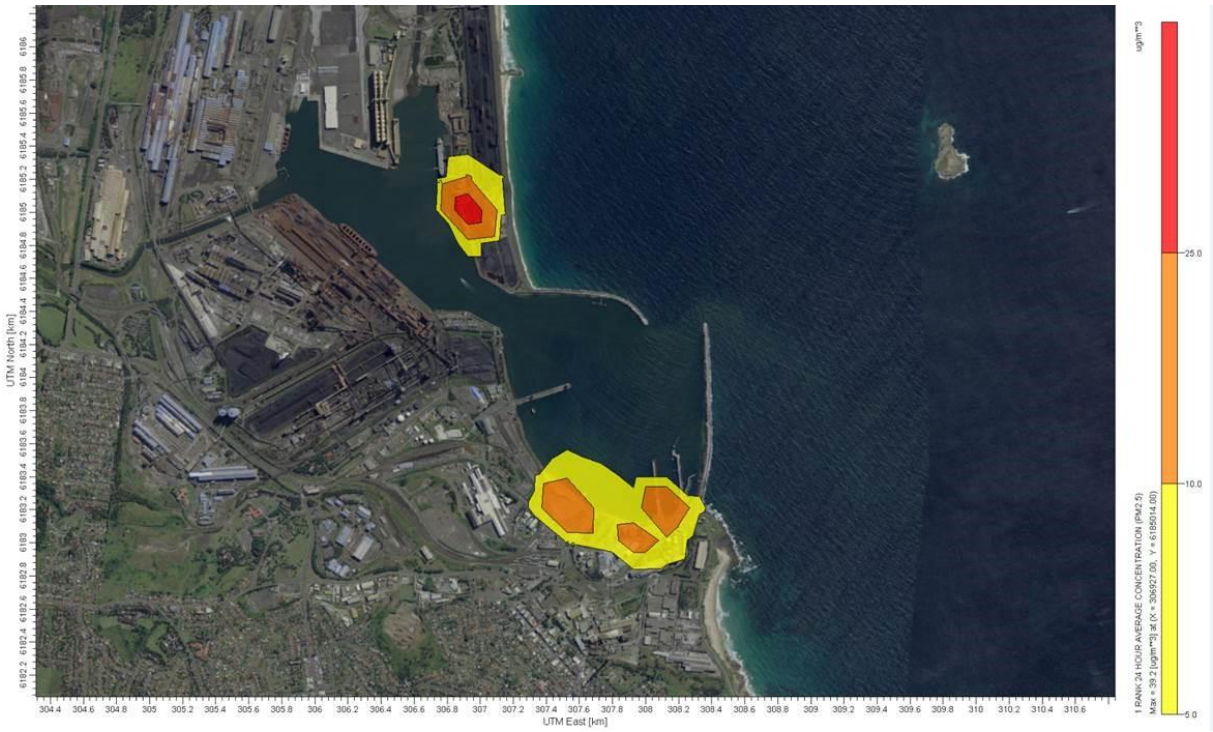

Figure 4-9 Predicted $PM_{2.5}$ concentrations ($\mu g/m^3$)

Contaminated soils

Detailed contamination investigations were undertaken as part of the EIS and reported within Chapter 11 and Appendix E1 and E3 for land based excavation areas and marine sediments respectively.

The investigations highlighted that the Berth 101 area comprises fill material comprising gravelly sand and sandy gravel to a depth of 5.5 metres overlying reclaimed sand. The results showed that the contamination within the area to be excavated was relatively minor and generally

consistent with only two isolated hotspots exceeding BaP (TEQ). There were no volatile contaminants detected above the adopted criteria.

Marine sediments within Port Kembla harbour are known to be contaminated as a result of historical use of the port. The findings of the investigation indicate the presence of contaminated sediments within the proposed dredging and disposal areas. Concentrations of contaminants of concern were largely consistent across the two areas, with the primary contaminants of concern including heavy metals, PAH and dioxins at concentrations above the nominated screening levels. It is noted that concentrations of volatile TRH in the fraction C6-C10 and BTEX were reported below the LOR in all samples selected for analysis.

Fill material from within the land based excavation area has the greatest potential to dry out and result in air dispersion during stockpiling and material handling. The investigations show the fill material has low levels of contaminants and the distance to surrounding sensitive receptors limits the potential impacts associated with air toxics, noting there were no volatile contaminants detected above the criteria. Water trucks will be used to manage dust where machinery is moving in or around the stockpiles and the project will comply with best practice construction management practices.

Dredging operations will be limited to mechanical dredging operations (eg. back hoe dredge as opposed to cutter suction dredge) to limit the potential for dispersal of contaminants. The dredged sediments will be transported by barge and placed in a confined cell beneath the water table to reduce the potential for air emissions. Further details are included in the Outline Dredge and Disposal Management Plan included as Appendix A.

4.6 Terrestrial biodiversity

4.6.1 Protected species habitat and offsets

The OEH submission notes that the BDAR correctly identifies and assesses potential impact of the Green and Golden Bell Frog and recommended calculation of an offset as allowed for, but not required by the “prescribed impact” requirements of the Biodiversity Conservation Act 2016.

OEH recommended that offsets for the Green and Golden Bell Frog be calculated based on loss of suitable habitat areas. OEH also noted that the Southern Myotis is now a full ‘species credit’ species, and offsets should be calculated based on a species polygon. OEH requested that an updated BDAR is required to provide the appropriate calculation and discussion of offset requirements for these species.

The BDAR has been updated to provide for a discussion of habitat areas for the Southern Myotis, and to allow for calculation of offsets for the Green and Golden Bell Frog (based on the loss of artificial ponds as per other major projects at Port Kembla), and the Southern Myotis (based on loss of vegetation within 200m of open waterbodies). The updated BDAR has also taken into consideration the slightly amended pipeline alignment described in Section 3.2. Potential impacts are largely as prescribed in the EIS and summarised below:

- Removal of 0.23 ha of planted native vegetation that is assigned PCT 1326 (Woollybutt – White Stringybark – Forest Red Gum grassy woodland) as the closest matching candidate PCT, and is considered habitat for the Southern Myotis.
- Temporary short-term disturbance of the potential movement corridor for the Green and Golden Bell Frog during construction of the pipeline.
- Removal of five, small artificial detention ponds (less than 0.1 ha) near the existing coal terminal Berth 101 site that may be used on occasion by the Green and Golden Bell Frog but are unlikely to provide breeding habitat.

- Potential indirect impacts on adjoining vegetation associated with edge effects, light spill, noise and introduction of weeds and pathogens.
- Potential impacts on water quality from construction and operation.

A BAM assessment and credit calculations have been performed in accordance with the methodology (OEH 2017a) and using credit calculator version 1.2.5.00. Credits required to be retired to offset the impacts of the project include:

- 3 ecosystem credits for impacts on PCT 1326 - Woollybutt – White Stringybark – Forest Red Gum grassy woodland.
- 2 species credits for impacts on the Southern Myotis (loss of 0.25ha of PCT 1326)
- 1 species credit for impacts on the Green and Golden Bell Frog (loss of 0.1 ha of artificial waterbodies).

One additional management measure has been included for the use of construction matting such as “Geoterra matting” for pipeline stringing operations over a Typha wetland on the corner of Springhill and Masters Road.

4.7 Heritage

4.7.1 Aboriginal cultural heritage sites

The OEH provided support for the modified alignment, which was altered to avoid harm to recorded Aboriginal site 52-2-3618 and areas of archaeological potential. The submission notes that if the impact footprint changes to impact upon sensitive areas, then further archaeological assessment is required and that the project team is obligated to update the site card for 52-2-3618 with the results of their research. The management strategy proposed for development of an unanticipated finds procedure was also supported by OEH.

A further submission was received from Council, who recommended that advice from OEH be sought as recorded Aboriginal site 52-2-3618 will be disturbed by the proposed works. The submission also stated that further Aboriginal heritage investigations should be undertaken in the form of an Aboriginal Cultural Heritage Assessment and that consultation with the local Aboriginal community be undertaken to ensure cultural significance of the area is properly considered.

Aboriginal heritage requirements for the project have been assessed in the *Port Kembla Gas Terminal Aboriginal Heritage Due Diligence Assessment* (AHDDA) (GHD 2018) included as Appendix I in Volume 2 of the EIS. The AHDDA has been informed by a desktop assessment, a site visit and consultation with the Illawarra Local Aboriginal Land Council (ILALC) and consultation with OEH in accordance with the SEARs.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) identified one Aboriginal site in the study area, 52-2-3618, an open camp site consisting of two flaked stone artefacts. The AHMIS coordinates for site 52-2-3618 place the site west of Springhill Road in the study area, however the site card description and mapping for 52-2-3618 place it east of Springhill Road and outside of the study area (refer to Figure 2 of the AHDDA). Such inconsistencies between AHIMS coordinates and site card mapping and descriptions are not uncommon.

Based on the results of the desktop assessment and site visit, areas of archaeological potential were identified along sections of Springhill Road (refer to Figure 9 of the AHDDA). The ILALC representative present during the site visit concurred with the identification of areas of archaeological potential and it was agreed that further Aboriginal heritage investigations would be required if these areas were to be impacted by the proposed works. Consultation with ILALC

during the site visit also identified the Fig trees on Spring Hill as culturally important to the local Aboriginal community and should be avoided by the proposed works.

Based on a number of factors, including Aboriginal heritage considerations, the proposed pipeline route was modified and sections proposed to be constructed via directional boring rather than trenching. Modification of the proposed pipeline route allowed 52-2-3618 and the majority of areas of potential for Aboriginal archaeology to avoided, however sections of archaeological potential east of Springhill Road will still be crossed by the proposed pipeline route (refer to Figure 9 of the AHDDA). The proposed pipeline route in this section will be constructed via directional drilling at depths greater than 2 m. Directional drilling at this depth greatly reduces the risk of harm, as it will avoid soil profiles with potential to contain Aboriginal objects. Within the Fairy Meadow soil landscape, sandy soils are typically less than a 1 m in depth before transitioning to clays (Hazelton 1990) and it is unlikely that Aboriginal objects will be encountered at greater depths in this landscape.

Council has suggested that archaeological testing (excavation) should still take place within the area of potential on the basis that future repairs or replacement of the pipeline may be required. The AHDDA has only assessed the potential impacts associated with the proposed pipeline's construction and operation. Potential future replacement activities are outside the scope of this assessment. Aboriginal heritage investigations for potential future impacts should be undertaken on a case by case basis as required, with methodologies appropriate to the activity impact being considered.

We note that archaeological excavation is by its nature a destructive investigation methodology and should only take place when harm or potential harm cannot be avoided. This is consistent with the good practice approach to conservation of heritage outlined in the Burra Charter to '*do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained*' (Australian ICOMOS 2004: 10). The *Code of Practice for Archaeological investigations of Aboriginal Objects in NSW* (2010) also outlines that archaeological test excavation should only be undertaken '*when sub-surface Aboriginal objects with potential conservation have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity'* and *'that unnecessary excavations do not comply with this Code'* (DECCW 2010: 24).

Council's submission has also queried the lack of Aboriginal archaeological potential identified between the Fig tree reserve and Springhill Road on Spring Hill. We note that Aboriginal archaeological potential has not been identified in this area due to historical disturbances as detailed in the AHDDA,

Based on modifications to proposed pipeline route and construction methodologies, the AHDDA assessed that harm to 52-2-3618 and areas of archaeological potential could be avoided and further Aboriginal heritage investigations are not required. OEH has supported the modification of the proposed pipeline route and construction methodologies to avoid harm to 52-2-3618 and areas of archaeological potential, but has also highlighted that if the pipeline route or construction methodologies changes, then further Aboriginal heritage investigations will be required (OEH submission 2018). OEH has also recommended that an unanticipated finds procedure for the project be developed and that the site card for 52-2-3618 be updated the reflect the results of the AHDDA investigation.

Based on the results of the AHDDA and consultation with OEH and ILALC, we believe that Council's concerns have been addressed. It has been demonstrated that 52-2-3618 will not be impacted by the proposed works. There is consensus with OEH that the proposed works can proceed without further investigation, unless the proposed pipeline route and construction methodologies are changed, in which case further investigation will be required. Consultation with the local Aboriginal community via the ILALC has been undertaken and the cultural

significance of the area considered as part of the AHDDA, resulting in avoidance recommendations for the Fig trees on Spring Hill.

It is noted that updated details for the 52-2-3618 site card have been sent to the OEH Assistant Heritage Information Officer to update the AHIMS records.

4.7.2 Historic heritage sites

The Council submission recommended that the NSW Heritage Council should be asked to comment on the potential of the project to impact on archaeology and relics protected under the NSW *Heritage Act 1977* and that clarification of archaeological potential for 'Spring Hill' should be provided.

Historical heritage requirements for the project have been assessed in the *Port Kembla Gas Terminal Historic Heritage Assessment* (HHA) (GHD 2018) included as Appendix J in Volume 2 of the EIS. The HHA was informed by a desktop assessment, archival research and a site visit. Based on the results of the HHA, areas of archaeological potential associated with the former 'Springhill' house site and other early rural structures has been identified on sections of Spring Hill, east and west of Springhill Road (refer to Figure 6 of the HHA).

The boundaries for archaeological potential (refer to Figure 6 of the HHA) have been determined using a combination of historical records, historical photographs and the results of the site visit. The submission suggested that the boundary for the area of archaeological potential on the west of Springhill Road should be extended east to the current alignment of Springhill Road. This suggestion appears to be on the basis that 1937 aerial photograph indicates that foundations are present both east and west of Springhill Road (refer to annotations on Plate 11 of the HHA). Foundations do appear to be present on this photograph, however Springhill Road is also shown as a dirt road and has since been expanded to a six lane dual carriageway. This expansion has involved the excavation and removal of significant portions of Spring Hill. As documented in the HHA, areas to the west of Springhill Road were also heavily modified by industrial developments in the 1950s and 1960s and then remediated in the late 2000s. While disturbance across the area has been widespread, the site visit identified localised areas with potential for historical archaeological, such as the Fig tree reserve area, as these areas still have potential for historical deposits to be present, albeit potentially disturbed.

As documented in the results of the site visit, the area of land between the Fig tree reserve and Springhill Road has been heavily modified by industrial construction activities and the widening of Springhill Road and is very likely to have destroyed any potential historical heritage features or archaeological deposits in these areas. The utilisation of disturbed areas for the proposed pipeline route is a preferred heritage outcome and the HHA does not recommend further historical heritage investigation on the basis of the current alignment as areas of potential will not be impacted. However if the alignment is modified and will impact areas identified as having potential for historical archaeology then further investigation will be required.

It is noted that the submission provided by OEH on the 11 December 2018 comments on biodiversity, Aboriginal cultural heritage, coastal waters, water quality and floodplain risk management, but does not comment on historical heritage. The Heritage Council has not provided independent comment to the Environmental Impact Statement. Comments are typically received on environment and heritage areas at risk. We note that the risk to historical heritage values has been assessed as low and comments are not always received for low risk activities.

4.8 Traffic and access

4.8.1 Predicted haul truck movements

A submission questioned the extent of impacts associated with road haulage of spoil to the disposal area and the anticipated 112 truck movements per day to the Outer Harbour disposal area. The EIS included a detailed traffic impact assessment including an analysis of the predicted truck movements on the local road network.

The traffic assessment found that even when adopting the maximum vehicle movements for peak construction activity, all roads would continue to operate well within their operating capacity, including morning and evening peak periods.

It is also noted that the maximum vehicle haulage for spoil transport would equate to a peak traffic generation of 11 vehicles per hour, which falls well within the maximum construction trucks per hour of 27 approved as part of the Outer Harbour project. NSW Ports have noted that no other major reclamation activities will be undertaken concurrently with the dredging and reclamation associated with this project and the maximum vehicle numbers would fall within historical figures.

Based upon a review of all contractor methodologies it is envisaged that transport by barge will be achieved for between 50 and 90% of excavated material equating to 360,000 cubic metres to 650,000 cubic metres. Road haulage will therefore be restricted to a maximum of 50% of the assessed vehicle movements within the EIS and will continue to have acceptable impacts upon the local road network.

4.8.2 Construction of road crossings

The road authority notes the need for Section 138 certificates and a road occupancy licence will be required for any works impacting a travel lane for a state road and request further liaison during detailed design in regards to proposed road crossings.

All state roads will be traversed through the use of directional drilling to avoid impacts upon the road network. Further consultation will be undertaken with road authorities during detailed design.

4.9 Strategic context

4.9.1 Strategic justification for the project

The majority of local Illawarra business groups and industry networks provided submissions in support of the project and recognised the strategic justification and benefits to the local region. A small number of individual submissions queried the strategic justification and benefits of the project in comparison to greater support for renewable energy.

Natural gas continues to play a critical role in NSW's energy mix. More than one million NSW households use gas for everyday uses like cooking or heating and around 33,000 NSW businesses and 500 heavy industrial operations rely heavily on natural gas for their operations. These businesses are estimated to support over 300,000 jobs across NSW, including in the order of 15,000 jobs in the Illawarra region. Despite this reliance on natural gas, NSW produces less than 5% of its own natural gas requirements.

As noted in the NSW Government's *Emerging Energy Program* (October 2018), NSW's energy system is in transition, with the share of renewable energy increasing. However, as noted also in the AEMO 2018 *Integrated System Plan*, the forecast change in electricity generation will still see gas-powered electricity generation playing a role in NSW and the broader National

Electricity Market (NEM) beyond 2040, including to smooth the entry of more and more renewable energy.

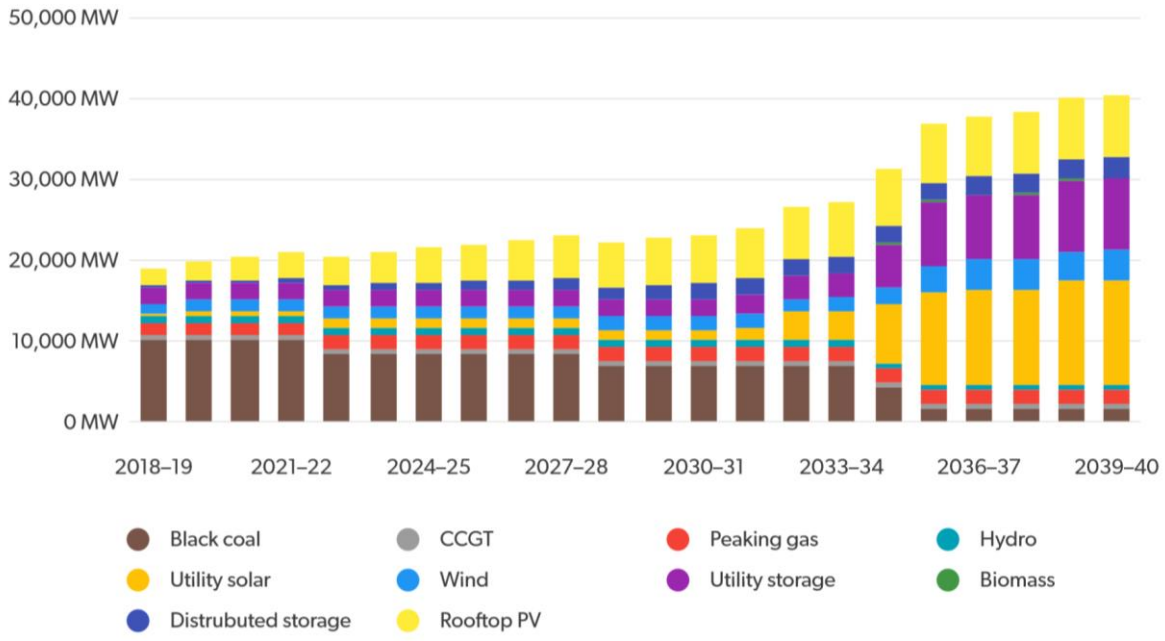

Figure 4-10 Projection for NSW electricity capacity under the AEMO 2018 Integrated System Plan neutral economic scenario (Source: NSW Government, Emerging Energy Program, October 2018)

As such, NSW will continue to require access to reliable and affordable gas supplies in order to meet the electricity needs of the community for the next decade or so.

In addition to electricity needs, gas plays an important role in many manufacturing processes where very intense industrial heat or burning functions are required. This may include functions such as smelting, glass production or incineration of hazardous waste.

While renewable energy may in time be able to meet these needs, there is no current wide-spread commercially viable renewable energy substitute for these processes.

Likewise, in many instances gas is used as an essential ingredient in manufacturing processes. For example, elements of natural gas are often used in the manufacturing of products as diverse as soft and hard plastics (e.g. milk bottles), dyes, fertilizers, and medicines. This gas is known as "feedstock".

Again, until a commercially viable alternative is found to the feedstock needs of these manufacturing operations, they will continue to require supplies of natural gas in order to produce these every-day items.

In terms of where NSW might source those natural gas requirements, it is true that Australia has enormous current and future reserves of natural gas. It is also true, that the bulk of these supplies are being exported to customers who agreed to essentially, pre-purchase the supply, in order to ensure the investment needed to develop the resources was green-lit. In other words, the developers of the natural gas resources needed the pre-committed sales to provide them with enough confidence to go ahead and invest the enormous levels of capital needed to get the gas fields operational. Now those developers must honour the sales contracts.

While the Australian Government has mechanisms available to it to encourage and/or require existing suppliers to re-direct any uncontracted gas to the domestic market, it does require there to be an excess of production over contracted requirements.

It also does not ensure NSW gets the gas at the cheapest price. Unconventional onshore gas, such as coal seam gas, tends to be a reasonably expensive to extract. On top of this higher production cost, you then also need to add the transportation costs to move the gas from high producing locations, such as Queensland into NSW.

Currently, gas is only transported from Queensland to NSW in a gaseous state, via on-shore pipelines. The ACCC April 2018 Interim Report on the Gas Inquiry found NSW consumers may pay as much as an additional $3.50 per gigajoule in additional transport costs over and above the purchase price of the gas, putting NSW consumers of natural gas at an immediate disadvantage over consumers in other eastern states with access to their own supplies of natural gas.

Import terminals are utilised around the world, including in countries like the US which are both exporters of and importers of LNG, because they can provide a cost competitive alternative to overland transportation, provide diversity of supply and introduce competition and downward pressure on prices.

4.10 Project Design

4.10.1 Proximity to power assets

The information provided by Endeavour Energy with regard to existing power assets is noted. The proponent would aim to entirely avoid or minimise any relocation of existing power assets and would carry out further investigations and consult with Endeavour Energy to that end.

The proponent would design and construct the project, including the gas pipeline, in consultation with Endeavour Energy and with due consideration to the relevant Australian standards and guidelines including AS/NZS 4853:2000 Electrical hazards on metallic pipelines.

4.10.2 Power supply requirements

Electricity from the grid is not anticipated to be required. Electricity would be produced by diesel generators during construction and on board the FSRU during operation.

4.10.3 Interaction with other facilities

Park Pty Ltd have raised a number of questions about the potential impacts of the PKGT proposal on their operations, specifically the operation and maintenance of a marine fuel / bunker oil pipeline which currently traverses Berth 101, as well as Berth 102 and the Port Kembla Coal Terminal (PKCT) site.

AIE is committed to working in a collaborative manner with NSW Ports and Port Kembla tenants through the detailed design, construction and operational phases of the project and is seeking to minimise any negative impacts on the operations of other tenants and Port users.

Initial discussions have been had with Park Pty Ltd, PKCT and NSW Ports seeking additional information about the operational needs, maintenance and future plans for the bunker oil pipeline.

Further detailed discussions with Park Pty Ltd will be required in order to determine the most effective and efficient relocation of the service pipeline as part of the construction sequencing.

A meeting with various members of the Park Pty Ltd team to advance these more detailed discussions and to address more general queries around operations and safeguards contained in the company's submission, is currently being confirmed for early February 2019, subject to Park Pty Ltd availability.

4.11 Statutory context

4.11.1 Project approvals

A submission makes reference to the declaration of the project as Critical State Significant Infrastructure under Schedule 5 of the State and Regional Development SEPP.

The submission also makes reference to an extra 6 – 6.5 km of pipeline which will be outside the declared area for the CSSI application. The referenced section of pipeline is related to a potential future upgrade to the existing Jemena network and does not form part of the project. Approval for any upgrades to the existing gas networks will be assessed via alternate approvals pathways.

4.11.2 Harbour master approvals

The proponent would comply with the *Ports and Maritime Administration Regulation 2012* including obtaining all required approvals from the Port Kembla Harbour Master.

4.11.3 Application of Commonwealth and State pollution regulations

The Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth) (Protection of the Sea Act), as amended by the Maritime Legislation Amendment Act 2015 (Cth) (MLA Act) is the critical piece of legislation. It implements into domestic federal law Australia's obligations under the International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out the legislative obligations relating to the prevention of accidental and operational marine environment pollution from vessel operations.

Section 5(2) of the Protection of the Sea Act states that, with certain exceptions, the requirements of the Act should be read and construed as being in addition to, and not in derogation of or in substitution for, any law of a State.

That is, while section 5(2) may allow for Commonwealth and State laws to apply together, the operation of section 5(2) would not prevail over section 109 of the Constitution, which invalidates a State law to the extent it is inconsistent with a law of the Commonwealth.

Therefore the usual construction would apply to state environmental protection legislation: it will be in force unless a Commonwealth Act purports to cover the same field. In that case the Commonwealth Act prevails.

4.11.4 Application of coastal regulations

A submission notes that the Coastal Management SEPP doesn't apply to land within the SEPP (Three Ports) land application area, but notes the gas pipeline traverses a small portion of a lot zoned RE2 Private Recreation under the Wollongong LEP. The section of pipeline the submission is referring to is located on the Bluescope sporting fields on approach to the existing metering station. The pipeline alignment has been modified to allow for an alternate tie-in point along the existing EGP spur line and is no longer anticipated to extend out of the SEPP (Three Ports) Land application area.

The coastal management principles and assessment considerations in Coastal Management SEPP have nonetheless been considered in the development of the project. The pipeline at this location is not anticipated to impact upon the values of a Coastal use area under the SEPP.

4.12 Stakeholder consultation

4.12.1 Public exhibition timing and duration

The EIS exhibition period ran from Wednesday, November 14 2018 until Friday, 14 December 2018. This is a total of 31 days, with no public holidays. This period of time is consistent with requirements stated in Schedule 1, Division 2, Clause 12 of the EP & A Act that prescribe the minimum public exhibition period of 28 days.

In addition, the EIS was made available electronically on the DPE major projects website, as well as via the AIE website. It was also available in hard copy at several locations in Wollongong and Sydney.

To ensure widespread local community awareness of the EIS and its availability, AIE also ran a notice in the Illawarra Mercury, the Advertiser/Lake Times and letter- dropped a Community Newsletter with further details to approximately 17,000 houses in the local area.

These activities were in addition to DPE's notification in major metro and state-wide papers.

Copies of the AIE materials are provided in Appendix C.

4.13 Social and economic

4.13.1 Potential impacts on fishing activity

In assessing the potential impacts of the proposed works on fishing activities, it is important to note that DPI – Fisheries has prohibited all forms of fishing within the Inner Harbour and placed restrictions on fishing within the Outer Harbour for public health and port operational reasons. Fishing closures within Port Kembla are presented in Figure 4-11.

Berth demolition, dredging and berth construction works within the Inner Harbour are not expected to have an impact on fishing within the Outer Harbour.

Construction activities within the Outer Harbour are expected to add to the level of noise and suspended solids within the proposed area of works. Impacts of these changes are expected to vary by species. Previous dredging campaigns of a similar nature have been reported to increase predation by pelagic fish due to the availability of disturbed benthic organisms. Conversely increased levels of marine noise during construction may result in mobile species moving away from the area.

Given the high level of shipping activity which takes place within the port, the impacts of additional noise and suspended solids is not expected to have an appreciable impact on fishing within the Outer Harbour.

Based on the extent of dredge plumes and marine noise, impacts are not expected to extend beyond the Outer Harbour.

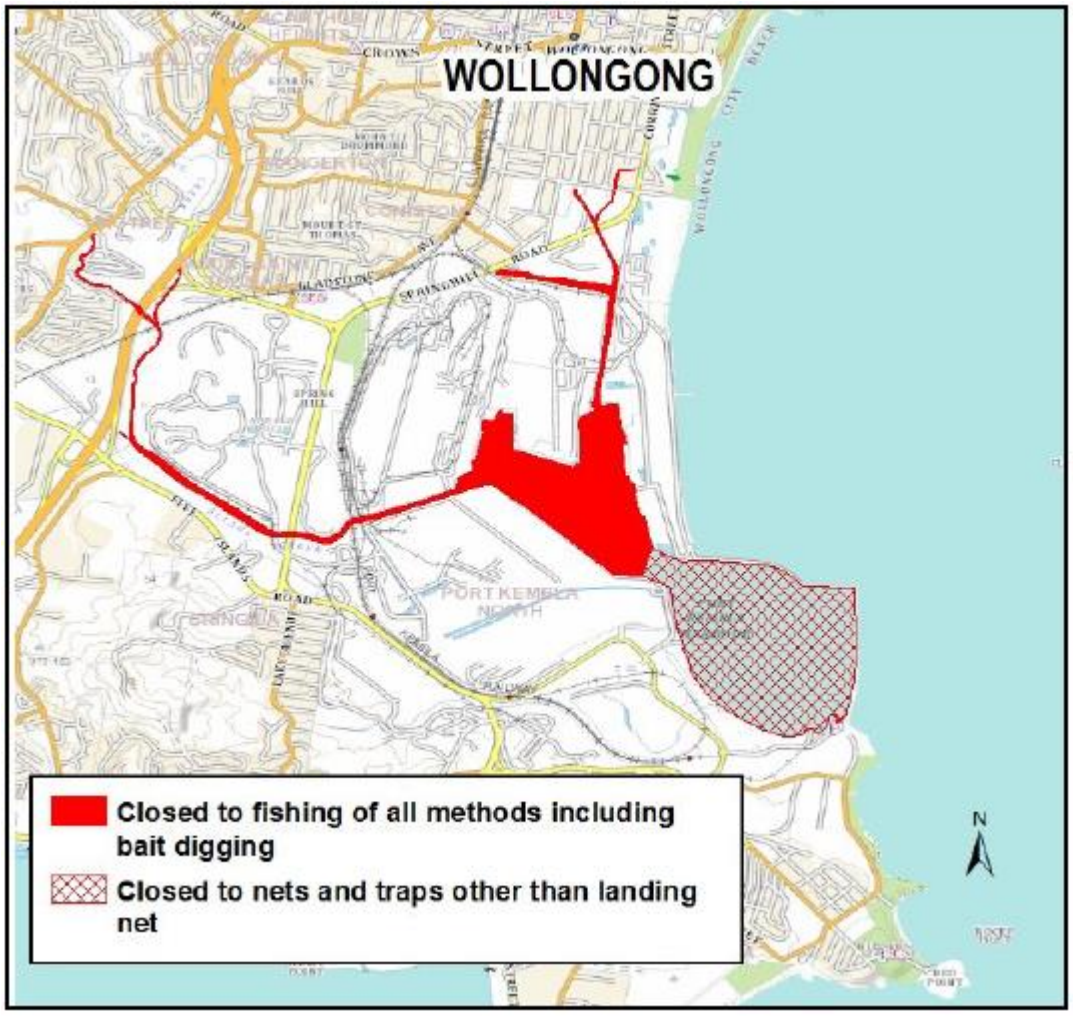

Figure 4-11 Port Kembla fishing closures DPI Fisheries (2018)

4.13.2 Compatibility with social amenity

Port Kembla has been a working port since 1883. It operates 24 per day, 7 days a week as an import and export terminal and there are multiple other business, cargo, logistics, bulk goods and heavy industrial facilities in the vicinity. The project will be predominantly located within land zoned for dedicated port and industrial uses.

Historical vessel numbers at Port Kembla show that over 1,000 vessels (2000 vessel movements) per year was common around 5 – 6 years ago. Since about 2015, there has been a slight reduction in numbers to around 850 vessels (1700 vessel movements) per year.

The 30 year Master Plan for the Port shows a forecast of over 1680 vessels (2380 vessel movements) from 2020 onwards.

AIE's project is anticipating around 24 vessels (48 vessel movements) per annum. This would represent about 3% of the current vessel movements, less against historical highs and about 2% of anticipated vessel movements.

As such, the AIE project does not represent a significant increase in or impact on vessel movements in the area.

For the visual assessment, the study area included land within 10 kilometers of the project site. While the FSRU and LNG carriers are of significant scale, they are not unique to the Port. Vessels of similar capacities regularly enter the Inner Harbour. In addition, vessels of larger scale, such as cruise ships, are also a less regular feature of the landscape. Lastly, there are

many land-based features in the Port precinct which are also of significant scale such as silos, stockpiles and other buildings.

As such, the project's visual impact is consistent with the existing landscape values. The impact can be further mitigated by ensuring all wharf facilities and/or lighting requirements conform to the Port Kembla Development Code through the use of preferred colours, materials and lighting requirements.

For the social assessment, the potentially positive, neutral and negative social impacts of the project were considered. Overall it was found the potential socio-economic benefits of the project , to both the local community and the broader state of NSW, outweighed the reasonably modest negative impacts of the project, especially after mitigation and management measures are applied.

It should be noted that the assessment for the local area and district area showed higher proportions of the population working in jobs such as manufacturing and construction than the regional area. These are precisely the types of roles which might benefit from the project's realisation.

While the overall strategic context of the project is presented in Section 3.1 of the EIS, it is perhaps worth noting the benefits highlighted by the various interest groups, corporations and individuals, many of whom are also local to the Port Kembla / Wollongong area, who made submissions in support of the project.

They highlighted the key benefits of:

- Energy security and diversity of supply
- Energy affordability
- Contribution to the competitiveness of existing local energy-intensive businesses and the corresponding retention of employment levels
- Regional economic diversity (a new industrial activity for the region)
- Port expansion and diversification
- Future regional investment attraction
- Overall economic growth and employment opportunities

In addition, the project's alignment with and/or contribution to specific local development plans, such as the Wollongong Economic Development Strategy 2013 – 2023 and the NSW Ports 30 Year Master Plan, was noted.

4.13.3 Long term benefits of project

During operation, the project is expected to support between 40 – 50 on-going roles. While this is a relatively modest project workforce, there will also be opportunities associated with key support functions such as catering, cleaning, waste management, painting and other maintenance works which could be sourced from the local area. In addition, AIE is keen to work with local skills development agencies, such as TAFE NSW and/or the University of Wollongong to design and deliver certification/qualification pathways to support the development of relevant skills in the area.

However, of potentially greater benefit to employment in the region, will be the availability of a local source of natural gas. Natural gas is used by a number of local manufacturing businesses, like BlueScope, Manildra, Bisalloy and others for heating and/or as a ingredient in the manufacturing process itself. These regional energy-intensive businesses are often large

employers. Figures from the Illawarra Business Chamber note there are around 15,000 jobs in the Illawarra region alone which rely on gas for their operations.

A local source of natural gas could provide these businesses with a more competitively priced input, as well as adding to the region's overall investment attractiveness for other industries which may also require natural gas for their operations and might otherwise look to other States and/or countries for their preferred location.

4.14 Greenhouse gas

4.14.1 Greenhouse gas emissions and climate change

While the consumption of natural gas may eventually be displaced by the consumption of non-fossil fuel alternatives, until such a time, natural gas provides consumers with a fossil fuel option which has a number of environmental benefits.

It's use produces almost half as much carbon dioxide per unit of energy as compared to coal, and indeed many other transportation and/or other widely used fossil fuel options. https://www.eia.gov/environment/emissions/co2_vol_mass.php

Burning natural gas does produce nitrogen oxides (NOx), but at lower levels than gasoline and diesel It also produces negligible amounts of sulfur, mercury, and particulates delivering improvements to air quality not otherwise measured by greenhouse gas emissions.

For these reasons you are seeing interest around the world in the possibility of using natural gas as a replacement for other transportation fuels (petroleum, diesel, marine oil) with LNG, as well as continued interest in the use of natural gas in the electricity sector.

Nevertheless, despite these benefits, natural gas is made up mostly of methane, which if accidentally released into the atmosphere is 25-30% more impactful, as a greenhouse gas, than carbon dioxide. However, the aim with transporting and consuming natural gas is to minimise any accidental leaks or emissions, as this is essentially wasting the fuel.

4.15 Coastal Hazards

4.15.1 Coastal hazards

The submissions note the project's proximity to the coastline and request that consideration be given to potential coastal hazards. In particular, information has been requested regarding the design measures required to address risks to life, infrastructure and the environment associated with a large coastal event in the near term and due to climate change impacts.

The Coastal Management Act 2016 (CM Act) provides for the integrated management of the coastal environment of New South Wales consistent with the principles of ecologically sustainable development, for the social, cultural and economic wellbeing of the people of the state.

Coastal hazards are defined in Section 4 (1) of the Act as:

a) beach erosion

b) shoreline recession

c) coastal lake or watercourse entrance instability

d) coastal inundation

e) coastal cliff or slope instability

f) tidal inundation

g) erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

Of the coastal hazards listed above, the proposed site of the PKGT is potentially exposed to beach erosion, shoreline recession, coastal inundation, tidal inundation and erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

Beach erosion and shoreline recession have the potential to undermine coastal assets, leading to risks to life, infrastructure and the environment. The PKGT is bounded to the west by the shoreline of the Inner Harbour and sits in close proximity to the open coast to the east of the site. In both cases, heavy duty shoreline protection will reduce the risks of erosion and shoreline recession to acceptable levels. In particular, the existing Coal Loader Seawall to the east of the site, has been designed to withstand major storm events over a design life significantly in excess of the proposed operational life of the PKGT. Similarly, the proposed berth face and adjacent rock revetment to the west will be designed to withstand propwash and vessel scour, tidal and flood flow currents, short period wind swells and long period wave energy which propagates through the entrance.

Inundation due high tides, low atmospheric pressure, flood events, wave setup and sea level rise has the potential to damage coastal assets, leading to risks to life, infrastructure and the environment. The PKGT will be designed such that all critical infrastructure and potentially hazardous materials will remain above super elevated water levels associated with coastal hazards (including consideration of run-up and overtopping due to wave action).

5. Conclusion

The Port Kembla Gas Terminal is considered to have a well-established strategic need and justification in that it responds to potential gas supply and price pressures in the east coast gas market and has been declared Critical State Significant Infrastructure by the NSW government.

Key issues raised in submissions were in relation to the level of detail and likely environmental consequences of the proposed dredging and disposal activities during construction and water quality impacts and safety risks during the operation of the FSRU.

A number of minor amendments to the project have been proposed to address issues raised in submissions and as part of the ongoing design and land acquisition activities being undertaken as part of the development of the project.

The key changes to the project include:

- Refined pipeline alignment and tie in facility to the EGP spurline.
- Selection of the preferred FSRU for the project.
- Refinement of the dredging and disposal methodology.
- Removal of the proposed landscape embankment on the eastern side of the Berth 101 site.

The proposed changes are considered to fall within the assessment parameters and achieve equivalent or improved environmental outcomes to those described in the original EIS. The revised location of the tie in facility will increase the distance between the gas pipeline and the nearest residential receivers, reducing the potential exposure to noise and dust during construction activities and safety risks during the operation of the pipeline.

Selection of the preferred FSRU uses the latest available technology and achieves improved environmental performance through consumption of 17% less fuel and improved dispersion for sea-water discharges. Further detailed water quality investigations have been undertaken and demonstrate that discharges from the Marine Growth Protection System comply with all relevant water quality objectives at the edge of a small mixing zone and are not expected to have a detrimental effect on water quality or marine ecology within the Inner or Outer Harbour of Port Kembla. The FSRU is also a more efficient with an ability to meet maximum gas send out by operating just two of its three processing trains, reducing emissions and safety risks and improving operational efficiencies resulting in reduced potential to operate under non-standard condition such as the need for cold venting or operating using MDO.

An Outline Dredge Environmental Management Plan has been prepared to provide further details on the likely sequencing and environmental management and monitoring requirements for dredge and sediment placement operations. The material transfer of sediments to the Outer Harbour disposal area has also been refined with a commitment to transfer between 50 and 90% of excavated material by barge, reducing heavy vehicle haulage on the local road network. Daily vehicle movements will continue to fall well within the capacity of the road network.

The proposed landscape embankment to the east of the proposed berthing infrastructure has also been removed from the project following feedback in a number of submissions.

A preliminary hazard analysis was carried out in accordance with planning guidelines for hazardous development adopted by the NSW Department of Environment and Planning including *Hazardous Industry Planning Advisory Paper No 6 Hazard Analysis* (2011a). The assessment found that risk to people or property in sensitive areas, residential areas or commercial areas in the area was very low and complied with the stringent risk thresholds. Risk

at adjacent industrial areas or open land were also assessed to be low given the low probability of a hazard event occurring.

The project has been designed and assessed with consideration to the matters for consideration under the EP&A Act, and is generally consistent with the principles of ecologically sustainable development. The economic benefits of the project are significant and wide reaching given the project has the capacity to deliver a new source of natural gas into the NSW and east coast gas market. The project is also consistent with the NSW gas Plan, the Illawarra Shoalhaven Regional Plan and the NSW Ports 30 year master plan. The biophysical, economic and social impacts associated with the project are generally limited and can be managed through adoption of environmental management measures as described in the EIS and this submissions report.

6. References

NSW Department of Planning and Environment 2017, Responding to Submissions, Draft Environmental Impact Guidance Series June 2017, https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/guideline-5-draft-responding-to-submissions-2017-06.ashx

Appendix A
Dredge management plan

Australian Industrial Energy

East Coast Gas Project

Outline Dredging Environmental Management Plan

February 2019

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Abbreviations

Abbreviation	Description
ACM	asbestos containing material
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AIE	Australian Industrial Energy
AMSA	Australian Maritime Safety Authority
ANZECC / ARMCANZ 2018	Australian and New Zealand Environment and Conservation Council / Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ASMP	Acid Sulphate Soil Management Plan
BaP(TEQ)	Benzo(a)pyrene Toxic Equivalence Quotient
CD	Chart Datum
CEMP	Construction Environmental Management Plan
CSSI	Critical State Significant Infrastructure
DEMP	Dredge Environmental Management Plan
DoEE	Department of Energy and Environment
DotEE	The Commonwealth Department of Environment and Energy
EGP	NSW Eastern Gas Pipeline
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act, 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
FM Act	Fisheries Management Act 1994
FSRU	Floating storage and regasification unit
LNG	liquefied natural gas
LNGCs	LNG carrier vessels
MFO	Marine Fauna Observer
MNES	Matters of National Environmental Significance
NAGD	National Assessment Guidelines for Dredging
NSW	New South Wales
NSW EPA	NSW Environmental Protection Authority
ODEMP	Outline Dredge Environmental Management Plan
PAHs	polycyclic aromatic hydrocarbons
PASS	Potential acid sulphate soils

Abbreviation	Description
PJ	Petajoules
POEO Act	Protection of the Environmental Operation Act 1997
SOPEP	Shipboard Oil Pollution Energy Plan
SSD	State Significant Development
SSI	State Significant Infrastructure
TBT	Tributyltin
TSS	Total Suspended Solids
WQMP	Waste Quality Management Program

1. Project Background

Australian Industrial Energy (AIE) proposes to develop the Port Kembla Gas Terminal (the Project). The Project involves the development of a liquefied natural gas (LNG) import terminal at Port Kembla, south of Wollongong in New South Wales (NSW). The Project will be the first of its kind in NSW and provide a simple and flexible solution to the state's gas supply challenges.

LNG will be sourced from worldwide suppliers and transported by LNG carriers to the Port Kembla Gas Terminal. The LNG will then be re-gasified for input into the NSW gas transmission network. At present it is envisaged that an LNG shipment will be required every two to three weeks to provide for an annual supply of up to 100 petajoules of gas per year which represents more than 70% of the NSW's gas needs. Supply could be increased further to around 140 to 150 petajoules per year through a slight increase in LNG delivery schedules and pipeline upgrades. In addition, the storage capacity of the Floating Storage and Regasification Unit (FSRU) equates to about 4 petajoules of gas, or around 10 to 12 days of natural gas storage for the whole of NSW in case of interstate supply disruption.

The project involves four key components:

- LNG carrier vessels (LNGCs) – of the hundreds currently in operation transporting LNG from production facilities to demand centres globally.
- Floating storage and regasification unit (FSRU) – a vessel which will be moored at Berth 101 on the eastern side of the Inner Harbour at Port Kembla. The FSRU contains all of the equipment necessary to safely store, regasify and dispatch the gas in the NSW distribution network.
- Wharf and berth facilities – including offloading arms which transfer gas from the FSRU into the pipeline, quay wall and mooring furniture.
- Gas pipeline – a short underground gas pipeline connection from Berth 101 to the existing east coast gas transmission network at Cringila.

The project has been declared critical state significant infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

2. Purpose and Scope

2.1 Introduction

This Outline Dredge Environmental Management Plan (ODEMP) has been prepared to document key management measures to be adhered to during the excavation and dredging works. It is envisaged that a more detailed DEMP will be prepared by the successful contractor prior to commencement of any works. The commitments outlined in the ODEMP will be adhered to in the DEMP, as well as any management measures subsequently agreed with government authorities and stakeholders.

It is intended that the final DEMP will ensure that the proposed dredging and reclamation works are completed in accordance with the relevant approval conditions and licenses.

The scope of this ODEMP is limited to the footprint detailed in Figure 1 and Figure 2, adjacent to Berth 101 and the disposal area in the Outer Harbour of Port Kembla, respectively.

The objective of this ODEMP is to provide a description of potential environmental impacts associated with the proposed dredging and relocation works required for the Project and to outline the mitigation and management framework that will be adopted for the Project.

2.2 Structure of the ODEMP

The ODEMP has been prepared in accordance with the following acts and government publications:

- National Assessment Guidelines for Dredging 2009 (NAGD)
- NSW Water Quality Guidelines
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC / ARMCANZ 2018)
- Environment Protection (Sea Dumping) Act 1981
- Commonwealth Marine Safety (domestic Commercial Vessel) National Law Act 2012
- Environmental Planning and Assessment Act 1979
- Protection of the Environment Operations Act 1997
- Ports and Marine Administration Act 1995
- Marine Safety Act 1998
- Fisheries Management Act 1994

This ODEMP encompasses the following:

- outline description of the proposed dredging and disposal works
- listing of the legislative requirements triggered as a result of the works
- description of the probable construction methodology to complete the works
- explanation of the existing environment that the works will impact
- Identification of the potential environmental and social impacts and highlights practical mitigation measures
- Provision of a preliminary monitoring program to be developed and ultimately adopted during the construction phase (including pre and post monitoring as required)

2.3 Requirements of the DEMP

It is envisaged that a more detailed DEMP will be prepared by the successful contractor prior to commencement of any works. The commitments outlined in the ODEMP will be adhered to in the DEMP, as well as any management measures subsequently agreed with government authorities and stakeholders.

It is intended that the final DEMP will ensure that the proposed dredging and reclamation works are completed in accordance with the relevant approval conditions and licenses.

The existing Project Approval relating to the Outer Harbour Development stipulated a number of requirements for the preparation of a Dredging and Reclamation Environmental Management Plan in clause C35. Given the common activities between both projects, it is proposed to prepare the DEMP in accordance with the requirements reproduced (as relevant) below:

Prior to the commencement of dredging, reclamation and emplacement works, or each phase of works, a Dredging and Reclamation Environmental Management Plan (including a Construction Marine Blasting Management Plan) shall be prepared in consultation with relevant government agencies. The Plan shall outline environmental management practices and procedures to be followed during dredging, reclamation and emplacement works to minimise human health and ecological risks. The Plan shall be consistent with the Department's Guideline for the Preparation of Environmental Management Plans (DIPNR 2004) and shall include, but not necessarily be limited to:

a) *description of all activities to be undertaken during dredging, reclamation and emplacement works, including proposed dredging methods, maps of dredge areas, disposal areas, containment structures and depths for each stage and locations;*

b) *statutory and other obligations that must be fulfilled during dredging, reclamation and emplacement works and associated activities, including all approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;*

c) *a description of the roles and responsibilities for all relevant employees involved in the dredging, reclamation and emplacement works;*

d) *environmental performance criteria for dredging, reclamation and emplacement works,, including turbidity levels; and*

e) *details of how the environmental performance of the dredging, reclamation and emplacement works will be managed and monitored and what actions will be taken to address identified adverse environmental impacts. In particular, the following environmental performance issues shall be addressed in the Plan:*

f) *Prior to the commencement of dredging, reclamation and emplacement works, or each phase of works, a Dredging and Reclamation Environmental Management Plan shall be prepared in consultation with relevant government agencies. The Plan shall outline environmental management practices and procedures to be followed during dredging, reclamation and emplacement works to minimise human health and ecological risks. The Plan shall be consistent with the Department's Guideline for the Preparation of Environmental Management Plans (DIPNR 2004) and shall include, but not necessarily be limited to:*

    i. *details of measures that will be employed to manage water quality, dredged materials and sediment impacts during dredging, reclamation and emplacement works,, including details of turbidity controls, barge movement management, and emplacement areas;*

ii. *a Water Quality Monitoring Program(s) as required by conditions C29 and C30;*

iii. *details of environmental controls to be retained after the completion of works which are likely to cause pollution of waters until the turbidity of the water within the systems return to background levels;*

iv. *measures to monitor and manage odours and dust emissions, including timeframes that barges would store dredged sediment and rock material before placing in reclamation areas;*

v. *measures to monitor and minimise soil erosion and the discharge of sediment and other pollutants to lands and/ or waters;*

vi. *adoption of best noise practice in the selection, operation and maintenance of dredging equipment and methods to evaluate and monitor ongoing noise performance during dredging, reclamation and emplacement works;*

vii. *measures to monitor and control odour and air emissions during handling of sediments; and*

viii. *monitoring, inspections, and contingency actions for risk factors (eg failure of the silt curtains or breakage of dredging pipelines) including a silt curtain monitoring program.*

The Plan shall be submitted for the approval of the Director General no later than one month prior to the commencement of dredging, reclamation and emplacement works, or within such period otherwise agreed by the Director General. The Plan may be prepared in stages, however, each stage shall not commence until written approval has been received from the Director General.

2.4 Limitations

This report has been prepared by GHD for Australian Industrial Energy and may only be used and relied on by Australian Industrial Energy for the purpose agreed between GHD and the Australian Industrial Energy as set out in this report.

GHD otherwise disclaims responsibility to any person other than Australian Industrial Energy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Australian Industrial Energy and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

3. Project Description

3.1 Overview of the proposed works

As part of the construction works for the new wharf and berth facilities, excavation, capital dredging and relocation of the retrieved material is required. GHD has been engaged to prepare this ODEMP for the proposed excavation and capital dredging works for the Project. The works will involve onshore and offshore components and will result in the relocation of around 720,000 cubic metres of excavated and dredged material.

The proposed action covered by this ODEMP includes two key components:

- Excavation and capital dredging to be carried out by a long reach excavator (situated on land) and backhoe dredger (over water), to a design level of approximately -14.7 metres CD (Chart Datum) (excluding allowances for tolerances and overdredging)
- The relocation of the excavated and dredged material Outer Harbour disposal area using split hoppers, barges and landside transport to a level of approximately +4.0 metres CD.

The Project footprint includes both the areas of direct disturbance adjacent to the Berth 101 and the relocation area. The potential indirect area of disturbance includes the predicted extent of turbid plumes and material migration from the Project footprint boundary.

3.2 Location of the works

3.2.1 Regional context

The Project is located at Port Kembla within the Illawarra region of NSW, about 80 kilometres south of Sydney. Port Kembla is characterised by the existing import and export terminal and multiple other business, cargo, logistics, bulk goods and heavy industrial facilities in the vicinity.

Port Kembla was first established in 1883 to facilitate the export of coal. Since then it has had a continuous history as a working port, with the establishment of Port Kembla's Outer Harbour more than a century ago. The port is now divided into an Inner Harbour and Outer Harbour, including a deep-water shipping channel to facilitate the arrival and departure of large carriers and cargo ships. The facilities currently includes 18 import and export berths and six major independently operated terminals.

Port Kembla operates 24 hours per day, 7 days per week and is a key infrastructure asset for NSW and an economic driver for the Illawarra region.

3.2.2 Local context

The Project will be predominantly located within land zoned for dedicated port and industrial uses. Berth and wharf facilities and the FSRU would be situated at Berth 101 within the Inner Harbour, while the gas pipeline would extend around the periphery of port operations from Berth 101 to a tie-in point at Cringila.

Berth 101 currently forms part of the Port Kembla Coal Terminal site and was most recently utilised as an off-loading wharf for materials handling equipment. The berth does not currently have any regular use with the majority of coal exports operating out of Berth 102 located to the north of Berth 101.

The Cringila gas transfer station owned and operated by Jemena provides a connection to the NSW Eastern Gas Pipeline (EGP). The EGP is a 797 kilometre long gas pipeline with a nameplate capacity in excess of 350 terajoules per day. The pipeline supplies gas to major gas

markets in Victoria, Wollongong and Sydney as well as regional NSW and the Australian Capital Territory (ACT).

3.3 Local and regional context

3.3.1 Need for project

The NSW Gas Plan notes more than a million NSW households use gas for everyday uses like cooking or heating and around 33,000 NSW businesses and 500 heavy industrial operations rely heavily on natural gas for their operations. These businesses are estimated to support over 300,000 jobs across NSW. In addition, over 10% of NSW's current electricity generation capacity is gas powered, with a number of proposed expansions already well advanced in the planning process.

NSW currently imports more than 95% of the natural gas it uses, with the majority of supplies coming as interstate supplies from Victoria and South Australia. In recent years, gas supplies to the Australia east coast market have tightened, resulting in increased prices for both industrial and domestic users. Several recent economic studies, including from the Australian Energy Market Operator (AEMO) and EnergyQuest have predicted significant future gas shortfalls for NSW by 2022.

The Project provides an immediate solution to address predicted gas shortages and will be of considerable economic benefit to both the Illawarra region and NSW. The Project will introduce a new source of competitively priced gas to the market, helping to put downward pressure on prices and improving overall gas security for NSW. With the potential to supply approximately 100 petajoules (PJ) of natural gas per annum, the single terminal location in Port Kembla could meet in excess of 70% of NSW's total natural gas needs.

In August 2018, the project was declared Critical State Significant Infrastructure, and thus essential to NSW on social, environmental and/or economic grounds, in accordance with section 5.13 of the Environmental Planning and Assessment Act 1979 and Schedule 5 of the State Environmental Planning Policy (State and Regional Development) 2011.

3.3.2 Social and economic

Construction of the Project is predicted to generate social and economic benefits directly through capital investment and job creation, and indirectly through industrial and supply chain effects such as the supply of goods and services to the construction workforce. It found that construction of the gas pipeline could lead to some temporary amenity impacts at nearby residences such as noise and dust from pipeline construction activities and equipment as well as additional road traffic.

Operation of the Project would also generate social and economic benefits through job creation and the potential local supply of gas to industrial users that could support in the order of 15,000 gas dependent jobs in the region and over 300,000 jobs across NSW. It found that the ongoing operation of the Project would not have any material impacts on amenity of nearby residences or the broader community.

A number of management measures are proposed to enhance the social and economic benefits and mitigate the potential social and economic impacts of the Project. The proposed measures included development and implementation of continued stakeholder engagement, especially during construction. To provide an information and feedback mechanism to residents, and the implementation of noise and vibration, air quality and traffic management plans for management of those amenity issues during construction.

The Project would involve a capital investment in the order of $200–$250 million. Construction of the Project is expected to employ about 150 workers at its peak while operation is expected to create about 40–50 ongoing roles.

Development of a contracting and procurement strategy, which seeks to maximise local content for both construction and operation, will support local employment and business opportunities. During operation the Project will seek to work with interested local parties to support new qualification/certification pathways for some of the specialised roles on the FSRU, which is unique to Australia at this stage and is both a marine vessel and a regasification plant.

3.3.3 Built Environment

The site of the Project and the surrounding environment is largely characterised by existing port and industrial development, providing the majority of the infrastructure required for the Project. Including the nearby Cringila gas transfer station which provides a connection to the NSW EGP. The EGP supplies gas to major gas markets in Victoria, Wollongong and Sydney as well as regional NSW and the ACT.

Further, the vast majority of the Project site has been heavily modified by historical development including large-scale reclamation and evidence of existing contamination of land and water. The potential impacts of the Project on the environment and landscape have been considered in detail in the Port Kembla Gas Terminal Environmental Impact Statement (GHD and AIE, 2018) and are summarised in Section 6.

4. Legislative Requirements and Guidelines

The following sections provide a brief overview of the key Commonwealth and State legislation, guidelines.

4.1 Project environmental principles and obligation

All personnel working on the construction of the Project have the following general obligations with regards to environmental management:

- Comply with all relevant International Conventions, Commonwealth and State legislative and regulatory requirements, policies and guidelines.
- Comply with the terms of the Infrastructure Approval and the requirements of the ODEMP and all relevant licences, approvals and permits.
- Minimise pollution of land, air and water.
- Minimise air and noise impacts to sensitive receivers.
- preserve the natural and cultural heritage environment
- Be a good neighbour to surrounding land users.
- Maintain equipment in proper working order.
- Adhere to all relevant communication and training requirements.

Copies of relevant licences, approvals and permits will be held on-site and in relevant Project offices.

4.2 Commonwealth guidelines

4.2.1 National Assessment Guidelines for Dredging (Commonwealth of Australia 2009)

The NAGD provides a framework for characterising the dredge material and the pathway for permitting for ocean disposal of dredge material. The development of this guideline has been guided by the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention) and the more recent 1996 Protocol to the London Convention, to which Australia is a signatory. These agreements aim to prevent pollution of the sea from the disposal of wastes or other matter, including dredged material.

The NAGD outlines the three key Commonwealth Acts related to the regulation of dredging and relocation of dredged material, which are:

- Protection *Environmental Protection and Biodiversity Conservation Act 1999*
- *Great Barrier Reef Marine Park Act 1975*
- *Environment (Sea Dumping) Act 1981*

A number of regulations and guidelines assist in identifying and assessing the potential impacts of the Project on matters protected by these Acts. The *Great Barrier Reef Marine Park Act 1975* is not applicable as the Project is not within the jurisdiction of the Great Barrier Reef Marine Park Authority.

4.2.2 Australian Ballast Water Management Requirements (Commonwealth Government of Australia 2017, Version 7)

Australia has ballast water management requirements to prevent new marine pests arriving in Australia as a result of ballast water discharge.

Vessels are required to manage their ballast water in accordance with the Australian ballast water management requirements. This document provides guidance on how vessel operators should manage ballast water when operating within Australian seas in order to comply with the Biosecurity Act 2015.

4.2.3 National Biofouling Management Guidelines for Non-Trading Vessels (Commonwealth Government of Australia 2009, Version 1.0)

Marine pests can be introduced into the environment via biofouling on vessels hulls, ropes, anchors and other equipment. To avoid the introduction of marine pest to Port Kembla, vessels are to follow the National Biofouling Management Guidelines for Non-Trading Vessels.

4.2.4 Anti-Fouling and In-Water Cleaning Guidelines (Commonwealth Government of Australia 2015)

If owners/operators of vessels wish to in-water clean, they are to follow the Anti-Fouling and In-Water Cleaning Guidelines. These guidelines need to be followed as the application, maintenance and removal of anti-fouling coasting can result in contamination of the aquatic environment. In additions, accidental reals of biofouling organisms during cleaning can lead to the spread of invasive aquatic species.

4.2.5 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC / ARMCANZ 2018)

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality advise on activities that may affect fresh and/or marine water quality. These guidelines provide criteria for establishing levels of ecological protection for marine areas based on existing levels of disturbance, but also recommend deferring to locally developed consultative guidelines where they exist and are relevant.

4.3 Commonwealth legislation

4.3.1.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act*)*

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as matters of national environmental significance (MNES). The Act establishes a process for the assessment and approval of the proposed actions when there is potential for significant impact to MNES.

Under the EPBC Act a referral is required to the Commonwealth Minister for Environment and Energy for proposals that have the potential to significantly impact on MNES or the environment of any Commonwealth land.

Considerations of potential impacts upon listed threatened species and communities and any other MNES potentially impacted by the project has been undertaken as part of the GHD's Environmental Impact Statement (EIS).

The EIS found that the Project is not considered to have potential to have a signification impact upon any listed matters of national environmental significance including listed threatened

species and communities. A referral under the EPBC Act is therefore not required for the Project.

4.3.2 Environmental Protection (Sea Dumping) Act 1981

The Environment Protection (Sea Dumping) Act 1981 requires permitting for the disposal of wastes or any other matter (e.g. dredge material) within Commonwealth waters (unless for prescribed purposes such as reclamation). In Australia, ocean disposal of dredged material within and outside of State and Territory waters is regulated by the Commonwealth Department of the Environment and Energy (DotEE).

The Project includes placement of up to 720,000 cubic metres of excavated and dredged material within the Outer Harbour of Port Kembla. The outer harbour has sufficient capacity to receive all dredged material generated by the Project. There will be no requirement for disposal of material within Commonwealth waters and a sea dumping permit will therefore not be required.

4.3.3 Commonwealth Marine Safety (domestic Commercial Vessel) National Law Act 2012

The Commonwealth Marine Safety (Domestic Commercial Vessel) National Law Act 2012 creates a national cooperative scheme between the Commonwealth, States and Territories to provide a single framework for safe operation, design, construction and equipping of domestic commercial vessels. The provisions of the law are enacted in NSW through the Marine Safety Act 1998 as discussed in Section 4.4.5. The law provides that the Australian Maritime Safety Authority established under the Australian Maritime Safety Authority Act 1990 is the National Marine Safety Regulator. Its functions are defined in section 10 of the law and include developing national standards for marine safety and undertaking monitoring and enforcement.

4.3.4 Other commonwealth legislation, regulation and guidelines

Other applicable Commonwealth legislation and guidelines include, but are not limited to, the following Acts, Regulations (and relevant amendments):

- Protection of the Seas (Prevention of Pollution from Ships) Act 1983
- Biosecurity Act (2015)
- Biosecurity Regulations (2016)
- National Water Quality Management Strategy (Commonwealth Government of Australia 1992)
- Australian National Guidelines for Whale and Dolphin Watching 2017
- Environment Protection and Biodiversity Conservation Regulations 2000
- Dangerous Substances Act 2004
- Maritime Transport and Offshore Facilities Security Act 2003
- Maritime Transport and Offshore Facilities Security Regulations 2003
- National Environment Protection Council Act 1994
- National Environmental Protection Measures (Implementation) Act 1998
- Australian Maritime Safety Authority Act 1990
- Seas and Submerged Lands Act 1973

- National Strategy for Ecologically Sustainable Development (Commonwealth Government of Australia 1992b)
- National Water Quality Management Strategy (Commonwealth Government of Australia 1992c)
- Intergovernmental Agreement on the Environment (Commonwealth Government of Australia 1992a)
- National Strategy for Conservation of Australia's Biological Diversity (Commonwealth of Australia 1996)

4.4 State legislation and guidelines

The key NSW legislation and regulations relevant to construction:

- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Protection of the Environmental Operations Act 1997 (POEO Act)
- Ports and Marine Administration Act 1995
- NSW water quality guidelines
- Fisheries Management Act 1994
- Biosecurity Act 2015
- Coastal Management Act 2016

4.4.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The key legislation in NSW for regulation of the use of land is the EP&A Act and the Environmental Planning and Assessment Regulation 2000. The EP&A Act institutes a system for environmental planning and assessment, including approvals and environmental impact assessment requirements for proposed developments. The EP&A Act contains three key parts that impose requirements for planning approval. These include:

- Part 4, which provides for the assessment and approval of 'development' that requires development consent from the local council, a regional planning panel or the NSW government for development which is classed as State Significant Development (SSD).
- Part 5 (Division 5.1), which provides for the environmental assessment of 'activities' that do not require approval or development consent under Part 4.
- Part 5 (Division 5.2), which provides for control of State Significant Infrastructure (SSI) including CSSI.

The need or otherwise for consent for a new development application is set out in environmental planning instruments as described below.

The Project has been declared CSSI in accordance with Section 5.13 of the EP&A Act. The Minister for Planning is the consent authority and the project is to be assessed in accordance with the provisions of Division 5.2 of the EP&A Act.

4.4.2 Protection of the Environmental Operations Act 1997

The objectives of the POEO Act are to protect, restore and enhance the quality of the environment, in recognition of the need to maintain ecologically sustainable development.

The POEO Act provides for an integrated system of licensing and contains a core list of activities requiring an environment protection licence (EPL) from the NSW Environmental

Protection Authority (NSW EPA). These activities are called ‘scheduled activities’ and are listed in Schedule 1 of the POEO Act.

Clause 19 of Schedule 1 defines extractive industries that are considered scheduled activities and includes water based extraction activities that involve the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials. The Project will involve excavation and dredging of around 600,000 cubic metres of extractive materials. Allowing for typical bulking factors, this volume would equate to about 720,000 cubic metres. The excavation and dredging will therefore constitute a scheduled activity requiring an EPL.

Clause 9 of Schedule 1 applies to chemical storage facilities and includes developments with capacity to store more than 200 tonnes of liquefied gases. The FSRU will be permanently moored at Berth 101 and will therefore likely constitute a scheduled activity requiring an EPL.

In accordance with Section 5.24 of the EP&A Act, an EPL cannot be refused if it is necessary for carrying out an approved CSSI project and is consistent with the development consent.

The POEO Act also defines a number of matters in relation to waste management including the definition of waste, management and licensing requirements and waste related offences.

4.4.3 Ports and Marine Administration Act 1995

The Ports and Maritime Administration Act 1995 (Ports and Maritime Act) regulates the operation of ports in NSW across a range of matters including commercial operation and port charges that apply, management of port infrastructure, port safety and the functions of port corporations as well as NSW Roads and Maritime Services in relation to port operations.

The Ports and Maritime Act provides broad powers to port operators to regulate activities that may pose a risk to the safety or security of the port including but not limited to the movement of vehicles and the loading/unloading of material.

NSW Ports is the port operator at Port Kembla.

4.4.4 NSW water quality guidelines

The Marine Water Quality Objectives for NSW Ocean Waters – South Coast (DEC 2005) specify the various environmental values and quality objectives to guide the management of ocean waters of NSW. These values and objectives are presented in Section 4 of the guidelines along with the applicable environmental quality criteria.

4.4.5 Marine Safety Act 1998

The Marine Safety Act 1998 aims to ensure the safe and responsible operation of vessels in ports and other waterways so as to protect the safety and amenity of other users of those waters and occupiers of adjoining land. The Marine Safety Act provides that the Commonwealth Marine Safety (Domestic Commercial Vessel) National Law Act 2012 apply as a law of the state.

Part 2 and Part 3 of the Marine Safety Act provide for the making of regulations with regard to the safe operation of vessels and assign powers to authorised officers to give directions. Part 4 provides for the granting and conditioning of marine safety licences for registering and operating vessels. Part 5 defines requirements for vessels including requirements for vessel registration. Part 6 defines requirements for pilotage including a requirement that pilotage is compulsory in ports defined as pilotage ports. Part 7 relates to the appointment and functions of harbour masters while Part 8 deals with compliance and investigation of marine safety matters.

Vessels operated as part of the Project would be subject to the provisions of the Marine Safety Act including requirements to obtain marine safety licenses. Pilotage would also be compulsory under Part 7 of the Marine Safety Act as Port Kembla is defined as a pilotage port.

4.4.6 Fisheries Management Act 1994

The objectives of the Fisheries Management Act 1994 (FM Act) are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. Part 7 of the FM Act requires a permit for a number of activities, including those involving dredging and reclamation work and those involving harm to marine vegetation.

In accordance with Section 5.23 of the EP&A Act, a permit under section 201, 205 or 219 of the FM Act is not required for approved CSSI.

The potential impacts associated with dredging and disposal of sediments upon fisheries and marine vegetation has been investigated as part of the EIS. There is not anticipated to be any significant detrimental impacts to fisheries resources as a result of the project.

4.4.7 Coastal Management Act 2016

The Costal Management Act sets out the legislative framework for coastal management. The Coastal Management Act 2016 replaces the Coastal Protection Act 1979 and establishes a new strategic framework and objectives for managing coastal issues in NSW. The new Act promotes strategic and integrated management, use and development of the coast for the social, cultural and economic wellbeing of the people of NSW.

4.4.8 Other state legislation and guidelines

Other applicable State legislation and guidelines include, but are not limited to, the following Acts, Regulations (and relevant amendments):

- Commercial Vessels Act 2012
- Marine Pollution Act 2012
- State Environmental Planning Policy No. 14 – Coastal Wetlands
- State Environmental Planning Policy No. 55 – Remediation of Land
- State Environmental Planning Policy No. 62 – Sustainable Aquaculture
- State Environmental Planning Policy No. 71 – Coastal Protection
- State Environmental Planning Policy (Three Ports) 2013
- Contaminated Land Management Act 1997
- Environmentally Hazardous Chemicals Act 1985
- Ports and Marine Administration Act 1995
- Ports and Maritime Administration Regulation 2012
- Protection of the Environment Administration Act 1991
- POEO Act including Section 55
- Crown Lands Act 1989
- Heritage Act 1977
- National Parks and Wildlife Act 1974
- Threatened Species Conservation Act 1995 (TSC Act) (repealed by the Biodiversity Conservation Act 2016, in force from 25 August 2017)

- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations Amendment (scheduled activities) regulation 2008
- Maritime Services Acts 1935

5. Dredging Methodology

It is estimated that approximately 600,000 cubic metres of material would be excavated and dredged. Allowing for bulking factors, this volume would equate to approximately 720,000 cubic metres of material that requires disposal. These works will be carried out using mechanical removal (i.e. not hydraulic removal) by a long reach excavator and backhoe dredger.

5.1 Project location

5.1.1 Excavation, dredging and Berth 101 temporary stockpile area

The excavation and dredge area component is located adjacent to the entrance to the Inner Harbour and includes part of the existing Berth 101. The footprint area is approximately 8 hectares and detailed in Figure 1.

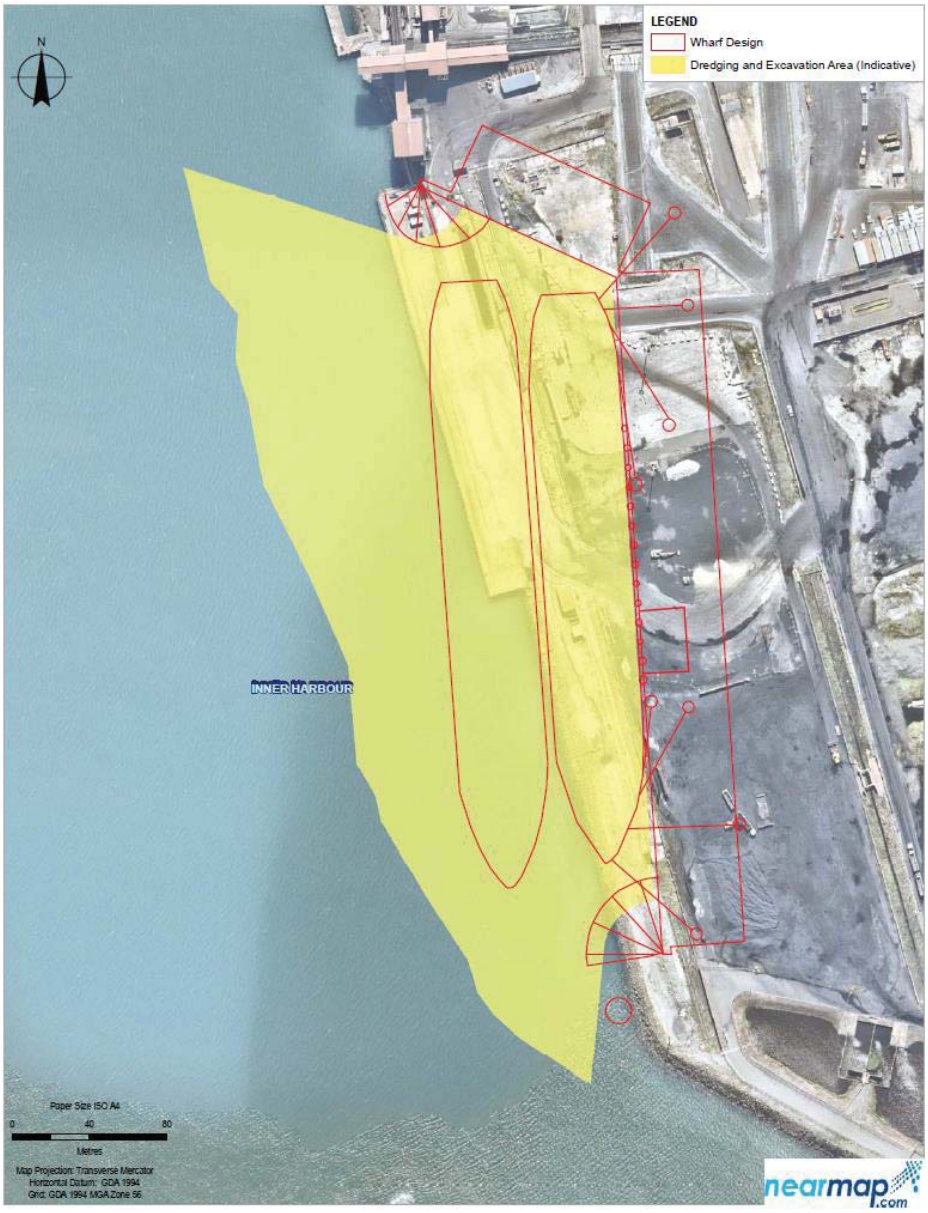

Figure 1 Excavation and dredging area

5.1.2 Excavated and dredged material relocation area

The dredged material will be relocated to the Outer Harbour disposal area (Figure 2), approximately 2 kilometres south-west of the Project area. The excavated and dredged material relocation area is located within the Outer Harbour of Port Kembla, covering an area of approximately 17 hectares. The disposal area is mostly within an area marked for future development of the Outer Harbour by NSW Ports in its 30 Year Master Plan (NSW Ports 2015).

Figure 2 Disposal and stockpile area

5.2 Plant selection

Indicative plant required for the excavation, dredging and disposal is shown in Table 1.

Table 1 Indicative Plant

Activity	Plant	Quantity
Excavation	Long Reach excavator	1
	Loader	1
	Dozer	1
	Excavator	3
	Haul truck (32 t)	10
Dredging	Backhoe dredger	1
	Survey crew/boat	1
	Tug boats	2
	Split hopper barges	2
	Spudded barge	1
Disposal	Long reach excavator	1
	Loader	1
	Dozer	1
	Dump truck (50 t)	2

5.3 Dredging, excavation and disposal methodology

5.3.1 Overview

The overall strategy for handling of each material type is presented below with further detail provided in Sections 5.3.2 to 5.3.9:

- Demolition materials, hardstand and fill material will be primarily used for bund and groyne construction (with a portion set aside for covering the proposed tie rods behind the berth face).
- Contaminated silts and harbour muds will be placed at depth within the emplacement area to be capped by clay
- Clay materials will be primarily placed in areas available below RL-3m
- Sands will be primarily placed in areas from RL-3 to +4m

Figure 3 and Figure 4 show indicative staging diagrams for construction of the proposed Inner Harbour berth and Outer Harbour bunds.

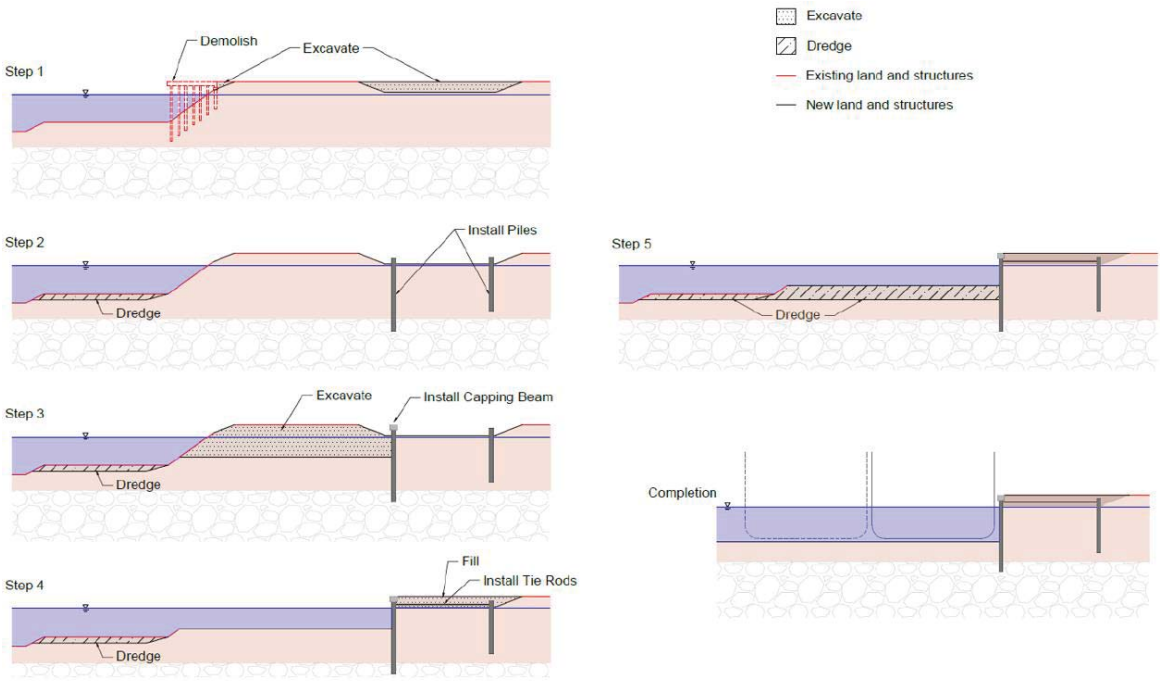

Figure 3 Staging of berth dredging and construction

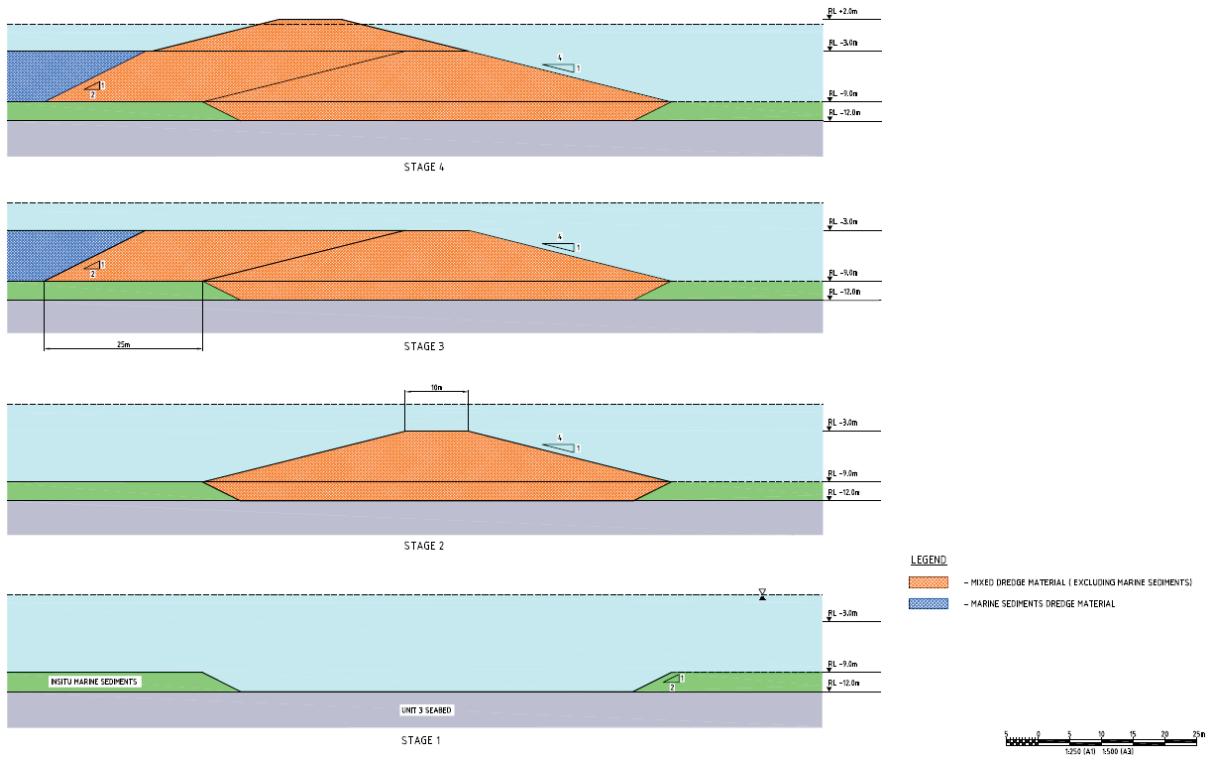

Figure 4 Staging of Outer Harbour bunds

5.3.2 Surveying

Topographical and hydrographic surveys will be undertaken, including pre-dredge and post-dredge surveys covering the dredge area, sailing routes and disposal areas. Surveys to be carried out using a Multi Beam Echo Sounder system (or equivalent) capable of achieving the required accuracy, precision, bottom coverage and object detection.

5.3.3 Installation of silt curtains

Silt curtains will be installed prior to commencement of the dredging works in order to minimise the spread of any sediments entrained within the water column during dredging and disposal operations.

Silt curtains are available in a range of designs and would be provided by the successful Contractor. It is envisaged that the silt curtain would comprise a geocomposite material consisting of a non-woven geotextile sewn to a woven geotextile, which would provide the required filtering capacity and rigidity/durability respectively. Vessel access would be via gated or overlapped curtains and / or through installation of a bubble curtain, which would provide a barrier to currents and suspended sediments without limiting vessel access.

The top of the curtain would be supported by a floating boom, whilst the lower portion of the curtain would be anchored or weighted with appropriate ballasting (eg. bars or chains) to ensure that the full length of the curtain is maintained at all times. The curtain would be anchored or fixed to existing structures as necessary.

Sea state and water conditions at Port Kembla Outer Harbour vary according to prevailing weather and vessel traffic. Generally, conditions are comparable with ‘open water’ conditions and the calibre of silt curtain and turbidity controls are to be designed and manufactured accordingly to best withstand the conditions.

Anchoring of the silt curtains may require input from the Port Authority of NSW and NSW Ports to determine the level of and requirement for navigation and special markers to alert vessels operating in the Port area of the presence of the marine hazard.

An overlapping curtain gate or bubble curtain entrance gate will be maintained for barges to enter and exit the excavation and dredging area. Bubble curtains allow movement of equipment over the barrier while minimising migration of sediment and other suspended matter beyond the immediate works zone by redirecting currents which may otherwise carry suspended sediment beyond the works zone.

Figure 5 Example of a silt curtain surrounding a dredging operation

5.3.4 Installation of turbidity monitoring equipment

A Water Quality Monitoring Program (WQMP) will be developed and implemented to assess the quality of water within zone of impact and nearby management zones ensuring that construction works do not cause exceedance of the marine water quality criterion of background plus 50 mg/L of suspended sediment, in accordance with recent Environmental Protection Licences (EPL) for similar activities within Port Kembla such as the Berth 103 Stage 2 Dredging & Spoil Disposal EPL20563).

Although subject to liaison with the relevant government agencies, port stakeholders and successful Contractor, it is envisaged that continuous turbidity monitoring will be undertaken using a series of at least four monitoring buoys to provide impact and background data (turbidity

(NTU), pH, temperature). Monitoring locations will be selected based on appropriate near field impact sites and appropriate background locations. Consideration will be given to the existing long term water quality monitoring program implemented within Port Kembla.

Consideration will be given to the integration of the proposed monitoring activities with the locations, parameters and reporting of the existing and previous monitoring programs. This is expected to be of benefit to both programs.

Prior to commencement of the dredging works, buoys will be deployed for an agreed period of time to confirm background conditions in the vicinity of the monitoring points.

Data will be logged and transmitted to an onshore recording station where it will be processed to allow automated comparison of averaged turbidity levels to a series of trigger values (typically termed green, amber, purple and red trigger levels).

Daily visual observations will be undertaken and documented during dredging operations to monitor dredge plumes and the potential release of oil or grease.

Collection of water samples and laboratory analysis for an agreed set of contaminants will be undertaken on a weekly basis, or as required, during dredging operations and compared to trigger levels for relevant management actions. Interim trigger values and response actions will be set up to the limits outlined in Table 2.

Table 2 Relevant water quality criteria

Water quality parameter	ANZECC/ARMCANZ Guidelines (2000)	NSW water quality objective
Aquatic ecosystems		
Toxicants (ANZECC / ARMCANZ Guideline trigger values are at the 95% protection level)		
Cadmium (Cd)	5.5 µg/L	Not listed
Chromium (Cr)	4.4 µg/L	Not listed
Copper (Cu)	1.3 µg/L	<1.3 µg/L
Nickel (Ni)	70 µg/L	Not listed
Lead (Pb)	4.4 µg/L	<4.4 µg/L
Zinc (Zn)	15 µg/L	<15 µg/L
Mercury (Hg) (inorganic)	0.4 µg/L	Not listed
Tributyltin	0.006 µg/L Sn	Not listed

The WQMP would include regular reporting, evaluation and revision where required to ensure the project objectives and approval conditions are achieved.

In order to allow correlation of readily measured NTU to limits expected to be nominated in TSS, a review of the NTU-TSS correlation will be undertaken. Previous EPLs for similar dredging activities within the Inner Harbour have commenced with a starting correlation of 2 NTU equal to 1 mg/l TSS. Through discussion with NSW Ports, it is understood that this correlation has been refined during monitoring undertaken for previous dredging projects within the Inner Harbour. Given the sensitivity of such correlations to varying material types, it is proposed to adopt the previously developed correlations as a starting point, which will be reviewed and adjusted following commencement of the works.

A series of trigger values and accompanying management actions will be developed and agreed between the Contractor, the relevant government agencies, and port stakeholders. When exceeded, an alarm would be triggered, automated email and SMS alerts sent and agreed the procedures implemented. Such procedures are expected to include:

- Inspection and repair of equipment associated with dredging silt curtains, bubble curtains, bunding etc;
- Vary the dredging technique including layer thickness, angle of retrieval, bucket type (environmental clamshell or open bucket etc) or fill ratio.
- Vary the location of the dredging.
- Vary disposal operations, including speed of barge during disposal, location of disposal.
- Time dredging and disposal operations to coincide with favourable tides.
- Review design/placement of the curtain;
- Deployment of an additional turbidity curtain around the extent of the turbidity plume;
- Reinstate or fix curtain;
- Additional turbidity monitoring using hand-held instrumentation at regular time intervals to monitor turbidity levels in the vicinity of any turbidity plume and construction activities; and
- Temporary cessation of construction works.

Project specific action criteria, decision trees, management actions and reporting frameworks would be agreed between the Contractor, the relevant government agencies, and port stakeholders. Typically agreed action triggers would be adopted for 50% (25 mg/l), 70% (35 mg/l), 90% (45 mg/l) and 100% (50 mg/l) trigger levels. Contingency measures would then be selected from agreed actions with consideration of:

- Current construction activities;
- Equipment placement and timing;
- Turbidity curtain condition and placement;
- Scale of exceedence; and
- Current port activities
- Meteorological, tidal and hydrological conditions.

Further information regarding water quality monitoring is provided in Section 8.

5.3.5 Excavation

Prior to dredging of contaminated sediments from Berth 101, the Contractor will first commence demolition of the existing wharf and excavation of the Berth 101 landside material (shown to contain relatively minor levels of contamination). Existing rock armour will be recovered and stockpiled for reuse as part of the berth construction. Figure 3 shows an indicative staging diagram for construction of the proposed Inner Harbour berth.

The material will be excavated by a long reach excavator and either loaded directly onto barges or put in haul trucks and transported a short distance to a temporary stock pile at Berth 101. The stockpile will be formed by dozers and prepared for loadout onto barges and transportation to the Outer Harbour for disposal. Sediment, erosion and dust control devices will be applied to the stockpile, as required to control emissions. Where possible the Contractor will load directly onto barges for transport to the Outer Harbour, in order to avoid short term stockpiling and the need to double handle materials.

Based upon a review of prospective contractor methodologies it is envisaged that transport by barge will be achieved for between 50 and 90% of excavated material equating to 360,000 cubic metres to 650,000 cubic metres. The remaining 10% – 50% of material may be transported by road haulage as described in the EIS.

5.3.6 Construction of the Outer Harbour bunds

A perimeter bund is required to be constructed to an elevation of -3m CD (over a number of interim lift heights) to assist in preventing the slumping of sediments and migration of dense plumes of suspended sediment along the seabed.

The disposal area contains sediments previously deposited from dredging at Berth 103, which may be too soft to support the bund. If this is the case, about 70,000 cubic metres of the soft sediments may need to be dredged along the perimeter. The dredging of the soft sediments would involve a backhoe dredger loading directly into the Outer Harbour disposal area or into spilt hopper barges for redisposition within the disposal area to align with the future Outer Harbour development plans of NSW Ports. Alternative stability improvement measures may be developed during the detailed design phase which could negate the need for pre-dredging of the bunds. This may include the use of a smaller toe bund at the base of the containment bund, or ground improvement measures prior to the ultimate development of the Outer Harbour reclamation.

Demolition materials, hardstand and fill material will be primarily used for bund and groyne construction (with a portion set aside for covering the proposed tie rods behind the berth face).

Where dredged materials are insufficient and additional materials would otherwise need to be sourced, the sandstone material already stockpiled in the Outer Harbour lands on Foreshore Road may also be assessed for potential use in bund construction.

Dredged material will be transported via hopper barges and placed by bottom dumping to construct the Outer Harbour perimeter bunds, which will prevent the slumping of the contaminated sediments to be dredged within the upper portion of the existing Berth 101 area. Bunds will be formed using granular materials, fill and compacted hardstand material.

These bunds will be designed and constructed in accordance with the existing Containment Structures and Emplacement Report prepared in 2015 on behalf of NSW Ports for the Berth 103 Stage 2 Dredging Project. Where necessary the design will be customised during the detailed design phase to suit any different material types associated with materials present at Berth 101 or to take advantage of any innovative techniques that offer improved outcomes. Figure 4 shows an indicative staging diagram for construction of the Outer Harbour bunds.

5.3.7 Dredging

Following installation of relevant environmental control provisions such as containment bunds, silt curtains, bubble curtains and associated water quality monitoring equipment, dredging will commence from the Berth 101 seabed area. This material will be excavated via mechanical dredging using a backhoe dredge or similar, operating within an area bounded by a silt curtain. Removal via mechanical dredging preserves the dredge material at close to insitu density, thereby minimising the potential for suspended solids and migration of contaminated sediments. No hydraulic dredging such as the use of a Cutter Suction Dredge is proposed during the works.

Material dredged by the backhoe dredger will be transported to the Outer Harbour for disposal via split hopper barges. To facilitate continuous dredging, two split barges with a hopper capacity of between 850 and 1200 cubic metres each would typically be required.

Contaminated sediments will be transported to the Outer Harbour via hopper barges for targeted placement at depth within the bunded emplacement area. These bunds will assist in

preventing the slumping of sediments and migration of dense plumes of suspended sediment along the seabed. Migration of turbid plumes through the upper portion of the water column will be minimised by enclosing the active disposal area within silt curtains (and bubble curtains where required to facilitate barge access).

Based upon a review of prospective contractor methodologies it is envisaged that transport by barge will be achieved for between 50 and 90% of excavated material equating to 360,000 cubic metres to 650,000 cubic metres. The remaining 10% - 50% of material may be transported by road haulage as described in the EIS.

5.3.8 Disposal

It is planned that the 720,000 cubic metres of material required to be dredged and excavated for the construction of berth and wharf facilities would be deposited at a disposal site in the Outer Harbour. The area would cover about 17 hectares and the maximum allowable final level of the disposal site will be R.L. +4.0 metres CD. Material may be temporary stockpiled on land adjacent to the disposal area prior to placement. Water trucks will be used to manage dust on the stockpiles and where machinery is moving around the stockpiles.

The use of water trucks may be minimal as the excavated and dredged material is expected to have a high moisture content and therefore limited potential to generate dust.

Once the stabilising perimeter bund is completed, the material that will be excavated and dredged for the construction of the berth and wharf facilities will be deposited within the bund. The material will be deposited in an order such that potentially contaminated material would be dumped well within the bund and covered over with lower risk material. Once the bund is constructed up to its final level, it is envisaged that rock armour will be placed to provide scour protection around the perimeter of the disposal area.

Potential acid sulphate forming material would be dumped below mean low water to ensure the material remains moist. Some disposal areas may not emerge above sea level. Any such areas will be filled to a level of around R.L. - 3 metres CD. Prior to disposal of any dredged soft sediments in these areas a low containment bund will be constructed to prevent the sediments form spreading across the harbour floor. Soft sediments will not be placed above R.L. - 4 metres CD to prevent re-dispersion.

Due to the likely draft of the barges, bottom dumping of material is expected to be limited to a level of R.L. - 3 metres CD. This will involve the use of partially loaded barges and high tides. Flat bottom barges maybe used and material pushed off with a dozer (or similar) to achieve a level higher than R.L. - 3 metres CD.

The disposal area is mostly within an area previously approved for future development of the Outer Harbour. Modifications have been made to the proposed placement footprint in order to align with the revised development plans of NSW Ports.

The disposal area comprises a combination of submerged and emergent reclamation. This places limitations on the volume of material that can be transferred directly by barge. It is envisaged that excavated material will be transported by split hopper barge for placement to a depth of approximately RL -4 to RL -3 metres to allow sufficient draft clearance of the barge above the reclamation area to allow bottom dumping. Potential strategies including the use of a second material handling barge with excavator or the construction of a temporary unloading facility with sheet pile retainment are being considered by alternate contractors, which will increase the volume of excavated material that is possible to be transported by barge. There will still be a need for some transport of material via road transport including crushed concrete and pavement from the initial Berth 101 demolition activities and select fill suitable for capping,

armouring of revetments or construction of a causeway to assist placement within the emerged disposal area .

5.3.9 Land transportation

As detailed in Section 5.3.5, a portion of the excavated material will be temporarily stockpiled at the rear of Berth 101. This temporary stockpile will be used to load road registered trucks to transport the material around the Outer Harbour to the disposal site, where material is unable to be transferred by barge. This may include coarse hardstand material and concrete rubble suitable for the construction of emergent bunds and groynes required to contain softer materials placed behind the bunds. Trucks with sealed tailgates will be utilised where wet spoil is required to be transported to address the risk of sediment spill during transport.

Loading and hauling activities are proposed to be undertaken 24 hours per day, 7 days per week.

Once at the disposal site, the material will be dumped close to the shoreline and pushed out with dozers. The bund will be widened and raised in a number of lifts to R.L. + 4 metres CD before filling. These works will be undertaken in a similar manner to the previously completed reclamation works within the Outer Harbour.

6. Existing Environment

6.1 Overview

The Project has been developed with consideration to the matters for consideration under the EP&A Act, and is broadly consistent with the principles of ecologically sustainable development. The biophysical, economic and social costs of the Project are generally limited due to a number of factors, which include:

- Location in an industrial port
- Distance from residential areas
- Small project footprint within a largely industrialised land (under State Environmental Planning Policy (Three Ports) 2013)
- Small scale of the project
- Quick construction period

6.2 Hydrodynamic conditions

Port Kembla's Inner Harbour is considered a relatively low energy environment with relatively low discharges from creeks and drains and relatively little wave energy propagation into the Inner Harbour.

The Outer Harbour is known to be impacted by long wave events, which are typically multidirectional, with long waves from multiple directions occurring at the same time.

6.3 Sediment and water quality and marine ecology

6.3.1 Sediment quality

The Project site is located primarily within industrial land that has been reclaimed from Tom Thumb Lagoon during the establishment of Port Kembla. While the source of fill cannot be confirmed, it is likely that it may contain dredge material from the Inner Harbour and steelworks slag throughout the project footprint.

Contamination in the fill material at Berth 101 was assessed to be relatively minor and generally consistent across the development area. Only two soil samples exceeded adopted criteria for benzo(a)pyrene (health limits) and for heavy end petroleum hydrocarbons (management limits). These samples were taken near the inferred base of fill material between four and five metres below ground level. The review of potential source-pathway-linkages for this contamination indicates that it is unlikely to pose any significant constraints to the project. The EIS concluded that potential risks to marine environmental receptors from relocation of the berth material is considered low and acceptable based on measured concentrations of contaminants.

Marine sediments within Port Kembla harbour are known to be contaminated as a result of the historical industrial land use in surrounding areas. Several previous contamination investigations have determined the upper soft silty clays to be contaminated within both the Inner Harbour and Outer Harbour sediments. Heavy metals commonly exceeded the screening levels for cadmium, chromium, copper, lead, nickel, mercury and zinc and Tributyltin (TBT), dioxins and polycyclic aromatic hydrocarbons (PAHs) were reported above the nominated guidelines in several previous studies.

Overall, the findings from the assessment indicate the presence of contaminated sediments within the proposed dredging and disposal areas. Concentrations of contaminants of concern

were largely consistent across the two areas, with the primary contaminants of concern including heavy metals, PAH and dioxins at concentrations above the nominated screening levels. As Port Kembla has been operating for many years, both capital and maintenance dredging impacts are well understood. As a result, mitigation measures and procedures are also well understood and can be captured in the ultimate Dredging Environmental Management Plan.

6.3.2 Water quality

Water quality within the Inner Harbour and Outer Harbour of Port Kembla has historically been impacted by urban and industrial discharges as well as port activities. In particular, these past activities led to contamination of marine sediments, groundwater and harbour waters.

Water quality monitoring within Port Kembla has indicated concentrations of aluminium, cadmium, copper, lead, zinc, tin and arsenic in excess of the ANZECC (2018) 95% trigger values for protection of marine waters. With elevated concentrations generally found in the vicinity of creeks and waterways that drain industrial and stockpile areas.

Average total suspended solids were found to be higher within the Inner Harbour (5.9 milligram per litre) than the Outer Harbour (3.2 milligram per litre). pH levels were generally lower in the Inner Harbour than the Outer Harbour, indicating freshwater discharge influences from the existing waterways within the Inner Harbour.

6.3.3 Marine ecology

Marine habitat within Port Kembla is primarily restricted to the hard substrates and the soft sediments. Hard substrate habitat consists of infrastructure such as piles, quay walls and breakwater around the perimeter of the port, which presents ideal habitat for biofouling communities within the sheltered environment. Assemblages are generally sparse with community structures reflective of the highly disturbed environment with introduced species accounting for more than half of the hard substrate assemblages in the Inner Harbour.

The different habitats within the Inner and Outer Harbour have been found to support varying diversities in fish assemblages and compositions. A number of listed marine species are considered to potentially occur on occasions within Port Kembla despite the disturbed nature of the marine environment.

6.4 Dust generation and air quality

The Project has potential to generate dust through construction activities, notably earthworks and the handling and transfer of earth and other material. Modelling results show that sensitive receptors in the study area will not experience dust related impacts during construction.

During dredging, excavation and disposal activities, all material dredged and excavated from the ocean floor will have a high moisture content. Due to the high moisture content, minimal dust will be released during the handling and transfer of the material and no significant dust impacts are anticipated. The distance to sensitive receivers will also limit the potential for impacts associated with berth construction.

6.5 Noise and vibration

A detailed assessment of noise and vibration impacts from the project has been undertaken as part of this EIS.

The closest sensitive residential receivers are located approximately two kilometres from Berth 101 and will not be impacted by the project. This includes, impacts from noise associated with

an increase in traffic during to construction and operation, sleep disturbance impacts due to awakening events during construction, and operational noise across all periods.

No vibration impacts above the vibration criteria are predicted from construction of the project due to the large distance between the construction area and the nearest residential receivers.

Minor exceedances of the noise management levels are also predicted during standard and outside of standard construction hours for fixed construction activities. However, the impacted receivers would be subject to existing ambient rail traffic noise and industrial noise from the port area.

To manage these impacts from construction noise, mitigation measures relating to general operation of plant and machinery have been recommended in the EIS, however there are no measures relating specifically to dredging and disposal works.

6.6 Cultural heritage

The construction of the Project is not expected to disturb any of the identified Aboriginal heritage values or areas of potential Aboriginal heritage significance.

The construction of the Project is also not expected to disturb any of the identified historic heritage values or areas of potential historic heritage significance.

7. Potential Impacts

7.1 Overview of potential impacts

Potential impacts associated with the capital dredging are primarily generated during the removal, handling and placement of dredged sediments. In particular, dredging and reclamation activities may generate turbid plumes, mobilise contaminants, disturb dinoflagellate cysts within the Outer Harbour and increased rates of sedimentation.

7.2 Turbidity

Turbidity occurs when particulate materials such as clay, silt and sand become suspended in the water column and result in opacity or muddiness of the water. In general, the more material that is suspended in the water, the greater is the waters turbidity and the lower its clarity.

The removal and placement of the sediment from Berth 101 area was identified as the activity with the greatest potential to impact upon turbidity levels. Model scenarios were developed to assess the impacts to total suspended solids (TSS) and sediment deposition associated with the dredging and disposal of sediments within the Inner and Outer Harbours.

Modelling predicts that the extent of the dredge plume will be confined to Port Kembla with significant TSS concentrations confined to the vicinity of the dredging and disposal areas.

7.3 Mobilisation of contaminants

Contamination bound within sediments has the potential to disperse to other locations and potentially become biologically available in the dissolved form.

Sediment sampling and analysis conducted for the EIS has confirmed the presence of contaminated sediments within the proposed dredging and disposal areas. Handling of Berth 101 sediment through dredging and disposal has the potential to cause mobilisation of some of these identified contaminants into the water column.

Contaminated sediments are proposed be transported to the Outer Harbour via hopper barges for targeted placement at depth within the bunded emplacement area. These bunds will assist in preventing the slumping of sediments and migration of dense plumes of suspended sediment along the seabed. Migration of turbid plumes through the upper portion of the water column will be minimised by enclosing the active disposal area within silt curtains (and bubble curtains or overlapped curtain gates, as required to facilitate barge access).

Physical behaviour of sediment during disposal via bottom dumping is well understood, whereby the bulk of sediment falls rapidly and is largely intact when it reaches the seabed. A relatively small fraction of the material remains within the water column and is termed the “advection cloud”. Upon reaching the seabed, the falling material creates an “impact cloud” which is comprised of both falling material and disturbed sediments of the existing seabed.

The EIS noted that Hedge & Knott (2009) found that metal concentrations were lower in the oyster tissues located in the Outer Harbour than the Inner Harbour; however the risk to human health from contaminant exposure through ingesting fish from the Outer Harbour still remains as fish move freely between the Inner and Outer Harbours. Similarly, Knott & Johnston (2007) concluded that the 2007 dredging works within the Inner Harbour affected the recruitment of several sessile invertebrates, likely due to suspended solids and or mobilisation of contaminants. Subsequent studies by Knott & Johnston (2008), found signs of recovery within four months of completion of dredging and concluded that there appeared to be no specific or strong long-term effects of dredging in Port Kembla Harbour on the recruitment of sessile invertebrates.

On this basis, the EIS concluded that the release of contaminants is likely to be localised within the Port Kembla environment and medium-term in nature. The duration of exposure to toxicants are considered to be short in duration while long-term toxic effects are considered unlikely. Nevertheless the EIS stipulated a number of management measures to be documented within the Dredging Environmental Management Plan (DEMP).

7.4 Long term fate of contaminants

It is noted that the broader Port Kembla Outer Harbour Development could remain partially completed for an extended period of time. Consequently consideration has been given to the risk of tides or rainfall mobilising contaminants.

A key strategy in minimising the long-term mobilisation of contaminants is the placement of all actual and potential acid sulphate soils and overlying contaminated silts, soft clays and harbour muds at depth within a designated emplacement facility. These materials of concern would then be capped with a layer of clay followed by sandy materials up to the final fill height. This approach ensures that marine organisms are able to access the contaminated materials, thereby preventing bioaccumulation of contaminants. Similarly, leaching of contaminants will not be a concern given the lack of hydraulic gradients within the lower portion of the Outer Harbour emplacement area.

Perimeter bunds and submerged disposal areas would be armoured as required to ensure long term stability until such time that the Outer Harbour development is completed and the sediments are covered with additional reclamation materials and hard stand areas suitable for operation of the ultimate container terminal.

7.5 Acid sulfate soils

Detailed sampling investigations for ASS were undertaken as part of the EIS. The subsurface conditions within the berth area indicated that there was about 4.0 to 5.0 m of fill above the standing water level and about 10 m to 12 m of reclaimed sands and silty sands with occasional sandy clays (Units 1A and 1B). Given that the majority of the material under Berth 101 was originally dredged from the nearby harbour it was probable that Unit 1A and Unit 1B formed preferentially as a result of settlement of fine and coarse fractions in the water column. This may also account for the high proportion of shell grit found in the samples and the corresponding high acid neutralising capacity (ANC). Below the reclaimed sands are varying layers of estuarine (Unit 2) and alluvial clays and sands and gravels overlying residual soils (Unit 3) and weathered rock (Unit 4). Table 3 indicates those stratigraphic units most at risk during excavation and dredging.

Table 3 Stratigraphic units at risk during excavation of Berth 101

Unit	Generalised Description	Corresponding Stratigraphic Unit	ASS Risk following Disturbance
Fill	Gravelly sand, sand, silt, black, dark brown, grey, some to trace, silts and cobbles. Foreign materials, coalwash, coal, slag, steel, wood, concrete.	Fill	None
Probable Reclaimed Sands	Sand, brown, pale brown, yellow, orange, fine to coarse grained, trace amounts of shell fragments, fine to coarse gravel, silt bands and layers, clayey sand layers, trace iron stained sand, fine black sand layers (probable heavy mineral sands), rounded to sub-rounded gravel, clay lenses and layers. Foreign materials: charcoal, wood and coal.	1A / 1B	Low High risk ASS are present within pockets and lenses throughout these units.
	Clayey Sand, black, dark grey, grey, fine to coarse grained sand, medium to high plasticity clay, trace silt, shell fragments, gravel.	1B	
	Gravelly Clay, black, dark grey, grey, low to medium plasticity, fine to coarse grained angular to sub-angular gravel, trace of fine to coarse grained sand.	1B	
Possible Alluvium / Tidal Sands	Sand, brown, pale brown, yellow, orange, fine to coarse grained, trace amounts of shell fragments, fine to coarse gravel, silt bands and layers, clayey sand layers, trace iron stained sand, fine black sand layers (probable heavy mineral sands), rounded to sub-rounded gravel, clay lenses and layers.	1A	Tidal sand units have low net acidity and high ANC indicating some self - neutralising capacity
Estuarine	Clay, brown, grey, high plasticity, trace of fine coarse grained, trace of gravel, rounded cobbles	2	High Net acidity above action criteria with little neutralising capacity
	Silty Sand, dark brown, grey, brown, fine to coarse sand, trace of fine gravel, shell fragments	2	
Residual	Sandy Claywith lesser amounts of Silty Clay, Silty/Clayey Sand and Clay	3	None
Weathered Rock	Siltstone with lesser amounts of Sandy Siltstone, Silty Sandstone and Sandstone	4	

Construction of the berth pocket will mean that avoiding ASS will not be possible. The general principle for managing the high risk ASS will therefore consist of prevention of oxidation with burial below permanent water table, with neutralisation (liming) as a contingency for low risk ASS if required to be placed above the permanent water table.

The following management principles will apply:

- High risk ASS (Unit 2) sediments will be placed within an anoxic environment within 48 hours of excavation and/or dredging. This will be achieved by placing the saturated sediments on barge hoppers to be transported to the emplacement area where they will be immediately placed below water in a tidal environment (below -1.0m AHD).
- Low risk ASS (Units 1A and 1B) will be placed within an anoxic environment within 48 hours of excavation and/or dredging or may be temporarily stockpiled. Where stockpiling exceeds 2 days these sediments will require daily pH monitoring using the field peroxide test (as per ASSMAC 1998 Appendix 1). Where stockpiling exceeds two week these sediments may require neutralisation with lime depending on the results of monitoring. These sediments show high concentrations of shell grit which may provide sufficient self neutralising capacity making liming unnecessary. Further testing would be required to confirm or otherwise the capacity for self neutralisation in the low risk ASS.

Figure 6 Emplacement area schematic below shows the intended burial sequencing of the sediments at the emplacement area.

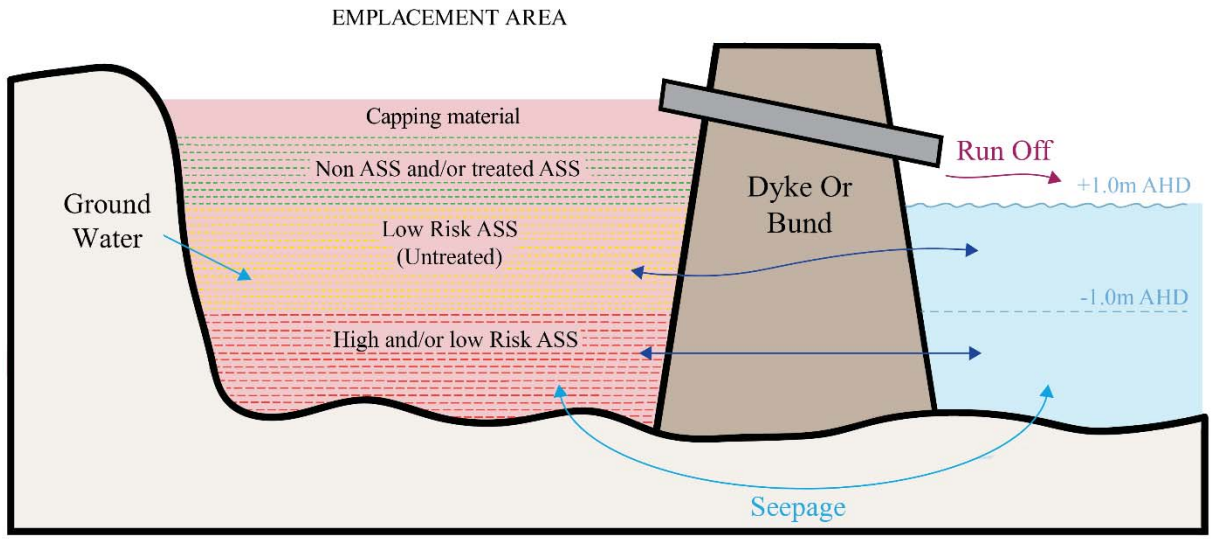

Figure 6 Emplacement area schematic

Further information regarding the management of ASS is provided in the project Acid Sulfate Soil Management Plan (ASSMP) which will be finalised prior to commencement of construction activities.

7.6 Marine ecology

Redevelopment of the berth will alter the existing biofouling, benthic and marine fauna communities through a range of processes as listed below.

- Direct disturbance to biofouling and benthic communities
- Deterioration in water quality
- Noise pollution from pile driving and rock placement

- Artificial light emissions
- Accidental release of waste or oil spills following vessel collisions

To reduce or eliminate the impacts from identified hazards on marine ecology, a number of management controls are recommended for implementation as part of the project. The environmental risks associated with these hazards will be limited within the port environment and are expected to be short term in nature, with low risk on existing species with the implementation of the nominated management controls. As such, risks associated with the project on marine ecology are generally considered acceptable and as low as reasonably practical.

7.7 Dinoflagellate cyst

The toxic dinoflagellate species Alexandrium catenella has been previously recorded in 2002 and 2009, however no toxic dinoflagellate blooms have been historically observed within Port Kembla or associated with historical dredging campaigns. Dredging of sediments with dinoflagellate cyst may cause the cysts to germinate triggering blooms when conditions are favourable. Blooms of the toxic dinoflagellate may deplete dissolved oxygen and produce toxins, causing environmental damage including fish kills.

The risk of blooms is considered to remain given the historical records of toxic dinoflagellate species at Port Kembla, however the likelihood of a bloom occurring is considered to be low given blooms have not been historically associated with dredging campaigns.

7.8 Marine fauna collision/interaction

Interaction with marine fauna can potentially occur during the dredging and disposal. There is potential for interactions with marine fauna during rock armour placement on the perimeter bund. The consequences of such collisions between marine fauna and vessels or construction materials for the marine organisms range from changes to fauna behavioural patterns to injury or death of the organism due to a direct collision.

The risk of potential vessel strike is considered low for all marine species likely to occur in the project area, including cetaceans, sharks and fish. This risk accounts for works being concentrated within a small area of the Inner and Outer Harbour limited by the port boundaries, and being undertaken at relatively low vessel speeds.

The risk of interaction between marine fauna and construction materials during rock armouring of the bund wall is low, as fauna would need to be directly in the path of the rock placement activities.

7.9 Accidental release of solid wastes

A variety of hazardous and non-hazardous solid waste may be potentially released unintentionally into the environment from overfull and / or uncovered bins or if blown off the deck of a vessel. Accidental spillage during transfers of waste from vessel to shore, and incorrectly disposed items may also cause the unintentional release of solid waste into the surrounding environment.

Non-hazardous solid waste includes plastics, packaging and paper materials and products while examples of hazardous solid wastes include oily and contaminated wastes, aerosol products, fluorescent tubes, batteries and medical waste.

There is capacity for non-hazardous solid waste such as plastic bags to affect the environment and cause entanglement or ingestion by fauna. The ingestion of solid wastes like plastic bags

can consequently result in internal tissue damage, prevention of normal feeding behaviours and potentially death of the affected fauna.

The pollution of the immediate environment with the release of hazardous solid waste has the likely consequence of negatively affecting the health of marine ecology within the area. Particularly fish and cetaceans are susceptible to chemical impacts, including disease or physical injury after ingesting or absorbing the waste.

7.10 Accidental release of hydrocarbons, chemicals and other liquid waste

Vessels require a wide variety of liquids, chemicals and hydrocarbon compounds to operate and to be maintained. Vessel engines and equipment operate on diesel fuel while hydraulic and lubricating oils are required for the operation and continual maintenance of mechanical components. Fuel drums may also be retained in dedicated storage areas while some vessel engines adopt independent storage tanks. Examples of hazardous liquids include corrosion inhibitors, biocide and miscellaneous chemicals like cleaning agents and lubricating oils.

In addition, other liquid wastes such as sewage and food waste will be generated during construction. There are various scenarios that may result in accidental release of liquid waste, including tank failure, pipework failure or inadequate bunding.

If refuelling is required during the proposed activity, then refuelling events have the potential to cause environmental impacts through reduction in water quality and / or contamination of marine ecology. Spills during refuelling can occur through several pathways, including fuel hose breaks, coupling failure or tank overfilling.

There are no releases planned during the construction of the project. Rather, all liquid waste will be stored for discharge to an appropriate onshore facility. There is potential that a leak or spill of hydrocarbons or other liquids (including environmentally hazardous wastes and non- hazardous substances) may occur at the site. Such an occurrence would result in the localised reductions in water quality and contamination of nearby marine receiving environment.

7.11 Damaged fuel tank associated with vessel or plant collision

There is potential for vessels or plant to collide. The rupture of a vessel's fuel tank is the predominant risk. The significance of the risk is attributed to the release of diesel into the environment from the damaged fuel tank. In the event of a tank rupture from vessel collision, a standard tank is expected to empty into the environment within hours.

An oil spill within Port Kembla due to vessel / plant collision and rupturing of a fuel tank may result in confined impacts upon a wide variety of organisms inhabiting the port environment depending upon the nature and extent of the oil spill. An oil spill occurred outside Port Kembla, impacts could extend to sensitive receptors such as rocky habitat (Red Point headland, Tom Thumb Islands and Five Islands Nature Reserve) and sandy beaches (Wollongong City Beach, Fisherman's Beach or North Beach) around Port Kembla.

8. Management Strategies and Actions

8.1 Summary of environmental management measures

The EIS proposed a number of management measures in relation to dredging and disposal activities, and more specifically in relation to water quality and the containment of contaminated sediments. These management measures are summarised in Table 4 through to Table 8 and where required, have been extended to meet the requirements stipulated in the submissions. More detailed outline plans are provided in Section 8.2.

Table 4 Summary of management measures for contamination

Issue	Measure	Timing
Contamination at Berth 101	One or more of the following is proposed for assessing the potential risk to human health. • Development of a human health risk assessment for BaP (TEQ) • Additional investigation to delineate the vertical and lateral extent of BaP (TEQ) • Bioavailability testing	Pre-construction
Contamination at Berth 101	Removal of any remnant asbestos containing material (ACM) fragments from the ground surface.	Construction
Contamination at Berth 101	Inclusion of an unexpected finds protocol for contamination in the Construction Environmental Management Plan (CEMP) for the work associated with construction activities.	Construction

Table 5 Summary of management measures for water resources

Issue	Measure	Timing
Dredging area and disposal area in the Outer Harbour	Preparation of a Construction Environmental Management Plan (CEMP) including a DEMP and Water Quality Monitoring Plan (WQMP) to provide a framework for the environmental management of construction activities to minimise the environmental risks to a level that is as low as practically possible for this Project.	Pre / Construction
Dredging area and disposal area in the Outer Harbour	Prior to commencement of dredging and disposal operations a perimeter disposal bund would be designed and constructed in accordance with the existing Containment Structures and Emplacement Report prepared in 2015 on behalf of NSW Ports for the Berth 103 Stage 2 Dredging Project. This will ensure long term stability of dredged materials and to minimise sediment migration during placement.	Pre / Construction

Issue	Measure	Timing
Water quality and hydrodynamics	The location of the proposed terminal berth has been refined through navigation simulations to minimise hydrodynamic impacts and reduce dredging and disposal volumes as far as possible.	Design
Flooding	The proposed pipeline between the terminal and the existing east coast gas transmission network at Cringila has been designed such that the pipeline will be below existing ground levels.	Design
Hydrology	The western extent of the reclamation footprint has been limited to ensure Salty Creek remains open to the Outer Harbour without the need for enclosed culverts, thereby minimising the impacts to fish passage.	Design
Water quality and hydrodynamics	The footprint of the Outer Harbour placement area has been minimised by raising the proposed fill height to include emergent reclamation. This approach minimises the quantity of material to be bottom dumped and thereby reduces the potential for generation of turbid plumes and mobilisation of sediments	Design
Water Quality	Silt curtains would be installed prior to commencement of the works in order to minimise the spread of any sediments entrained within the water column during dredging and disposal operations. Silt curtains are available in a range of designs and would be provided by the successful Contractor. It is envisaged that the silt curtain would comprise a geocomposite material consisting of a non-woven geotextile sewn to a woven geotextile, which would provide the required filtering capacity and rigidity respectively. Vessel access would be via gated or overlapped curtains and / or through installation of a bubble curtain. The top of the curtain would be supported by a floating boom, whilst the lower portion of the curtain would be anchored or weighted with appropriate ballasting (eg. bars or chains) to ensure that the full length if the curtain is maintained at all times. The curtain would be anchored or fixed to existing structures as necessary. In the event that the water quality monitoring shows the proposed silt curtains do not provide adequate control over the migration of suspended solids, consideration would be given to replacement or duplication with a multiple barrier system.	Construction

Issue	Measure	Timing
Water quality	Subaqueous sediment removal would be undertaken using a backhoe dredge. The use of mechanical dredging (rather than hydraulic dredging) ensures that sediments are removed, transported and placed as close to their in-situ density as possible. Thereby minimising the suspension and mobilisation of sediments at the dredge and disposal sites. Method statements would be prepared by the contractor to ensure that loading of dredged materials into the hopper barges is undertaken in a manner that reduces spillage and avoids overfilling barges. In the event that water quality monitoring shows suspended solids are unable to be contained at acceptable levels in the vicinity of the dredge, consideration would be given to the use of an environmental clam shell bucket which would further reduce the amount of sediment put into suspension during dredging operations.	Construction
Water Quality	A site specific erosion and sediment control plan (ESCP) will be prepared as part of the CEMP to provide control of all land based excavation and stockpiling requirements. All erosion and sediment control measures shall be designed, implemented and maintained in accordance with 'Managing Urban Stormwater: Soil and Construction Volume 1' (Landcom 2004) ('the Blue Book).	Construction
Water quality, chemical and fuel impacts	A site specific emergency spill plan will be developed, and will include spill management measures in accordance relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers)	Construction
Water quality, chemical and fuel impacts on flora and fauna	An emergency spill kit will be kept on site at all times. All staff will be made aware of the location of the spill kit and trained in its use.	Construction
Water quality, chemical and fuel impacts	Machinery will be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	Construction

Table 6 Summary of management measures for marine ecology

Issue	Measure	Timing
Water quality, chemical and fuel impacts on flora and fauna	Port Kembla's Emergency Spill Plan will be implemented during construction.	Construction
Biofouling and benthic community disturbance	Works to remove the current quay wall and piles will commence after a visual inspection for protected mobile fauna. If present, these will be relocated to adjacent habitats, outside the zone of influence by the proposed works, where feasible. Dredging will be carried out using mechanical backhoe dredge, split barges and supporting tug vessels, as opposed to suction-style dredging, to minimise the potential mobilisation of sediments within the Inner Harbour.	Construction
Impact of on marine fauna through artificial noise or collision	The interaction of all vessels with cetaceans and pinnipeds will be compliant with Part 8 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000). The Australian Guidelines for Whale and Dolphin Watching (DoEE, 2017) for sea-faring activities will be implemented across the entire Project.	Construction
Pest introduction and proliferation	Locally sourced vessels (within NSW waters) to complete the construction works, where possible International vessels to empty ballast water in accordance with the latest version of the Australian Ballast Water Management Requirements (DAWR, 2017) If an IMP is identified or suspected, then the contractor is obliged to immediately (within 24 hours) notify the NSW Department of Primary Industries Aquatic Biosecurity Unit hotline on (02) 4916 3877 Project activities to adhere to the National System for the Prevention and Management of Marine Pest Incursions (National System) and NSW requirements for IMP identification and management.	Construction Operation

Table 7 Summary of management measures for noise and vibration

Issue	Measure	Timing
Airborne noise from transport	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	Pre-construction
Management of sensitive receivers from airborne noise	Notify the affected receivers detailing the construction activities, time periods over which they would occur and the duration of works.	Pre-construction

Table 8 Summary of management measures for waste

Issue	Measure	Timing
Construction waste	Develop and implement a waste management plan for construction that integrates all statutory requirements for waste in NSW and includes: • systems to sort and track the actual types and quantities of waste generated • measures for separating waste based on classification of management options including colour coded bins Options for offsite reuse, reprocessing, recycling and energy recovery of waste	Construction

8.2 Monitoring and management plans

The following sections details specific actions for the management of environmental issues during the Project dredging program. Table 9 provides the framework for each monitoring and management element.

Table 9 Elements of monitoring and management actions

Element	Description
Objective	What is intended to be achieved.
Management Action	The actions required to assist in meeting the objective. These can be single actions or multiple liked actions to address the Objective.
Responsibility	Who is responsible for implementing the actions.
Timing	The time period when the management actions need to be implemented.
Measures	The metrics for recording the outcomes.
Reporting	The way in which the compliance with the management actions and outcomes are reported.
Target	The thresholds, which, if exceeded, require differed management actions (contingency) to be implemented.
Contingency	Actions to be undertake if the management action is not met.

Using the framework presented in Table 9, six monitoring and measurement plans (Table 10 to Table 15) have been developed to guide the Project's excavation and dredging program. These include:

- Marine mega fauna
- Marine water quality
- Sediment quality
- Introduced marine pests
- Hydrocarbon management
- Solid and liquid waste management

It is important to note that management requirements in relation to ASS will be documented within a standalone ASSMP and are not covered within this document. Dredging and disposal activities must be undertaken in accordance with the project ASSMP.

8.2.1 Marine Megafauna

Table 10 provides a summary of the management process to address the impacts of the Project on marine megafauna. All management measures would be collated in management plans prepared by the Contractor prior to commencement of construction.

Table 10 Environmental management processes for marine megafauna

Risk Area	Megafauna		
Factor(s)	Marine Fauna		
Objective(s)	To maintain the diversity, geographic distribution and viability of fauna at the species and population levels		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	• Prior to the commencement of the dumping activities, the dredging contractor must ensure that a check is undertaken, using binoculars from a high observation platform, for marine species[1] within the 'monitoring zone'[2]. If any marine species are sighted in the 'monitoring zone', dumping activities must not commence until the marine fauna is no longer observed in the monitoring zone, or the vessel is to move to another area of the disposal site to maintain a minimum distance of 300 m between the vessel and any marine species.	Dredging Contractor	Prior to dumping activities, during daylight hours only
	• Internal training of Marine Fauna Observer(s) (MFO), which provides clear direction on: o The area that comprises the 'monitoring zone' o How to identify marine fauna (i.e. whales, dolphins, seals, sea turtles and sharks) that are known or likely to be encountered within the waters of Port Kembla. o The actions to be undertaken by the observer in the event of marine fauna being sighted within the monitoring zone. o The actions to be undertaken by the observer in the event of an incident resulting in injury or death of a marine species.	Dredging Contractor	Prior to commencement of dredging project
	• While traveling from the dredge site to the disposal site is to be ensured that the interaction of all vessels with cetaceans and pinnipeds will be compliant with Part 8 of the *Environment Protection and Biodiversity Conservation Regulations* (2000).	Dredging Contractor	While traveling from the dredge site to the disposal site

[1] All whales, dolphins, dugongs and marine turtles listed under the *Environment Protection and Biodiversity Conservation Act 1999*

[2] Refers to the area within a 300 metre radius of the vessel

Task	Action	Responsibility	Timing
	The Australian Guidelines for Whale and Dolphin Watching (2017) for sea-faring activities will be implemented across the entire Project. This includes the implementation of the following guidelines: o Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. o Caution zone must not be entered when calf (whale or dolphin) is present o No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod, or follow directly behind o If there is a need to stop to avoid collisions, reduce speed gradually o Do not encourage bow riding, with the vessel's wake. A vessel should not be brought within the caution zone for dolphins faster than a 'no wake' speed. o If animals are bow riding, do not change course or speed suddenly.		
	• Internal training of selected dredge crew on the requirements, role and responsibilities of MFOs so that integration of MFOs into the management of the dredging operations can occur.	Dredging Contractor	At appropriate times throughout dredging project
	• Minimise impacts of the dredge through underwater noise through proper maintenance of equipment.	Dredging Contractor	At all times throughout dredging project
	• Minimise impacts of light on fauna through the minimisation of unnecessary light sources not required for safe operation of the dredge.	Dredging Contractor	At all times throughout dredging project
Measures	Number of reported incidents involving marine fauna	Dredging Contractor	During Dredging
Reporting/Evidence	• A log detailing all marine fauna observations within the monitoring zone (during daylight operations only) shall be maintained. The log shall include (as a minimum) the following information: date, name of MFO, time (commencement of pre-dumping observations), time (completion of pre-dumping observations), whether fauna was sighted in the monitoring zone during the pre-dumping monitoring period, type of marine	Dredging Contractor	Throughout dredging and disposal activities

Task	Action	Responsibility	Timing
	species identified (where possible), general comments on animal behaviour, description of mitigation measures undertaken (e.g. fauna sighted therefore pre-dumping observations recommenced), time (commencement of dumping) and time (completion of dumping).		
	• Document and record any incidents involving the dredging or dumping activities that result in injury or death to any marine species. The date, time and nature of each incident and the species involved, if known, must be recorded.	Dredging Contractor	Throughout dredging and disposal activities
	• Report all incidents involving dredging or dumping activities that result in injury or death to any marine species, to AIE following the NSW Port's procedures.	Dredging Contractor	Immediately, but no later than 12 hours from the time that the incident occurred.
	• Dredging Manager will notify AIE who will formally notify relevant authorities of any incidents involving the dredging or dumping activities that result in injury or death to any marine species.	Dredging Contractor / AIE	Within 24 hours from the time that the incident occurred.
	• Provide the AIE with a copy of the training package delivered to Marine Fauna Observers, and records of training attendance / completion for each person trained.	Dredging Contractor	Throughout project
Target	No injury or death to any marine megafauna.	Dredging Contractor	Throughout the project
Contingency	Completion of detailed incident analysis and implementation of any corrective measures in consultation with relevant authorities.	Dredging Contractor	ASAP

8.2.2 Marine water quality

Table 11 provides a summary of the management approach for the potential marine water quality impacts outlined in Section 7. All management measures would be collated in management plans prepared by the Contractor prior to commencement of construction.

Table 11 Environmental management processes for Marine water quality

Risk Area	Marine water quality		
Factor(s)	Marine water quality		
Objective(s)	1. To maintain the quality of water so that the environmental values, both ecological and social, are protected. 2. To minimise mobilisation of sediments and associated contaminants 3. To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales. 4. To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	• The dredging contractor will develop a DEMP, addressing the commitments outlined in the ODEMP and will adhere to any other requirements of the EIS, planning approvals and licences.	Dredging Contractor	Pre-construction
	• Implementation of a Water Quality Monitoring Program (WQMP) to assess the quality of water within zone of impact and nearby management zones ensuring that construction works do not cause exceedance of the marine water quality criterion of background plus 50 mg/L of suspended sediment, in accordance with recent Environmental Protection Licences (EPL) for similar activities within Port Kembla such as the Berth 103 Stage 2 Dredging & Spoil Disposal EPL20563). Although subject to liaison with the relevant government agencies, port stakeholders and successful Contractor, it is envisaged that continuous turbidity monitoring would be undertaken using a series of at least four monitoring buoys to provide impact and background data (turbidity (NTU), pH, temperature). Monitoring locations would be selected based on appropriate near field impact sites and appropriate background locations. Consideration would be given to the long term water quality monitoring program implemented within Port Kembla. Consideration would be given to the integration of the proposed monitoring activities with the locations, parameters and reporting of the existing and previous monitoring programs. This is expected to be of benefit to both programs. Prior to commencement of the dredging works, buoys would be deployed for an agreed period of time to confirm background conditions in the vicinity of the monitoring	Dredging Contractor	14 days prior, during and 14 days post completion of each dredge campaign

Task	Action	Responsibility	Timing
	points. Data would be logged and transmitted to an onshore recording station where it would be processed to allow automated comparison of averaged turbidity levels to a series of green, amber, purple and red trigger levels. Daily visual observations would be undertaken during dredging operations to monitor dredge plumes and the potential release of oil or grease. Collection of water samples and laboratory analysis for an agreed set of contaminants would be undertaken on a weekly basis, or as required, during dredging operations and compared to trigger levels for relevant management actions. The WQMP would include regular reporting, evaluation and revision where required to ensure the project objectives and approval conditions are achieved.		
	• In order to allow correlation of readily measured NTU to limits expected to be nominated in TSS, a review of the NTU-TSS correlation will be undertaken. Previous EPL's for similar dredging activities within the Inner Harbour have commenced with a starting correlation of 2 NTU equal to 1 mg/l TSS. Through discussion with NSW Ports, it is understood that this correlation has been refined during monitoring undertaken for previous dredging projects within the Inner Harbour. Given the sensitivity of such correlations to varying material types, it is proposed to adopt the previously developed correlations as a starting point, which will be reviewed and adjusted following commencement of the works. • A series of trigger values and accompanying management actions will be developed and agreed between the Contractor, the relevant government agencies, and port stakeholders. When exceeded, an alarm would be triggered, automated email and SMS alerts sent and agreed the procedures implemented. Such procedures are expected to include: o Inspection and repair of equipment associated with dredging silt curtains, bubble curtains, bunding etc; o Vary the dredging technique including layer thickness, angle of retrieval, bucket type (environmental clamshell or open bucket etc) or fill ratio. o Vary the location of the dredging. o Vary disposal operations, including speed of barge during disposal, location of disposal. o Time dredging and disposal operations to coincide with favourable tides. o Review design/placement of the curtain;	Dredging Contractor Dredging Contractor	Pre-construction Pre / During construction

Task	Action	Responsibility	Timing
	o Deployment of an additional turbidity curtain around the extent of the turbidity plume; o Reinstate or fix curtain; o Additional turbidity monitoring using hand-held instrumentation at regular time intervals to monitor turbidity levels in the vicinity of any turbidity plume and construction activities; and o Temporary cessation of construction works. • Project specific action criteria, decision trees, management actions and reporting frameworks would be agreed between the Contractor, the relevant government agencies, and port stakeholders. Typically agreed action triggers would be adopted for 50% (25 mg/l), 70% (35 mg/l), 90% (45 mg/l) and 100% (50 mg/l) trigger levels. Contingency measures would then be selected from agreed actions with consideration of: o Current construction activities; o Equipment placement and timing; o Turbidity curtain condition and placement; o Scale of exceedence; and o Current port activities o Meteorological, tidal and hydrological conditions.	Dredging Contractor	Pre-construction
	• All dumping activities shall occur within the nominated disposal area	Dredging Contractor	Throughout dredging and dumping
	• Silt curtains with bubble gate (if required to facilitate vessel access) to be installed prior to commencement of excavation and dredging works in order to minimise the spread of sediments.	Dredging Contractor	Throughout dredging and dumping
	• The contractor is to ensure that a perimeter is be constructed within the Outer Harbour placement area to ensure long term stability of dredged materials and to minimise sediment migration during placement.	Dredging Contractor	Throughout dredging and dumping
	• Subaqueous sediment removal to be undertaken by a backhoe dredge, split barges and supporting tug vessels opposed to a suction-style dredge. To ensure that sediments are removed, transported and placed as close to their in-situ density as possible, reducing suspension and mobilisation of sediments at both sites.	Dredging Contractor	Throughout dredging and dumping
	• The backhoe dredger, long arm excavator, barges and hopper works shall be managed in a manner to comply with nominated TSS limits.	Dredging Contractor	Throughout dredging and dumping
	• The dredged material shall be placed in a manner over the nominated disposal area to minimise release of TSS	Dredging Contractor	Throughout dredging and dumping

Task	Action	Responsibility	Timing
	• The dredged material shall be dumped in a manner to ensure that the Salty Creek remains open to the Outer Harbour without the need of enclosed culverts (in order to minimise the impacts to fish passage)	Dredging Contractor	Throughout dredging and dumping
Measures	• Implementation of a WQMP to monitor and maintain the quality of water within the Port Kembla Inner and Outer Harbour through the excavation and dredging works through the setting of non-conformance limits and mitigation actions when these limits are exceeded.	Dredging Contractor	14 days prior, during and 14 days post completion of each dredge campaign
	• All dredged material placed within approved disposal area, inside the perimeter bunds, with potentially contaminated material being dumped well within the bund and sealed over with lower risk material.	Dredging Contractor	Throughout dredging and dumping
Reporting/ Evidence	• WQMP results and reporting including weekly and monthly reports for review by AIE and onward transmission to government agencies as required.	Dredging Contractor	Monthly
	• Document and retain records comprising either plotting sheets or a certified extract of the ship's log which may include but not be limited to: o the dates and times of when each dumping run commenced and finished; and o the track of all dredge vessels (as determined by GPS) during: (a) dredging activities, and (b) transit between the dredging area(s) and the nominated disposal area; o the position (as determined by GPS) of the dumping vessel at the commencement of dumping (i.e. hopper doors opened) and at the completion of dumping (i.e. hopper doors closed), including the path / track of each dumping run.	Dredging Contractor	Throughout dredging and dumping
Target	• To minimise the impact on water quality due to the Project's excavation and dredging works.	Dredging Contractor	Daily monitoring program
	• All dredged material placed within approved and nominated disposal area	Dredging Contractor	Daily monitoring program
Contingency	• Investigate and report and breaches of sediment placement to relevant authorities and commence processes to investigate any impact (relevant authorities notification) • Review of water quality data and reassess environmental controls in consultation with relevant authorities, including: o Inspection and repair of equipment associated with dredging silt curtains, bubble curtains, bunding etc; o Vary the dredging technique including layer thickness, angle of retrieval, bucket type (environmental clamshell or open bucket etc) or fill ratio.	Dredging Contractor Dredging Contractor	ASAP

Task	Action	Responsibility	Timing
	o Vary the location of the dredging. o Vary disposal operations, including speed of barge during disposal, location of disposal. o Time dredging and disposal operations to coincide with favourable tides. o Review design/placement of the curtain; o Deployment of an additional turbidity curtain around the extent of the turbidity plume; o Reinstate or fix curtain; o Additional turbidity monitoring using hand-held instrumentation at regular time intervals to monitor turbidity levels in the vicinity of any turbidity plume and construction activities; and o Temporary cessation of construction works.		

8.2.3 Sediment quality

Exposure of contaminated sediments to the surrounding environment at Berth 101 and the disposal area to can cause harm to marine flora and fauna. The environmental management processes for the Project's excavation and dredging works are described in Table 12, which are designed to minimise the risk and severity of contaminated sediments. All management measures would be collated in management plans prepared by the Contractor prior to commencement of construction.

Table 12 Environmental management processes for marine sediment quality

Risk Area	**Sediment Quality**		
Factor(s)	1. Marine Environmental Quality 2. Benthic Communities and Habitat 3. Marine Fauna		
Objective(s)	1. To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected. 2. To minimise mobilisation of sediments and associated contaminants 3. To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales. 4. To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	• All dumping activities shall occur within the nominated disposal area	Dredging Contractor	Throughout dredging and dumping
	• The dredge vessel(s) shall dump within the bund with potentially contaminated material would be dumped well within the bund and sealed over with lower risk material.	Dredging Contractor	Throughout dredging and dumping
	• The dredged material shall be dumped in a manner over the nominated disposal area to minimise mounding from dumping activities.	Dredging Contractor	Throughout dredging and dumping
Measures	All dredged material placed within approved disposal area as per the DEMP.	Dredging Contractor	Throughout dredging and dumping
Reporting/Evidence	• Make and retain records comprising either plotting sheets or a certified extract of the ship's log which may include but not be limited to: o the dates and times of when each dumping run commenced and finished o the track of all dredge vessels (as determined by GPS) during: (a) dredging activities, and (b) transit between the dredging area(s) and the nominated disposal area o the position (as determined by GPS) of the dumping vessel at the commencement of dumping (i.e. hopper doors opened) and at the completion of dumping (i.e. hopper doors closed),	Dredging Contractor	Throughout dredging and dumping

Task	Action	Responsibility	Timing
	including the path / track of each dumping run		
	• Undertake bathymetric survey of the disposal site (by a suitably qualified person): o Prior to the commencement of dumping activities o Following completion of all dumping activities	Dredging Contractor	Prior to, and following completion of, dumping activities
Target	All dredged material placed within approved and nominated disposal area	Dredging Contractor	Throughout dredging and dumping
Contingency	Investigate and report and breaches of sediment placement to relevant authorities and commence processes to investigate any impact (relevant authorities notification)	Dredging Contractor	ASAP

8.2.4 Introduced marine species

Non-indigenous species, if introduced, could result in adverse environmental impacts by altering the composition and function of natural ecosystems. Minimisation of the risk of the introduction of non-indigenous marine species will be achieved through the management processes described in Table 13. All management measures would be collated in management plans prepared by the Contractor prior to commencement of construction.

Table 13 Environmental management processes for introduced marine pests

Risk Area	Introduced Marine Pests		
Factor(s)	1. Benthic Communities and Habitat 2. Marine Fauna 3. Marine Environmental Quality		
Objective(s)	1. To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales 2. To maintain the diversity, geographic distribution and viability of fauna at the species and population levels 3. To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	All vessels will comply with Commonwealth Department of Agriculture and Water Resources – Biosecurity requirements as well as all State legislation relating to management of introduced marine organisms.	Dredging Contractor	Prior to dredge vessel(s) entering Australian Waters or moving from one Australian port to Port Kembla
	All vessels will comply with the following guidelines to manage the risk of marine pests: • Australian Ballast water Management Requirements • National Bio-fouling Management guidelines for non-trading vessels • Anti-Fouling and In-Water Cleaning Guidelines	Dredging Contractor	Prior to dredge vessel(s) entering Australian Waters or moving from one Australian port to Port Kembla
Measures	Implement the requirements from the following guidelines: • Australian Ballast water Management Requirements • National Bio-fouling Management guidelines for non-trading vessels • Anti-Fouling and In-Water Cleaning Guidelines	AIE and Dredging Contractor	From prior to dredge vessel(s) entering Australian waters or mobilising to Port Kembla until all dredging operations have ceased.
	• Incidence of non-compliance with Biosecurity and/or NSW Port requirements.	AIE and Dredging Contractor	From prior to dredge vessel(s) entering Australian waters or mobilising to Port Kembla until all dredging operations have ceased.
Reporting/Evidence	All vessels to provide copies of the relevant documentations to NSW Ports for assessment, in regards to: • Australian Ballast water Management Requirements	Dredging Contractor	Prior to dredge vessel(s) entering Australian Waters or moving from one

Task	Action	Responsibility	Timing
	• National Bio-fouling Management guidelines for non-trading vessels • Anti-Fouling and In-Water Cleaning Guidelines		Australian port to Port Kembla
Target	• No introductions or movement of marine pests.	Dredging Contractor	From prior to dredge vessel(s) entering Australian waters or mobilising to Port Kembla until all dredging operations have ceased.
	• No noncompliance with Biosecurity and NSW Ports requirements		
Contingency	• Implementation of contingency measures as required by NSW Ports and Department of Primary Industries quarantine requirements.	Dredging Contractor	Within 12 hours of any incident.
	• Notification to NSW Ports and the Department of Primary Industries in the event of an introduction of a marine pest species.	Dredging Contractor	Within 12 hours of any incident.

8.2.5 Hydrocarbon management

The discharge of oil and oily mixtures (of any volume or concentration) from any ship into Port Kembla waters is prohibited. This prohibition includes any discharges from oily water separators, as this would be in contravention of the *Marine Pollution Act 2012*.

The environmental management processes are described in Table 14. All management measures would be collated in management plans prepared by the Contractor prior to commencement of construction.

Table 14 Environmental management processes for hydrocarbon management

Risk Area	Hydrocarbon Management		
Factor(s)	1. Marine Environmental Quality 2. Benthic Communities and Habitat 3. Marine Fauna		
Objective(s)	1. To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected 2. To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales 3. To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	• Undertake an environmental Inspection of all dredging vessel(s).	Dredging Contractor	Prior to dredging / dumping activities
	• Emergency response management actions as described in Roads and Maritime Services (RMS) NSW South Coast Marine Oil And Chemical Spill Contingency Plan	Dredging Contractor	Duration of dredging / dumping activities
	• All vessels to be maintained in accordance with the dredging contractor's vessel management systems.	Dredging Contractor	Duration of dredging / dumping activities
	• Industry standard hydrocarbon management practices including implementation of Shipboard Oil Pollution Emergency Plane (SOPEP). Equipment shall be designed and operated to prevent spills and leaks through the provision of in-built safeguards including, but not limited to, relief valves, overflow protection, and automatic and manual shut-down systems.	Dredging Contractor	Duration of dredging / dumping activities
	• Use of appropriately-licensed bunkering facilities.	Dredging Contractor	Duration of dredging / dumping activities
	• Hydrocarbons (including hydrocarbon wastes) shall be stored in accordance with AS1940-2017.	Dredging Contractor	Duration of dredging / dumping activities

Task	Action	Responsibility	Timing
	• Spill control equipment/materials held on board the dredging vessel(s) as required under the SOPEP shall be commensurate with risk of the activity being performed, and shall be available at all times.	Dredging Contractor	Duration of dredging / dumping activities
Measures	Number of spill incidents	Dredging Contractor	Duration of dredging operations
Reporting/Evidence	• Report any discharge of oil or other hydrocarbons to the marine environment of Port Kembla (irrespective of quantity / volume) to NSW Ports Vessel Traffic Services *without delay*.	Dredging Contractor	Immediately
	• Evidence of implementation of SOPEP.	Dredging Contractor	Duration of dredging operations
	• "Pollution Report" (POLREP) is to be submitted electronically to either RMS or Australian Maritime Safety Authority (AMSA) and a copy of this sent to NSW Ports.	Dredging Contractor	Immediately (but no later than 12 hours from the incident occurring)
	• A documented report on the incident shall be submitted to NSW Ports, including (as a minimum) details of the incident, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken	Dredging Contractor	Immediately (but no later than 12 hours from the incident occurring)
Target	No discharges of hydrocarbons to the marine environment.	Dredging Contractor	All times during dredging operations
Contingency	Implementation of oil spill response measures in accordance with the requirements of RMS' NSW South Coast Marine Oil And Chemical Spill Contingency Plan	Dredging Contractor	Immediately on notification of spill incident

8.2.6 Solid and liquid waste management

The disposal of garbage from any ship into the Port Kembla waters is prohibited. The definition of garbage is consistent with MARPOL 73/78 Annex V and includes (but is not limited to):

- Plastics
- Synthetic ropes
- Fishing gear
- Plastic garbage bags
- Lining and packing materials
- Paper, rags, glass, metal, bottles, crockery and similar refuse
- Food scraps and cooking waste
- Scrap metal
- Domestic sewage

The accidental discharge of waste material (without appropriate dilution or treatment) to the environment may:

- Contaminate food sources for marine organisms;
- Result in toxicity to marine organisms; or
- Rut in death or injury of marine fauna if ingested, or entangled.

Consistent with the requirements of MARPOL Annex V it is prohibited to discharge wastes into Port Kembla from the deck (or other external surfaces) of a ship during deck cleaning and or washing.

The environmental management processes are described in Table 15.

Table 15 Environmental management processes for waste management

Risk Area	Solid and Liquid Waste Management		
Factor(s)	1. Marine Environmental Quality 2. Benthic Communities and Habitat 3. Marine Fauna		
Objective(s)	1. To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected. 2. To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales. 3. To maintain the diversity, geographic distribution and viability of fauna at the species and population levels. 4. To preserve the health of workers		
Task	**Action**	**Responsibility**	**Timing**
Management Actions	• The dredging contractor to develop a health risk assessment and management plan protocol for BaP (TEQ), asbestos containing materials (ACM) and unexpected finds of contaminated material, as required.	Dredging Contractor	Pre-construction
	• The dredging contractor to establish a waste management	Dredging Contractor	Duration of dredging operations

Task	Action	Responsibility	Timing
	plan that complies with the requirements of NSW Ports.		
	• The dredging contractor to ensure that waste management systems are maintained to ensure systems are efficient, fully operational and discharging treated water in accordance with MARPOL 73/78 Convention Annex IV (sewage) and Annex V (garbage).	Dredging Contractor	Duration of dredging operations
	• Garbage (including galley waste) from internationally trading ships must not be landed ashore at Port Kembla without permission from the Department of Agriculture and Food.	Dredging Contractor	Duration of dredging operations
	• Only licenced Controlled Waste Carrier to be used for any controlled waste discharged ashore	Dredging Contractor	Duration of dredging operations
	• Solid and liquid wastes and hazardous materials shall be stored in appropriately labelled drums or tanks and be correctly disposed of and not discharged to the environment.	Dredging Contractor	Duration of dredging operations
	• Reporting of any discharge of solid or liquid wastes to the marine environment of Port Kembla (irrespective of quantity / volume) to NSW Ports Vessel Traffic Services without delay.	Dredging Contractor	Duration of dredging operations
Measures	Number of incidents where waste has entered the marine environment.	Dredging Contractor	Duration of dredging operations
Reporting/Evidence	• Any incident where discharge of solid or liquid wastes to the marine environment has occurred (irrespective of quantity / volume) shall be reported to NSW Ports Vessel Traffic Services without delay. A documented report on any solid or waste spill incident shall be submitted to NSW Port's Dredging Manager, including (as a minimum) details of the incident, the response measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Dredging Contractor	Within 12 hours of a reportable incidence.
	• Copies of all controlled waste tracking forms to be provided to AIE including but not limited to: o Controlled waste tracking forms completed for all waste discharged ashore. o Discharge logs correspond with controlled waste tracking forms. o Approval certification to demonstrate that an IMO certified sewage	Dredging Contractor	Prior to during and following dredging activities

Task	Action	Responsibility	Timing
	treatment unit is on board. • POLREPs for discharge of waste.		
Target	No unauthorised discharges of wastes to the marine environment.	Dredging Contractor	All times during dredging operations
Contingency	Implementation contingency measures as required by waste management guidelines.	Dredging Contractor	Immediately on notification of discharge incident

9. Responsibilities, Training and Awareness

9.1 Management responsibilities

All Project staff have a general environmental duty to be responsible for actions that affect the environment and must not carry out any activity that causes or potentially causes environmental harm unless all reasonable and practicable measures are taken to prevent or minimise the harm.

The contractor will be responsible for the development of a final DEMP that includes all the commitments outlined in the ODEMP, as well as any additional items raised by any government agencies or stakeholders. The contractor will be responsible for ensuring that all employees, officers, subcontractors and agents associated with the Project are familiar with and comply with all elements of the ODEMP and the approved DEMP. As well as the relevant legislations, guidelines and permits. The contractor must ensure that environmentally sound practices are implemented throughout the duration of the Project.

9.2 Training and awareness

All employees and subcontractors will undertake training, inductions and toolbox talks to ensure that they are aware of their responsibilities and are competent to carry out the work as outlined in the approved DEMP, this includes receiving complaints. Persons performing tasks which have the potential to cause significant environmental impact shall be competent on the basis of appropriate education, training and/or experience. This may involve project-specific environmental training and refreshers to ensure they have the necessary competency levels to meet their responsibilities. Environmental requirements will be explained to employees during site induction and on-going training via tool box meetings, briefings, notifications and the like.

All supervisory staff shall receive detailed training in the environmental requirements of the operation and control measures detailed in this plan.

Toolbox meetings will be conducted on an as needed basis to address environmental issues encountered during the operation and ensure personnel have a current understanding of environmental issues and controls.

The Construction Supervisor is responsible for ensuring that personnel involved in the Project, including subcontractors and visitors, have received environmental training. That is required to ensure they are aware of and understand their responsibilities under the approved DEMP, and that environmental approvals adhere to the strategies outlined in the approved DEMP.

Records of induction and training including attendees, topics covered, type and duration of training are to be maintained.

9.3 Incident management

All incidents and near misses must be recorded, investigated and reported. The procedure for recording and investigating incidents will be detailed in the CEMP.

All potential and actual non-conformances, including incidents and complaints must be reported so that they can be investigated and prevented from recurring. An incident could result in a fine or penalty.

9.3.1 Emergency response

All necessary action should be taken to minimise the size and any adverse effects of the incident. If adequate resources are not available to control the incident, or there is a threat to public health, property or the environment, the following authorities should be contacted:

- NSW Fire Brigade: Phone 000 or 112
- Office of Environment and Heritage / NSW National Parks and Wildlife Service Hotline: Phone 1300 361 967
- NSW Department of Primary Industries:
  - General enquires: Phone 02 6391 3100
  - Aquatic Pest Reporting Hotline: Phone 02 4916 3877
  - Emergency Plant Pest Hotline: Phone 1800 084 881
  - Fishers Watch Hotline: Phone 1800 043 536
  - Invasive Plant and Animals enquiries: Phone 1800 680 244
- Department of Environment and Energy: Phone 1800 803 772
- NSW Ports, Port Kembla Office: Phone 1300 922 524

Emergency response equipment including fire extinguishers and spill equipment with a containment/absorption capacity appropriate to the type of plant and equipment shall be kept in readily accessible locations on-site and clearly marked "**SPILL RESPONSE EQUIPMENT**" at all times.

The four main steps to manage pollution/fire emergencies are:

1. Control:

   Eliminate the source and contain emergency using extinguishers, spill response equipment, earth, shut-off valve or other suitable material or equipment at hand.

2. Contain:

   Use appropriate materials (including spill kit equipment) to contain the spill preventing further contamination.

3. Notify Supervision:

   Notify the most senior supervisor available to co-ordinate an appropriate response and seek advice as required.

4. Clean-up:

   Use available resources (e.g. spill response equipment) under the direction of the Emergency Response Officer to clean up the spill immediately to minimise the potential for further contamination.

5. Remediate / Dispose:

   Under the direction of the Emergency Response Officer remediate or appropriately dispose of any residual contaminates immediately to minimise the potential for further contamination.

9.3.2 Complaints

The CEMP will outline the procedure in which complaints will be handled.

Complaints and incident reports may be received from stakeholders by the AIE via the dedicated 1300 telephone number or email address. They may also be received in person, via

the site office or by telephone through head office. All AIE site personnel, subcontracts and relevant persons will be trained in receiving complaints so that relevant information is recorded.

A register of incidents and complaints shall be maintained on-site.

9.4 Action plans

If an issue arises outside the scope of this ODEMP and the final DEMP, a risk-based action plan will be developed by the Site Supervisor in collaboration with the Project Environmental Representative, Superintendent and relevant authorities.

This risk-based action plan with be undertaken for the migration measures within this ODEMP and the final DEMP found to be ineffective.

9.5 Communication and notification

Communications procedures will be detailed in the CEMP and will include reporting, incidents, complaints and action plans as outlined in Section 8.2, Section 9.3 and Section 9.4 respectively.

The CEMP will also outline the produces in which employees are informed about the changes in the Project.

10. References

Commonwealth of Australia (2009). National Assessment Guidelines for Dredging, Commonwealth of Australia, Canberra, 2009.

GHD 2018, *Volume 1 – Environmental Impact Statement Dredge*, report prepared for Australian Industrial Energy

NSW Ports (2015). Navigating the Future, NSW Ports' 30 Year Master Plan,

https://www.nswports.com.au/assets/Uploads/Publications/NSW-Ports-Master-Plan-2015.pdf

GHD

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2127477-39924/https://projects.ghd.com/oc/Sydney1/eastcoastlngterminal/Delivery/Documents/2127477-Australian Industrial Energy-Outline DMP.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
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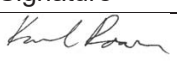
0	J Tesarieso	C Dengate		K Rosen		4/2/19

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Appendix B
Hydrodynamic modelling

See appended document

Appendix C
Stakeholder consultation materials

ISSUE 2 | NOVEMBER 2018

AIE
Powering Australian Industry

PORT KEMBLA GAS TERMINAL COMMUNITY NEWSLETTER

Impression of the PKGT - FSRU moored adjacent to modified Berth 101, with LNG carrier berthed alongside to deliver an LNG cargo

Welcome to the second edition of our community newsletter where we will update you on our work to develop Australia's first liquefied natural gas (LNG) import terminal at Port Kembla.

We have now lodged the Project's key assessment document, the Environmental Impact Statement (EIS), with the NSW Government.

Since announcing Port Kembla as the site of our proposed LNG import terminal in June, a wide range of Government agencies and regulators have been briefed on the project and several have travelled to Port Kembla to visit the site. These agencies then provided their advice on the scientific studies and impact assessments which would need to be included in the Project's EIS.

The Government must now determine if our EIS satisfies these requirements, and the Project can be carried out safely, with minimal environmental and social impacts.

The EIS is on public exhibition until December 14, with the community and interest groups able to make submissions on the Project.

See page 4 for more information on how to view the EIS and make a submission.

ABOUT THE PKGT

- Located at Berth 101 in Port Kembla's Inner Harbour
- Will have the capacity to supply over 70% of NSW's total annual gas demand
- Will deliver gas to market by 2020, subject to regulatory approval timeframes
- Could provide between 10 to 12 days of natural gas storage in case of supply disruptions
- Around 130 to 150 jobs created during construction and 40 to 50 ongoing roles during operation
- A new source of local energy will add to the investment attractiveness of the Wollongong region

AUSTRALIAN INDUSTRIAL ENERGY
1800 810 680 | Info@ausindenergy.com
Level 25, Aurora Place, 88 Phillip Street, Sydney NSW 2000

www.ausindenergy.com

At the i3net dinner - Mark Grimson - Wollongong City Council Economic Development Manager, Paul Lackersteen – Broadspectrum, Kylie Hargreaves and Leesa Selke – AIE, Wollongong Lord Mayor – Gordon Bradbery AM and Bianca Perry – i3net

IN THE COMMUNITY

COMMUNITY INFORMATION SESSION

On August 14 we held a community information session at Steelers' Leagues Club in Wollongong.

Attendees were interested in how the Port Kembla Gas Terminal would work, the facilities involved and in the proposed pipeline route. Our safety and environment team members were also on hand to cover off on these key areas.

Several local business people and service providers stopped in to find out more about the Project and discuss how it might positively impact the local economy and provide opportunities for their businesses in the future.

Since our last community update in July, we have briefed a number of local groups on the project.

AUGUST

- It was great to meet more of the local business people at the Port Kembla Chamber of Commerce meeting and to see how passionate they are about promoting their local area.
- Having previously met Neighbourhood Forum 5, we attended the August meeting of Neighbourhood Forum 7 and were pleased to meet the community members who live closest to our proposed terminal and discuss our project with them.

SEPTEMBER

- We briefed Bluescope Steel's Community Consultative Committee
- Later in the month around 25 regional and local emergency services staff toured our proposed site and were given a detailed rundown on the Project.
- We were also pleased to accept an invitation to present to the Illawarra Business Chamber's Regional Advisory Council made up of delegates from the wider region.

OCTOBER

- Last month, we met with a number of Port Kembla tenants, our proposed neighbours, to outline how our project can work in with their businesses and minimise impacts to their operations.

NOVEMBER

- Thanks to Emilio Salucci, Bianca Perry and the i3net board for inviting AIE's Kylie Hargreaves to be a guest speaker at i3net's Illawarra Industry Showcase Dinner on November 8. It was an excellent showcase of regional capabilities.

If your local community group or organisation would like to know more about the PKGT please contact us via our website.

Above photo courtesy of Chilby Photography www.chilby.com.au

WHAT IS LNG?

- LNG is natural gas, mostly methane
- It is liquefied by cooling it to approximately -161 degrees Celsius
- LNG is odourless, colourless, non-toxic and not flammable or explosive, making it safe to transport
- It quickly evaporates when exposed to air leaving no residue
- In liquid form, the volume of gas is 1/600th its original size
- LNG was first transferred by ship almost 60 years ago
- There are hundreds of LNG carriers in operation around the world

ABOUT AIE

Australian Industrial Energy was formed in 2017 by a consortium of Australian and international companies with extensive global energy sector expertise:

- Squadron Energy - leading Australian industrialist Andrew Forrest's privately owned energy company
- Marubeni Corporation - a major Japanese trading and investment business with operations and interests in over 66 countries including LNG import terminals, gas pipelines and power investments
- JERA Co., Inc.– a Japanese company which is the largest buyer of LNG in the world, operator of eight LNG import terminals and its own fleet of LNG carriers

FSRU PARTNER CHOSEN

AIE is thrilled to have secured an exclusive agreement, subject to planning approvals, with Höegh LNG, a global leader in the development and operation of floating storage and regasification units (FSRUs). Headquartered in Norway and with a long history of both LNG and marine transportation, Höegh LNG will operate the Project's FSRU, which will be under charter to AIE.

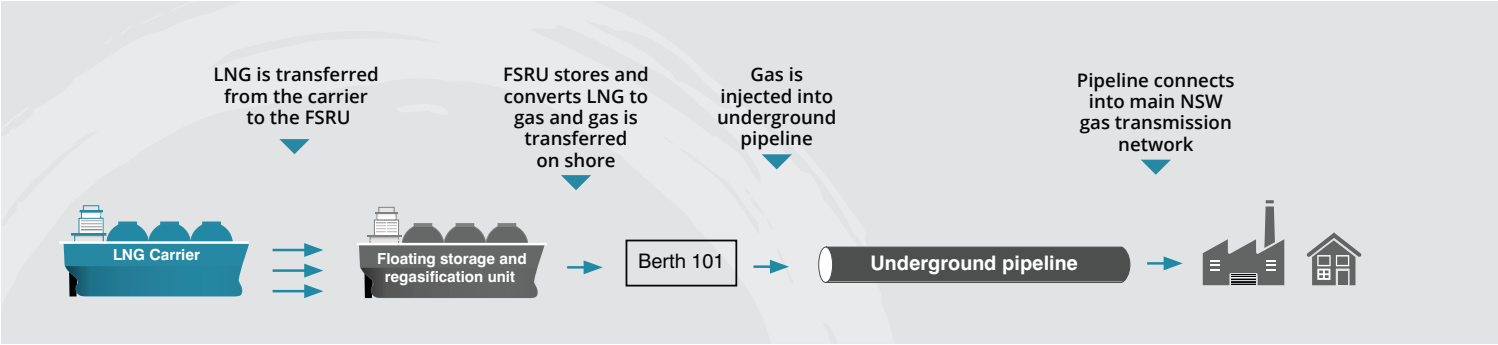
The vessel will be moored at Berth 101 in Port Kembla's Inner Harbour, take on regular LNG cargoes from visiting carriers, store the LNG and then regasify it onboard for transfer into the local gas transmission network.

FSRUs and LNG carriers are built to very strict international design standards, including the International Maritime Organisation's - International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). Höegh's vessels make up one third of the global FSRU fleet and our partnership will ensure the FSRU includes the most up to date safety and environmentally sustainable solutions.

Our team inspecting a Höegh FSRU under construction in Korea

ABOUT THE FSRU

- The FSRU is a large vessel, almost 300 metres in length with capacity of 170,000m^3
- The FSRU is similar to an LNG carrier but is also equipped to regasify LNG on board
- Although moored in Port, the FSRU remains a seaworthy vessel, with a marine crew living on board, so it can be sailed out of Port quickly if required
- LNG will be stored onboard the FSRU in double-hulled tanks designed to keep gas at -161^{o}C in liquid form
- The double-hulled tanks also provide protection against accidental leaks or rupture
- When stored as a liquid, natural gas is odourless, non-toxic and not flammable or explosive
- When needed, the LNG is regasified onboard the FSRU
- The LNG is flowed through a series of pipes onboard and seawater from the harbour is circulated around the pipes to warm the LNG, slowly turning it back into gas
- The gas is then transferred via high pressure loading arms or hoses into the onshore underground pipeline



ISSUE 2 | NOVEMBER 2018

PORT KEMBLA GAS TERMINAL COMMUNITY NEWSLETTER

COMMUNITY INFORMATION LINE 1800 810 680

The University of Tasmania's maritime simulation programs were used to model impacts of the PKGT on Port Kembla's operations.

PROJECT UPDATE

Over the past few months we have been busy finalising the engineering design for the Project, often called Front-End Engineering Design (FEED). At the same time, we've been carrying out a number of scientific studies and assessments for input into our EIS.

We have conducted noise, air quality and traffic studies, as well as assessing the visual impact of the Project. Hazard and risk assessments are also a requirement of the EIS and have been undertaken to ensure the safe operation of the Project.

Existing Berth 101 will be excavated and harbour dredging will take place so, that when moored, the FSRU will sit inset from the current shoreline and not protrude into the entrance to the Inner Harbour. As part of our early design work, geotechnical drilling has recently been completed at the berth site. The core samples gathered have been analysed and the data included in the EIS contamination investigations. The testing has confirmed material excavated from the berth and harbour should be suitable for use in Port Kembla's planned Outer Harbour reclamation project.

We have carried out marine ecology and water quality studies to confirm the construction and the ongoing operation of the Project will not significantly impact the Port's marine environment.

To assess any effects on Port operations from the Project, the Port Kembla Harbour Master and his team travelled to the University of Tasmania's Maritime Simulation Centre. They trialled various ship movement scenarios on the Centre's state-of-the-art simulation equipment, with the information fed into the Terminal design work and the PKGT EIS.

The Project also includes construction of an underground pipeline, around 6.3 kilometres long, to link the terminal with existing gas transmission infrastructure at Cringila. We have undertaken ecological assessments of the proposed route. We plan to drill underneath any areas of potential biodiversity and cultural heritage significance, as well as roads and rail networks, in order to minimise the impacts of the pipeline.

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PROJECT PROGRESS:

- [x] AIE announces plans for NSW LNG import terminal
- [x] Port Kembla site selected
- [x] Project declared Critical State Significant Infrastructure
- [x] Planning assessment process commences
- [x] Studies and broad community engagement underway
- [x] EIS lodged
- [x] EIS public exhibition and submissions
- [ ] AIE responds to submissions
- [ ] NSW Government considers the Project
- [ ] NSW Government makes its assessment decision

WHERE TO SEE THE EIS

Wollongong City Council:
41 Burelli St Wollongong

Warrawong District Library:
Level 1, 67-71 King St Warrawong

Department of Planning and Environment:
Level 30, 320 Pitt Street Sydney

Nature Conservation Council:
Level 14, 338 Pitt Street Sydney

Online: www.majorprojects.planning.nsw.gov.au

MAKE A SUBMISSION

Online: www.majorprojects.planning.nsw.gov.au

Mail: Executive Director Resource Assessments & Business Systems
Department of Planning and Environment
Application number CSSI 18_9471
GPO Box 39, Sydney NSW 2001

The EIS is on exhibition until December 14. All submissions must be received by that date.

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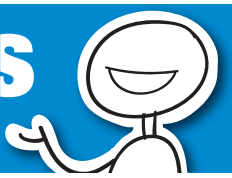

Fairfax Media

Index

Deaths & Funerals

FITZPATRICK
Brian
of Windang
formerly of Warrawong

Passed away after a short illness on October 31, 2018. Dearly loved husband of Annette (deceased), loved brother of Oswald (dec), Frank (dec), Margaret and Daphne (dec). Adored Uncle and Great Uncle of his many nieces and nephews. Brian will be sadly missed by his loving family and many dear friends.

Aged 85 Years
Re-united with Annette

A graveside service for Brian will be held on **Saturday November 3, 2018** at **2.30pm,** in **Lakeside Memorial Park Cemetery, 230 Kanahooka Road, Kanahooka.**

Rankins FUNERALS Phone: 4276 1000

SHEEHAN
John "Jack"

Passed away peacefully at home surrounded by loving family. Dearly beloved Husband of 68 years to Marie. Loving Father and Father-in-law of Evelyn (dec), Lyn, John, Wendy & Rob. Cherished Poppy to his loving Grandchildren and Great Grandchildren Lisa, Ben, Isabelle, James, Ryan, Leigh, Maree, Debbie, Johnny, Jasmine, Grace, Allie, Poppie, Abel, Chelsea, Livvy and Ellie.

Aged 90 Years
We have so many happy memories,
You will be in our hearts forever.

Relatives and friends of **Jack** are invited to attend his funeral service to be held at the **Lakeside Memorial Park Chapel, 230 Kanahooka Road, Dapto** on **Monday 5th November, 2018** commencing at **12pm.**

HANSEN & COLE | Kembla Grange 4272 4900 | Proudly Australian
hansenandcolefunerals.com.au

In Memoriam

HART
Leslie Bond
November 2, 2000
As the sun sets and the day is done that's when I miss you most of all.
Always loved
Your loving wife and family

Condolences

PENNO, John ~"Jack"

The Windang Sharks RLFC would like to extend their sincerest condolences on the passing of Mr Penno, a wonderful man and our very first life member.
The Committee and Life Members of Windang RFLC .

Garage Sales

☐ VISIT ☐ VISITED

WARRILLA, 16 Spofforth St, Sat 3 Nov, 8am. Moving Sale!

Beauty Health and Fitness

ERIKA'S Swedish Relaxation Massage. $60/hr. Kiama.
0477 070 308

NEW Shop Open new lady. 9am-7:30pm. Open 7 days. 32 Queen st Lake Illawarra
0426 095 768

SUNSHINE Thai Massage Oil & Thai. 9am-9pm. 126 Gladstone Ave, Coniston 0431 059 370.

Boats and Accessories

BOATING LICENCE
Wollongong
4th November
Limited places avail.
Phone 0468 544 567

Accessories and Spare Parts

Accessories and Spare Parts

$$A1 ABANDONED DAMAGED or UNWANTED
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Top cash on the spot
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Call Jim now
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We are local!
*Conditions apply

To Let & Wanted

ALBION PARK. Lake & Mtn views. 2 lrg 4 br townhouses. Built in w'drobes, 3 bath, dbl garage. Brand new. Priv. No pets/kids. Working couple. Good ref req $640 & $650
0407 469 934

Public Notices

JESUS answered, ... If any one love me, he will keep my word... John 14:23

Public Notices

PORT KEMBLA GAS TERMINAL

Public Notice

AIE Powering Australian Industry

Notice of Development Application for Critical State Significant Infrastructure under section 5.15 of the Environmental Planning & Assessment Act 1979 by Australian Industrial Energy Pty Ltd (ABN 20 624 375 417) in respect of the Port Kembla Gas Terminal (CSSI 18_9471)

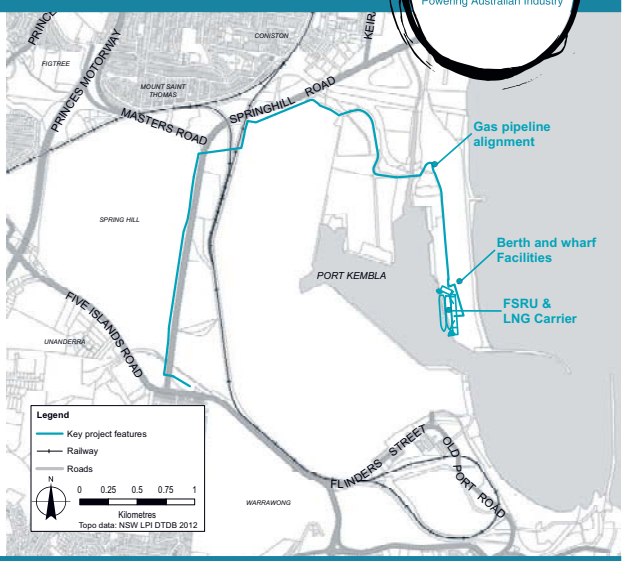
Pursuant to section 193(4) of the Environmental Planning and Assessment Regulation 2000, Australian Industrial Energy hereby gives notice of a development application to be made to the New South Wales Minister for Planning and Environment under section 5.15 of the Environmental Planning and Assessment Act 1979 to develop the Port Kembla Gas Terminal Project (the project).

Australian Industrial Energy comprises a consortium of world renowned Australian and international companies with extensive expertise and experience in the global energy sector. The consortium partners being Squadron Energy, Marubeni Corporation and JERA Co., Inc.

The project involves the development of a liquefied natural gas import terminal at Port Kembla, south of Wollongong in NSW. The project includes four key components being berth and wharf facilities at Berth 101 at Port Kembla, a floating storage and regasification unit (FSRU) moored at Berth 101, carriers that would deliver liquefied natural gas to the FSRU, and a short underground gas pipeline that would connect Berth 101 to the existing east coast gas transmission network at Cringilla.

An environmental impact statement has been prepared to accompany the development application for the project and will be available shortly on the Department of Planning and Environment major project assessments website at:

www.majorprojects.planning.nsw.gov.au/



Contact Details: Kylie Hargreaves **(02) 8823 3428**

Further information about AIE and the project is available at **www.ausindenergy.com**

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https://projects.ghd.com/oc/Sydney1/eastcoastlngterminal/Delivery/Documents/Submissions/03 Report/2127477_Submissions_Report.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	M Goodall C Dengate	K Rosen		K Rosen		4/2/19

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