Port Kembla Gas Terminal

Volume 1 Environmental Impact Statement

November 2018

Declaration

This environmental impact statement for the Port Kembla Gas Terminal has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* and submitted under section 5.15 of the *Environmental Planning and Assessment Act 1979*.

Development application	**Project**	Port Kembla Gas Terminal		
	Proponent	Australian Industrial Energy		
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Declaration	The environmental impact statement has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. The environmental impact statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates. The information contained in the environmental impact statement is neither false nor misleading.			
	Signature			
	Name	Karl Rosen	Craig Dengate	Michael Goodall
	Date	5/11/2018	5/11/2018	5/11/2018

Executive summary

Introduction

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 will be the first of its kind in NSW and provide a simple, 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 State'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 proponent

AIE was formed in 2017 by a consortium of Australian and international companies with extensive global expertise and experience in the energy sector. The consortium consists of:

- ***Squadron Energy*** — a privately owned energy company forming part of the Minderoo Group, with a record of world class natural resource projects across Australia.
- ***Marubeni Corporation*** — a major Japanese trading and investment business with significant energy sector expertise and interests in over 25 countries including LNG import terminals, gas pipelines and power plant.
- ***JERA Co., Inc.*** — established in April 2015 as part of a comprehensive alliance between TEPCO Fuel & Power, Incorporated (a wholly owned subsidiary of Tokyo Electric Power Company Holdings, Incorporated) and Chubu Electric Power Co., Incorporated. JERA Co., Inc. is the largest buyer of LNG in the world (about 10 to 15% of the global market), operates eight import terminals, is an equity owner in four Australian LNG export projects, and operates a fleet of LNG transport ships and approximately 70GW of power generation.

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.

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

Site setting

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 include 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.

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 ACT.

Project Description

The Port Kembla Gas Terminal consists of four key components:

- LNG carrier vessels — there are hundreds of these in operation worldwide 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.

An overview of the proposed layout for the project is shown on Figure E1.

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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Australian Industrial Energy
Port Kembla Gas Terminal

Project No. **21-27477**
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Project layout

Figure E-1

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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

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.

The FSRU has four key functional elements: facilities to receive LNG from LNG carriers; facilities to store LNG; facilities to convert LNG to high pressure gas; and connection to the gas pipeline.

Purpose built flexible hoses will be used to transfer LNG from visiting LNG carriers to the FSRU. It is expected that the FSRU itself will have six hoses, which will include four for receiving LNG and two for maintaining a balance of vapour gas between ships.

Cargo tanks to store the LNG in the FSRU are purpose built and designed to achieve two outcomes:

- to insulate and contain LNG cargo at cryogenic temperatures (approximately minus 161 degrees Celsius); and
- to prevent leakages and isolate the cargo from the hull structure.

Boil-off gas (BOG) management facilities are also in place to capture small amounts of natural gas that is generated from LNG in the storage tanks. This BOG is used to fuel the on-board generators for the operation of pumps and other equipment used on-board.

The regasification unit located on board the FSRU is typically located toward the bow or centre of the vessel. The regasification process involves LNG being pumped up from the cargo tanks into a suction drum. The LNG is then pumped through a series of heat exchanges, which utilise seawater as a source of natural heat differential to warm up the LNG. Once in a gaseous form, the gas is exported, under pressure, through the marine loading arms into the gas pipeline.

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.

A range of topside facilities will be established at the wharf, including mooring infrastructure, gas transfer infrastructure including offloading arms, and gas pipeline tie-in and maintenance infrastructure. A range of ancillary facilities would also be required at the wharf including access roads, fencing and other security, lighting, telecommunications, electricity, water, sewerage and other utilities.

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 the a tie-in point at Cringila, which in turn is connected to the 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 receiving approval, construction will commence in 2019 and 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.

Subject to approval processes, the project expected to receive first gas delivery by 2020 and have a design life of around 10 to 15 years, which may be extended subject to sufficient ongoing gas demand. Once fully operational, the project is expected to employ about 40–50 personnel.

Project approval process

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*. This Environmental Impact Statement (EIS) has been prepared to support the development application for determination by the NSW Minister for Planning.

This EIS has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act), Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the Secretary's Environmental Assessment Requirements (SEARS) issued by the Department of Planning and Environment (DPE) on 10 August 2018.

All applicable NSW and Commonwealth legislation has been considered in during the preparation of this EIS.

The project is not considered to have potential to have a significant impact upon any listed matters of national environmental significance including listed threatened species and communities. A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is therefore not required for the project.

Stakeholder Consultation

A wide range of consultation activities have been undertaken as part of the project. This includes more than 40 group or one on one briefings and a project website (www.ausindenergy.com), which has been developed to provide comprehensive, clear and accessible information that is updated on a regular basis.

As well as the local Port Kembla and broader community of the Wollongong region, extensive engagement was also undertaken with a range of other interested key stakeholders, such as local commerce organisations, the Port Authority and local and state government.

The engagement activities provided an opportunity to inform stakeholders about the project and the CSSI assessment process, and to answer questions and obtain feedback on additional benefits, concerns or challenges associated with the project.

The issues and opportunities identified during the consultation process have been considered by the project team in relation to the proposed scope and design of the project and have been used to inform the preparation of this EIS.

Port Navigation

Port Kembla has a deep-water shipping channel that can accommodate vessels with ship length of up to 311 metres and has capacity for Capesize vessels at nominated berths. Pilotage is compulsory for all vessels over 30 metres in length.

The Port Authority of NSW is responsible for the management of shipping operations in Port Kembla, including the provision of Harbour Master functions, pilotage, navigation services and ship scheduling. The Harbour Master establishes port operational procedures (port instructions) relating to vessel navigation protocols, ship scheduling, berthing and under keel depth requirements, as well as performance standards to achieve safe, effective, reliable and cost efficient shipping.

The project proposes an LNG shipment every two to three weeks, which equates to around 4 vessel movements on average per month. The LNG carrier movements are low in proportion to the vessels movements anticipated from other operational arrangements at the port (1,680 to 2,380 vessel movements per year) and are not expected to significantly increase vessel movements or restrict navigability within the port.

A navigation simulation study was undertaken during the development of the project to determine potential risks associated with interaction with other vessels and to refine the layout of the proposed berthing arrangements. The final berth layout was moved slightly to the north and is aligned to be parallel with Berth 102 as part of the design process. The layout provides a 40 metre offset from the Inner Harbour turning basin when the LNG carrier is berthed alongside the FSRU. This typically occurs every two to three weeks for a period of around 24 to 36 hours so an additional buffer distance is available for the majority of the year.

The navigational study indicated there is a need for some modifications to the current operating practices when turning other vessels in the Inner Harbour to maintain safe clearances. Currently, vessels commence turning once they cross the Eastern Basin (eastern side of the turning basin). When an LNG carrier is in berth, vessel turning will have to occur further towards the north-west quadrant of the turning basin to allow for vessel leeway, particularly under westerly wind conditions. This was successfully tested in the simulators and will require modifications to the current turning circle, extra Pilot training, extra aids to navigation for Pilots (upgraded portable Pilot Unit computers using differential global positioning systems) and to include the turning circle, and extra monitoring by the VTIC. Additionally, the Harbour Master may need to modify port parameters for vessels using the turning basin in higher wind conditions, which may also involve the use of existing Port Kembla tugs or reduced wind conditions.

Overall, results of the navigational simulation study showed that safe navigation through the channel and in the Inner Harbour is possible for all vessels when combined with the proposed berth layout.

Ship-handling protocols will be developed by the Harbour Master to ensure adequate management measures are implemented for passing vessels which may cause interaction with vessels berthed at Berth 101 (LNG carrier's and FSRU).

Hazard and Risk

The project represents a new industry to NSW and introduces potential associated hazards and risk to people and property located in the surrounding area. The project is being developed in accordance with a range of global best practice and international, Australian and NSW regulations, standards and guidelines that would mean the risk posed by the project is inherently low.

A preliminary hazard analysis (PHA) was carried out in accordance with the NSW Department of Planning and Environment guideline *Hazardous Industry Planning Advisory Paper No 6 Hazard Analysis*, including quantitative risk assessment of the LNG carriers, FSRU, berth and wharf facilities and the gas pipeline. The PHA involved the identification of specific hazardous events, the probability of them occurring and the consequences for people and property if they did occur. The overall risk associated with the hazards was determined in relation to defined criteria under *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning*.

The main hazards that were identified related to a loss of containment of liquid natural gas from a LNG carrier or the FSRU, or a loss of containment of natural gas from the FSRU, the gas pipeline or connecting unloading arms and pipes at the berth and wharf facilities. The potential impact of propagation risk to and from adjacent industrial sites was also considered. Lastly, the

potential for collision between a LNG carrier and another vessel was also considered. The potential consequences of those hazardous events, including potential fire and explosion, were then determined in specialist risk modelling software.

The assessment found that risk to people or property in sensitive areas, residential areas or commercial areas was very low and complied with the stringent risk thresholds in the Department of Planning and Environment guideline *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning*. Risk at adjacent industrial areas or open land were also assessed to be low given the low probability of a hazard event occurring.

In addition to various safety features proposed to be built into the project, a comprehensive safety management system would be implemented in accordance with relevant regulations, standards and guidelines including *Hazardous Industry Planning Advisory Paper No 9 Safety Management*. A detailed safety case will be developed for the project in accordance with the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2017*. The safety case would require separate approval from SafeWork NSW and would provide further detailed assessment of safety risks, emergency planning and management systems informed by the detailed design of the project.

Soils and contamination

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) near the inferred base of fill material between four metres 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, subject to further delineation of hotspots and mitigation measures developed to manage potential health impacts during construction works as part of an environmental management plan. Potential risks to marine environmental receptors from relocation of the berth material is considered low and acceptable based on measured concentrations of contaminants.

Groundwater inflows at Berth 101 were typically encountered at depths between about 3.7 metres and 5.0 metres below ground level. There were no obvious signs of groundwater contamination identified during well installation or groundwater sampling, however laboratory analysis indicated some relatively minor impacts from heavy metals and ammonia with a perched fresh to brackish groundwater lens. The proposed piling and excavation works will limit the amount of perched water discharging into the marine environment, which will in any event significantly reduce the concentrations of contaminants observed in this investigation.

The investigations did not identify any widespread, gross contamination of soils along the proposed pipeline alignment. However, fill materials are considered to have a moderate likelihood of contamination based upon current and historical land uses. The potential for localised contamination to be present within fill along the pipeline alignment should be anticipated in the development of environmental management plans for the project.

Potential acid sulphate soils (ASS) occur in natural sediments below the level of fill and within marine sediments, particularly where dark grey and green clays exist. Disturbance of these natural sediments during excavation or dredging has the potential to impact the surrounding marine environment. The activities will need to be carefully managed and it is recommended that an acid sulphate soil management plan (ASSMP) be prepared as part of the environmental

management plan for the project. The ASSMP will include measures to minimise the potential oxidation of sediments such as minimising the time of exposure to oxygen during excavation and transport and placement at depth beneath the sea level within the disposal footprint.

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.

Additional sediment sampling within the proposed dredge footprint adjacent to Berth 101 and at two locations within the disposal area was completed to confirm the findings of the previous assessments. Elevated metal concentrations were reported above the nominated screening levels in the dredge footprint at both Berth 101 and the Outer Harbour disposal area. Other contaminants of potential concern, including PAH, TBT and hydrocarbons reported 95% UCL average concentrations below the nominated screening levels in the dredge area at Berth 101 with some elevated concentrations within the Outer Harbour.

Analytical results were generally consistent with those reported previously by others including detailed studies undertaken by AECOM (2010) for the Outer Harbour Project and Worley Parsons (2012) for a previously proposed redevelopment of Berth 101. No new contaminants of potential concern were identified at levels exceeding screening criteria during the current investigations.

Overall, the findings of 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 any dredging management plan.

A dredging management plan should be prepared by the proponent prior to the dredging of Berth 101, outlining the contamination management and mitigation measures, including surface water monitoring, which will be implemented during the course of the works to minimise potential impacts to the receiving waters.

Water Resources

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.

A number of water quality monitoring studies have been undertaken in order to define ambient water quality within the port and to monitor water quality parameters during previous dredging campaigns. The 2002-2005 monitoring program undertaken by the Port Kembla Environment Group is considered to be the most comprehensive study of ambient water quality conditions within the harbour. The program aimed to establish benchmarks to determine trends and future improvements in water quality and assess whether contaminant concentrations exceed the ANZECC / ARMCANZ Guidelines (2000).

The program identified concentrations of aluminium, cadmium, copper, lead, zinc, tin and arsenic in excess of the ANZECC (2000) 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. Total suspended solid (TSS) concentrations are influenced by shipping movements and freshwater flood events and are slightly higher within the Inner Harbour than the Outer Harbour. Monitoring indicates pH levels are lower in the Inner Harbour than the Outer Harbour and are likely to be influenced by freshwater discharges from existing waterways. Water temperatures within Port Kembla are generally higher than those measured offshore due to tidal flushing patterns and existing warm water industrial discharges into the Inner Harbour.

Potential impacts during the construction phase are primarily associated with water quality impacts 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 increase rates of sedimentation.

Numerical modelling was undertaken to assess impacts to Total Suspended Solids (TSS) and sediment deposition associated with the dredging and disposal of harbour muds within the Inner and Outer Harbours respectively. The dredge plume is predicted to be confined to waters within the port with significant TSS concentrations confined to the vicinity of the dredging and disposal areas. Sedimentation is predicted to occur in the immediate vicinity of the dredging and disposal activities with no noticeable impacts to sedimentation rates outside of the port. Potential impacts to turbidity levels and sedimentation rates will be further restricted through the use of silt curtains surrounding equipment and activities where there is a potential for impacts to water quality.

Potential impacts during operations are primarily associated with seawater discharges from the FSRU generated during the regasification process and hydrodynamic impacts associated with the altered port configuration.

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 at up to 7^{o} Celsius cooler than the ambient sea water temperature. Modelling predicted that initial mixing will reduce the temperature differential to one degree at each end of the proposed berth and average temperatures within the port are expected to decrease by 0.1 to 0.2 degrees. This will be partially offset by the current warm water discharges from industrial releases into Allans Creek.

The FSRU operates a Marine Growth Prevention System (MGPS), which helps to ensure no marine growth in the various pipes and other processes which use seawater within the operations. The MGPS takes seawater from the surrounding area, uses its natural salts to produce a solution of sodium hypochlorite to act as a natural biocide. The sodium hypochlorite degrades naturally and so most of the created solution will be used within the vessel well before the water is ready for re-release.

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 will ensure that free chlorine (total residual oxidant in estuarine/marine water) concentrations remain below 0.2 ppm. The discharge plume is predicted to have been diluted by a factor of four by the time the plume reaches the floor of the Inner Harbour and a dilution factor of 30 at a distance of 400m from the discharge point. Slightly elevated levels of chlorine residual in receiving waters is expected to be primarily restricted to the Inner Harbour and are not expected to extend beyond the Outer Harbour.

Modelling has also been undertaken to understand the impacts of the project on hydrodynamic processes within the Inner and Outer Harbours. Results demonstrate that the revised disposal footprint is expected to increase long wave heights at select locations within the Outer Harbour.

These predicted impacts will require consideration by NSW Ports during the design development of the berthing and mooring infrastructure associated with the proposed Outer Harbour Development. No impacts to long waves are predicted within the Inner Harbour.

The location of the proposed terminal berth has been refined through navigation simulations to be located as close possible to the existing turning basin. This approach minimises hydrodynamic impacts and reduces dredging and disposal volumes as far as possible.

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 seabed within the Inner Harbour consists of fine, unconsolidated silt expanses with large decapod burrows. There are no known seagrass habitats, however macroalgae has been known to occur in sparse distributions across soft sediments habitats within the port.

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.

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

Direct disturbance to biofouling and benthic communities

Disturbance to the biofouling community will be short term as recolonisation of the new piles is expected to commence following installation, after which, the biofouling community will undergo a long-term natural recruitment succession process reaching mature level community within years.

Dredging activities will directly impact on biofouling and benthic communities through direct removal of the substrate from the environment, and indirectly through generation of turbid plumes. The dredged areas within the berth will eventually be covered with fine layers of silt from the vessel propeller wash, and will be colonised with similar benthic communities from the surrounding areas within the Inner Harbour.

The construction of the perimeter bund and subsequent dredged sediment disposal is expected to permanently remove a maximum of 16.5 hectares of benthic habitat and associated benthic communities from the Outer Harbour area. This will be offset by the creation of the disposal area infrastructure providing new surface for colonisation by biofouling communities.

Deterioration in water quality

Deterioration of water quality through increased turbidity, mobilisation of contaminants and seawater releases has potential to impact upon marine ecology values within the port.

Turbidity from removal and placement of the sediment has the potential to impact on fish feeding ability, fish gills and filter-feeding organisms. However, it is likely that organisms are already established within a marine environment historically exposed to numerous dredging and disposal campaigns and regular sweeping within Port Kembla. These species will be resilient to any short-term increases in suspended solids resulting from dredging and disposal activities. The potential release of contaminants will be localised within the harbour and medium-term in

nature. Suspended sediment will be confined within silt curtains at Berth 101 while dredge material will be confined within the perimeter bund at the Outer Harbour to minimise the migration of sediments following disposal. Contaminated sediment will be capped with clean material at the disposal area, so the duration of exposure to toxicants are considered to be short in duration while long-term toxic effects are considered unlikely.

Handling of sediment may trigger blooms of the toxic dinoflagellate *Alexandrium catenella* when conditions are favourable. Such blooms 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 low because cysts have not been detected during recent investigations.

Release of cold water from the FSRU will have minor impacts on seawater temperatures confined within the port limits. Release of cold water from the FSRU will also involve release of residual chlorine. The discharge plume is predicted to have been diluted by a factor of four by the time the plume reaches the floor of the Inner Harbour and a dilution factor of 30 at a distance of 400 m from the discharge point and residual chlorine is expected to be primarily restricted to the Inner Harbour environment.

Marine communities in close proximity to the discharge point have potential to be adversely affected by the decrease in temperature/presence of residual chlorine. This is likely to include the biofouling communities at adjacent pylons, the benthic community under and adjacent to the FSRU and benthic/pelagic fish passing through the plume area. Decreases in temperature and the presence of residual chlorine may lead to the avoidance of the area by mobile species, and the inhibition of growth, spawning or larval settlement of sessile organisms.

Noise pollution from pile driving and rock placement

Piling and dredging construction activities have potential to generate noise that could displace fauna from the area realising a temporary reduction in diversity. They also have potential to cause a temporary or permanent threshold shift (TTS or PTS) in the hearing ability of sensitive fauna that use acoustic means of navigation or communication. Underwater noise impacts from dredging are not anticipated to cause permanent auditory damage to marine fauna in the area. Once construction is completed, underwater noise will be restricted to standard shipping noise associated with vessel movements between port environments.

Artificial light emissions

Artificial light emissions may occur through the use of vessel and site construction safety lighting during the construction phase of the project and from lights installed as part of the new berth infrastructure and FSRU. Artificial lighting may affect fauna by altering use of visual cues for orientation, navigation or other purposes, resulting in behavioural responses, which can alter foraging and breeding activity in marine turtles, cephalopods, birds, fish, dolphins, and other pelagic species.

The existing berth is currently lit at night, it is therefore assumed that marine fauna species currently using the project area will be habituated to extant light conditions. Similar lighting will be installed on the redeveloped berth and on the FSRU and LNG Carriers when in berth. This lighting is expected to be minimal in comparison to cumulative light emissions of other illuminated infrastructure within Port Kembla. As such, site lighting is not predicted to result in any change in migratory behaviours of birds that use the area and are already habituated to current light conditions.

Introduction or assisting the spread of marine pests

The project has potential to introduce pests via vessels and proliferation. However, through implementation of mitigation measures this issue can be appropriately managed. These include adhering to relevant port requirements and international vessels will adhere to relevant requirements, sourcing vessels locally (within NSW waters) for construction works, and following the correct channels of notification in the event that an invasive marine pests is identified or suspected

Marine fauna collisions

The risk of potential vessel strike during construction is considered low for all marine species likely to occur in the project area, including cetaceans, sharks and fish.

Accidental release of waste or oil spills following vessel collisions

Accidental release of waste or oil spills following vessels collisions has potential to impact upon water quality and the heath of marine ecology in the area.

Overview

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.

Terrestrial Biodiversity

A detailed assessment of biodiversity has been undertaken as part of this EIS. The project is located in a highly disturbed and modified industrial environment with minimal native vegetation and associated habitat for threatened species present in the area.

A single patch of native vegetation is located on the pipeline's alignment on the western side of Springhill Road. This patch comprises a small area of dense revegetation on modified/cleared lands and does not constitute a threatened ecological community. The project will result in the removal of 0.25 hectares of planted native vegetation (PCT 1326 Woollybutt – White Stringybark – Forest Red Gum grassy woodland) and is not expected to have a significant impact upon the habitat values of the locality.

Potential impacts upon native vegetation and fauna habitat have been further avoided by the use of directional drilling instead of open trenching for the pipeline (in particular to avoid areas of Illawarra Lowlands Grassy Woodland and natural swamp areas that intersect the proposed alignment).

The Port Kembla Key Population of the Green and Golden Bell Frog (Litoria aurea) occurs in the Port Kembla and southern Wollongong areas. This species is listed as an endangered species (Biodiversity Conservation Act 2016) and a vulnerable species (Environment Protection and Biodiversity Conservation Act 1999). Green and Golden Bell Frogs have also been found in unnatural habitats in the area including detention ponds and residential ponds, and can use disturbed habitats to disperse between breeding sites (DEC 2007).

The pipeline construction corridor has also been reduced in some locations to minimise temporary impacts on potential Green and Golden Bell Frog habitat. Following construction, groundcover would be re-established, thus minimising impacts in the long-term. Construction of the pipeline may result in temporary short term disturbance to the potential movement corridor for the Green and Golden Bell Frog. Given the temporary nature of the impacts on connectivity

and avoidance of direct impacts on high quality areas of habitat, the project is unlikely to have a significant impact on this species.

During construction of the new berth, the project proposes to remove four, small artificial detention ponds on the existing coal terminal Berth 101 site that may be used on occasion by the species while moving to more attractive habitat, but are unlikely to provide breeding habitat. There have been no sightings of Green and Golden Bell Frog's in these detention ponds in recent years. Nevertheless, a number of measures are recommended to minimise potential impacts on the Green and Golden Bell Frog, including pre-clearing surveys at detention basins before they are to be removed, use of frog fencing, and management and daily inspection of the pipeline trench for any trapped individuals.

The project would not impact upon any threatened freshwater biota listed under the Fisheries Management Act 1994. There would be no direct impacts on key fish habitat or marine vegetation within Allans Creek or Gurungaty Waterway.

No biota impacted by the project were identified as being a candidate for Serious and Irreversible Impact classification.

The project would have limited impacts on any other threatened or migratory biota and no impacts on important habitat for migratory species.

To further avoid and minimise potential impacts of the project on biodiversity, a suite of mitigation and management measures have been identified, which would be implemented as part of the construction and operation environmental management plan for the site.

Heritage

A detailed assessment of impacts upon Aboriginal and historical heritage from the project has been undertaken as part of this EIS.

The Aboriginal heritage assessment showed that areas of potential for Aboriginal heritage features and archaeological deposits are located on Spring Hill, to the east and west of Springhill Road. The proposed pipeline route has been designed to avoid impacts to areas of potential for Aboriginal cultural material and no significant impacts are anticipated to either tangible or intangible heritage values.

Results of the historic heritage assessment showed that the study area has been heavily modified with little to no potential for historical features and/or archaeological deposits to survive. Pockets of less disturbed land with potential for historical heritage features and archaeological deposits are located on Spring Hill to the east and west of Springhill Road. Industrial moveable heritage items are also on display in the study area as part of the Inside Industry Visitor Centre on Bluescope Steel land.

The proposed pipeline route avoids areas of potential historical heritage values and items of moveable heritage and no impacts are anticipated.

Traffic and transport

A detailed assessment of traffic and transport impacts from the project has been undertaken as part of this EIS. Results showed that the majority of key roads in the vicinity of the project are expected to operate well within the acceptable capacity for weekday morning and evening peak periods. Traffic modelling indicates that the key intersections in the study area would operate with a satisfactory level of service under the construction traffic conditions.

The additional traffic generated by the construction activities and minor increase in traffic during operation are not anticipated to impact pedestrians, bicycle riders, pedestrian or bicycle facilities, and public transport (train or bus) services operating in the vicinity of the site.

The project is not anticipated to have an adverse impact on the road network subject to adoption of appropriate management through the implementation of a Construction Traffic Management Plan.

Noise and vibration

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

The noise modelling demonstrates that project related noise for construction and operation of the LNG import terminal is expected to be compliant with the project noise trigger levels. 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.

The predicted noise levels are expected to exceed the noise management levels during pipeline construction works located in the closest proximity to the residential receivers. However, the impacts from pipeline construction activities would be intermittent in duration as the pipeline construction would progress sequentially along the construction corridor and will not impact upon any individual receiver for an extended period of time.

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 have been recommended. No specific operational noise mitigation measures are recommended.

Air quality

A detailed assessment of air quality impacts associated with the project has been undertaken as part of this EIS.

Key sensitive receptors within proximity to the project site include residential areas located approximately 2 kilometres from the proposed LNG import terminal site.

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.

The modelling results for operation of the FSRU showed that there are no predicted exceedances of the criteria during normal operations, which consists of two gas engines operating on the FSRU and two gas engines on the LNG carrier.

The assessment identified that formaldehyde had the potential to exceed the criteria in a worst case operating scenario comprising four gas engines operating on the FSRU and two gas engines operating on the docked LNG carrier. This scenario is unlikely to occur in reality as four gas engines are only required to be operated on the FSRU when travelling at full speed on open seas and the potential exceedance of the criteria is restricted to water within the Inner Harbour. No other exceedances of the impact assessment criteria are predicted during operation of the project.

The predicted pollutant emissions from the project are expected to comply with the relevant criteria when assessed in accordance with the EPA Approved Methods. The application of

standard dust mitigation measures will assist to minimise potential impacts from construction of the project. Compliance with International Maritime Organization legislation and guidelines will minimise the impacts from the operations of the project.

Landscape and visual

The landscape and visual assessment showed significant landscape characteristics within the study area included the Illawarra Escarpment, the escarpment foothills, the coastal plain, beaches and foreshore, and Lake Illawarra. Key urban features include the Wollongong City Centre, the port precinct, and the residential development on the surrounding foothills.

Key views were found to be achieved from elevated locations within the study area, and headland locations with clear open views across the water. The most important of these are sensitive receptor locations such as tourist lookouts, as well as residential areas.

Of particular note are the following key viewing locations within the project viewshed:

- Mount Keira lookout
- Wollongong Head Lighthouse lookout
- Hill 60 Park lookout
- Heritage Park / Breakwater Battery Military Museum

Also of note are residential areas on elevated locations within the viewshed, on the foothills and to the south of the project. The elevated topography forms a visual 'bowl' within which the flat landscape of the project site lies. As the topography and vegetation decreases from the escarpment towards the coast, views open up from the foothills to the east, from elevated buildings and from roadways.

While the FSRU and visiting LNG carrier will be visible from a variety of viewer locations, the magnitude of change is considered low as they will be visually integrated with other industry and port infrastructure at Port Kembla.

Social and Economic

A social and economic impact assessment was prepared as part of the EIS with reference to relevant guidelines including the NSW Department of Environment and Planning *Social impact assessment guideline* (2017). Existing social and economic conditions were considered with reference to stakeholder feedback received during consultation as well as publicly available demographic and economic data from sources including the Australian Bureau of Statistics and Wollongong City Council.

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 information and a 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.

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.

Waste management

Waste management matters relevant to the project was identified as part of the EIS including type and quantities of waste that may be generated during the construction and operation of the project.

Construction would have various waste streams including demolition and construction waste, excavated and dredged material and waste vegetation. The largest waste stream will be excavated and dredged sediment and soil material, which will primarily be placed at the disposal area in the Outer Harbour generally in accordance with NSW Ports reclamation plans.

Waste generated by the project during operation would largely be limited to the waste generated by the FSRU and the workforce stationed on board the vessel including the generation of sewage and other wastewater as well as general rubbish and food waste.

Waste generated by construction and operation would be managed in accordance with the waste hierarchy defined in the *Waste Avoidance and Resource Recovery Act 2001* through separate waste management plans developed for construction and operation.

Waste in NSW is regulated under a number of laws including the *Protection of the Environment Operations Act 1997*, *Waste Avoidance and Resource Recovery Act 2001* and *Marine Pollution Act 2012*, which gives effect to the International Convention for the Prevention of Pollution from Ships.

The International Convention for the Prevention of Pollution from Ships (MARPOL) includes regulations aimed at preventing both accidental pollution and pollution from routine marine vessel operations. MARPOL protocols prescribe procedures for minimizing, collecting, storing, recording, recycling, processing and/or disposing of waste, including from the crew and use of equipment on board.

These requirements include the maintenance of detailed waste management plans, protocols and record keeping such that every discharge to a port reception facility (for example) shall include date and time of discharge, port or facility or name of ship, categories of waste discharged, and the estimated amount discharged for each category in cubic metres.

Greenhouse and climate change

The greenhouse gas assessment was undertaken in accordance with the *National Greenhouse and Energy Reporting Act 2007* and *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and supplementary documentation in line with good accounting practice.

The assessment estimated that greenhouse gas emissions would be about 8,314 t CO_2-e during construction, mainly due to diesel consumption, and 44,145 t CO_2-e each year during operation, mainly due to electricity generation on board the FSRU. During operation this would comprise about 0.03% of emissions in NSW and 0.01% of emissions in Australia.

A preliminary climate change risk assessment was also undertaken to inform the project proponent of potential vulnerabilities of the proposed asset from climate change and identify ways to address and minimise this vulnerability. The assessment has been prepared in accordance with Australian Standard 5334-2013 *Climate change adaptation for settlements and infrastructure – A risk based approach*.

This preliminary climate change risk assessment identified eleven risks which are applicable to the proposed FSRU and associated infrastructure. The risks were associated with climate variables including extreme temperatures, sea level rise, storm surge, sea water temperature, east coast lows, hail and extreme winds

An FSRU and associated wharf infrastructure may inherently be more resilient to the effects of climate change than a fixed asset. An FSRU is a moveable, seaworthy vessel designed to operate in a wide variety of climates across the world, which may be more extreme than Australia's under the effect of climate change for some variables. Given that FSRUs are also required and designed to travel across the sea in rough conditions, risks from storm surge and hail were assessed as low. Typically impacts identified have consequences for the infrastructure service, causing delays or early renewal, and financial cost to the operation of the asset.

Cumulative Impacts

An assessment was undertaken to consider the potential for cumulative impacts of the project with other existing or proposed major developments. The main areas where potential cumulative impacts could occur were considered to be hazard and risk, water resources, traffic and access, noise and vibration, air quality and visual impacts.

The potential for cumulative hazards and risks was assessed in accordance with propagation risk criteria under *Hazardous Industry Planning Advisory Paper No 4, Risk Criteria for Land Use Safety Planning*. The propagation risk criteria define the extent to which a hazardous event at one facility could trigger another hazardous event at an adjoining facility.

The assessment found that the propagation risk from potential hazard events caused by the project, including the LNG carriers, FSRU, berth and wharf facilities, and gas pipeline, would not extend to adjacent industrial facilities including the Port Kembla Coal Terminal and proposed Port Kembla Bulk Liquids Terminal. Further, a review of the available hazard assessments undertaken for adjacent industrial facilities found that the propagation risk from potential hazard events from those facilities would similarly not extend to the project.

Water quality impacts are primarily associated with dredging operations during construction and cold sea water releases during operation of the project. Dredging is regularly undertaken at Port Kembla to facilitate the development of new shipping berths and maintenance of the navigation channels, with impacts associated with the project analogous to other dredging operations. The release of cold water from the FSRU during operation is predicted to only have minor impacts on seawater temperatures which will somewhat offset the warm industrial releases currently discharged from Allans Creek.

There is potential that the construction of the project may coincide with the Port Kembla Bulk Liquids Terminal resulting in additional truck movements on the local road network. An analysis of the traffic modelling undertaken indicated the peak hour traffic generation during construction for these projects is not planned to occur at coinciding times and that the combination of traffic from both projects is not expected to have a significant impact on the surrounding road network. Consultation between the relevant proponents should be undertaken during preparation of traffic management plans to minimise the disruption to the local community should concurrent construction occur.

Similarly, the distance between nearby developments is expected to preclude excessive impacts to local amenity such as noise, air quality and visual impacts during construction and operation the project.

The potential for cumulative impacts in each of these areas was considered limited, drawing on specialist assessments of the project and the other identified projects where relevant.

Conclusion

The project as a whole 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. 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 including its location in an industrial port, its distance from residential areas, its small project footprint within largely industrialised land under State Environmental Planning Policy (Three Ports) 2013, the small scale of the project and quick construction period. The potential economic benefits of the project are potentially 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.

Table of contents

Table index

Figure index

Appendices

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Terms and abbreviations

Term	Definition
ACM	asbestos containing material
ADGSM	Australian Domestic Gas Security Mechanism
AEC	areas of environmental concern
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AIE	Australian Industrial Energy
AMSA	Australian Maritime Safety Authority
AQIA	Air Quality Impact Assessment
AQIS	Australian Quarantine and Inspection Service
ARTC	Australian Rail Track Corporation
AS	Australian Standard
ASS	acid sulphate soils
ASSMP	Acid Sulphate Soil Management Plan
BAM	NSW Biodiversity Assessment Method
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	Biosecurity Act 2015
BOG	Boil of Gas
BoM	Bureau of Meteorology
CAPEX	Capital expenditure
CCGT	Combined Cycle Gas Turbine
CD	chartered depth
CEEC	critically endangered ecological community
CEMP	construction environmental management plan
CLM Act	Contaminated Land Management Act 1997
Coastal Management SEPP	State Environmental Planning Policy (Coastal Management) 2018
CRS	chromium reducible sulphur suite
CSIRO	Commonwealth Science and Industrial Research Organisation
CSM	conceptual site model
CSSI	critical state significant infrastructure
DCP	Development Control Plan
DGPS	differential global positioning system
DJF	December-January-February
DO	Dissolved Oxygen
DP	Douglas Partners

Term	Definition
DP&E	Department of Planning and Environment
DPTI	Department of Planning Transport and Infrastructure
DWT	deadweight tonnage
EEC	endangered ecological community
EGP	Eastern Gas Pipeline
EHS	Environmental, Health, and Safety
EIS	Environmental impact statement
EP&A Act	Environmental Planning and Assessment Act, 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	environment protection licence
ESCCI	Eastern Seaboard Climate Change Initiative
ESD	Ecologically sustainable development
FM Act	NSW Fisheries Management Act
FM Act	Fisheries Management Act 1994
FSRU	Floating storage and regasification unit
GCU	Gas Combustion Unit
GDE	Groundwater Dependent Ecosystems
GJ	Gigajoule – a billion or 10^9 Joules
GSOO	Gas Statement of Opportunities
HDD	Horizontal directional drilling
Heritage Act	Heritage Act 2015
HIPAP	Hazardous Industry Planning Advisory Paper
HOBr	Hypobromous acid
IAP2	Core Values and Code of Ethics of the International Association for Public Participation
ICNG	Interim Construction Noise Guideline
ICOLL	Intermittently Closed or Open Lake or Lagoon
IMO	International Maritime Organization
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
IPCC	Intergovernmental Panel on Climate Change
JGN	Jemena Gas Network
LCZs	Landscape Character Zones
LNG	liquefied natural gas
LNG	liquefied natural gas
LNGCs	LNG carriers
LOR	Limits of Reporting
LVIA	landscape and visual impact assessment
Marine Safety Act	The Marine Safety Act 1998
MARPOL	International Convention for the Prevention of Pollution from Ships
MEIA	Marine Ecology Impact Assessment

Term	Definition
MGO	Marine gas oil
MGPS	Marine Growth Prevention System
MMBTU	Million British Thermal Units (units of energy)
MNES	Matters of National Environmental Significance
MPa	Megapascal
MSDS	Materials Safety Data Sheet
NAGD	National Assessment Guidelines for Dredging
NAPL	non-aqueous phase liquids
NCA	Noise catchment areas
NEPM	National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) 2013
NML	Noise management level
NPI	Noise Policy for Industry
NPW Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Service
NSW EPA	NSW Environmental Protection Authority
NSW WQOs	NSW Water Quality Objectives
NTU	Nephelometric Turbidity Units
NWQMS	National Water Quality Management Strategy
OEMP	Operation Environmental Management Plan
ORP	Oxygen Reduction Potential
PAH	polycyclic aromatic hydrocarbons
PASS	potential acid sulphate soil
PCT	plant community type
PEA	preliminary environmental assessment
PFM	planning focus meeting
PIANC	World Association for Waterborne Transport Infrastructure
PJ	petajoules
PKCT	Port Kembla Coal Terminal
POEO Act	Protection of the Environment Operations Act 1997
Project	Port Kembla Gas Terminal
RCP	Representative Concentration Pathway
RMS	NSW Roads and Maritime Services
SAII	serious and irreversible impact
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SIGTTO	Society of International Gas Tanker and Terminal Operators
SPR	Source-Pathway-Receptor
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
SSD	State Significant Development

Term	Definition
SSI	State Significant Infrastructure
t CO2-e	tonnes of carbon dioxide
TBT	tributyltin
TDS	Total Dissolved Solids
the Roads Act	NSW Roads Act 1993
the Sea Dumping Act	Environment Protection (Sea Dumping) Act 1981
TJ	Terajoule a trillion (10^12) joules
TSS	Total Suspended Solids
UFP	unexpected finds protocol
UST	underground storage tank
VCR	Volume Capacity Ratio
VTIC	Vessel Traffic Information Centre
WHP	Wilton to Horsley Park Pipeline
WM Act	Water Management Act 2000
Wollongong LEP	Wollongong Local Environmental Plan 2009
Work Health and Safety Act	Work Health and Safety Act 2011
WQMP	Water quality management plan
WQOs	Marine Water Quality Objectives
WWP	Wilton to Wollongong Pipeline

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 will be the first of its kind in NSW and provide a simple, flexible solution to the state's gas supply challenges.

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 shortages and will result in considerable economic benefits for both the Illawarra region and NSW. The project will have capacity to deliver 100 petajoules of natural gas, equivalent to more than 70% of NSW's gas needs and provide between 10 to 12 days of natural gas storage in case of interstate supply disruption. 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.

Key objectives of the project are to:

- Introduce a new source of competitively priced gas to meet predicted supply shortfalls and help put downward pressure on prices
- Provide gas security to NSW with ability to supply more than 70% of the State's gas needs
- Provide long term contracts to industrial users and ability to meet 100% of the State's industrial demand (manufacturers, power stations, hospitals, small businesses etc.)
- Help support the 300,000 jobs across NSW, and the 15,000 jobs in the Illawarra region, which rely on the competitive, reliable supply of natural gas
- Support the diversification and future growth of Port Kembla consistent with the NSW Ports 30 Year Master Plan.

1.2 The proponent

AIE was formed in 2017 by a consortium of Australian and international companies with extensive global expertise and experience in the energy sector. The consortium consists of:

- ***Squadron Energy*** — a privately owned energy company forming part of the Minderoo Group, with a record of world class natural resource projects across Australia.
- ***Marubeni Corporation*** — a major Japanese trading and investment business with significant energy sector expertise and interests in over 25 countries including LNG import terminals, gas pipelines and power plant.
- ***JERA Co., Inc.*** — established as part of a comprehensive alliance between TEPCO Fuel & Power, Incorporated (a whole owned subsidiary of Tokyo Electric Power Company Holdings, Incorporated) and Chubu Electric Power Co., Incorporated. JERA Co., Inc. is the largest buyer of LNG in the world (about 10 to 15% of the global market) and operates

eight import terminals, is an equity owner in four Australian LNG export projects, and operates a fleet of LNG transport ships and approximately 70GW of power generation.

1.3 Project Overview

The project incorporates four key components proposed to be located primarily within industrial land declared under the State Environmental Planning Policy (Three Ports). These include:

- LNG carriers (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. There are around 30 of these currently in operation worldwide with a further 75 ordered or in feasibility planning. The FSRU contains all of the equipment necessary to safely store, regasify, and dispatch the gas into the NSW distribution network. Once no longer required the vessel can be relocated and reused.
- Wharf and berth facilities — such as offloading arms which transfer gas from the FSRU into the pipeline.
- Gas pipeline — a short underground gas pipeline connection from Berth 101 to the existing east coast gas transmission network at Cringila.

At present it is envisaged that an LNG shipment will be required every 2 to 3 weeks to provide for an annual supply of up to 100 petajoules of gas per annum. Supply could be increased further to around 140 to 150 petajoules per annum through a slight increase in LNG delivery schedules and pipeline upgrades.

It is expected to take about 10 to 12 months to complete construction and other works in order to commence operations. Sub to approval processes it is possible to have first gas by the end of Quarter 1 in 2020.

The estimated capital investment for the development is between $200 and $250 million.

1.4 Project approval process

This Environmental Impact Statement (EIS) has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act), Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the Secretary's Environmental Assessment Requirements (SEARS) issued by the Department of Planning and Environment (DPE) on 10 August 2018.

The project has been declared critical state significant infrastructure (CSSI) in accordance with section 5.13 of the EP&A Act and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011*. This EIS has been prepared to support the development application for determination by the NSW Minister for Planning.

1.5 Document purpose and structure

This EIS has been prepared by GHD Pty Ltd on behalf of AIE to support the development application. The EIS has been prepared using a risk-based assessment approach to identify and evaluate environmental, social and economic matters relevant to the project.

This has been achieved through a process of ongoing engagement with stakeholders from government agencies and the community, risk assessments to identify and scope key environmental assessments and development of mitigation and management measures.

The EIS is presented in multiple volumes. Volume 1 includes a standalone EIS including a detailed description of the proposed development and consideration of potential impacts upon environmental aspects potentially affected by the Project. Volume 2 contains a series of specialist assessments that have informed the overall assessment in Volume 1.

The structure and contents of Volume 1 summarised in Table 1-1 while the supporting specialist assessments included in Volume 2 are listed in Table 1-2.

Table 1-1 Volume 1

EIS chapters		
1	Introduction	Provides an overview of the project, proponent and approval process
2	Site description	Describes the site within the context of the existing port operations and interaction with existing approved projects at Port Kembla
3	Strategic context	Explains the strategic need for the project in the context of the NSW energy policy setting
4	Project alternatives	Outlines alternatives considered during development of the preferred project
5	Project description	Provides a detailed description of the project
6	Statutory context	Discusses relevant State and Commonwealth laws and planning instruments
7	Stakeholder consultation	Discusses the engagement strategies for the project and the consultation outcomes
8	Issues identification	Outlines the process for the identification and prioritisation of the assessment for key environmental aspects
9	Port navigation	Provides an assessment the projects impacts upon vessel navigation within Port Kembla and the safe handling of LNG carriers
10	Hazard and risk	Provides an outline of potential hazards and associated control measures for the project
11	Soils and contamination	Describes the existing soil and landforms within the project site and considers the potential for disturbance of contaminated soils, sediments and acid sulfate soils
12	Water resources	Considers the impact of the project on water quality and hydrodynamic processes
13	Marine ecology	Provides an outline of the marine ecological values within the harbour and the potential impact upon those values
14	Terrestrial biodiversity	Provides an outline of the terrestrial biodiversity values for the project application area and potential impacts upon those values
15	Heritage	Considers the impact of the project upon Aboriginal and non-Aboriginal heritage values in the Project application area
16	Traffic and access	Considers impacts of the project on the local and regional transport network
17	Noise and vibration	Considers the impact of noise and vibration during construction and operation of the project
18	Air quality	Consider the impacts to local air quality associated with emissions during construction and operation of the project

EIS chapters		
19	Landscape and visual	Provides an assessment of potential impacts of the project on the amenity of its surrounds
20	Social and economic	Provides an assessment of social and economic impacts and benefits associated with the construction and operation of the project
21	Waste management	Discusses waste identification and management practices for the likely waste streams generated during construction and operation of the project
22	Greenhouse gas	Provides an assessment of the likely greenhouse emissions during construction and operation of the project and its ability to tolerate and adapt to potential climate change
23	Climate change risk assessment	Provides the findings of a preliminary climate change risk assessment undertaken to inform the design development process
24	Cumulative Impacts	An assessment of potential cumulative impacts of the project with other approved major developments
25	Environmental management	Provides an outline of the proposed environmental management framework and a consolidated list of the proposed mitigation and management measures
26	Justification and conclusion	Provides an overview of the conclusions from the assessment process and discusses the project's justification on balance of environmental, social and economic considerations.

Table 1-2 Volume 2

Appendices	
A	Indicative design drawings
B	Stakeholder consultation materials
C	Port navigation
D	Hazard and risk
E	Contamination
F	Hydrodynamic modelling report
G	Marine ecology
H	Biodiversity Assessment Report
I	Aboriginal heritage
J	Historic heritage
K	Traffic and access
L	Noise and vibration
M	Air quality
N	Landscape and visual
O	Social and economic
P	Greenhouse gas
Q	Climate risk

2. Site description

2.1 Overview

This chapter describes the site of the project and its surrounds. Section 2.2 describes the regional context of the site of the project including Port Kembla and surrounding localities. Section 2.3 describes Port Kembla in more detail including other existing and proposed facilities. Section 2.4 describes the site of the project and its relationship to adjacent land uses at Port Kembla.

2.2 Regional context

The site of the project is situated at Port Kembla within the Illawarra region of NSW, about 80 kilometres south of Sydney. Port Kembla is mainly 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 and its regional context including the surrounding localities are shown in Figure 2-1.

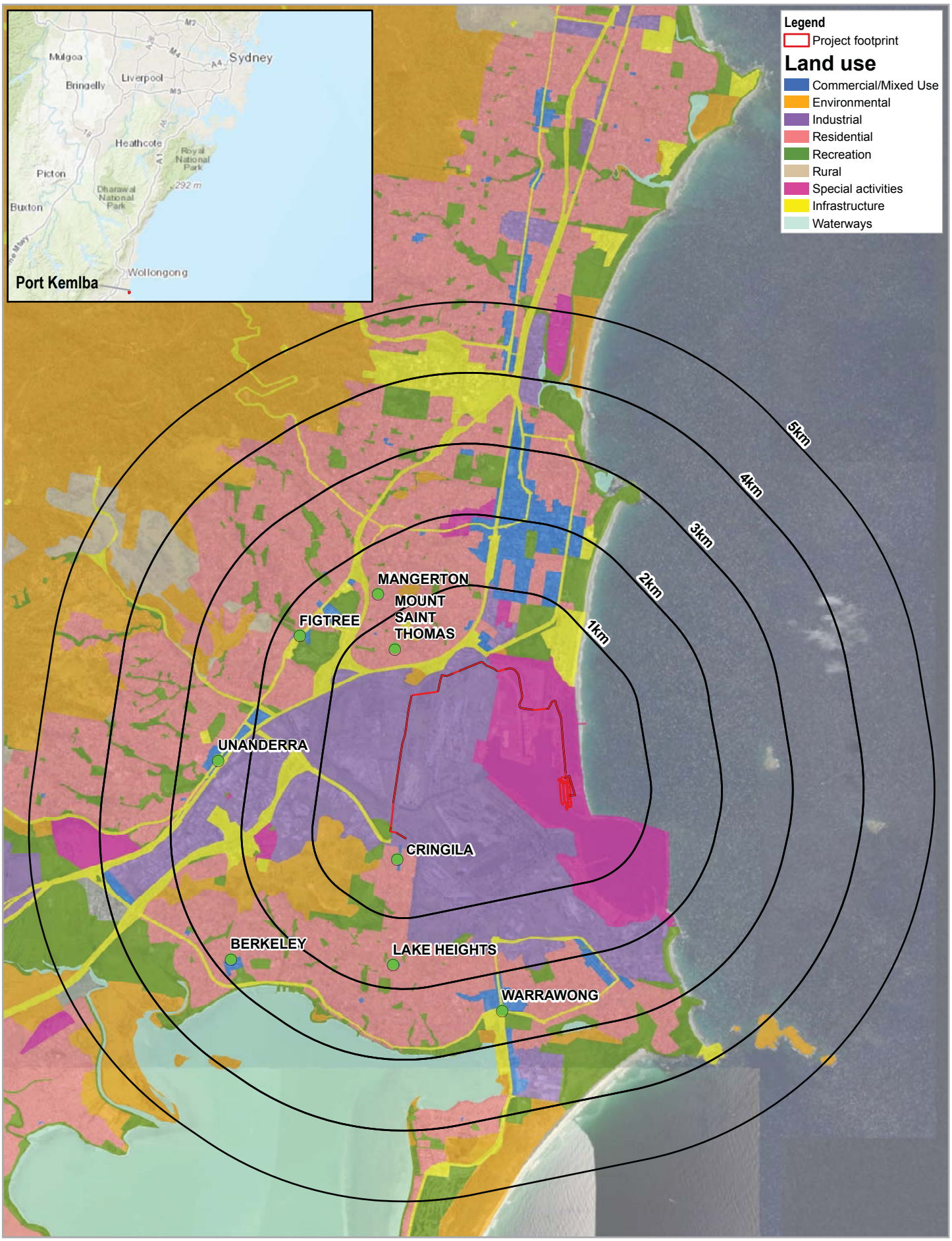
As shown Port Kembla is situated about two kilometres south of the centre of Wollongong. Other localities surrounding Port Kembla and the project site include Mangerton, Mount St. Thomas and Figtree to the north-west; Unanderra to the west; Berkeley to the south-west; and Cringila, Lake Heights, Warrawong and the residential region of Port Kembla to the south.

The zoned land use in the region include special use and industrial use at Port Kembla and a mix of primarily residential and commercial uses at the surrounding localities.

Major infrastructure in the region of Port Kembla includes the Princes Highway, which is a major state and regional highway connecting Sydney and Wollongong and regional areas further south. Princes Highway provides access to Port Kembla through turnoffs at Masters Road, Five Islands Road and Northcliffe Drive and is broadly utilised including by heavy vehicles from the port.

The South Coast railway line runs along the periphery of Port Kembla including the stations Port Kembla, Port Kembla North, Cringila and Lysaghts. The rail line services commuters and is also used to transport bulk solid goods like coal, grain, copper and steel from Port Kembla.

The environmental features of Port Kembla and the surrounding region are limited given the extensive industrial, commercial and residential development. Waterways in the region include the Gurungaty Waterway, Allans Creek, American Creek and Byarong Creek. Green space includes JJ Kelly Park and Wollongong Golf Club to the north and a larger open area to the south west.



Paper Size ISO A4

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Metres

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
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Australian Industrial Energy
Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **31 Oct 2018**

Regional context

Figure 2-1

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2.3 Port Kembla

Port Kembla was first established in 1883 to facilitate the export of coal. Since then it has had a long, continuous history as a working port, with the construction of Port Kembla's Outer Harbour given approval by the NSW State Government more than a century ago, in 1898. An increase in shipping traffic over the subsequent years led to a decision in the 1950s to carry out extensive dredging and the construction of the Inner Harbour, which opened in 1960. NSW Ports became the custodian of Port Kembla in May 2013 with its purchase of the 99 year lease of Port Kembla along with Port Botany, Cooks River Intermodal Terminal and Enfield Intermodal Terminal. The seabed at Port Kembla is under ownership of NSW Roads and Maritime Services.

Port Kembla has grown to become NSW's largest motor vehicle import hub, its second largest coal export terminal, the leading grain export terminal for Southern and South-Western NSW and a significant location for the import and export of a range of other bulk liquids and cargoes. More recently, it has also been a location for day-visits for large cruise ships seeking to offer their clients a unique industrial tourism opportunity, as well as access to the rich cultural, environmental and recreational qualities of the area.

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

The port is 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 existing facilities include a total of 18 import and export berths and a total of six major independently operated terminals. The berths are allocated numbers from 101 to 113 in the Inner Harbour and 201 to 206 in the Outer Harbour as shown in Figure 2-2.

Existing users of the berths include Port Kembla Coal Terminal at Berth 101 and 102, Australian Amalgamated Terminals general cargo facilities and Quattro Port grain facility at inner harbour Berths 103, 105, 106 and 107, a GrainCorp grain terminal at Berth 104, and bulk liquids facilities operated by NSW Ports at outer harbour Berths 201 and 206.

In addition to operations at import and export berths there are multiple other business, cargo, logistics, bulk goods and heavy industrial facilities in and around Port Kembla including Ceva Logistics, AutoNexus, PrixCar, Patrick Autocare, Linx, Qube Stevedores, BlueScope, Port Kembla Gateway, Svitzer, Cement Australia, NSW Port Maritime Centre, Pacific National and TQ Holdings and a bulk fuel storage facility yet to be constructed.

The location of these facilities is shown in Figure 2-2.

The precinct also hosts almost 3,500 metres of quay line, 3.5 kilometres of roads and 29 kilometres of rail network. The rail network includes multiple rail lines, siding and loops, that connects to the Illawarra Line and Moss Vale-Unanderra Line and thereafter the Main South Line. The rail lines mainly function to transport bulk solid goods like coal, grain, copper and steel.

The project footprint will be restricted to a highly disturbed area primarily within reclaimed and industrial land. The nearest residential area is approximately two kilometres from the proposed LNG import terminal location.

Toward the south of Port Kembla is the Cringila gas transfer station owned and operated by Jemena, which provides a connection to the NSW Eastern Gas Pipeline (EGP). The EGP is a 797 kilometre long gas pipeline with an operational capacity of about 300 terajoules per day. The pipeline supplies gas to major gas markets in Victoria, Wollongong and Sydney as well as regional NSW and the ACT.

2.4 Site of the project

2.4.1 Existing landuse

The project will be predominantly located within land zoned for dedicated port and industrial uses as shown on Figure 2-2. Berth and wharf facilities and the FSRU would be situated at Berth 101 at 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. A small section of the pipeline will traverse beneath Bluescope sporting fields in Cringila, which are zoned RE2 Private Recreation under the *Wollongong Local Environmental Plan 2009*.

The real property descriptions of the land occupied by the project are listed in Table 2-1.

Table 2-1 Real property description

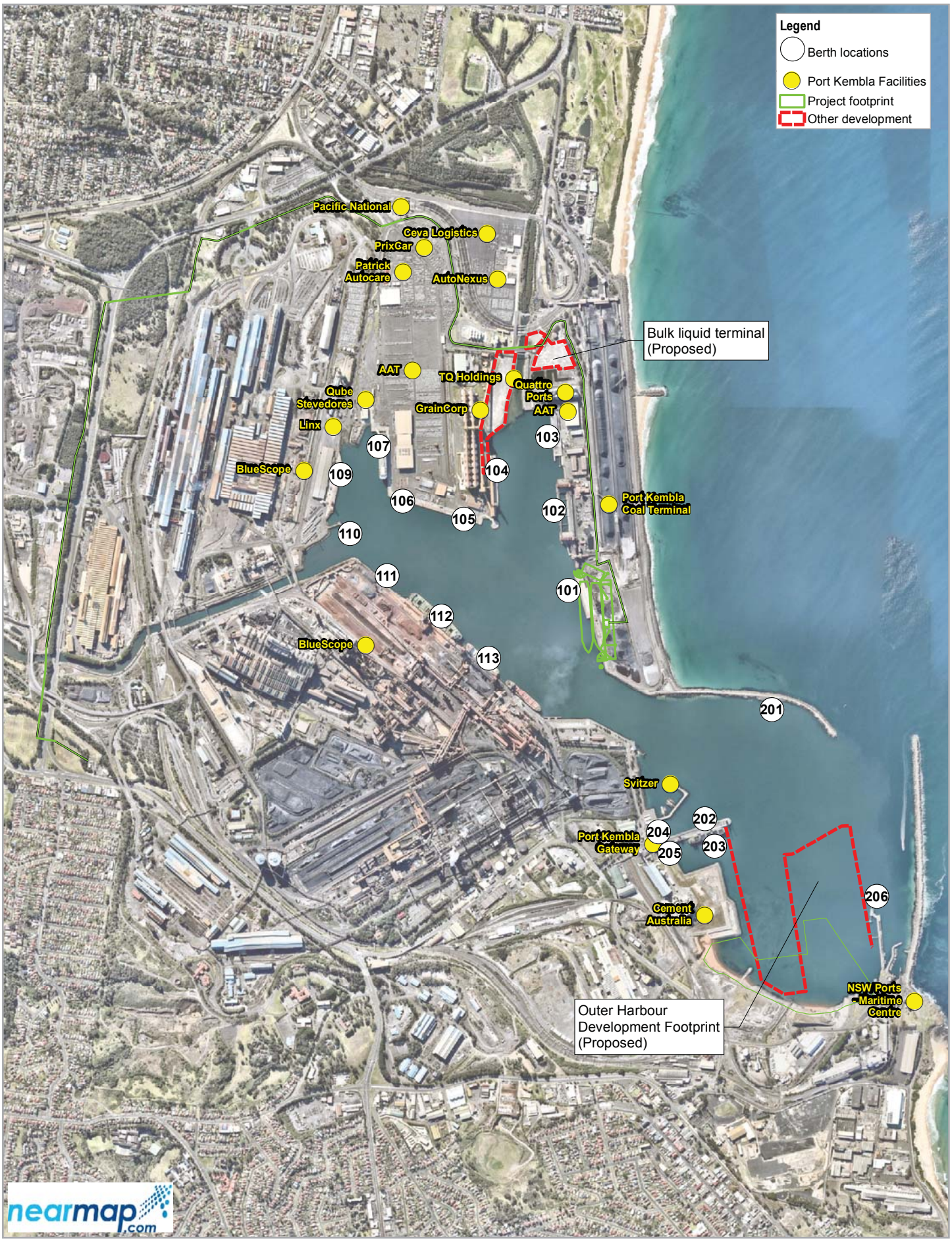
Component	Lot	Plan
Berth and wharf facilities	22	DP1128396
	8	DP1154760
	70	DP1182824
Gas pipeline	1	DP1125445
	2	DP1125445
	11	DP1182111
	12	DP1182111
	103	DP801243
	501	DP1035674
	81	DP1170187
	3	DP837554
	1	DP606434
	6	DP837554
	1	DP203783
	64	DP1188514
	2	DP837554
	1	DP606430
	2	DP570107
	3	DP606430
	1	DP785374
Disposal area	2001	DP1176582
	2	DP1182823
	105	DP1013971

The import terminal is proposed to be located at Berth 101 which currently forms part of the Port Kembla Coal Terminal site. Berth 101 was most recently utilised as an off-loading wharf for materials handling equipment, but 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.

There are two key agreements in place, one between NSW Ports and the Port Kembla Coal Terminal to release the area from the current lease back to NSW Ports, and a second between NSW Ports and AEI to negotiate for a new lease. Both agreements are subject to a number of conditions being met, such as receiving development consent for the project.

Existing land uses in the vicinity of the gas pipeline route include Port Kembla Coal Terminal at Berth 102 and Australian Amalgamated Terminals general cargo facility and Quattro Ports grain facility at Berth 103. The gas pipeline route also passes in the vicinity of a number of cargo and logistics facilities including AutoNexus, Ceva Logistics, Pacific National and PrixCar and for a distance runs along the periphery of the BlueScope Steel facility. The gas pipeline route runs near road or rail infrastructure including Tom Thumb Road, Springhill Road and Port Kembla Railway. Environmental features along the gas pipeline route are limited but include Gurungaty Waterway, Allans Creek and some green spaces or vegetated areas.

The above land uses and other features are shown in Figure 2-2.



Paper Size ISO A4

0 200 400 600 800

Metres

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

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Australian Industrial Energy
Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **31 Oct 2018**

Site of the project

Figure 2-2

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Data source: Aerial imagery - nearmap 2018 (image date 19/07/2018, date extracted 12/10/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy

2.4.2 Relationship to other developments

The CSSI application (18_9471) is seeking authorisation for all aspects associated with the development of the project including the construction and ongoing operation of infrastructure associated with the project. The site's location within an established port results in considerable interaction with other planned developments in the port precinct. An overview of the interaction with other key developments within and surrounding Port Kembla is provided below.

Port Kembla 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 on Figure 2-2.

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.

The majority of dredged sediments and excavated material required for the establishment of a new berthing pocket at Berth 101 is proposed to be disposed within a 17 hectare disposal area within the Outer Harbour.

The disposal area has been developed through discussion with NSW Ports to accommodate the latest options for redevelopment of the Outer Harbour. The disposal footprint falls predominantly within the approved development area for Stage 1 of the Outer Harbour Development Project. A small portion of the disposal area does extend beyond the approved footprint near the southern shoreline of the Outer Harbour as shown on Figure 2-2.

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.

Bulk Liquids terminal

The Port Kembla Bulk Liquids terminal was approved as a state significant development in September 2016 and involves the construction and operation of a bulk liquids storage and distribution terminal. The terminal is located at three sites on either side of Tom Thumb Road within the Port Kembla Industrial precinct.

The gas transmission pipeline proposed as part of the project will follow the alignment of Tom Thumb Road and will run immediately adjacent to the approved bulk liquids terminal. While there is no direct overlap between the project footprints, key interaction in relation to traffic, and risk have been considered as part of the preparation of this EIS.

Eastern Gas Pipeline

The Eastern Gas Pipeline (EGP) is a key gas supply artery between the Gippsland Basin in Victoria and NSW. The pipeline delivers natural gas supplies to demand centres in Sydney, Canberra and Wollongong and passes through Kembla Grange to the west of Port Kembla. An EGP lateral extends approximately 6.5 kilometres from Kembla Grange to an existing Cringila metering station and services industrial customers at Port Kembla. The proposed tie in location for the project is at Cringila to facilitate the transport of gas to the market.

The existing lateral spur line between Kembla Grange and Cringila has a diameter of 200 mm (8 inches). The existing spur line will be utilised for the project and may be upgraded in the future to accommodate the maximum potential gas flows from the project. A separate approval process under the EP&A Act would be undertaken by Jemena as operators of the existing gas infrastructure to upgrade the spur line to accommodate future prospective flows for the project.

3. Strategic context

3.1 Overview

This chapter describes the strategic context of the project with regard to the NSW gas market, predicted gas shortfalls, as well as other key NSW government policies.

NSW is the only mainland eastern state that does not have its own material local gas supplies. As such, NSW relies on Queensland, Victoria and South Australia for 95% of its gas needs. While this means NSW is widely exposed to supply and/or price disruptions from other States, the requirement to transport natural gas over large distances via on-shore transmission networks also puts NSW gas consumers at an immediate financial disadvantage. According to the Australian Competition and Consumer Commission's April 2018 Interim Report on the Gas Inquiry (ACCC 2018), NSW consumers may pay as much as an additional $3.50 per gigajoule (GJ) in transportation costs.

Forecasts from a range of market analysts and the Australian Energy Market Operator (AEMO) note the east coast gas market is becoming increasingly reliant on undeveloped, contingent or prospective sources of supply in order to meet forecast demand. These supplies may never be realised. In addition, gas producers in Queensland are expected to continue to focus on the export markets while gas producers in the south continue to note declining production levels and increasing extraction costs. Other prospective sources of gas such as unconventional gas from the Northern Territory or gas transported from Western Australia via a new transnational pipeline are speculative, and would take at least 5 –10 years to develop.

Government policies such as the Australian Domestic Gas Security Mechanism (ADGSM) have the potential to provide some short-term relief to potential gas shortfalls, however, any gas to be supplied to NSW from interstate would likely remain expensive due to upstream production and pipeline transportation costs.

The project provides NSW with its own 'virtual pipeline' to natural gas produced from existing and new LNG projects all around Australia and the world. 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. The FSRU has a typical storage capacity of up to four petajoules of natural gas at any one time. This is equivalent to 10–12 days of emergency supply for the entire NSW economy, should there be a significant disruption to gas supplies from other sources.

The key objectives of the project are to:

- Introduce a new source of competitively priced gas to meet predicted supply shortfalls and help put downward pressure on prices
- Provide gas security to NSW with ability to supply more than 70% of the State's gas needs
- Provide long-term contracts to industrial users and ability to meet 100% of the State's industrial demand (manufacturers, power stations, hospitals, small businesses, etc.)
- Help support the 300,000 jobs across NSW, and the 15,000 jobs in the Illawarra, which rely on the competitive, reliable supply for natural gas
- Support the diversification and future growth of Port Kembla.

Subject to planning approvals, the project could be in a position to supply gas to NSW customers by early 2020. The project will not only support manufacturing jobs in NSW but also

increase the natural competitive pressures in the entire east coast gas market, keep a cap on prices and ensure adequate, secure and reliable supplies for NSW into the future.

3.2 Need for gas

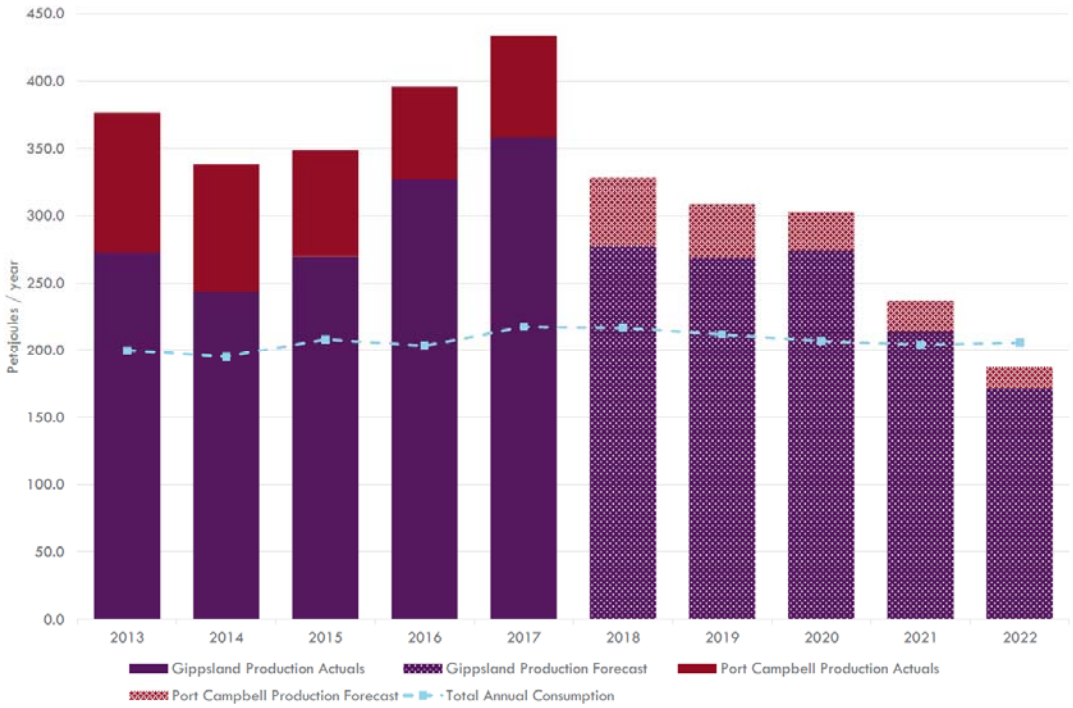
Gas is an important natural resource for households, businesses and industries. The NSW Gas Plan notes more than a million households use gas for everyday uses like cooking or heating. It also notes about 33,000 NSW businesses and 500 heavy industrial operations rely heavily on natural gas for their 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 approved or well advanced in the planning process.

AEMO is responsible for operating the retail gas markets across NSW, Victoria, Queensland and South Australia. Every year AEMO releases a Gas Statement of Opportunities (GSOO) to forecast the ability of Australian gas markets to meet demand. AEMO's latest GSOO (2018) shows NSW has a heavier reliance on natural gas for use in its industrial sector than other east coast states. In NSW, industry accounts for 42% of demand, gas powered generation accounts for 21% of demand while residences account for the remaining 37% of demand.

Total annual gas consumption in NSW is about 130 PJ per annum (2017) with growth in demand expected to continue out to 2038 when demand is forecast to reach around 150 PJ per annum (AEMO 2018a). However, as noted in more recent publications, gas demand may increase further this if gas powered generation is increasingly relied upon to provide a firming solution for the increasing penetration of renewable energy in the National Energy Market.

In March 2018, while AEMO noted shortfalls in 2019 were unlikely, its Victorian Gas Planning Report (2018b) specifically stated that without additional gas supply, a potential shortfall in meeting annual Victorian gas consumption is likely from 2022 as shown in Source: AEMO (2018b)

Figure 3-1. Furthermore, this shortfall could have potential flow-on effects for NSW, South Australia and Tasmania, which are all heavily reliant on Victorian gas.



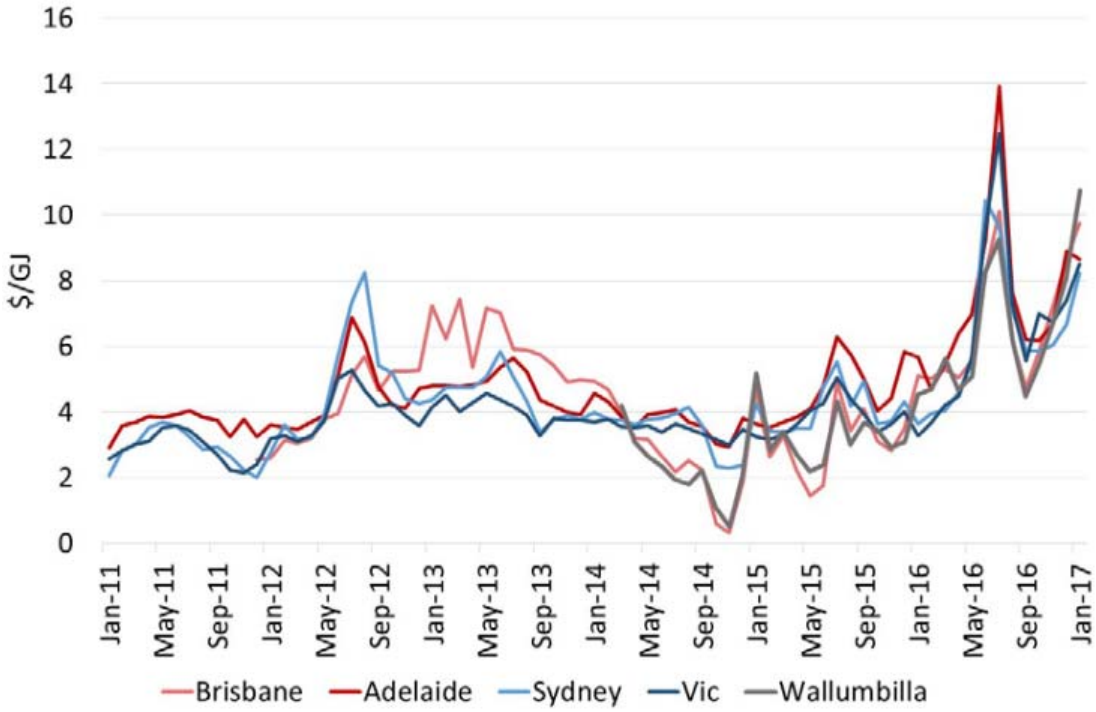
Source: AEMO (2018b)

Figure 3-1 Predicted shortfall in Victorian gas supply

AEMO has also stated that "from 2030, additional gas supply infrastructure will be needed to deliver gas to southern customers, unless early investment in exploration and development programs brings highly uncertain — and as yet undiscovered — southern prospective resources to market" (2018). Gas supply is discussed further in Section 3.4.

3.3 Gas pricing

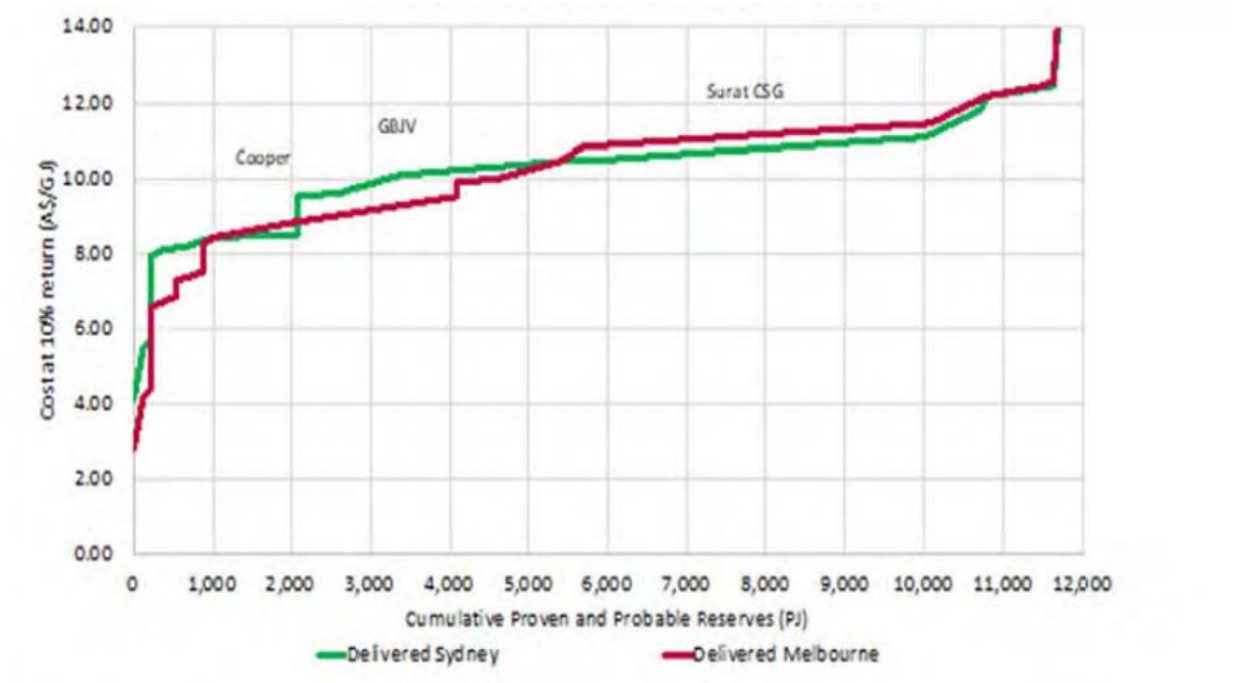
The Gas Price Trends Review Report 2017 (Department of the Environment and Energy 2018) found substantial increases in wholesale gas prices on the east coast gas market. Between 2015 and 2017 wholesale gas prices for large industrial users were found to have risen by 21% in NSW, 78% in Victoria and 60% in Tasmania (Department of the Environment and Energy 2018). The volatility of gas prices and potential for sharp increases is demonstrated in the wholesale spot gas price trends over the longer term between 2011 and 2017 as shown in Figure 3-2.



Source: Australian Industry Group (2017)

Figure 3-2 Monthly average wholesale gas prices

Future gas prices will be set by competitive forces, which amongst other drivers such as policy settings or demand, is heavily influenced by the amount of supply competition in the market. Locally developed supply will need to price at the cost of production plus an acceptable margin, with the lowest cost supply generally developed ahead of higher cost supply. Figure 3-3 highlights that of the majority of remaining uncontracted reserves available to the east coast domestic gas market, the price will need to be well in excess of $10/GJ delivered to Sydney to ensure they are brought to market in an economically viable manner. The project will provide competitively priced alternatives to ensure continued downward pressure on prices and may be able to source supply from Western Australia, Northern Territory or elsewhere internationally at prices below these local alternatives.



Source: EnergyQuest (2018)

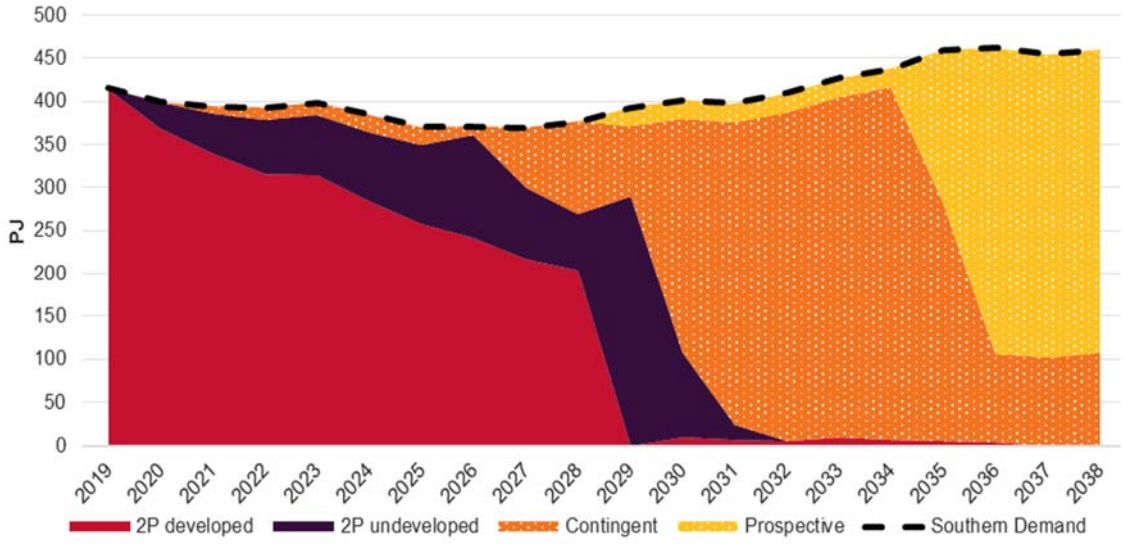
Figure 3-3 Non-LNG related delivered gas costs and reserves

3.4 Gas supply

The most recent AEMO GSOO has a specific section on supply adequacy. In that section, AEMO notes, “there are no gas supply gaps forecast in 2019, or in the short term, under expected conditions, although some field expansions are needed”. Furthermore, the GSOO states:

> *Provided yet undeveloped reserves do come online there is anticipated to be a level of resilience in the domestic market. However, should demand exceed neutral forecasts, there may be some pressure on the market.*
>
> *Specifically, as existing fields decline, exploration and development will be needed to deliver contingent and prospective resources to market. These new gas supplies will help improve adequacy of supply but, as flagged in the 2017 GSOO, supply from these fields is likely to be more costly than existing production.*
>
> *Without exploration and development of new southern resources, additional investment in gas supply infrastructure will be required by 2030 to deliver the gas to where it is needed.*
>
> *[There is expected to be a] southern field decline of developed and undeveloped reserves, and [increased] need for contingent and prospective resource development to meet southern demand (New South Wales, Victoria, South Australia, and Tasmania). The location of this exploration and development will influence the needs for pipeline infrastructure.*

Figure 3-4 below shows the predicted decline of developed and undeveloped reserves.



Source: AEMO (2018)

Figure 3-4 Status of southern resources to meet demand 2019–38

LNG import terminals have been and are being used around the world to provide fast, economical access points to global gas supplies for markets seeking to increase their independence from traditional suppliers, increase pricing competition and/or to support decarbonisation plans in the electricity sector as economies move from a dependency on coal to more renewable sources of energy.

The use of FSRU technology has the additional advantages of being faster to develop than onshore LNG storage and distribution facilities, and being easily decommissioned and relocated once no longer required.

An LNG import terminal in Port Kembla, NSW would provide the same benefits to NSW in the face of a tightening eastern gas market.

3.5 Policy setting

3.5.1 NSW Gas Plan

NSW Government gas policy is put forward in the *NSW Gas Plan — Protecting what's valuable Securing our future*. The Plan outlines a strategic framework to secure "vital gas supplies for the State". It recognises that "without affordable and reliable gas supplies our manufacturers will struggle to compete and … households will pay higher prices". The Plan identifies five priority pathways, including a pathway dedicated to "securing NSW gas supply needs" which includes a range of measures to diversify supply sources and keep downward pressure on prices.

The project is consistent with the NSW Gas Plan as it contributes to a diversification of gas supply and an increase in competition in both the wholesale gas and the pipeline transmission markets while also avoiding some of the concerns over potential impacts of on-shore gas field development on land valued for its agricultural, environmental, social or cultural heritage values.

3.5.2 Australian Domestic Gas Security Mechanism (ADGSM)

The ADGSM was established to enable the Australian Government to place export controls on uncontracted LNG exports liquid natural gas to shore up domestic supply.

The mechanism has not yet been triggered, as under the Australian East Coast Gas Domestic Gas Supply Commitment some east coast LNG exporters have agreed to "offer sufficient gas to meet [expected shortfalls] through the good faith offering of gas to the domestic market on

reasonable terms" (Department of Industry, Innovation and Science 2017). This agreement is set to expire in 2020.

While the ADGSM and associated commitments may provide additional domestic supply, it is reasonable to expect they would remain at relatively high prices due to production and transportation costs, especially for users in NSW.

3.5.3 Illawarra Shoalhaven Regional Plan

The Illawarra Shoalhaven Regional Plan is an overarching regional plan applying to the local government areas of Kiama, Shellharbour, Shoalhaven and Wollongong. The plan identifies a number of key planning principles for the region that include:

- Protecting land with high environmental value and recognising cultural heritage values
- Sustainable use of land and resources while building resilience to climate change
- Supporting a strong, resilient and diversified economy
- Supporting improvements to transport infrastructure including active, public and freight
- Provide for the balanced and orderly supply of land for housing development
- Increase housing density around centres with access to jobs and transport
- Encourage urban design that reduces car dependency and promote energy efficiency
- Improvement coordination on the delivery of infrastructure

The project is considered broadly consistent with these planning principles. The project would not have direct impacts on land with high environmental value. The proposed berth and wharf facilities would be at the existing Berth 101 that has been subject to prior disturbance while the FSRU would be a floating facility that would not involve any disturbance to land.

The alignment of the gas pipeline is the result of a detailed options and alternatives development process. The alignment has been selected to minimise disturbance, including directional drilling to entirely avoid areas of environmental or cultural heritage sensitivity.

As discussed in Section 3.6 the project would have a number of economic benefits including increasing NSW's gas security and price competition, providing capital investment and substantial employment opportunities during construction and operation to support a strong, resilient and diversified economy in the region.

The regional plan identifies that Port Kembla as a major economic asset that directly and indirectly supports over 3,500 jobs and contributes $418 million to the regional economy each year. It makes a number of specific directions in relation to Port Kembla including to grow the capacity of the port as an international trade gateway. The project is considered to be consistent with this direction given operations would involve international trade and the disposal of dredged and excavated material would support the development of the Outer Harbour.

3.5.4 NSW Ports 30 Year Master Plan

The NSW Ports 30 Year Master Plan provides the long-term strategy for ports and other assets operated by NSW Ports including Port Kembla, Port Botany and intermodal facilities.

The plan states that Port Kembla is an economic asset of national significance and will be required to cater for growing trade volumes over the next 30 years. It anticipates containers could more than triple from 2.3 million to 8.4 million in total, bulk liquids more than double from 5.1 million kilolitres to 10.8 million kilolitres; motor vehicles more than double from 390,000 to 850,000 and dry bulk products grow from 20.3 million to 30 million tonnes over that time.

It states that the priority to address growing trade volumes is to maximise utilisation of existing port infrastructure before investing in new infrastructure, and identifies five objectives:

- Provide efficient road connections to the port
- Grow rail transport of containers
- Use land and infrastructure efficiently
- Grow port capacity with new infrastructure
- Protect ports from urban encroachment

The project would be contained to the existing Berth 101 area and is considered to be consistent with the overall strategy to utilise existing port infrastructure. During operation of the project, natural gas would be transported through a gas pipeline rather than by road or rail and would not affect the ability of NSW Ports to implement its objective to improve road efficiency and rail utilisation.

With regard to the objective to use land and infrastructure efficiently, the NSW Ports 30 Year Master Plan states that it would prioritise the allocation of land at the ports for uses that require a direct connection to berths. The project is consistent with this objective as it would require a direct connection to the berth and would operate 24 hours per day, 7 days per week from that berth.

With regard to the objective to grow port capacity with new infrastructure, the NSW Ports 30 Year Master Plan states that it will facilitate early reclamation works in the Port Kembla Outer Harbour by supporting opportunities to use surplus material from excavation projects. The project will involve excavation and dredging of a large volume of material form the Inner Harbour that would be disposed largely within the approved footprint for the Port Kembla Outer Harbour Development and adjacent areas and is therefore considered to be consistent with future development plans for the port.

With regard to the objective to protect ports from urban encroachment, the NSW Ports 30 Year Master Plan states that planning should prevent incompatible uses surrounding Port Kembla and that authorities should consult with NSW Ports regarding developments that may impact, or be impacted by, port operations. The project is consistent and compatible with the use of Berth 101 and surrounding port land and is not expected to impact surrounding developments.

3.5.5 NSW Ports Sustainability Plan

The NSW Ports Sustainability Plan the long-term sustainability strategy for ports and other assets operated by NSW Ports being Port Kembla, Port Botany and intermodal facilities.

The plan identified five focus areas for sustainability, being:

- Transport and logistics
- Development and land use planning
- Local environmental outcomes
- Resource conservation and efficiency
- Stakeholder consultation and relations

With regard to transport and logistics, the plan identifies a goal to support commercial shipping as the most efficient mode of transport by providing and maintaining port infrastructure to meet demand. It also states that rail transport should be promoted and road/rail efficiency improved. As noted above, the project is consistent with these goals as it would involve commercial

shipping to transport natural gas to the port and would not affect road/rail efficiency during its operation.

With regard to development and land use planning, the plan identifies goals to promote development for expected long-term increases in trade volumes, promote development that is compatible with ports, promote sustainable design and operations, and assess the likely impacts of climate change on ports and adapt as necessary to ensure long-term resilience. The project could increase its LNG import capacity, if demand increases, and as such is consistent with these goals. The design of the berth and wharf facilities has also been carried out with consideration to the potential impacts of climate change at the port over the life of the project.

With regard to local environmental outcomes, the plan identifies the goal to maintain local environmental values and the amenity of communities. The potential impacts of the project on environmental values and the amenity of communities is assessed throughout the EIS. The environmental values of the site of the project are largely limited and the project is not expected have significant impacts on these values or the amenity of communities. As such the project tis not expected to materially impinge on the identified goal for these values to be maintained.

With regard to resource conservation and efficiency, the plan identifies the goal to minimise resource consumption and waste through the better use of land, infrastructure, renewable energy and recycled materials. The project would involve relatively limited landside development by utilising floating infrastructure such as the FSRU, while the demolition and construction of berth and wharf facilities would be consistent with the existing intended use of Berth 101. During operation, the project would largely generate its own power on board the FSRU from LNG supplies. This results in considerably lower emissions when compared to other marine oil or diesel marine powered vessels.

With regard to stakeholder consultation, the plan identifies that NSW Ports should engage proactively with stakeholders to ensure a coordinated and transparent approach to sustainability. AIE has engaged extensively with local stakeholders and community members as discussed in Chapter 7. In addition, AIE and NSW Ports have been in close consultation throughout the design of the project. It is planned that NSW Ports will continue to be engaged through to construction and operation.

3.6 Other project benefits

The project is expected to involve a capital investment of about $200–250 million and employ about 150 workers at its peak. Once fully operational, the project is expected to employ about 40–50 workers. The project is also expected to contribute to the realisation of a number of other NSW State and Local Government Policy and Program commitments, including:

- **NSW's commitments to the COAG Energy Council** — including the Australian Gas Market Vision and Gas Market Reform Package — which note the critical need to increase the volume of gas available domestically, the number of competitors in wholesale supply and pipeline transmission, and the level of pricing transparency
- **NSW Energy Security Taskforce Final Report** — which in part recommended the NSW Government be more proactive in managing risks to NSW's energy security, including disruption from other states and fuel supplies, albeit primarily for electricity
- **NSW Renewable Energy Plan** — designed to increase the participation of renewable energy in a stable, safe electricity grid and reduce carbon emissions A local supply of natural gas, not only supports existing firming solutions but also potentially provides a reliable fuel supply for any additional Combined Cycle Gas Turbine power stations needed to support NSW's stable transition to a more decarbonised electricity sector.

- **NSW Climate Change Policy Framework** — which aims to achieve net-zero emissions by 2050
- **Regional Development Framework** — which in part notes the importance of "fast tracking infrastructure projects that supports business confidence, private sector investment and job creation in regional areas
- **Wollongong Economic Development Strategy 2013–2023** — which outlines a desire to support the diversification of the economy and the Port, as well as the attraction of new industrial investment, especially around the surplus industrial landholdings located near the Port.
- **Industry Action Plan for Manufacturing** — which outlines a vision for manufacturing in NSW to 2021 and includes an "objective of sustaining existing manufacturing capability".

The consultation process for this project has identified a number of additional economic benefits of possible interest to the local region, including:

- Possible use of the facilities for **open tolling**
- Possible use of the facilities to support new value-add capabilities in port, such **as LNG Bunkering** (refuelling marine vessels in port). This is also relevant when noting international regulations governing emissions of the marine transportation sector are set to change in 2020. As such, an increasing number of marine vessels, including cruise ships and car carriers are moving to use LNG in place of other marine fuels. Ports which cannot provide LNG re-fuelling facilities may become marginalised over time.
- Possible optionality for a new **Combined Cycle Gas Turbine (CCGT) power station** in the Illawarra region. Latest technology CCGT power stations can provide both baseload and dispatch load, keeping downward pressure on prices and delivering greater grid stability.
- Possible **additional investment appeal for new industrial manufacturers seeking to move to the region** due to the availability of a local source of gas supply, with the corresponding avoidance of unnecessary interstate in transportation costs for securing gas supplies. This appeal would be even greater, if the region also hosted a local CCGT power station.

4. Project alternatives

4.1 Overview

A number of technical studies have been undertaken to investigate alternatives for the project. The investigations have been undertaken by AIE in conjunction with Advisian, responsible for leading the feasibility and design process and with input from GHD regarding environmental and social constraints and opportunities.

This section examines the key alternatives considered at each of two major phases; Concept and Feasibility. In each case, the alternatives proposed have been assessed considering key outcomes such as engineering, design, operational, environmental, social, economic, schedule, cost, approvals, availability/reliability and accessibility. The analysis of alternatives has been presented to address a key requirement of the SEARs, which requires a justification for the proposed project as opposed to other alternatives considered during the development of the project.

4.2 Site selection considerations at Concept Phase

In the initial feasibility studies, three NSW ports where LNG could potentially be imported were considered including Port Kembla, Port Botany and Port of Newcastle. The initial site selection screening was undertaken in 2017 (Worley Parsons, 2017). The availability of viable berthing options, plus the feasibility of pipeline connections to existing gas systems near the ports were considered as part of the process.

A framing workshop (1 February 2018) considered six locations (i.e. Port Kembla, Port Botany, Port of Newcastle, Offshore Shellharbour, Offshore Stockton Beach, Offshore Port Kembla) and five regasification/storage technologies (i.e. FSRU, floating storage unit [FSU], shuttle LNG carrier, onshore storage, onshore regasification) for the project. Analysis of these alternatives incorporated the outcomes from the initial site selection (Worley Parsons, 2017) carried out for Port Kembla, Port Botany and Port of Newcastle.

Figure 4-1 shows the locations of the identified sites for the project during the Concept Phase.

A narrowing workshop (15 February 2018) developed the alternatives identified at the framing workshop. These comprised three locations of nearshore and offshore (Port Kembla, Port Botany and Port of Newcastle); a range of regas/storage technologies (FSRU, FSU, onshore storage and onshore regas) and a generic berth within each port.

Key issues investigated to inform the narrowing workshop included: pipeline configuration, technology selection, offshore mooring (Turret Mooring System versus Submerged Soft Yoke), meteorology and oceanography limitations, screening cost estimates, location/port constraints, advantages (e.g. distances from residential areas), and identification of potential berthing and loading configurations (e.g. side-by-side or in-line). Multi-criteria analysis (schedule, cost, approvals, availability/reliability and accessibility) was undertaken using a range of screening tools.

4.2.1 Initial project options considered - Concept Phase

An overview of all the options considered during the framing workshop are provided in Table 4-1 (Advisian 2018a).

Paper Size ISO A4

0 9,100 18,200 27,300 36,400

Metres

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

N

Australian Industrial Energy
East Coast Gas Project

Project No. **21-27477**
Revision No. **A**
Date **19 Oct 2018**

Initial port location options

Figure 4-1

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Print date: 19 Oct 2018 - 09:58 (SMA record: 2)

Table 4-1 Comparison of initial project options considered

Option / Criteria	Port Kembla option 1	Port Kembla option 2	Port Kembla option 3	Port Kembla option 4	Offshore option 1 (at Port Kembla)	Port Botany option 1	Port of Newcastle option 1	Port of Newcastle option 2
Location	Port Kembla	Port Kembla	Port Kembla	Port Kembla	Offshore	Port Botany	Port of Newcastle	Port of Newcastle
Gas storage	FSRU	FSU	Shuttle LNG carrier	Shuttle LNG carrier	FSRU	FSRU	FSRU	Shuttle LNG carrier
Onshore storage	No	No	Yes	Yes	No	No	No	Yes
Loading of gas	Side by side	Side by side	In line using loading arms	In line using loading arms	Side by side	Side by side	Side by side	In line using loading arms
Regas	FSRU	Onshore	Onshore	Onshore	FSRU	FSRU	FSRU	Onshore
Pipeline	8 km to the Eastern Gas Pipeline network	8 km to the Eastern Gas Pipeline network	8 km to the Eastern Gas Pipeline network	8 km to the Eastern Gas Pipeline network	6 km of horizontal directional drills and 8 km onshore	43 km to Horsley Park network	3 km	3 km plus 33 km for stage 2

Additional pipeline options considered

Along with the pipeline options outlined in Table 4-1, additional pipeline options were considered including their connection to the gas network and cost. Options included those for Port Kembla, Port Botany and Port of Newcastle.

An overview of these and their associated costs, connections and lengths are outlined in Table 4-2 (Advisian, 2018a).

Table 4-2 Comparison of pipeline connection options considered

Port Kembla	Port Botany	Port of Newcastle
A new pipeline to the Eastern Gas Pipeline, 18 inch pipe, 1.6 km in length and costing around $7 million A new pipeline to the Eastern Gas Pipeline, 18 inch pipe, 6 km in length, costing around $32 million A new pipeline from Berth C to Wilton to Wollongong pipeline junction at Figtree, 20 inch pipe, 6.1 km in length, and costing around $40 million	A new pipeline from Port Botany to Leppington or Smithfield (both around 40 km in length), 20 inch pipe 47 km pipeline, costing around $240 million	Upper River berth to Kooragang metering station, 20 inch pipe, 3 km in length, and costing around $14 million Kooragang metering station to Hexham (loop 14 inch), 20 inch pipe, 12 km in length, costing around $43 million

Based on the estimated cost and difficult of construction of the Port Botany pipeline option, this option was dismissed as unviable and was dropped from consideration.

Instead, a more detailed comparison between the Eastern Gas Pipeline (EGP) connection option at Port Kembla and the Hexham pipeline connection option at the Port of Newcastle was considered. See Table 4-3 (Advisian, 2018a).

Table 4-3 Comparison of pipeline connection options at Port Kembla and Port of Newcastle

Port Kembla: Eastern Gas Pipeline connection	Port of Newcastle: Hexham pipeline connection
Low cost option (1.6 km) using existing 8 inch branch line Could loop existing branch line to Kembla Grange EGP pipeline has capacity up to 300 TJ/d, with average of 200 TJ/d Greater than 300 TJ/d would require looping Low cost, fastest schedule Limited landowners to negotiate easements within an industrial area	Approximately 11 km long pipeline from Mayfield 6 to Hexham Size pipeline to match Hexham capacity 12" pipeline at 10 MPa inlet would deliver over 300 TJ/d at 7 MPa * Jemena confirm capacity of system at Hexham: • Current limit of pipeline is 5 MPa which would deliver 200 TJ/d • * Would need $30 million upgrade (heating) to go to 7 MPa, 300 TJ/d Power company AGL, their LNG's plant injects up to 120 TJ/d: • This could restrict amount of new gas into the pipeline

Capacity, operating pressure, anticipated licensing requirements, and existing pipeline condition were assessed for both of these options.

The more detailed comparison showed that insufficient capacity existed in the current pipeline system in the Newcastle area to accommodate the required flowrates.

As such, Port Kembla provided a more suitable site for pipeline connection, as it is well served for connection to the Jemena Gas Network (JGN) upstream of the greater Sydney gas market via either of the Jemena owned and operated EGP or the Wilton to Wollongong Pipeline (WWP) with the latter being connected with the Wilton to Horsley Park (WHP) main trunk line.

The preferred site location for pipeline connection was therefore nominated as Port Kembla with a connection to the EGP tie-in point at Cringila.

Technology options

A range of technologies for storage and regasification of the LNG were considered including offshore FSRU, LNG carrier shuttle tankers, onshore storage and regasification, FSRU, and FSU.

Technology options considered for each project option outlined in were:

- FSRU (Port Kembla option 1, Port Botany option 1 and Port of Newcastle option 1)
- FSU and onshore regasification (Port Kembla option 2)
- LNG carrier shuttle tankers, onshore regasification and small storage tank (Port Kembla option 3 and Port of Newcastle option 2)
- LNG carrier shuttle tankers, onshore regasification and large storage tank (Port Kembla option 4)
- Offshore FSRU with soft yoke mooring and subsea pipeline (Offshore option 1 at Port Kembla)

A comparison of the technology options considered are provided in Table 4-4.

Table 4-4 Comparison of technology options considered

Technology	Advantages	Disadvantages
Offshore FSRU	n/a	This option does not meet the availability targets Uses new technology which is not well proven Offshore environment is multi-directional with harsh and extreme meteorology oceanography conditions Requires a subsea pipeline
LNG carrier shuttle tanker	Has some onshore storage: • Manage LNG carrier changeover • Manage weather events Single wharf requirement Option to expand into full onshore storage	Requires onshore regasification: • Higher initial capital expenditure • More space required • Permits • Scheduling impacts
Onshore storage and regasification	Highest availability Minimal use of the wharf	High costs (highest capital expenditure and initial capital expenditure) Longest schedule Mostly onshore facilities, which require large areas of land Not suited to a short term development
FSRU	Low overall cost Minimal onshore works Fasted schedule	Potentially higher operating expense in comparison to FSU
FSU	(The FSU has not advantages over the FSRU)	FSU has no advantages over the FSRU Requires onshore regasification

Overall, the FSRU option was selected as it was considered the fastest, cheapest option with minimal works onshore. The schedule is critical as the project is required to be operational in 2020, therefore meeting market demands for a new gas supply.

Berth options

With Port Botany having been dismissed early on in the Concept Phase, and the preferred technology for the project identified as an FSRU, consideration of berthing options at the Port of Newcastle and Port Kembla were then considered.

Berth options for both ports were compared and ranked according to a set of evaluation criteria.

Outer harbour options at Port Kembla were dismissed early on in the Concept Phase due to the negative impact of meteorology and oceanography constraints such as long period waves. Long period waves are a well documented and frequent occurrence in Port Kembla. In recent times, such events had resulted in at least 12 instances where vessels were required to leave their locations. This frequency of supply interruption would have been an unacceptable risk to reliability and therefore all Outer Harbour options were dismissed as unviable.

Subsequent comparisons therefore focused on more protected options for the selected technology (FSRU); Port of Newcastle at Berth Mayfield 6; Port Kembla at Berth 111 West Inner Harbour and Port Kembla Berth 101 - FSRU and LNG carrier side-by-side as outlined in Table 4-5 (Advisian, 2018a). The option at Port Kembla Berth 101 was identified as an option through consultations with Port Kembla Coal Terminal (PKCT).

Table 4-5 Comparison of berth options at Port Kembla and Port of Newcastle

Berth option	Advantages	Disadvantages
Port Kembla Berth 111 West - FSRU and LNG carrier side-by-side	Minimal impact to port operations Requires minimal redirection of Allans Creek due to flow velocity	Requires a new berth Requires using BlueScope land Excavate landside to create more room for navigation Dredging required
Port of Newcastle Berth Mayfield 6 - FSRU and LNG carrier in-line	Minimal impact to port operations Some dredging required	Requires a new berth for the FSRU and upgrade/extension to Berth Mayfield 7 for the LNG carrier Additional pipework and loading arms required
Port Kembla Berth 101 – various alignment options considered *	Site is rarely used Identified by Port Kembla Harbour Master as being preferable from a navigation perspective Additional remoteness of location from nearest residential areas	n/a

*Various berthing options considered for Berth 101 included both a side-by-side and an in-line configuration. An end to end arrangement would interfere with coal loading operations at Berth 102 located to the north of Berth 101 and would require additional loading arms and cryogenic piping. A side-by-side option would require a cut into the existing berth to accommodate the two vessels side-by-side.

The preferred alternative for Berth 101 was a side by side transfer of LNG at Berth 101 in Port Kembla (Figure 4-2).

After site visits and discussions with third parties the final recommendation on the preferred Berth was Port Kembla Berth 101.

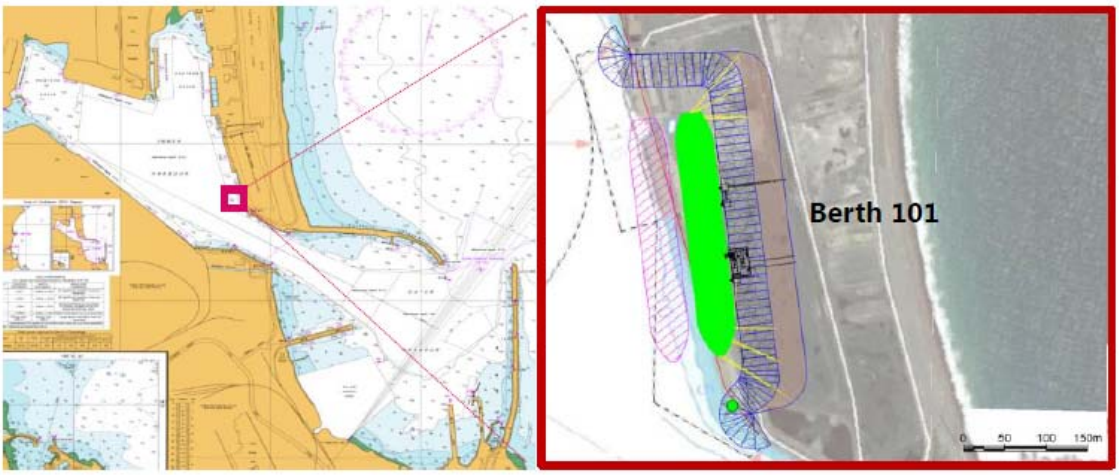

Figure 4-2 FSRU in Port Kembla at Berth 101 East

Pipeline options from Berth 101

With a berth location selected, additional consideration of pipeline options was required. The following options were identified for further investigation (Advisian, 2018):

- A 6.1 kilometre pipeline, mainly land based conventional construction, skirting to the north of the industrial port precinct (Figure 4-3).
- A 2.65 kilometre pipeline, primarily consisting of two major horizontal directional drills (HDDs) under the Inner Harbour (about 1.3 kilometre) to a location on the south bank of Allans Creek and then a drill around 660 metres from EGP tie-in point also to a location on the south bank of Allans Creek. A 690 metre conventional connection pipe segment would be required to join the two HDDs along Allans Creek Road (Figure 4-3).

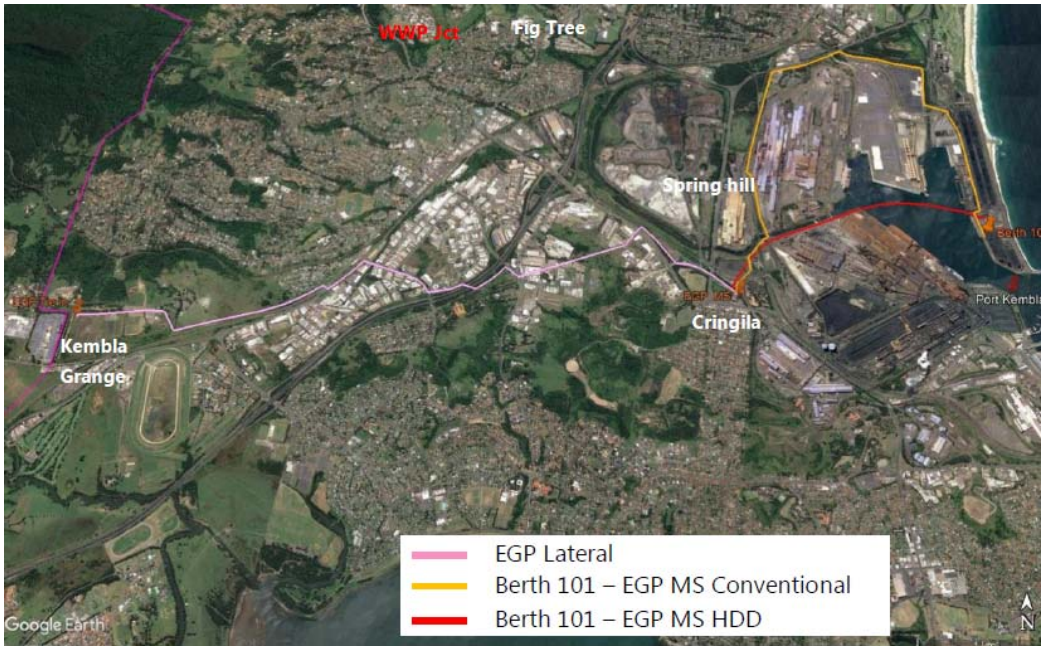

Figure 4-3 Initial concept pipeline and connection options

The existing EGP lateral pipeline from Cringila to Kembla Grange can be utilised by the project. However, upgrades to the EGP lateral could be undertaken to expand the project capacity to greater than 100 petajoules per annum. An upgrade to the EGP lateral does not form part of the scope of the project.

A comparison between the two pipeline options from Berth 101 at Port Kembla is provided in Table 4-6 (Advisian, 2018c).

Table 4-6 Comparison of pipeline options from Berth 101 at Port Kembla

6.1 km conventional pipeline option	2.65 km HDD pipeline option
Disadvantages	
Significantly longer Has several land holders Slow installation Requires multiple crossings including at least two horizontal directional drills under road/rail areas	Would involve disruption to traffic on the Steelworks road alongside Allans Creek where pipe strings would be made up Would be contingent on the geological conditions beneath the harbour sustaining the drill hole integrity and the feasibility of establishing a pipeline make up area along the Steelworks road, plus acceptance by BlueScope of the temporary traffic disruption that would result May interfere with port operations, either ship movements and/or maintenance dredging schedules Technically more difficult than open trench and/or land-based horizontal directional drills
Advantages	
Default option for gas hydraulics and pipeline sizing due to a relative minimal risk surety of implementation	Reduced length in comparison resulting in a shortened construction phase

Further consideration of pipeline connection options were completed during the Feasibility Phase and are outlined in Section 4.3.2.

4.2.2 Summary of Concept Phase pipeline, technology and berth options

The preferred alternative selected at the conclusion of the concept phase featured an FSRU berthed in side by side configuration with LNG carriers at Berth 101 in the Inner Harbour or Port Kembla. Pipeline options were evaluated in further detail at Feasibility Phase.

4.3 Feasibility Phase

The Feasibility Phase (Advisian, 2018c) confirmed the preferred option of a side by side configuration of LNG transfer at Berth 101 in Port Kembla Inner Harbour. It also dismissed the pipeline option under the sea bed.

In reaching these conclusions, the Feasibility Phase (Advisian, 2018c) considered a number of design options. Key options included:

- Wharf layout and geometry design options for a quay wall versus an island berth
- Pipeline options to connect the FSRU to the tie-in point at Cringila

These are summarised below.

4.3.1 Wharf layout and geometry design options

Two design options were considered for the wharf at Berth 101; a quay wall and an island berth. Typical designs of these are provided in Figure 4-4 and Figure 4-5.

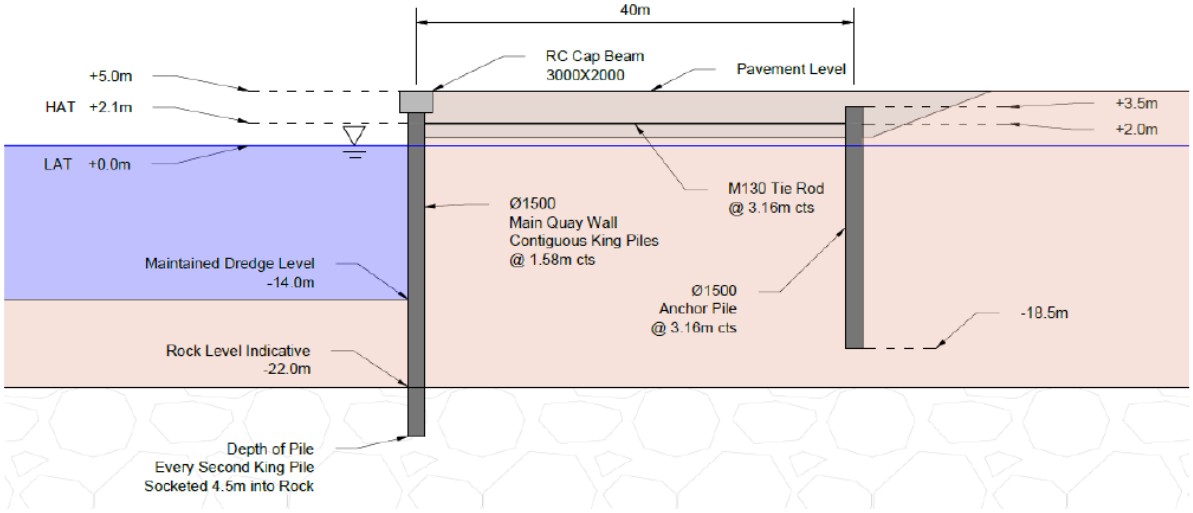

Figure 4-4 Typical quay wall option cross section

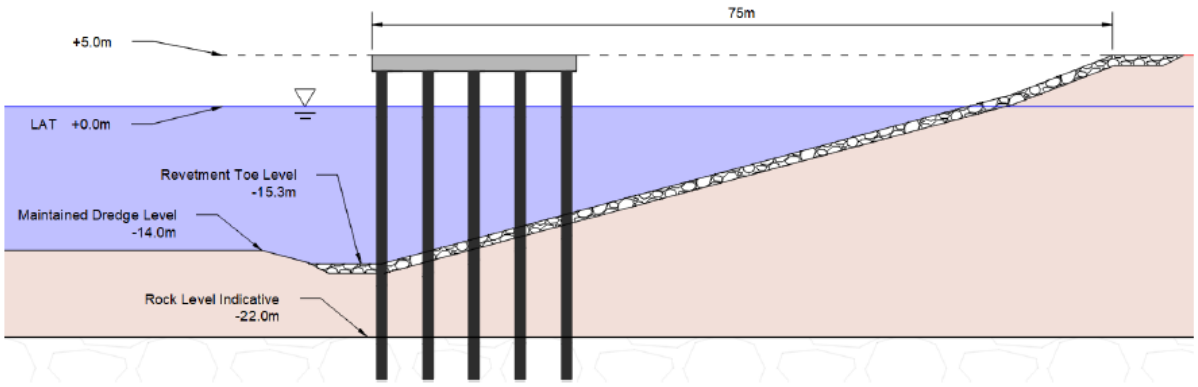

Figure 4-5 Typical island berth option cross section with no under layer fill

The Feasibility Phase (Advisian, 2018c) assessed key issues such as design, cost, construction sequence/methodology and timeframe for these options. Key points of comparison included:

- Less piling is required for the island berth thus the revetment can be installed earlier
- Cost saving of approximately 20 % between the island berth with no under layer fill and the quay wall option
- The island berth requires more dredging and land to be excavated to build the revetment and, hence, more land would need to be excavated in comparison to the vertical quay wall
- For the Island berth approximately 140,000 cubic metre of rock fill would need to be brought in from offsite to fill over the lower strength in-situ material to steepen the revetment slope and, hence, garner more land area.

The quay wall alternative was selected as it would require considerably less dredging and excavation and would result in less restriction of vessel movements within the Inner Harbour.

Navigation simulation studies were undertaken to identify the degree of separation required from the berth to the Inner Harbour turning basin as detailed in Chapter 9 and Appendix C in

Volume 2 of this EIS. A buffer of 40 metres was selected to provide the optimum balance to ensure safe navigation and passage of vessels within the Inner Harbour and minimising the extent of dredging and reclamation required for the berth (refer to Figure 5-4 in Chapter 5: Project Description).

Sediment disposal options were considered in conjunction with NSW Ports with the aim of disposal of the dredged material within disposal areas dedicated within the Outer Harbour. Alternatives for both submerged and emergent disposal in the Outer Harbour were investigated to best meet NSW Ports latest plans for the expansion of the Outer Harbour. Transport of sediments from the dredging and excavation of Berth 101 could be undertaken by either barge within the harbour or through road haulage. A combination of disposal options has been selected for the project as described in Chapter 5.

4.3.2 Pipeline alignment options

Options were assessed for the connection of regasified LNG from the FSRU send out facilities at Port Kembla Berth 101 to the Eastern Gas Pipeline. FSRU constraints, pipeline constraints and compression requirements were considered.

This options' assessment included:

- Constructability Issues (technical difficulty, operational impacts on the port etc.)
- Pipeline hydraulic analysis to determine maximum achievable flow capacity and compression requirements
- Assessment of pipeline and compression capital expenditure (CAPEX)
- Assessment of compression natural gas consumption and associated cost
- A number of pipeline alignments were considered (Figure 4-6).

Alignments considered included:

- A central alignment involving a single directional drill directly under the harbour to the Cringila meter station. This option was rejected reasonably quickly due to greater technical challenges and possible impacts on Port operations (ship movements and/or maintenance dredging schedules).
- A southern alignment involving a series of directional drills and traditional trenching through the southern areas of Port Kembla (Figure 4-6).
- A northern alignment passing through the northern and western areas of Port Kembla.

The northern alignment was selected as the preferred option and will involve pipeline installation primarily using traditional trench methods with directional drilling adopted at road and rail crossings and areas of environmental sensitivity. The alignment was refined throughout the preparation of this EIS to avoid biodiversity and heritage constraints.

Construction of the pipeline will be primarily restricted to previously disturbed sites and road verges within the Port Kembla industrial precinct. The pipeline will be designed and constructed to Australian standard AS2885, which is the standard applicable to the design, construction, testing, operations and maintenance of gas pipelines of this nature.

Paper Size ISO A4

0 200 400 600 800

Metres

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

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Port Kembla Gas Terminal

Pipeline alignment options

Project No. **21-27477**
Revision No. **-**
Date **05/07/2018**

FIGURE 4-6

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Print date: 05 Jul 2018 - 14:57

4.4 Summary of project alternatives considered

The preferred development selected during the Concept Phase included a FSRU side-by-side configuration for LNG transfer at Berth 101 at the Inner Harbour of Port Kembla with a pipeline connection to the existing EGP. The preferred project was considered to have a number of advantages in comparison to other alternatives including:

- Ability to accommodate side by side berthing of the FSRU with the LNG carrier
- Inner harbour sheltered from long period wave action
- Site is located more than two kilometres from residential receivers
- Relatively short pipeline connection and ease of access into the existing gas network.

The Feasibility Phase then considered further detail on wharf layout and geometry and pipeline alignment options. A quay wall design was selected as the preferred wharf layout as it would require less dredging and pose less restrictions to port navigation. A buffer of 40 metres from the Inner Harbour turning basin was selected to provide the optimum balance between the required dredge and excavation volumes and safe navigation of vessels within the Inner Harbour.

The northern pipeline alignment was selected and comprises a connection from the FSRU to the tie-in point at Cringila, which is connected to the EGP. Installation of the pipeline would primarily use traditional trench methods with directional drilling adopted at road and rail crossings and areas of environmental sensitivity.

5. Project description

5.1 Overview

AIE proposes to develop the Port Kembla Gas Terminal (the project) in Port Kembla, New South Wales. The project involves the development of a liquified natural gas (LNG) import terminal, which would be the first such import terminal in NSW and provide a simple, flexible solution to the State's gas supply challenges.

NSW currently imports more than 95% of its natural gas requirements from Victoria, South Australia and Queensland. An import terminal would enable NSW to control and secure its own direct supplies. The project has the capacity to deliver in excess of 100 petajoules of natural gas per annum to NSW. This is equivalent to more than 70% of the State's annual needs. Supply could be increased further to around 140–150 petajoules per annum through a slight increase in scheduled deliveries and pipeline upgrades.

The project consists of four key components:

- LNG carrier vessels — there are hundreds of these in operation worldwide 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. There are around 30 such vessels currently in operation around the world;
- Berth and wharf facilities – including landside offloading facilities to transfer natural gas from the FSRU into a natural gas pipeline located on shore; and
- Gas pipeline – a Class 900 carbon steel high-pressure pipeline connection from the berth to the existing gas transmission network.

The project design and layout, construction, operation and decommissioning is described in the following pages. A layout of the entire project is shown in Figure 5-1. Indicative general arrangement designs for the berth and FSRU are included as Appendix A.

The project, subject to approvals, is scheduled for construction in 2019 with first gas delivery in 2020. The project life is 10–15 years but could be extended with sufficient demand.

Construction of the project is expected to involve a capital investment of about $200–250 million and employ about 150 workers at its peak. Once fully operational, the project is expected to employ about 40–50 personnel.

5.2 Structure

This project description is divided into sections covering the design, construction and operation of the project followed by the decommissioning of the project at the end of its life.

Section 5.3 describes the overall design of the infrastructure that makes up the project including berth and wharf facilities, the gas pipeline and the FSRU.

Section 5.4 describes how the project would be constructed including the construction schedule, the material and equipment required, the workforce and vehicle movements and specific works to be carried out for construction of the project including excavation, dredging and disposal.

Section 5.5 describes how the key components of the project would operate including the transfer of LNG from LNG carriers to the FSRU, through to the berth and wharf facilities, into the gas pipeline and then on to market.

Section 5.6 outlines plans for decommissioning at the end of the project.

Paper Size ISO A4

0 50 100

Metres

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

N

Australian Industrial Energy
Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Project layout

Figure 5-1

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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

5.3 Design

5.3.1 Floating storage and regasification unit

The FSRU is a cape-class ocean-going vessel approximately 300 metres in length and about 50 metres in breadth. It has a total capacity of about 170,000 cubic metres or equivalent to about 4 PJs of gas. This in turn is equivalent to about 10 – 12 days of natural gas supply for the whole of NSW.

The FSRU is a double-hulled vessel with a cargo area which consists of four cargo tanks suitable for carrying LNG at low temperatures (about minus 161 degrees Celsius) and at atmospheric pressure. There are also two high pressure manifolds located on the vessel that are required to export the natural gas produced via the regasification process into the pipeline.

The FSRU, for the term of the project, and subject to any maintenance requirements or Port Authority directions, would be moored at the berth and wharf facilities discussed in Section 5.3.2.

The vessels will be obtained and operated under long-term charter by Höegh LNG, the world's largest and most experienced owner and operator of FSRUs globally. All Höegh LNG vessels are designed to comply with comprehensive international safety regulations and standards.

One of the key purposes of the FSRU is to receive LNG from regularly scheduled LNG carriers visiting Port Kembla. These vessels will be operated by the suppliers of LNG contracted to the project. A global tender is currently underway to select the most competitive sources of reliable scheduled supply. It is anticipated that in the order of 24 LNG carriers would visit Port Kembla in any one year during project operations.

These LNG carriers will tether alongside the FSRU for around 24–36 hours while they transfer their LNG cargo, still under atmospheric pressure, into the cargo holds of the FSRU. Once the transfer is completed the LNG carriers will leave the port subject to suitable navigational conditions.

The FSRU has four key functional elements: facilities to receive LNG from LNG carriers; facilities to store LNG; facilities to convert LNG to high pressure gas; and connection to the gas pipeline.

Purpose built flexible hoses will be used to transfer LNG from visiting LNG carriers to the FSRU. It is expected that the FSRU itself will have six hoses, which include four for receiving LNG and two for maintaining a balance of vapour gas between ships.

Cargo tanks to store the LNG in the FSRU are purpose built. The vessel is double-hulled enabling both a primary and secondary barrier to exist, further supported by insulation and intervening spaces. These cargo tanks are designed to achieve two outcomes:

- to insulate and contain LNG cargo at cryogenic temperatures (approximately minus 161 degrees Celsius); and
- to prevent leakages and isolate the cargo from the hull structure.

Boil-off gas (BOG) management facilities are also in place to capture small amounts of natural gas that is generated from LNG in the storage tanks. This BOG is used to fuel the on-board generators for the operation of pumps and other equipment used on-board.

The regasification unit located on board the FSRU is typically located toward the bow or centre of the vessel. The regasification module contains all necessary pumps, motors, heat exchangers, instrumentation, control and emergency shutdown systems to ensure the operation of the unit can occur. The regasification unit involves LNG being pumped up from the cargo tanks into a suction drum. The LNG is then pumped through a series of heat exchanges, which

utilise seawater as a source of natural heat differential to warm up the LNG. Once in a gaseous form, the gas is exported, under pressure, through the marine loading arms into the gas pipeline.

The operations of the FSRU and the LNG carriers are discussed further in Section 5.5. The general arrangement plan for an example FSRU is included in Appendix A.

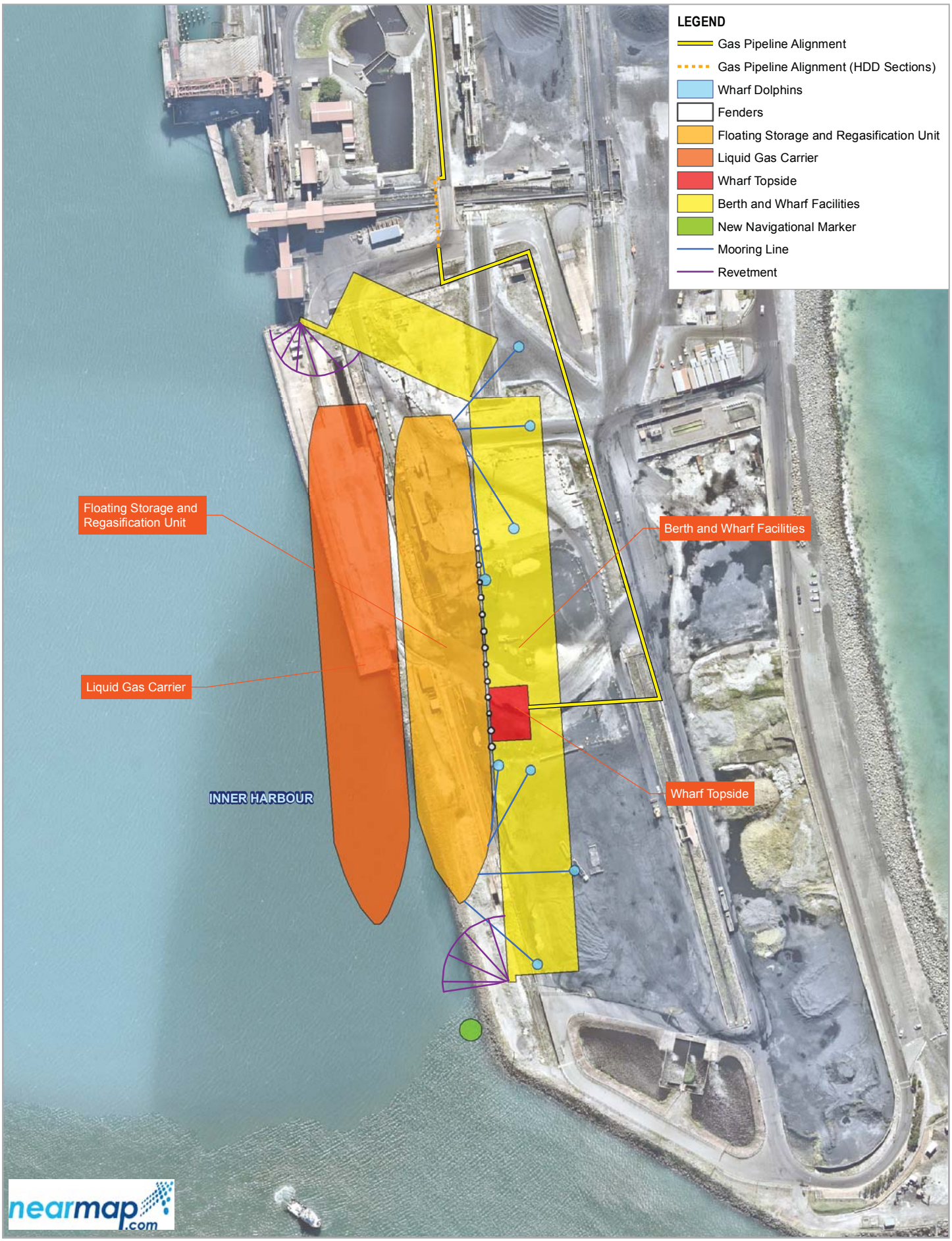
5.3.2 Berth and wharf facilities

Berth and wharf facilities are proposed to be situated 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 to support such a configuration and is discussed in further detail in Section 5.4.

A range of topside facilities will be established at the wharf. These facilities will include mooring infrastructure for the FSRU, gas transfer infrastructure including offloading arms, and gas pipeline tie-in and maintenance infrastructure.

A range of ancillary facilities will also be situated at the wharf including access roads, fencing and other security, lighting, telecommunications, electricity, water, sewerage and other utilities.

An indicative site layout is included in Appendix A.



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Map Projection: Transverse Mercator
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Project No. **21-27477**
Revision No. **A**
Date **30 Oct 2018**

Berth and Wharf Facilities

Figure 5-2

G:\21\27477\GIS\Maps\Deliverables\EIS\21_27477_EIS_Z002_Berth_and_Wharf_Facilities.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

5.3.3 Gas pipeline

A short gas pipeline would connect the FSRU to the a tie-in point at Cringila, which in turn is connected to the 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. The gas pipeline would be designed to comply with all current environmental and safety requirements including those required under Australian Standard (AS) 2885. The tie-in point would either be at 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 will measure gas transferred from the project into the gas network. This will either be installed at the tie in point for the project 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 route of the gas pipeline is shown in Figure 5-3. The alignment of the gas pipeline is the result of a detailed options and alternatives development process as described in Chapter 4. The alignment has been selected to minimise disruption to public access, port operations and avoid areas of environmental and cultural sensitivity. Directional drilling has also been adopted for key road, rail and waterway crossings and to avoid previously undisturbed areas of biodiversity and heritage value. The drilling methodology is discussed in further detail in Section 5.4

As shown, the gas pipeline would follow a route about 6.3 kilometres in length from Berth 101 to the north along the road verge of Road No 1 within the Port Kembla Coal Terminal. It would then turn west along the road verge of Tom Thumb Road, including a horizontal directional drill beneath Gurungaty Waterway. It would continue along the road verge of Tom Thumb Road to the north and west, generally following the boundary of the existing car storage facilities and BlueScope facilities, including a horizontal directional drill beneath the crossings of Tom Thumb Road, the Pacific National railway and BlueScope's Northgate access. It would then continue east including a horizontal directional drill beneath the crossing of NSW RailCorp's South Coast Line and Springhill Road and the intervening vegetated area. It would then follow the road verge of Springhill Road south including a horizontal directional drill beneath Allans Creek. It would then tie in to Jemena's assets connected to the EGP.

The project application area for the purpose of the EIS includes a 20 metre corridor (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 as been considered for 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 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).

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Map Projection: Transverse Mercator
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Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Figure 5-3

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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

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

Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Figure 5-3

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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

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Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Figure 5-3

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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

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Australian Industrial Energy
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Gas Pipeline

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Figure 5-3

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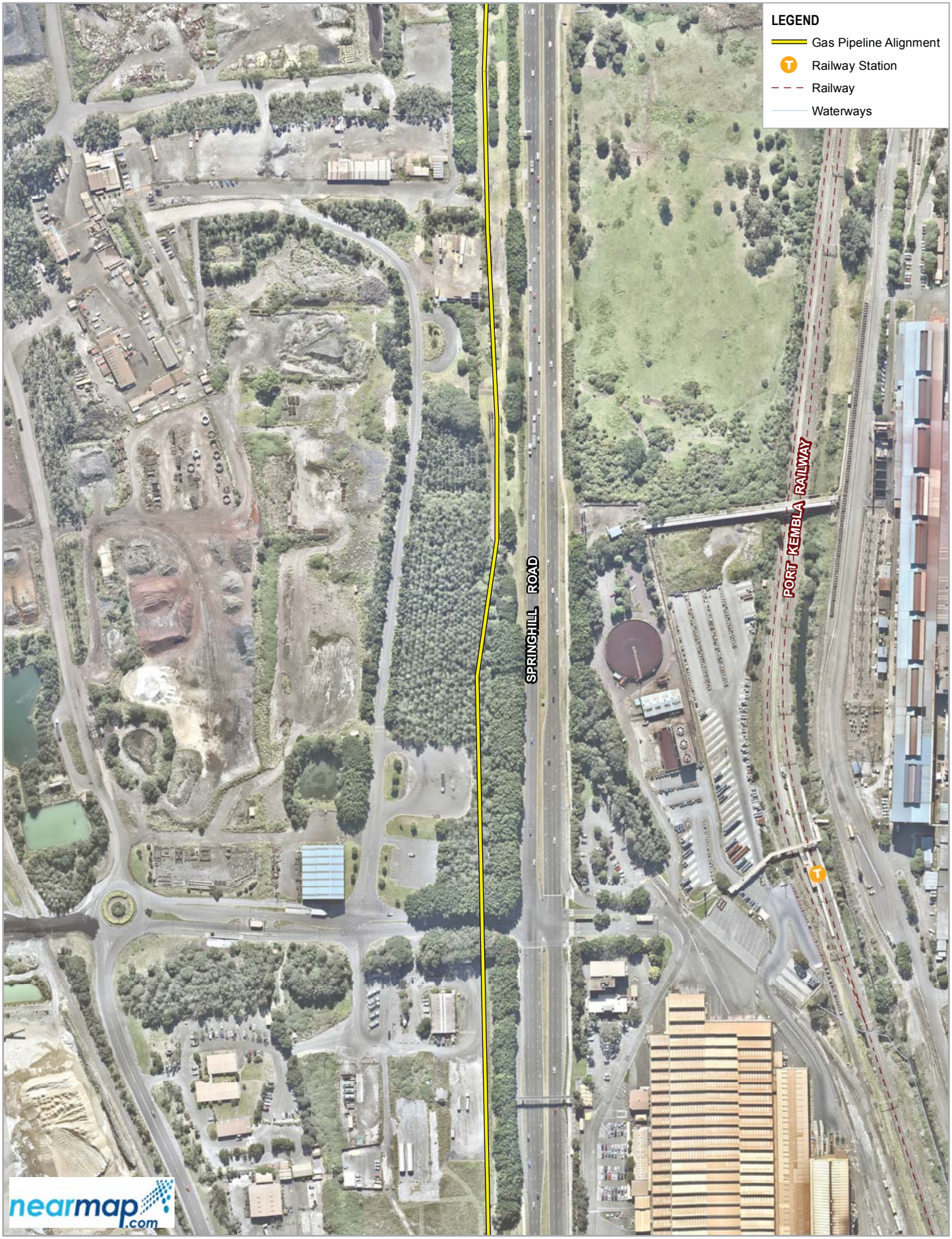
Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



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Australian Industrial Energy
Port Kembla Gas Terminal

Gas Pipeline

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Figure 5-3

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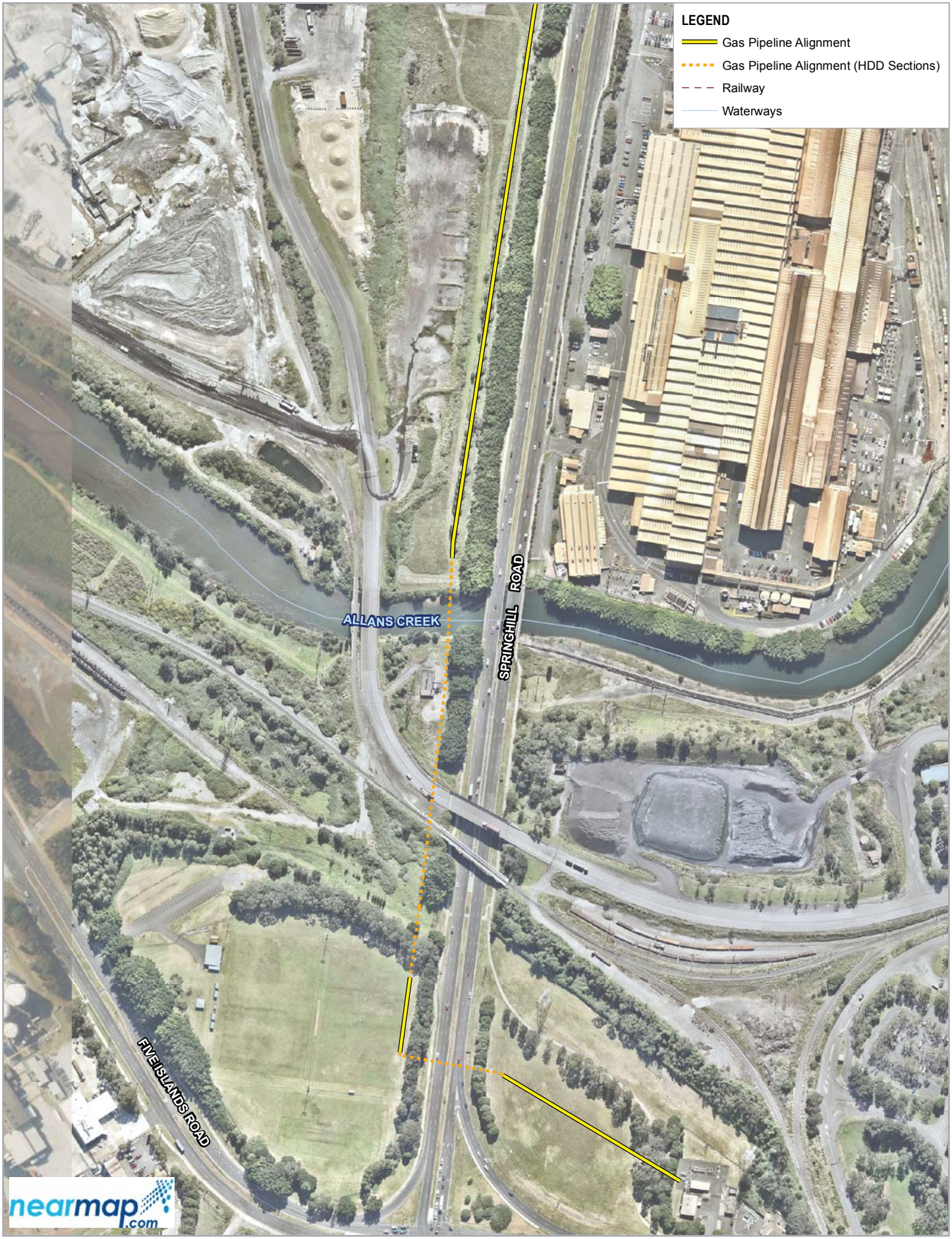
Data source: Aerial imagery - nearmap 2018 (image date 16/04/2018, date extracted 01/08/2018); General topo - NSW LPI DTDB 2017, 2015 & 2015; Berth footprint - Australian Industrial Energy. Created by: afoddy



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Australian Industrial Energy
Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **02 Nov 2018**

Gas Pipeline

Figure 5-3

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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

5.4 Construction

5.4.1 Overview

The project is scheduled for construction during 2019 subject to CSSI approval. Construction of the berth and wharf facilities including required excavation, dredging and disposal is expected to take about 10–12 months. Construction of the pipeline is expected to take about 6 months.

Construction is proposed to be carried out continuously 24 hours per day and 7 days per week for the duration of the construction program. Construction is planned for completion by 2020.

5.4.1 Construction workforce

At the peak of the construction program the project is expected to employ a construction workforce of about 125–150. An indication of the split of the workforce is provided in Table 5-1.

The construction workforce would generally work on 10 or 12 hour shifts. Changeover of the construction workforce would generally occur at the start of a morning shift at around 7 am, an evening shift at around 5 pm or a night shift at around 7 pm. Changeover of the workforce that would be conducting dredging would generally occur at 6 am and 6 pm or 12 am and 12 pm.

Table 5-1 Construction workforce

Construction sites	Workers
Berth and wharf facilities	76
Disposal area	37
Gas pipeline	37

5.4.2 Construction equipment

Indicative equipment required for construction is shown in Table 5-2.

Table 5-2 Indicative equipment

Activity	Equipment	Quantity
Demolition	Excavator	9
	Barge with crane/excavator	1
	Loader	2
	Dump truck (50 t)	4
	Truck and trailer	4
Construction	Piling rig	4
	Pile driving hammer	4
	Vibro-hammer	3
	Crane (150–300 t)	5
	Crane (30–150 t)	6
	Drilling machine (90 t)	3
	Concrete pump	2
	Truck and jinker	2
	Telehandler	2
Dredging	Backhoe dredger	1
	Survey crew/boat	1
	Tug boat (1200 HP)	2

Activity	Equipment	Quantity
	Tug boat (600 HP)	1
	Barge	2
Excavation	Long reach excavator	1
	Loader	1
	Dozer	1
	Excavator	3
	Haul truck (32 t)	10
Disposal	Long reach excavator	1
	Loader	1
	Dozer	1
	Dump truck (50 t)	2

5.4.3 Construction materials

Construction of the project would involve the use of a range of materials. These would include building materials for the construction of berth and wharf facilities and gas pipeline. Building materials would include materials such as piles, concrete and pipeline lengths.

Construction of the project would also involve the use of excavated and dredged materials as discussed in Section 5.4.7.

Construction of the project would involve the use of construction water for dust suppression when required. Water for dust suppression will primarily be sourced from stormwater run-off collected in existing stormwater ponds at the southern end of the Berth 101 area or tertiary treated water from the coal terminal.

Construction of the project would also involve the use of potable water for the construction workforce. The demand for potable water is expected to be about 100 litres per day per person. This would total up to 15,000 litres per day at the peak of the construction program.

It is expected the demand for potable water would in part be serviced by existing coal terminal infrastructure.

Construction of the project would involve the use of fuel for the equipment in Section 5.4.2. The estimate volume of fuel required is described and assessed in Chapter 22.

5.4.4 Construction traffic

At the peak of the construction program the project is predicted to generate light and heavy vehicle movements. The light vehicle movements would reflect travel to the site of the maximum construction workforce plus a nominal number of additional light vehicle movements to support construction. The heavy vehicle movements would be primarily due to the transport of excavated and dredged material from the berth and wharf facilities to the disposal area (where not practical to be transported by barge) plus a nominal number of additional heavy vehicle movements for general deliveries of materials to support construction.

The light vehicle movements would typically occur at the start and end of each shift at the construction sites and are expected to involve travel between Port Kembla and the places of residence of the construction workforce. While the exact routes followed by the workforce are not known it is expected most would access Port Kembla from roads including Princes Highway, Masters Road, Springhill Road, Port Kembla Road, Five Islands Road and Flinders Street.

Heavy vehicle movements will mainly occur between the berth and wharf facilities and the disposal area along Port Kembla Road, Springhill Road, Five Islands Road, Flinders Street and Old Port Road. Other heavy vehicle movements for general deliveries are expected to follow similar routes to the light vehicles to and from Port Kembla from Princes Highway.

The light and heavy vehicle movements during construction, including during peak periods, are quantified and assessed in the traffic assessment in Chapter 16.

It is expected that construction traffic would utilise existing parking at Port Kembla in the vicinity of Berth 101. Additional parking is not anticipated to be required to support construction. Construction traffic and access is described in further detail in Chapter 16.

Construction of the project would also involve some marine traffic for excavation, dredging and reclamation. This would be limited to movements of a small number of vessels including a backhoe dredger, barges and tug boats between the Inner Harbour and Outer Harbour. The vessels would be required to comply with the port navigation protocols in place at Port Kembla as described in Chapter 9.

5.4.5 Floating storage and regasification unit

The FSRU would be procured from Höegh LNG as an established global supplier. The project currently has an exclusivity agreement on two vessels pending final selection. Both vessels are purpose-built FSRUs (as opposed to retro-fitted LNG carriers). One is four years old on active service and the other is currently being built. Construction of the FSRU is under the operational control of the supplier and would occur outside of Australia. Therefore, the construction of the FSRU is not covered in this environmental impact assessment. FSRUs are designed to comply with comprehensive international safety regulations and standards and these would be a condition of the procurement process. Indicative drawings of the FSRU are in Appendix A.

5.4.6 Berth and wharf facilities

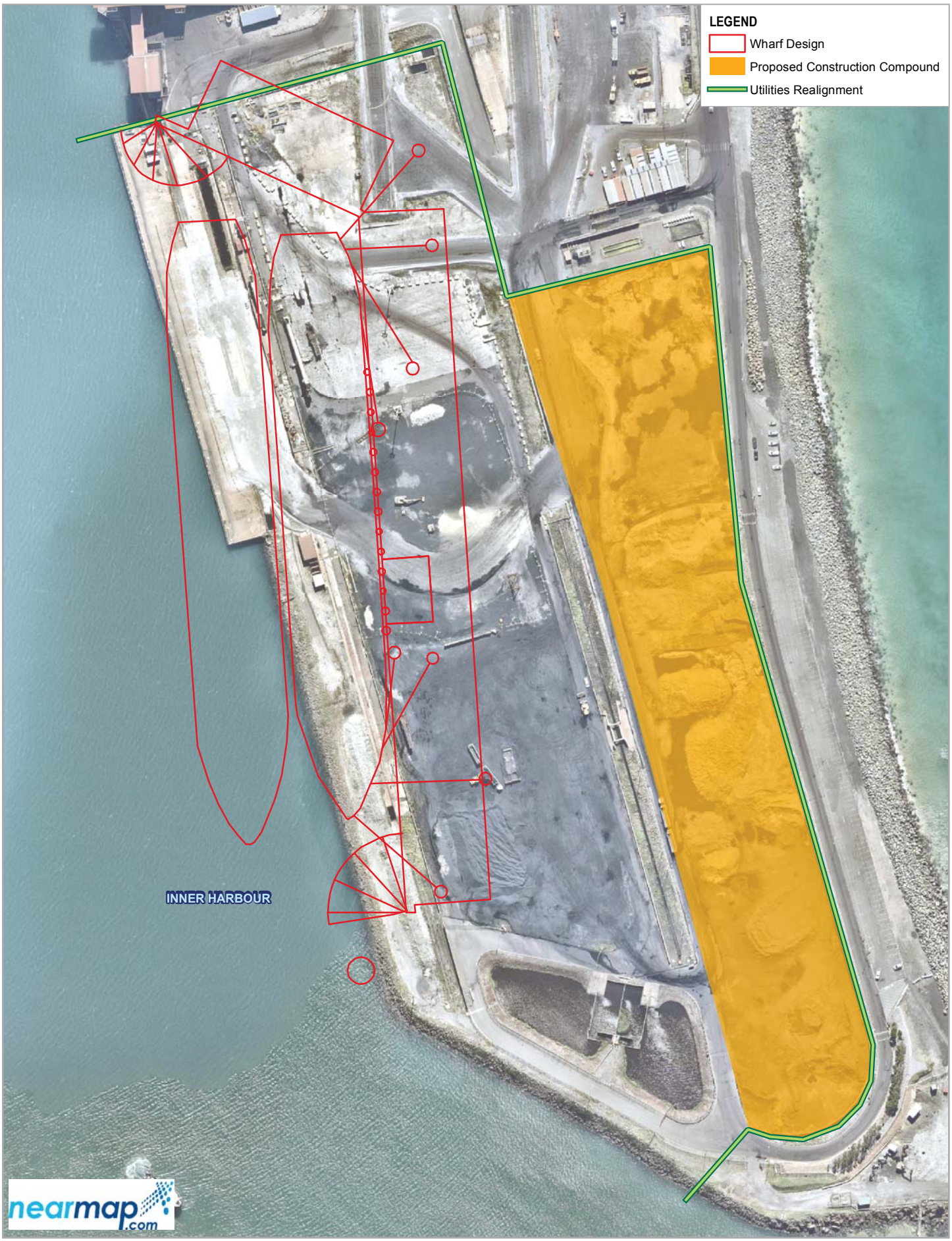
Construction of new berth and wharf facilities would involve establishment of a temporary construction compound, demolition of existing wharf facilities, and building of quay wall and topside facilities. In addition, a number of existing utilities used by neighbouring tenants and/or the project will need to be realigned and reconnected prior to major construction disturbance. It is understood that the following utilities would need to be realigned and reconnected:

- Bunker oil pipeline
- Domestic water pipeline
- Electricity supply
- Communications

The temporary construction compound would be established adjacent to the berth and wharf facilities at the start of construction as shown on Figure 5-4. The temporary construction compound would include site offices, storage sheds, hardstand areas and stockpile areas and would be fully bunded.

The expected construction sequence for the demolition of existing wharf facilities and building of quay wall and topside facilities is shown in Figure 5-5. Demolition of existing wharf facilities would include removal of existing structures, services and support structures. Installation of the quay wall would include the installation of piles and tie rods, placement of fill and pavement to complete the wharf surface.

As shown in Figure 5-5, demolition of existing wharf facilities and building of quay wall and topside facilities would involve significant excavation and dredging which is described in Section 5.4.7.



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Map Projection: Transverse Mercator
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Temporary Construction Compound

Project No. **21-27477**
Revision No. **A**
Date **31 Oct 2018**

Figure 5-4

G:\21\27477\GIS\Maps\Deliverables\EIS\21_27477_EIS_Z004_Temporary_Construction_Compound.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

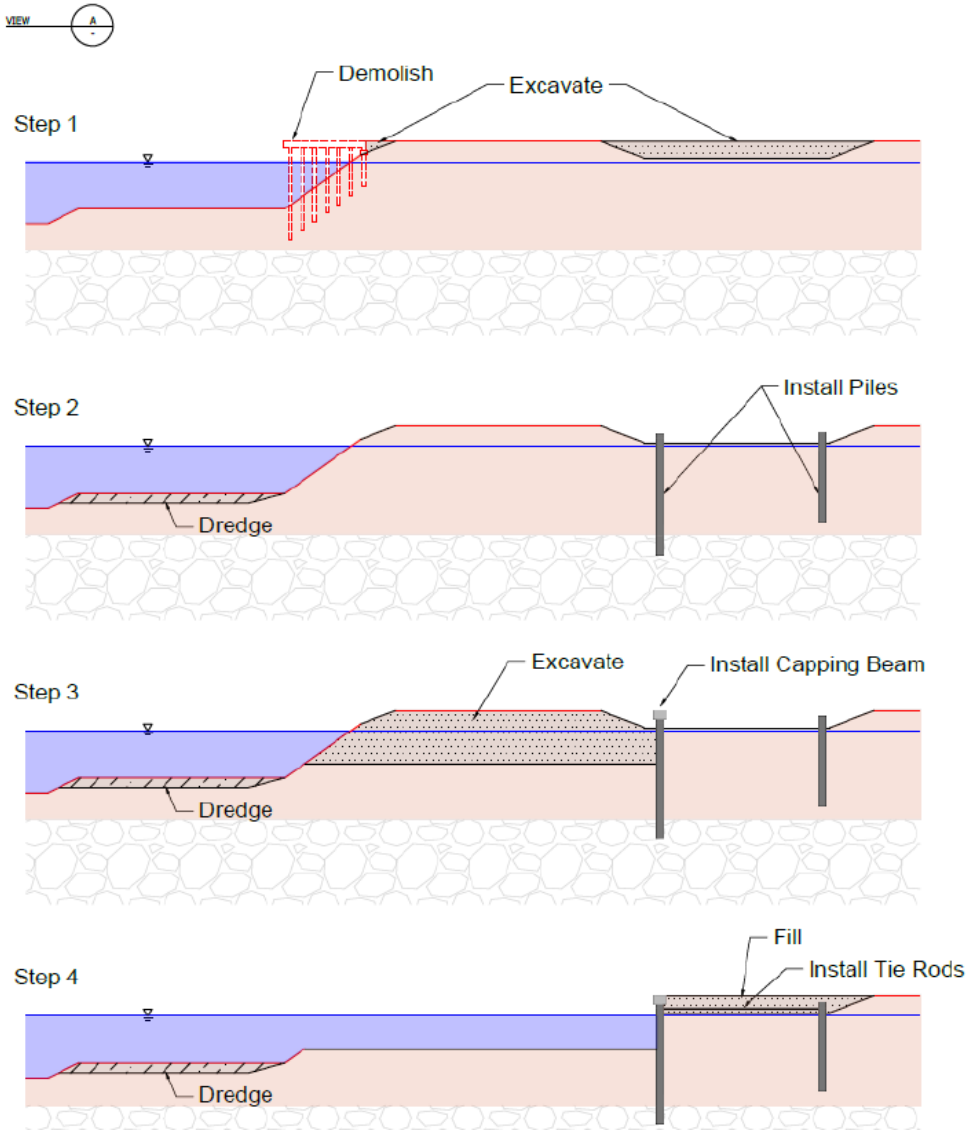


Figure 5-5 Indicative wharf and berth construction sequence

5.4.7 Excavation and dredging

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. The excavation and dredging would occur over an area of about 8 hectares including parts of the existing berth and wharf as shown in Figure 5-6.

Excavation and dredging would 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. Material excavated by the long reach excavator would be put in haul trucks and transported a short distance to a stockpile at Berth 101. The stockpile would be formed by dozers and prepared for transportation to the Outer Harbour for disposal.

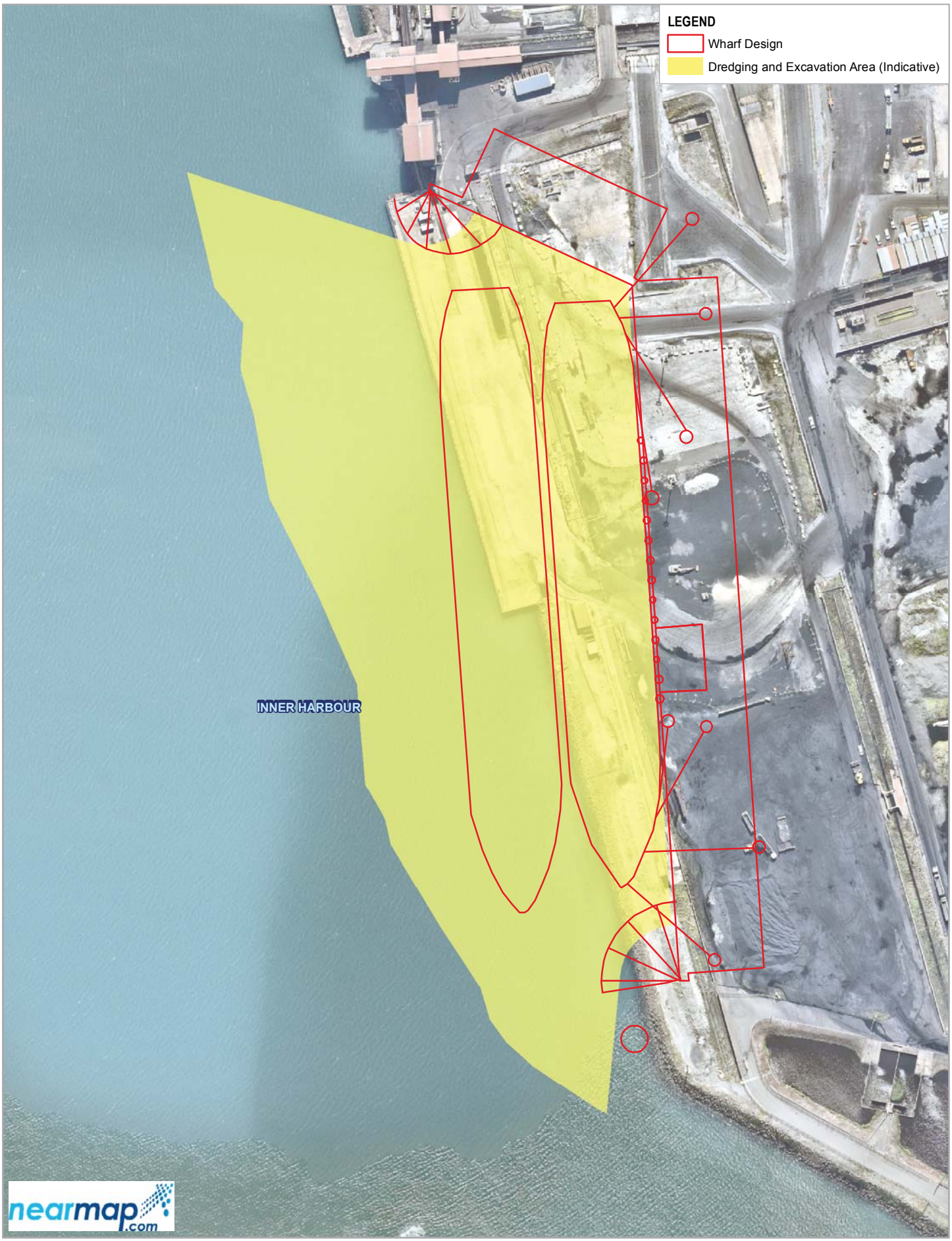
The backhoe dredger would be situated in the Inner Harbour adjacent to Berth 101 and would primarily be used to excavate the deeper sediments at Berth 101. Material dredged by the backhoe dredger would be put in barges for transport to the Outer Harbour for disposal.

The volume of material to be excavated by long reach excavator and transported by haul truck versus the volume of material to be dredged by backhoe dredger and transported by barge may vary depending on the preference and capacity of the construction contractor.

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

Actual volumes may comprise any combination of the above methodologies totalling about 720,000 cubic metres. The maximum potential volume of 720,000 cubic metres has been adopted for each methodology for the purpose of worst case impact assessment.



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Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **31 Oct 2018**

Excavation and Dredging

Figure 5-6

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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

5.4.8 Disposal

It is planned that the 720,000 cubic metres of material that would be excavated and dredged for the construction of berth and wharf facilities would be deposited at a disposal area in the Outer Harbour. The disposal area would cover about 17 hectares as shown in Figure 5-7. Material may be temporarily stockpiled on land adjacent to the disposal area prior to placement.

The deposition will comprise emerged and submerged disposal. Prior to any emerged disposal a stabilising bund would be constructed along the perimeter of the emerged disposal area. The stabilising bund would be constructed from the granular and sandy material excavated and dredged from the Berth 101 site. Sandstone material already stockpiled in the Outer Harbour lands on Foreshore Road may also be used as appropriate for bund construction.

The disposal area contains sediments previously deposited from dredging at Berth 103. About 70,000 cubic metres of the sediments would need to be dredged along the perimeter and redeposited further within the disposal area to support construction of the stabilising bund.

Once the stabilising bund is completed the material that would be excavated and dredged for construction of berth and wharf facilities would be deposited within the bund. The material would be deposited in an order such that potentially contaminated material would be dumped well within the bund and sealed over with lower risk material.

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 3 m below Port Kembla height datum. 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 4 metres below Port Kembla height datum to prevent re-dispersion.

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). The consistency of the disposal area and other approvals is discussed further in Chapter 6.

A portion of the dredged material may be utilised for the establishment of a 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. The majority of dredged and excavated material is therefore still proposed to be disposed of within the Outer Harbour disposal area.

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Port Kembla Gas Terminal

Project No. **21-27477**
Revision No. **A**
Date **31 Oct 2018**

Disposal area

Figure 5-7

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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

5.4.9 Gas pipeline

The gas pipeline would be constructed progressively by a combination of trenching and horizontal directional drilling. A temporary right of way would be established along the length of the pipeline route to provide space for vehicles and stockpiles of topsoil, subsoil and vegetation. Temporary construction compounds may also established intermittently adjacent to the right of way for the laydown of segments of gas pipeline and other construction materials as necessary.

The gas pipeline temporary right of way and construction compounds would be situated to avoid the known constraints of existing facilities, roads and waterways in the area. The right of way would also allow for micro siting of the gas pipeline to minimise impacts such as clearing.

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.

As identified in Section 5.3.3, horizontal directional drilling would be employed instead of trenching to avoid impacts to some surface features such as road, rail and waterways. Initially horizontal directional drilling would require the excavation of launch and receive pits at either end of the horizontal directional drill. A horizontal directional drilling rig would then be employed to drill a conduit between the launch and receive pits. The conduit would be drilled by progressively adding drilling head lengths at the drilling rig for the length of the horizontal directional drill.

Sections of the gas pipeline for horizontal directional drilling are shown in Figure 5-3.

5.5 Operation

5.5.1 Overview

Operation of the project is planned to commence in 2020. Once operational the project would operate 24 hours per day and 7 days per week supplying up to 100 petajoules of gas each year.

5.5.2 Operational workforce

The project is expected to employ an operational workforce of about 40–50 personnel. About 20–25 of the operational workforce would be on board the FSRU. The remaining workforce would be situated at the berth and wharf facilities or other operational tasks.

5.5.3 Operational traffic

Operational traffic on the road network would be limited to light vehicle movements associated with the operational workforce. Accommodation is available on the FSRU and is anticipated to be used by a portion of the workforce with the remainder travelling between Port Kembla and their places of residence. The workforce would utilise car parking facilities at Berth 101.

It is expected that a LNG carrier would arrive at the FSRU once every two to three weeks dependent upon operational demand. The LNG carrier would typically remain at the berth for around 24 to 36 hours to allow transfer of gas to the FSRU prior to departing. During arrival and departure the LNG carriers would be accompanied by pilot tug boats. The LNG carriers are expected to be able to travel to and from the FSRU within the existing marine traffic and access arrangements at Port Kembla, with some minor changes to operating practices for the duration a LNG carrier is present. LNG carriers and other vessels associated with the project will be required to comply with the port navigation protocols in place at Port Kembla. The interaction of the LNG carriers and existing marine traffic and access arrangements is considered in detail in Chapter 9.

Delivery trucks carrying supplies to the FSRU would include delivery of potable water, lubricant and consumables for the workforce. While the main source of fuel for the FSRU is expected to come from boil-off gas some delivery of fuel is also expected to be required. These delivery trucks would visit the FSRU relatively infrequently, in the order of 1–5 of trips per month and would not represent a significant increase to road traffic to and from Port Kembla.

Trucks transporting waste from the FSRU would include collection of waste streams such as grey water, sewage and bilge water, recyclable plastics, metals, cardboard and paper, and other general waste streams. Trucks transporting waste would also visit the FSRU relatively infrequently, in the order of 1–5 of trips per month. It should be noted that the technical processes on-board do not produce waste streams as such. Waste is mainly generated by packaging, food, consumables and maintenance work. Waste is assessed in further detail in Chapter 21.

It is also possible that from time to time the workforce on board an LNG carrier may change over or require deliveries of supplies or transport of waste to and from Port Kembla.

5.5.4 Floating storage and regasification unit

During operation LNG carriers operated by external suppliers will regularly visit Port Kembla with LNG shipments. They will pull alongside the FSRU, tether to the FSRU and then transfer their load to the FSRU. While the capacity of LNG carriers can vary, it is most likely that the LNG supplier to the project will seek to match the LNG carrier capacity to the FSRU capacity as closely as possible, in order to ensure a full transfer of cargo. As such, the LNG carriers are most likely to have a capacity of around 170,000 cubic metres. With a total annual capacity of

around 100 PJs per annum, this would typically equate to about 24 LNG carriers per annum. Figure 5-8 is an indicative illustration of a LNG carrier tethered to a FSRU in side-by-side configuration.

Figure 5-8 LNG carrier and FSRU

The LNG within the LNG carriers will be in liquid form at very low temperatures in the order of minus 161 degrees Celcius. At very low temperatures the gas shrinks to about one six hundredth of its normal size. The LNG would need to be warmed back to normal temperatures (in the order of 5 degrees Celcius) on board the FSRU to become gas again and be able to be transported through the gas pipeline.

LNG will be transferred from a LNG carrier to the FSRU through purpose built cryogenic flexible hoses. As the FSRU will have a capacity of up to 170,000 cubic metres, at the nominal gas transfer rate a full load of LNG would be transferred from the LNG carrier to the FSRU over a duration of typically around 24–36 hours.

The LNG is then stored in purpose-built storage tanks on board the FSRU until needed. A small fraction of the gas in the order of 0.15% per day would evaporate and be captured in a boil-off gas management facility on board. The boil-off gas would be used as a source of fuel on board or would be reliquefied and sent back to the storage tanks.

The LNG would be pumped from the storage tanks to a regasification unit that brings the LNG to a temperature of about 5 degrees at which point it would revert to a gaseous state. The gas would then be transferred through offloading arms from the FSRU to the gas pipeline tie-in facilities as discussed in Section 5.5.5.

A process flow diagram of the FSRU including the loading hoses and marine offloading arms, storage tanks, boil-off gas management facility and regasification unit is shown as Figure 5-9.

The FSRU will use seawater from the Inner Harbour at various times during the regasification process, as well as for a number of other purposes including engine cooling, ballast and fire-fighting, similar to any ocean-going vessel visiting the port. However, the use of seawater for the purpose of a water curtain during transfer of LNG from the LNG carrier to the FSRU, and for heat exchange purposes during regasification is unique to an FSRU.

It is expected that about 9.5 megalitres of seawater per hour would be used in the regasification system during its operation while about 2.4 megalitres of seawater per hour would be used for

cooling of engines and other machinery. During offloading of gas it is expected that about 5.2 megalitres of seawater per hour would be used for ballast systems and about 0.16 megalitres of seawater per hour would be used for a water curtain.

Seawater used for these purposes is usually re-released into the ocean. However, before releasing water back into the ocean, vessels must comply with both international and national regulations on the treatment of seawater.

The findings of studies undertaken as part of the EIS indicate the release of seawater back into the Inner Harbour is not expected to have a significant impact on water quality or biodiversity. The release of seawater back into the Inner Harbour is assessed in further detail in Chapter 12.

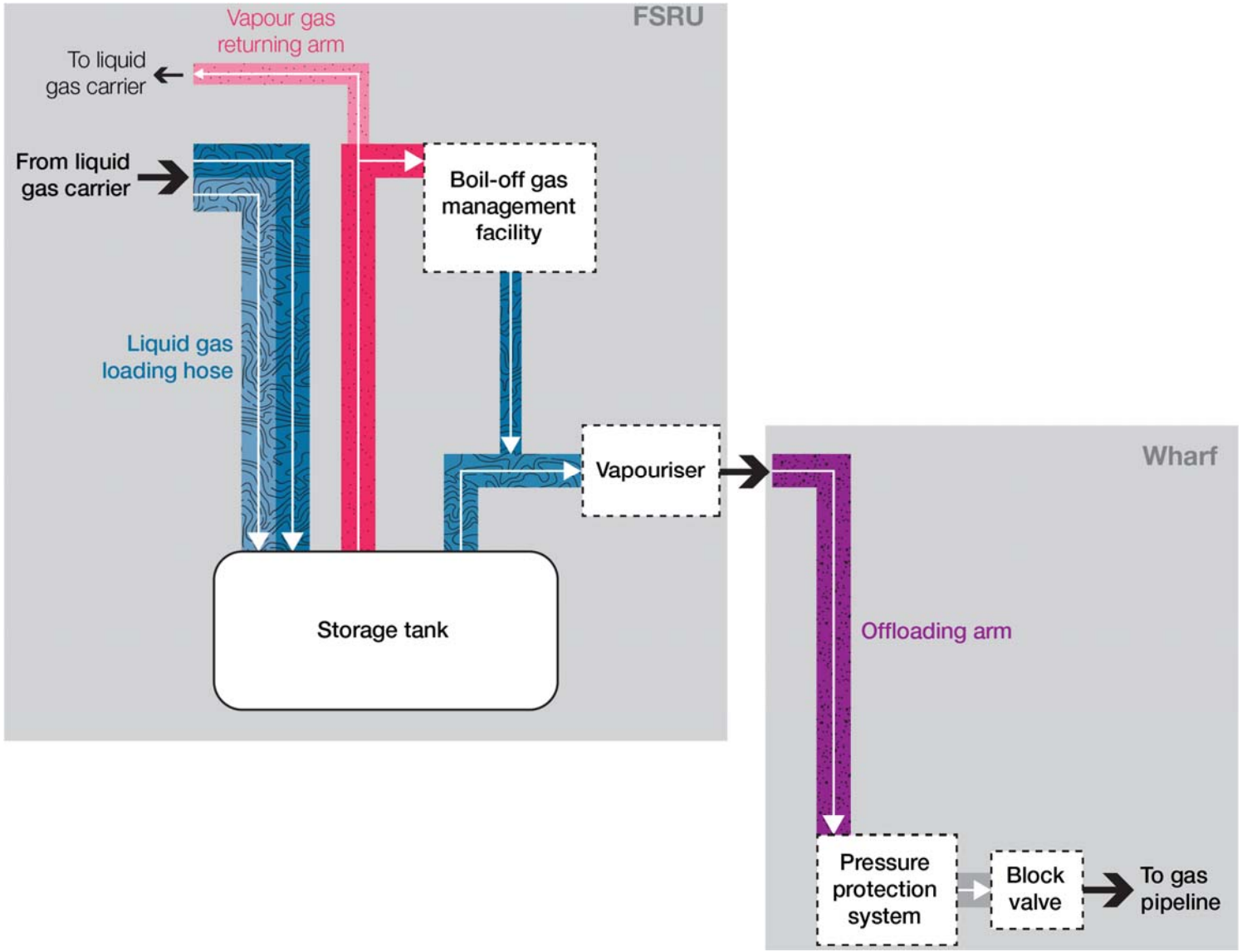


Figure 5-9 Process flow diagram

5.5.5 Berth and wharf facilities

During operation the berth and wharf facilities would mainly function to receive pressured gas from the FSRU through an offloading arm that would connect to the gas pipeline tie-in facilities and flow through to the gas pipeline. A process flow diagram of the pipeline tie-in facilities at the berth and wharf facilities is shown in Figure 5-9.

5.5.6 Gas pipeline

The operation of the gas pipeline would involve the transport of gas from the berth and wharf facilities through the gas pipeline to Jemena's existing assets and from there to market. The existing EGP can transport about 300 terajoules per day.

During the operation of the gas pipeline the flow rate and pressure of gas would be continuously monitored by an automated system at the control room. The pipeline is expected to operate at a pressure consistent with the network operator requirements for the Eastern Gas Pipeline.

The gas pipeline would occupy an operational easement about 6 metres wide. During operation the gas pipeline would be routinely inspected and maintained as necessary for safe operation. The easement would be routinely maintained to manage issues that may arise such as vegetation, erosion and subsidence as well as any landholder issues.

5.6 Decommission

The project would be decommissioned at the end of the project life. The FSRU is an ocean going vessel, which can simply sail away from port at the completion of the project.

The activities involved in decommissioning would depend on the intended use of the land occupied by the project. It is expected the berth and wharf facilities would be retained for other port related uses. The gas pipeline would likely remain in situ subject to landholder agreements and either decommissioned completely or placed into care and maintenance arrangements.

A detailed decommissioning plan for the entire project, including the pipeline, would be developed in consultation with relevant stakeholders including NSW Ports at the end of the project life.

6. Statutory context

6.1 Introduction

This chapter sets out the key planning and environmental regulatory framework applicable to the project, including the identification of relevant environmental planning instruments and key development approval requirements. Both NSW and Commonwealth legislative requirements are identified.

6.2 Environmental Planning and Assessment Act 1979

6.2.1 Overview

The key legislation in NSW for regulation of the use of land is the Environmental Planning and Assessment Act 1979 (EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). 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 critical SSI.

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 critical SSI 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.

This EIS has been prepared to address the Secretary's environmental assessment requirements (SEARs) issued under section 5.16 and the environmental assessment and consultation requirements under section 5.17 of the EP&A Act.

6.2.2 Environmental planning instruments

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) identifies development that is considered to be of state significance and includes provisions for SSD and SSI.

The SRD SEPP provides for the declaration of development to be critical SSI in accordance with the provisions of Section 5.13 of the EP&A Act. Critical SSI is development that is considered to be essential to the State for economic, environmental or social reasons.

The project has been declared as critical SSI and is listed in Schedule 5 of the SRD SEPP.

State Environmental Planning Policy (Three Ports)

State Environmental Planning Policy (Three Ports) 2013 (Three Ports SEPP) provides a consistent planning regime for the development and delivery of infrastructure on land in Port Botany, Port Kembla and the Port of Newcastle and includes the identification of certain development as SSD or SSI.

The project falls within the Port Kembla land application map under the Three Ports SEPP and the provisions of the policy therefore apply to the project. The import terminal is located on land zoned SP1 Special Activities and the gas transmission pipeline will span both SP1 Special Activities and IN3 Heavy Industrial zones. The project meets the definition of a port facility in accordance with the SEPP and is considered to be consistent with the land zonings.

The project is permissible with consent under the provisions of the Three Ports SEPP. The project would also meet the definition of SSD in accordance with Clause 27 of the Three Ports SEPP as it is located within the Port Kembla lease area, is permissible with consent, has a capital investment value of more than $100 million dollars and would otherwise be considered a designated development.

However, the project has been declared critical SSI in accordance with Clause 16 of the SRD SEPP as discussed above. The project will therefore be assessed in accordance with Division 5.2 of the EP&A Act and can be undertaken without the need for development consent under Part 4 of the EP&A Act.

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across NSW and allows for a range of developments to be permitted with and without consent.

Division 9 of the Infrastructure SEPP includes consent requirements for gas transmission or distribution and pipelines. Clause 53(1) states that development for the purpose of a pipeline may be carried out by any person without consent on any land if the pipeline is subject to a licence under the *Pipelines Act 1967* or a licence or authorisation under the *Gas Supply Act 1996*. The project will require a licence under the Pipelines Act and the proposed pipeline is therefore considered permissible without consent.

Division 13 of the Infrastructure SEPP applies to port, wharf or boating facilities, but it is noted that the provisions of this division do not apply to development on land that the Three Ports SEPP applies, with the exception of certain areas in the City of Newcastle. Division 13 is therefore not applicable to the project.

Division 15 of the Infrastructure SEPP applies to railways and includes provisions for development in or adjacent to rail corridors. Clause 86 relates to development that includes penetration of land within, below or above a rail corridor and includes the need for notification of the development to the rail authority. The project includes a gas pipeline that will traverse a rail corridor trigger and therefore will trigger the notification requirements. Extensive liaison with the rail authority has been undertaken as part of the pipeline design and easement acquisition process regarding the preferred pipeline alignment. The consent authority will require concurrence from the rail authority prior to giving a development consent.

State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*.

Clause 7 of the Coastal Management SEPP states the policy does not apply to land within the Port Kembla lease area within the meaning of the Three Ports SEPP. The project is partly within this area, including the proposed berth and wharf facilities and part of the gas pipeline. The coastal management principles and assessment considerations in Coastal Management SEPP have nonetheless been considered in the development of the project.

State Environmental Planning Policy No 33—Hazardous and Offensive Development

State and Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33) requires the consent authority to consider particular matters in determining a development application for a project that is a potentially hazardous industry or potentially offensive industry. A number of government agencies have responsibility for regulating risks and hazards associated with the project including:

- the Australian Maritime Safety Authority (AMSA), which will exercise safety jurisdiction over “vessels” including the FSRU.
- SafeWork NSW, which has jurisdiction to ensure safe operations on the FSRU.
- The Port Authority, which has jurisdiction to regulate any activity which may pose a risk to safety or security within their port operations including fixed facilities and vessels.

The proponent acknowledges that it has a primary duty to ensure the safety of its operations and extensive hazard and risk assessments have been undertaken during the development of the project. A preliminary hazard analysis has been undertaken as part of the EIS and presented in Chapter 10 and Appendix D. The assessment includes the identification and assessment of potential hazards during the construction and operation of the project and concludes that there is a low level of of risk associated with the project.

State Environmental Planning Policy No 55—Remediation of Land

State Environmental Planning Policy No 55—Remediation of Land (SEPP 55) provides for a statewide planning approach to the remediation of contaminated land and aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment by:

(a) specifying when consent is required, and when it is not required, for a remediation work,

(b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular,

(c) by requiring that a remediation work meet certain standards and notification requirements.

In determining a development application, a consent authority is required to consider if the land is contaminated and, if contamination is identified, whether the land suitable in its contaminated state for the purpose for which the development is proposed to be carried out and if any remediation is required to make the land suitable for that purpose.

Contamination investigations have been undertaken as part of the EIS to understand the extent of existing contamination and determine treatment and disposal options for management of sediments. Further details are provided in Chapter 11 and Appendix E of this EIS.

Wollongong Local Environmental Plan 2009

The *Wollongong Local Environmental Plan 2009* (Wollongong LEP) provides local environmental planning provisions within the designated land application area for the LEP in the Wollongong local government area. As Port Kembla is covered by the Three Ports SEPP it does not form part of the land falling under the provisions of the Wollongong LEP.

The proposed FSRU, berth and wharf infrastructure and majority of the gas transmission pipeline are located within the Three Ports SEPP land application area. A small section of gas pipeline traverses beneath the BlueScope sporting fields in Cringila, which are zoned RE2 Private Recreation under the Wollongong LEP. The pipeline is permitted without consent in accordance with provisions of the Infrastructure SEPP and the project will be assessed as a critical SSI in accordance with the SRD SEPP.

6.3 Other NSW legislation

6.3.1 Marine Safety Act 1998

The *Marine Safety Act 1998* (Marine Safety Act) 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. Commonwealth legislation is discussed in 6.4.

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. Further details on safe navigation within Port Kembla is provided in Chapter 9.

6.3.2 Ports and Maritime 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.

6.3.3 Work Health and Safety Act 2011

The *Work Health and Safety Act 2011* (Work Health and Safety Act) provides for a nationally consistent framework to secure the health and safety of workers and workplaces. To this end it prescribes a range of health and safety duties for employers and employees including a general duty of care to ensure the health and safety of workers so far as is reasonably practicable. It provides that SafeWork NSW is the regulator for the purposes of the Work Health and Safety Act.

The Work Health and Safety Regulation 2017 establishes a regime for the determination and licensing of major hazard facilities. Major hazard facilities are determined by the presence of chemicals listed in Schedule 15 of the Regulation in a quantity exceeding a defined threshold.

Schedule 15 lists natural gas with a threshold quantity of 200 tonnes. The project would involve storage and processing of natural gas in excess of this quantity. Section 530 states a facility is not a major hazard facility if it is in a port operational area under the control of a port authority, however it also states port operational area does not include any long-term storage areas where dangerous goods are usually kept for more than 5 days. The project would involve storage of dangerous goods for more than 5 days and therefore trigger the major hazard facility provisions.

A licence for a major hazard facility would therefore be required under Part 9.7 of the Work Health and Safety Regulation 2017 subject to consultation with SafeWork NSW. The application for a licence for a major hazard facility would include a safety case as required under Part 9.3.

6.3.4 Protection of the Environment Operations Act 1997

The objectives of the *Protection of the Environment Operations Act 1997* (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 SSI 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.

6.3.5 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* promotes waste reduction and better use of resources. It includes provisions for waste strategies and programs, and for industry actions to reduce waste, including extended producer responsibility schemes and container deposit schemes. The Act establishes a waste hierarchy for the management waste. In accordance with the hierarchy, waste should in the first instance be avoided through avoidance of unnecessary resource consumption. When waste is produced, options to recover the waste should be looked at including options for reuse, reprocessing, recycling and energy recovery. Waste should only be disposed of where other options have first been investigated.

6.3.6 Pipelines Act 1967

Sections 12 and 13 of the *Pipelines Act 1967* (Pipelines Act) outline the licensing application requirements for pipelines. Under Section 11 of the Pipelines Act, a licence is required to:

- commence, or continue, the construction of a pipeline;
- alter or reconstruct a pipeline; or
- operate a pipeline.

A licence under the Pipelines Act is required for the construction and operation of the proposed gas transmission pipeline. 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 SSI project and is consistent with the development consent.

6.3.7 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 SSI.

The potential impacts associated with dredging and disposal of sediments upon fisheries and marine vegetation has been investigated as part of the EIS with further details in Chapter 13 and Appendix G of this EIS. There is not anticipated to be any significant detrimental impacts to fisheries resources as a result of the project.

6.3.8 Water Management Act 2000

The *Water Management Act 2000* (WM Act) is intended to ensure that freshwater water resources are conserved and properly managed for sustainable use benefitting present and future generations. It is also intended to provide a formal means for the protection and enhancement of the environmental qualities of waterways and their catchments.

Part 2 of the WM Act requires a licence for the “taking of water” from a water source. A licence entitles its holder to specified shares in the available water within a defined water management area or from a specified water source. It enables the licence holder to take water from the environment in accordance with specified rates and conditions under the terms of the licence.

Part 3 of the WM Act specifies approval requirements for water use, water management works approvals and activity approvals. There are two kinds of activity approvals including controlled activity approvals and aquifer interference approvals.

Controlled activity approvals confer a right for the holder to carry out a specified controlled activity on waterfront land which is defined as land within 40 metres of a river, lake, estuary or shoreline. An aquifer interference approval may be required for any works that involve:

a. the penetration of an aquifer;

b. the interference with water in an aquifer;

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

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

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

The project will involve excavation within 40 metres of the shoreline and has the potential to intercept water within an aquifer during excavation or directional drilling. However, the project is not anticipated to require major dewatering of water from a water source and is not expected to trigger the need for a water use approval, water management works approval or controlled activity approval under sections 89, 90 or 91 of the WM Act as these approvals are not required for SSI in accordance with Section 5.23 of the EP&A Act.

6.3.9 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) aims to conserve biodiversity at a bioregional and state scale and lists a number of threatened species, populations and ecological communities to be considered in deciding whether there is likely to be a significant impact on threatened biota, or their habitats.

The project would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the BC Act. A biodiversity assessment report has been prepared in accordance with Section 7.9 of the BC Act as part of the EIS. The report is provided as Appendix H and summarised in Chapter 14.

6.3.10 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) specifies the duties of public and private landholders as to the control of priority weeds and biosecurity matters including terrestrial, aquatic and marine species. The Biosecurity Act defines prior weeds by local government area and assigns duties for their control. Part 3 of the Biosecurity Act provides that any person who deals with biosecurity matter and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter has a duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised. As such, if present, priority weeds located on the project site should be assessed and controlled.

6.3.11 Heritage Act 1977

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

Heritage places and items of particular importance to the people of NSW are listed on the State Heritage Register. Approval under section 60 of the Heritage Act is required for any direct impacts on an item on the register. Approval from the NSW Heritage Council under section 139 of the Heritage Act is required prior to the activities likely to disturb a relic while section 140 of the Heritage Act provides for the application for a permit for excavation likely to disturb a relic.

The project is anticipated to have a low potential to impact upon any identified heritage item or relic protected under the Heritage Act. Approval under Part 4 or an excavation permit under section 139 of the Heritage Act is also not required for SSI. Further details of items of heritage significance in the locality are provided in Chapter 15 and Appendix J of the EIS.

6.3.12 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Under the NPW Act, an Aboriginal object is defined as any deposit, object or material evidence relating to indigenous and non-European habitation, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the Act as a place of special significance for Aboriginal culture. An Aboriginal place may or may not contain physical Aboriginal objects.

It is an offence under Section 86 of the NPW Act to harm or desecrate an object the person knows is an Aboriginal object. It is also a strict liability offence to harm an Aboriginal object or to harm or desecrate an Aboriginal place, whether knowingly or unknowingly.

Section 87 of the NPW Act provides a series of defences against the offences listed in Section 86 which includes if the harm was authorised by and conducted in accordance with the requirements of an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act. It is noted that an AHIP permit under Section 90 of the NPW Act is not required for approved SSI in accordance with Section 5.23 of the EP&A Act.

The project footprint will be restricted to a highly disturbed industrial precinct primarily within reclaimed and industrial land at Port Kembla. The design of the project has been amended to avoid areas of archaeological potential as outlined in Chapter 15 and Appendix J.

6.3.13 Roads Act 1993

The *NSW Roads Act 1993* (the Roads Act) requires applicants to obtain consent from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road.

The project will require installation of a pipeline to connect the LNG import terminal to a tie-in point at Cringila. The pipeline will likely be installed through a combination of traditional trenching methods and directional drilling within the Port Kembla industrial precinct. The pipeline will pass along the edge of a number of road verges and directional drilling will be adopted to minimise disruption to traffic for major road crossings.

A permit will be required under section 138 of the Roads Act for the works.

6.3.14 Marine Pollution Act 2012

The *Marine Pollution Act 2012* gives effect to the International Convention for the Prevention of Pollution from Ships (MARPOL) in NSW. In line with the objectives of the convention, the Act aims to prevent both accidental pollution and pollution from routine vessel operations.

The *Marine Pollution Act 2012* contains a number of offences in relation to pollution from vessels including discharge of oil or oil residues, noxious liquids substances, sewage, garbage and other forms of pollution. It sets requirements for vessels including to develop and implement pollution emergency plans, on-board garbage management plans, and to keep records of on-board oil, garbage and cargo. It provides that the Minister administering the Act may provide notices to vessel operators to prevent pollution or clean-up pollution where it occurs.

6.4 Commonwealth Legislation

6.4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage environmental values considered to be of national environmental significance.

The EPBC Act requires approval from the Commonwealth Minister for the Environment and Resources for actions that are likely to have a significant impact on listed matters of national environmental significance (MNES).It is the responsibility of the applicant proposing to undertake an action to initially consider whether the proposal is likely to have a significant

impact on any MNES. If the applicant considers there is potential for significant impacts upon any matters protected under the EPBC Act, then a referral is required to be submitted to the Minister for the Environment and Energy. Developments considered likely to result in significant impacts are defined as “controlled actions” and require assessment and approval.

Consideration 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 EIS. No impacts have been identified that are considered likely to be significant and consequently a referral to the Commonwealth Minister for the Environment and Energy has not been made.

6.4.2 Environment Protection (Sea Dumping) Act 1981

The loading and dumping of waste at sea is regulated under the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act). Permits are required for all sea dumping operations with Commonwealth waters. 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. The relationship of the project and approved Port Kembla Outer Harbour Development footprint is discussed in 2.4.2. There will be no requirement for disposal of material within Commonwealth waters and a sea dumping permit will therefore not be required.

6.4.3 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 6.3.1. 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.

7. Stakeholder consultation

7.1 Introduction

This chapter provides an overview of the stakeholder and community consultation activities undertaken prior to the lodgement of the project EIS. Also included are details of the activities proposed to continue during the assessment determination and ongoing development of the project:

The project will be the first of its kind in NSW and with no similar facility currently operating in Australia, an introduction to the concept of an LNG import terminal, the workings of the facility and the need for the project have been key focuses in community and stakeholder engagement.

A wide range of stakeholders have been identified and consultation activities have been undertaken, including more than 40 group or one on one briefings. A project website (www.ausindenergy.com) has been developed and provides comprehensive, clear and accessible information that is updated on a regular basis.

As well as the local Port Kembla and broader community of the Wollongong region, extensive engagement was also undertaken with a range of other interested key stakeholders, such as local commerce organisations, the Port Authority and local and state government.

Examples of various stakeholder engagement activities undertaken includes briefings to:

- Community Consultative Committees of Bluescope Steel, and Port Kembla Harbour Environment Group — 30 attendees
- Illawarra Business Chamber & Regional Advisory Council, i3net, Australian Industry Group, Port Kembla Chamber of Commerce and other local economic development bodies — 50 attendees (More numbers)
- Community Neighbourhood Forums 5 & 7 – 60 attendees
- Emergency service providers — 20 attendees (included site tour)
- Government agency representatives at Planning Focus Meeting and other briefing sessions — 25 attendees (included site tour)

In addition:

- An advertised, drop-in style Community Information Session was held in Wollongong CBD (30 attendees)
- A newsletter with information about the project and advising date of Community Information Session, was letterbox dropped to around 16, 000 (15,732 homes and small businesses) in Port Kembla and surrounding neighbourhoods.
- Key note addresses were given to the Australian Institute of Energy, at the Australian Domestic Gas Outlook 2018 and the AFR Energy Summit– 650+ attendees

The engagement activities provided an opportunity to inform stakeholders about the project and the Critical State Significant Infrastructure (CSSI) assessment process, and to answer questions and obtain feedback on additional benefits, concerns or challenges associated with the project.

The issues and opportunities identified during the consultation process have been considered by the project team in relation to the proposed scope and design of the project and have been used to inform the preparation of this EIS.

This chapter outlines the consultation and engagement activities in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued in accordance with Section 5.16 of the *EP&A Act.*

7.2 Approach and objectives for community consultation

7.2.1 Engagement objectives

The objectives of the communication and engagement activities are to:

- proactively and regularly engage with stakeholders to ensure they are appropriately consulted throughout the assessment and development process;
- inform and advise the community, with a particular focus on the Port Kembla, Wollongong and wider Illawarra region community, of the current activity and the next steps in the assessment process;
- engage with the community to communicate the benefits of the project and address any points of concern;
- encourage participation, provision of feedback and submission of comments through community consultation opportunities; and
- provide accessible, reliable and updated information about the project.

7.2.2 Communication and engagement strategy

An overarching Stakeholder Engagement Plan was developed to support and guide the communication and engagement activities, generate relevant stakeholder interest and assist in securing the required project consents and approvals throughout the development of the EIS.

The Stakeholder Engagement Plan outlined: roles and responsibilities, actions and deliverables, a complaints management process and recording and reporting processes. Two stakeholder groups were defined to assist with targeting activities to best meet their needs and the objectives of the project:

- Stakeholders to be engaged via direct communication activities, such as one-on-one meetings and roundtables, including:
  - local landholders, environmental and community groups and business chambers
  - local Federal and State Members with a direct portfolio or geographic responsibility
  - Local Council and the Lord Mayor; and
  - Federal and State Departments, including consent authorities and regulators, with a direct portfolio responsibility.
- Community members and general stakeholders to be initially engaged via indirect activities, such as e-newsletters, letterbox mailouts (see Appendix B.1), newspaper advertising (see Appendix B.2) including:
  - general community and businesses in the Port Kembla region; and
  - national peak industry bodies with NSW members.
  - A detailed stakeholder matrix and engagement register spreadsheets were developed to assist with the tracking and reporting processes for both stakeholder groups.

7.2.3 Engagement approach

The engagement approach for the preparation of the EIS was guided by the Core Values and Code of Ethics of the International Association for Public Participation (IAP2).

The matrix below in Figure 7-1 is from stakeholdermap.com and provides a simple way to help prioritise engagement resources and efforts, it was used to assist in identifying the level of consultation to be undertaken for stakeholders of the project.

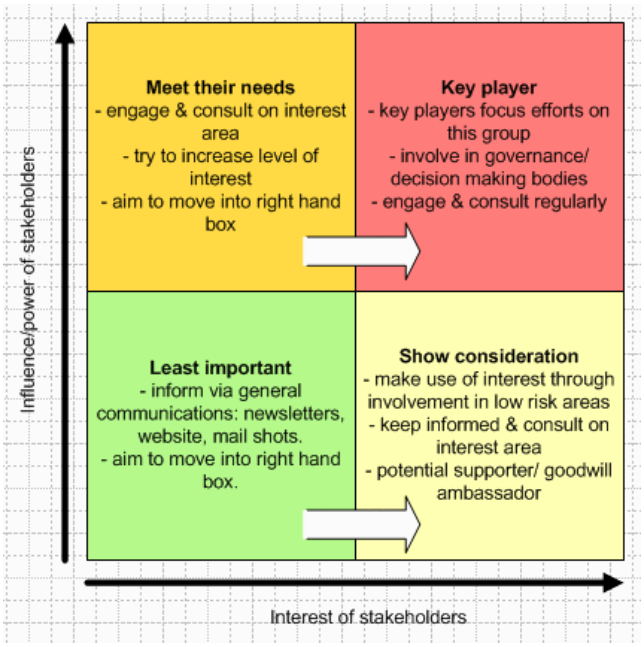


Figure 7-1 Stakeholder map

7.3 Overview of consultation

Due to the relatively short development timeframe of the project, engagement has been largely focused around key milestones. Once key stakeholders have been briefed on the project, regular updates have been provided to them to coincide with these milestones and to maintain open and accessible channels of communication. These channels of communication will remain throughout the project.

7.3.1 Initial engagement – February 2018 onwards

The consortium first announced their interest in a LNG import terminal in late February 2018 at the Australian Domestic Gas Outlook conference. The announcement was widely reported in domestic, international and industry specific publications. At the time, three locations were of potential interest – Port of Newcastle, Port Botany and Port Kembla as discussed in Chapter 4.

While AIE was investigating a number of possible locations for its proposed export terminal, early engagement centred around potential customers for the gas, as well as the various port authorities and administrators in the relevant regions. When Port Kembla began to emerge as the preferred location, broader engagement began with high level briefings arranged for local political, council and business stakeholders. This included a roundtable event held on the 27th of March 2018, hosted by NSW Ports and attended by a range of Port tenants, local gas exposed businesses and peak industry bodies.

In addition, several of the local economic development agencies including i3net, Illawarra Business Chamber, AiGroup and AdvantageWollongong co-funded, a business community briefing on the 16th of April. This was attended by a range of local government agencies, regional councils, peak industry bodies and local businesses.

7.3.2 Site announcement – 4 June 2018

The announcement of Port Kembla as the site for the facility was made on 4 June 2018.

Key stakeholders and the media were invited to attend the event, which afforded the opportunity to not only further increase understanding of the proposed project, but to meet with the international partner representatives who travelled to Port Kembla for the event. Key political stakeholders and representatives from various local organisations attended the launch including:

- NSW Minister for Primary Industries, Regional Water and Trade and Industry, Hon. Niall Blair
- Member for Wollongong, Paul Scully
- Member for Keira, Ryan Park
- Lord Mayor of Wollongong, Gordon Bradbery AM
- Regional Development – Illawarra
- Illawarra Business Chamber
- I3Net
- AI Group
- University of Wollongong

Journalists from both local and state media attended and the announcement was widely reported by local and state television news networks, local radio and local and state newspapers including:

- Channel 7 News Sydney
- Sky News
- ABC Illawarra TV and radio
- The Illawarra Mercury
- The Daily Telegraph, The Australian, The Sydney Morning Herald and the Financial Review.

As it was now timely to commence broader community engagement, several steps were taken at this juncture to make information accessible to those stakeholders:

- The AIE website was upgraded just prior to the site announcement to include several factsheets about the project (see Appendix B.3) and include the ability to email through enquiries and questions.
- 1800 phone number was set up to coincide with the site announcement and was promoted via the website, providing another information and contact avenue for stakeholders and the community.

7.3.3 Critical State Significant Infrastructure declaration – 22 June 2018

The project was granted CSSI status by the NSW Government on June 22 2018. All key stakeholders and community groups were emailed information about this milestone and any follow-up email or telephone questions surrounding the assessment process were answered.

The website was updated to include information about CSSI and comprehensive, project-wide Frequently Asked Questions were added to the website.

The media was notified and the story ran on the front page of the Sunday Telegraph and was picked up by local and state outlets.

7.3.4 Preliminary Environmental Assessment lodgement – 10 July 2018

Once again, key stakeholders were notified about the latest update to the project and the project website was updated and a link to the PEA provided.

A Planning Focus Meeting was scheduled with representatives from government agencies providing input to the Secretary's Environmental Assessment Requirements (SEARs). The meeting was held in Port Kembla and included a briefing on the project and site tour of the proposed berth and pipeline alignment.

Attendees included representatives from the:

- Department of Planning and Environment
  - Division of Assessment
  - Division of Assessment – Hazards Unit
  - Division of Energy, Water and Portfolio
- Environment Protection Authority
- SafeWork NSW
- Office of Environment and Heritage
- Wollongong City Council
- Port Kembla Port Authority
- NSW Ports

A comprehensive overview of the proposed development was provided by representatives from the project, Worley Parsons and GHD, including safety, pipeline, berth and vessel overviews.

Key issues raised included potential heritage concerns near Spring Hill, dredging and sediment disposal, hazard and risk and maintaining safe navigation within the harbour. These issues have been further explored and addressed in the relevant chapters of the EIS.

7.3.5 Community newsletter – July 2018

AIE produced the first edition of its quarterly newsletter in July (see Appendix B.1). The 4 page newsletter included:

- Key project facts
- Project location map
- How the project will work
- Information about liquefied natural gas
- Updates on community engagement
- Information about the assessment process and CSSI declaration
- The partners involved in the AIE consortium
- An invitation to the Community Information Session
- Website address and 1800 number
- The newsletter was widely distributed to local stakeholders and the community:

- Letterbox-dropped to approximately 16,000 (15,732) homes and small businesses in and around Port Kembla (Appendix B.1)
- Copies sent to the offices of the Member for Wollongong and the Member for Keira
- Copies sent to the Wollongong City Council
- Copies sent via the Council for distribution to the 6 Council-run public libraries in the area for display on noticeboards
- Email copy sent to the office of the Member for Cunningham
- Email copies sent to the Principals or key contacts at 10 local schools and 5 social clubs (eg. surf lifesaving/golf clubs) for distribution to their parents/members
- All key stakeholders and community groups were emailed copies of the newsletter and many groups, such as i3net and the Regional Development Authority, disseminated the newsletter to their members and promoted through their social media channels.
- The newsletter was posted on the AIE website.

7.3.6 Community Information Session – 14 August 2018

A drop-in style information session was held on August 14 2018 at the Steelers Club in Wollongong, a centrally located and well-known local venue (refer to Appendix B.1). The event was open to all and ran from 3pm – 8pm. The timing was designed to facilitate the attendance of those groups with work and school commitments as well as those community members unable to attend evening events. The session provided the community and stakeholders with the opportunity to increase their understanding of the project, see the project progress and discuss any issues with the project team.

The event was extensively promoted:

- Via the community newsletter (see distribution above)
- Advertised on 1/8/2018 in the free local publication The Advertiser/Lakes Times (average readership of 42,000 per issue). Refer to Appendix B.2 for the advertisement and Appendix B.1 for the distribution area map.
- Advertised in the Illawarra Mercury on Saturday 4/8/2018 (16,000+ papers produced) and on Tuesday 07/08/2018 (11,000+ papers produced) https://projects.ghd.com/oc/Sydney1/eastcoastlngterminal/Delivery/Documents/Stakeholder/Newsletters/Community Newsletter July.pdf. Refer to Appendix B.2 for the advertisement.
- Email invitation to attend the community information session sent to 10 local schools, along with the Community Newsletter
- Email invitation to attend the community information session sent to local golf and surf lifesaving clubs, along with the Community Newsletter
- AIE website updated to include details of the event

There were 30 attendees in total at the community information session. Thirteen were local community members and the remainder were from local businesses.

The general sentiment was supportive of the proposed project with general interest in how it will be constructed and the ongoing economic benefits.

The key themes raised during the information session included:

- construction and ongoing job and business opportunities
- pipeline alignment route options
- general environmental impacts, some expressed a preference for renewable energy as opposed to natural gas
- questions about the impacts to marine ecology due to dredging and cooled water from the re-gasification unit
- general interest about what the project involves and the economic benefits it can deliver to Port Kembla, Wollongong and broader Illawarra region.

These comments were documented in writing and provided for appropriate consideration by the project team and those involved in preparing the EIS.

7.3.7 Receipt of Secretary's Environmental Assessment Requirements and announcement of procurement of Floating Storage and Regasification Unit – August 20

Key stakeholders were notified by phone and email of the above key milestones. An update was posted on the AIE website and included a link to the SEARs on the NSW Government's Major Projects website. A media release was issued and the story appeared in The Australia, The Sydney Morning Herald, The Australian Financial Review and a number of industry publications.

In addition, news of these two major milestones were emailed to 60 individuals who had registered for regular updates through the website.

7.3.8 EIS lodgement

The next edition of the Community newsletter has been prepared and is planned for distribution just after the lodgement of the EIS. It will include updates on the project, including the lodgement of the EIS and information on where/ how to see the EIS. The newsletter will also detail how a submission on the project can be made.

Once again the newsletter will be letterbox-dropped to approximately 16,000 local homes and businesses and disseminated through stakeholder networks.

Once on public exhibition, a link to the EIS will be prominently featured on the AIE website.

7.3.9 Stakeholder engagement

While key milestones provided several natural opportunities to engage with stakeholders, AIE proactively reached out to key individuals and groups to offer briefings.

In all instances, with the exception of the Port Kembla Pollution Meeting Group, the offer of an in-person briefing was accepted. The Port Kembla Pollution Meeting Group declined as they felt they did not have a suitable venue. They were provided information on the Community Information session as an alternative and one of their members participated in the BlueScope Community Consultative Committee.

Table 7-1 provides an overview of the various different stakeholder and community groups engaged and the approach taken for consultation activities.

Table 7-1 Engagement approach for stakeholders

Stakeholder group	Level of consultation	Stakeholder	Tools and activities
Commonwealth	Informing	Offices of the Prime Minister & Deputy Prime Minister	Project briefing and updates provided
		Federal Members for Whitlam & Cunningham	Project briefing and updates provided. Email copy of Community Newsletter
		Offices of the Minister for Environment and Energy and Minister for Resources	Briefing provided to office
		Environment and Energy Committee	Project briefing provided
		Senator Concetta Fierravanti-Wells	Project briefing and updates provided
		Office of Shadow Minister for Energy	Project briefing
		Department of the Treasury Department of Industry, Innovation and Science Department of Environment and Energy	Project briefing and updates provided
		Office of Chief Economist	Project briefing and updates provided
		Regional Development Australia	Project briefing and updates provided
		AusIndustry	Project briefing and updates provided
NSW Government	Informing	Office of Premier	Project briefing and updates provided
		NSW Deputy Premier and Ministers for Trade and Industry, Energy and Resources, Planning and Environment, Roads, Maritime and Freight	Project briefing and updates provided
		Shadow Minister for Planning and Infrastructure Shadow Minister for Industry, Resources & Energy	Project briefing and updates provided
	Active participation	Member for Keira and member for Wollongong	Project briefing and updates provided Attended site announcement Newsletters in office for distribution Briefings provided to recommended groups at Member suggestions (e.g. Neighbourhood Forum 5, Port Kembla Chamber)

Stakeholder group	Level of consultation	Stakeholder	Tools and activities
		Department of Premier and Cabinet Department of Industry Department of Planning and Environment Department of Planning and Environment – Division of Energy, Water and Portfolio Environmental Protection Authority Safework NSW NSW Ports Authority Roads and Maritime	Project briefing and updates provided. Numerous agencies attended the Planning Focus Meeting and site visit. On-going discussion with several agencies on specific elements of the project of interest, for example, environment.
		Office of Regional Development	Project briefing and updates, with ongoing engagement specifically around business impacts and opportunities. Attendance at local engagement activities and circulation of Community Newsletter.
		NSW Police, Fire and emergency Services	Project briefing and site tour provided with safety consultant present
Local government	Active participation	Lord Mayor of Wollongong	Project briefing and updates provided Attendance at site announcement Attendance at Councillor briefing session
		Wollongong City Council	Project briefing and regular updates to senior staff Project briefing provided to a number of Councillors Engagement around the character of the area, demographics, Typical community consultation channels

Stakeholder group	Level of consultation	Stakeholder	Tools and activities
Landholders	Active participation	NSW Ports & Port Kembla Harbour Environmental Group & NSW Ports (Port Kembla) Tenants	Extensive input into the planning for the Project Briefing provided to the Port Kembla Harbour Environmental Group organised by NSW Ports Briefing organised for all interested NSW Port tenants
		Bluescope Steel & Bluescope CCC	Project briefing, updates provided to Bluescope representative at Port Kembla Harbour Environmental Group Briefing given to Bluescope CCC, ongoing engagement Re. pipeline route
		Port Kembla Coal Terminal & WHS Committee	Ongoing updates Regular contact and consultation as immediate neighbour and current lessee of the Terminal site Project briefing and safety briefing to staff
Environmental groups	Informing and active participation	Port Kembla Harbour Environment Group	Project briefing and updates emailed to members
		Port Kembla Pollution Meeting Group	Updates provided and briefing offered but declined Community newsletter and information session invitation Emailed to President for circulation amongst members Key member attended briefing given to the Bluescope CCC
State and Local Media	Informing	Illawarra Mercury ABC Illawarra WIN Television Daily Telegraph	Key note addresses at major events (eg Australian Domestic Gas Outlook) Media releases sent with regard to all major announcements

Stakeholder group	Level of consultation	Stakeholder	Tools and activities
		Sydney Morning Herald The Australian The Financial Review Various other media outlets	Invitation to attend site announcement Interviews given to a number of outlets including the Illawarra Mercury Project covered extensively by local and state media
Peak Industry Bodies	Informing	Australian Industry Group Illawarra	Regular briefings and updates provided
		Manufacturing Australia	Project briefing and ongoing discussions around how the project can assist their members
		Chemistry Australia	Project briefing
		NSW Business Chamber	Project briefing
		Australian Institute of Energy	Key note address on the project and import terminals
Education, skills and labour groups	Informing and active participation	University of Wollongong	Project briefing and regular updates Consultation around opportunities for future partnerships
		TAFE NSW	Project briefing and regular updates Consultation around opportunities for future partnerships
Key business stakeholders	Informing	Advantage Wollongong Illawarra Business Chamber Illawarra Innovation Industry Network Australian Industry Group Illawarra	Project briefing and regular updates Ongoing consultation with regard to how the Project can benefit members Community newsletters and project updates disseminated through their networks
		IBC Regional Advisory Council	Project briefing
		Port Kembla Chamber of Commerce	Project briefing and regular updates

Stakeholder group	Level of consultation	Stakeholder	Tools and activities
Key community interest groups	Informing	Neighbourhood Forum 5 and 7	Project briefing and regular updates sent to key contact within the group for dissemination to members
Local indigenous community	Informing	Illawarra Local Aboriginal Land Council	Project briefing and regular updates to the Illawarra Aboriginal Land Council Investigation potential pipeline alignments AIE website, Community newsletter and invitation to Community Information Sessions
Local community	Informing	Local residents Small business (not affiliated with any of the business organisations) Social groups School groups Local fishermen and surfers Recreational boat users	AIE website set up with email contact/enquiry facility, project factsheets and comprehensive FAQs. As at October 31 the website had received 2,149 visitors with 12,921 page views. Community newsletter with project information and invitation to attend Community Information Session: letterbox-dropped to 15,732 homes and businesses in the Port Kembla area, distributed to Wollongong Council libraries, emailed to local school principals and various local organisations and interest groups Community Information Session held and advertised in local media Various media stories providing updates to the community
First responders	Informing	NSW Police and security agencies	Project briefing and discussion on further involvement upon project approval

7.4 Issues raised during consultation

During the consultation process, a number of different questions, benefits and/or concerns were raised by various stakeholder groups. Table 7-2 provides an overview of the issues raised along with the response provided by AIE during the consultation process. Where applicable these issues have been further examined as part of the EIS.

Table 7-2 Issues raised during consultation

Issue raised	Interested stakeholder groups	Consultation response
Need for gas importation	Community Business groups Peak Industry Bodies State Government Media	A number of studies and reports have predicted shortfalls in the NSW gas supply from around 2022. NSW imports more than 95% of its natural gas from other states. The gasfields that have traditionally supplied the NSW market, offshore Victoria and the Cooper Basin in South Australia, are in decline, so volumes are decreasing and the gas is more costly to extract. In addition, the gas being developed from coal seam gas projects in Queensland is expensive to extract and is also contracted to overseas buyers via long term, high priced agreements. These changing east coast gas market conditions have made importation of natural gas a viable, fast and flexible solution to NSW energy challenges
Source of gas procured	Community Business groups	AIE will use the purchasing power of our partner, JERA Co., Inc., the world's largest buyer of LNG to source the best priced natural gas. It may come from Australia or overseas, whichever cargoes can be obtained most economically.
Port Kembla vs other Port locations	Community Business Groups Local Council State Government Landholders	A detailed engineering assessment was conducted on three potential port locations within NSW. Port Kembla was ultimately selected, given the specifics of the berth and inner harbour layout and the site's proximity to existing gas transmission pipelines. The facility will be a good fit with the surrounding infrastructure and industry and there was strong support for the Project from NSW Ports and the local business community.
Detail about how an LNG import terminal works	All stakeholders	Presentation briefings, project factsheets and collateral explain the workings of an LNG terminal.
Local job opportunities	Community Business groups Government	With a forecast capital cost of between A$200 and $250 million, it is estimated that the Project will create around 130 to 150 jobs during construction and between 40 – 50 ongoing roles during operations.

Issue raised	Interested stakeholder groups	Consultation response
Regional economic benefits	Community Business groups Local Government State Government	The key benefit to the region is the access to secure supplies of gas, delivered locally and thus avoiding expensive over-land transportation costs. It is estimated there are around 15,000 jobs in the Illawarra region that are associated with gas-reliant businesses. Access to competitive gas supplies provides some assistance in retaining those jobs in the region, as well as providing a potential incentive for new industrial clients to consider establishing operations in the region. In addition, the presence of LNG import handling facilities paves the way for new potential value-add services to be established at Port Kembla, such as LNG Bunkering or potentially even a local Combined Cycle Gas Turbine power station.
Gas storage	Community Local Council Landholders	There are no on-shore storage facilities associated with this project. Instead, the LNG will be contained in the FSRU and stored in a cooled, liquid form until it is required to be put into the gas network.
Impacts on Port Kembla Harbour	Community Business groups Landholders Port Authority NSW Ports Local Council State Government	With only a proportionally small number of additional ship movements each year (approx. 20 shipments of LNG, compared to 800+ vessels visiting Port Kembla each year) we expect impacts to be easily managed. NSW Ports and the Ports Authority have been extensively consulted throughout the planning and design phases of the project. Various studies have been carried out as part of the EIS have confirmed impact on the harbour will be minimal.
Impacts on the emerging cruise ship industry in Port Kembla	Community Business groups Landholders Port Authority NSW Ports Local Council	There should be no impact on the cruise industry. The number of ship movements is manageable and we have worked with Port Authority to ensure the project activities will not negatively impact other harbour users

Issue raised	Interested stakeholder groups	Consultation response
Changes to public access to Seawall Rd?	Community	We do not anticipate any additional access restrictions. Preliminary hazard and risk studies have identified no need to change the current regime around public access to Seawall Road. This will need to be confirmed by the detailed hazard and risk assessments which will form part of the EIS.
About CSSI and whether it means assessment will be less stringent	Community	To be declared Critical State Significant Infrastructure (CSSI), a project must be deemed by the State Government to be essential for NSW's economic, environmental or social benefit. While the CSSI designation is not a development consent. It simply sets out the approval pathway and the timelines for the project. It does not alter the robust planning assessment process which remains as stringent as for other similar scale projects
At least four gas import terminals are planned for Australia's east coast. Will this considerable investment in imported gas in any way slow down investment in renewable energy production?	Community	This is not anticipated for a number of reasons: First - there are many manufacturing processes for which renewable power is not a substitute for gas. For example, elements of natural gas are often used as an ingredient in many manufacturing process for things like soft and hard plastics (e.g. milk bottles), dyes, fertilizers, medicines. This is known as "feedstock". Second - in relation to heating, while research continues, there is still no affordable alternative to some of the very intense industrial heat and burning functions required for various manufacturing and waste management processes our economy currently needs. eg smelting, glass production, incineration of hazardous waste etc. Lastly - in relation to power, gas provides an important transition to a lower emission future and an immediate need for large-scale, quick, dispatchable power to balance out renewable energy volatility. Large scale batteries are not yet viable, and while they no doubt will continue to get better and better, reliance on coal or hydro for base-load and dispatchable power is difficult given coal emissions and increasing drought challenges. There is also a strong case for a new entrant in the power market (just like in the gas market) to increase competition between the three current incumbents. A Combined Cycle gas turbine power station consisting of the latest technologies, partnered with a wind energy provider, for example, would

Issue raised	Interested stakeholder groups	Consultation response
		probably provide the best option for the NEM in terms of the trifecta of grid stability, affordability and low emissions. So we are hopeful, new gas power might actually support new wind or solar investment.
You tell us that studies show NSW face gas shortages in the early 2020s? Please provide references for these studies.	Community	References provided to AEMO https://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/GSOO/2018/2018-Gas-Statement-Of-Opportunities.pdf EnergyQuest - https://www.energyquest.com.au/reports.php?id=1
Is LNG dangerous?	All stakeholders	LNG is not flammable or explosive. The transportation of LNG by ship commenced almost 60 years ago and the industry is well established. Both the carriers and the FSRU are designed to strict international standards. They are purpose-built and have double hulled tanks to provide protection against accidental leaks or rupture. The vessels are equipped with automated leak detection mechanisms and Emergency Shut Down Systems.
What are the fire risks of the terminal?	All stakeholders	The storage and transfer of gas will be carefully managed at all times to minimise any risk. LNG is not flammable. When the LNG is regasified onboard the FSRU and put under pressure for transfer into the pipeline it is flammable, but there are a number of stringent safety and emergency mechanisms in place to manage the risk. The FSRU terminal will be required to be located a prescribed distance from any potential external ignition point and a sufficient distance from any other facilities should a fire break out. These distances would be calculated as part of the hazard studies carried out during the regulatory assessment process for the project.
Visual impacts	Community Landholders	The visual impacts of the terminal will be minimal and in keeping with other Port facilities. The visual impact will not vary considerably from that of Berth 101 in its current use as part of the Port Kembla Coal Terminal.

Issue raised	Interested stakeholder groups	Consultation response
The impact on marine ecology due to dredging and cooled water from the re-gasification unit	Community	A number of studies, including baseline studies, will be undertaken including environmental studies on aspects of the project like noise, air quality, water quality, hazard and risk and social impacts. These studies will be used to inform the best approaches to avoid, minimise or mitigate any impacts. The sea water used on board the FSRU to warm the LNG and convert it to gas will be released back into the harbour. Its composition will be largely unchanged but it will be no more than 7 degrees cooler that the ambient water temperature. This water should blend into the rest of the harbour and is not expected to impact the overall water temperature. However, studies will be conducted to ensure this process can be managed and not materially impact the marine environment.
Placement and management of the dredged materials	Community Port Authority NSW Ports Local Council	Extensive contamination studies will be carried out to identify the most appropriate management and disposal methods for dredged material. In addition, AIE has worked closely with NSW Ports to ensure any timing, location and/or disposal techniques they may prefer are considered in the design of the Project.
Traffic movements and trucking of LNG	Community Landholders Local Council	During operation of the terminal we do not anticipate an increase in existing traffic movements. The LNG will not be transferred by truck, it will be transferred via underground pipeline. The construction period for the terminal may result in increased traffic movements, we anticipate a maximum 10 – 12 month construction period. Traffic studies have been included as part of the EIS.
Noise Impacts of the Terminal	Community Landholders Local Council	Noise levels associated with the operations of the terminal will be minimal and appropriate for facilities located in a major existing industrial hub. As there is a full-time crew stationed on the FSRU, the vessel is also designed to minimise noise outputs and impacts. Noise studies have been included as part of the EIS.

Issue raised	Interested stakeholder groups	Consultation response
Emissions and flaring	Community Landholders State Government	Modern LNG carriers, powered by natural gas, are among the most environmentally friendly vessels on the ocean and have substantially lower emissions than the diesel-powered vessels that dock at Port Kembla. The systems on board both the LNG carriers and the FSRU are designed to avoid accidental or fugitive emissions by capturing the small amount of liquid 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. Flaring of gas does not occur on either LNG carriers or the FSRU. Venting capacity (not flaring) exists as a safety feature to be used only as a last resort measure.
How will gas get to users? Will a pipeline need to be constructed?	Community Business Groups Local Council	Gas will not need to be trucked. Instead a short pipeline will be constructed to link the terminal to the tie-in point at Cringila and then onto the Eastern Gas Pipeline (EGP). The pipeline will pass largely through existing industrial land at the Port and be designed and constructed to Australian Standard 2885. A Safety Management Study will also be conducted to identify and manage any hazards.
Handling of waste from FSRU	Community	Waste from the FSRU vessel will be contained onboard and then removed and managed as with any other vessel visiting the Port and in accordance with existing Port procedures
Will LNG vessels anchor offshore?	Community	Under normal operating schedules, vessels will not anchor offshore. The manageable number of LNG carrier arrivals (around 20 per year) will allow swift turnaround of vessels.

7.5 On-going consultation

Consultation with key stakeholders and the wider community on the project will continue until the project is fully operational. Table 7-3 below provides details of the key methods of engagement used to date and which ones will be provided on an on-going basis.

These measures will ensure the stakeholders, including the wider community, remain informed of the outcomes of the development application and the project's progress.

Table 7-3 Ongoing community consultation tools

Engagement tool	Description
Community Information Line	1800 810 680 community enquiries number established on 4 June 2018 following the site announcement. No enquiries have been received to date, despite widespread publication of the number.
Company Website	Provides extensive FAQs, Fact Sheets, and project updates. Also provides clear information on alternative ways to seek information: email, 1800 telephone number and/or subscription service. Website analytics as of October 31, 2018 show there have been 2,419 visits to the website, with 12,921 page views.
Website Enquiries	info@ausindenergy.com established for community enquiries. To date 41 enquiries have been received through this channel, 34 seeking employment/contract opportunities; 4 media enquiries, 1 project information request; 1 invitation to present on the project and 1 ASX listing timeframe query.
Subscriber updates	Around 60 individuals / organisations have recorded their interest in receiving regular email updates on project developments through the Subscriber feature on the AIE website. These subscribers will receive regular updates around key project milestones.
Community information session	Drop-in style event (3pm -8pm) in a convenient, public access venue. One such event has already been held and a second will occur during the EIS exhibition period. However, the EIS session will be run by the NSW Department of Planning.
Community newsletter	Every 3 – 4 months a Community Newsletter is prepared, published and distributed (hardcopy & electronic)
Letterbox drop	Community Newsletter will be letterbox dropped to approximately 16,000 homes and small businesses in the local area, in line with the delivery zone for the first Community Newsletter. These leterbox drops ensure wide-spread promotion of key events such as the Community Informatino Session and EIS exhibition period.
In-person group briefings	> 40 delivered to date
CCC briefings	2 delivered to date
1:1 meetings/telephone /discussions/email exchanges	Daily Activity
Media engagement	On-going responsiveness to media enquiries, as well as proactive distribution of key project developments to local, state and national media

8. Issues identification

8.1 Approach to impact assessment

Australian Industrial Energy (AIE) are proposing to develop the Port Kembla Gas Terminal involving the development of a liquefied natural gas (LNG) import terminal to provide a simple, flexible solution to the State's gas supply challenges. The use of a pre-assembled and operating floating storage regasification unit (FSRU) moored semi-permanently within the inner harbour at Port Kembla provides an immediate solution to meet predicted New South Wales (NSW) gas shortages without the lengthy construction timeframes and risks associated with development of an equivalent land based import facility.

The framework for the impact assessment has been designed to provide a structured and objective approach to identifying environmental, social and economic impacts, and to developing effective mitigation, management and offset measures. The approach has generally involved:

- project definition including analysis of the need and alternatives to introduce a new source of gas to NSW and meet predicted supply shortfalls;
- identification of key issues through risk assessment process and consultation with key government and community stakeholders;
- identifying existing environmental, social and economic baseline conditions;
- completion of impact assessments for the project based on the broad description of the project having regard to the baseline conditions;
- refinement of the project having regard to the impact assessments; and
- identification of appropriate mitigation, management, monitoring measures for the identified potential impacts.

The baseline (or existing environment) conditions for Port Kembla and surrounding locality were derived using a combination of desktop and field investigations relevant to each environmental aspect or value. Where possible, the investigations built on previous studies that have been completed over a number of years at Port Kembla in recognition of the extent of historical development that has been undertaken in the region.

The impact assessment methodology for each environmental, social and economic value was developed to meet the Secretary's Environmental Assessment Requirements (SEARs) for the project issued by Department of Planning and Environment (DP&E) and the requirements of the Environmental Planning and Assessment Act 1979 (EP&A) Act and the EP&A Regulation.

Mitigation and management measures were applied to reduce the level of identified potential impacts. These measures aim to protect the identified environmental values and will be applied as required during the planning and design, construction and operation phases of the project. A number of monitoring plans will also be developed and implemented to monitor potential impacts associated with the development of the project.

8.2 Stakeholder and community engagement

Consultation and liaison with government authorities and key stakeholders has been integral in refining the project and development of the assessment method for the completion of the Environmental Impact Statement (EIS).

Consultation with the NSW Port Authority, NSW Ports and the Port Kembla Coal Terminal has been integral to defining the preferred location for the project and defining the extent of dredging and excavation required for the establishment of a new berth, while minimising impacts upon safe operations and vessel movements within the harbour.

Consultation has been undertaken with DP&E and relevant government authorities throughout the preparation of the EIS including a planning focus meeting (PFM) on 25 July 2018. A preliminary environmental assessment (PEA) including a description of the project and risk screening assessment were distributed to each government authority and presented on the DP&E Major Projects web site. The assessment and PFM were used to provide a common understanding of the project for each government authority providing input into development of the SEARs for the project.

The SEARs for preparation of an EIS for the Port Kembla Gas Terminal were issued by the DP&E on the 10 August 2018. An outline of the key issues raised in the SEARs, together with an outline of where each issue has been addressed in the EIS is presented in Table 8-1.

Consultation with local community representatives has also been undertaken and has assisted in identifying key issues to be considered as part of the assessment process.

Issues raised during consultation are outline in Chapter 7 and have been addressed as part of the EIS where applicable.

Table 8-1 Secretary's environmental assessment requirements

Secretary's Environmental Assessment Requirements	Cross-reference
General Requirements	
The EIS for the project must comply with the requirements in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.	
In particular, the EIS must include:	
• a stand-alone executive summary	Executive Summary
• a full description of the project, including:	Chapter 5
– all components, materials and activities required to construct and operate the project (including any infrastructure that would be required for the project, but the subject of a separate approvals process);	Chapter 5 and Section 2.4.2
– site plans and maps at an adequate scale with dimensions showing:	Chapter 5 and Appendix A
○ the location and dimensions of all project components;	Chapter 5
○ existing infrastructure, land use, and environmental features in the vicinity of the project (including any other existing, approved or proposed infrastructure in the region); and	Chapter 2
○ the pipeline corridor that has been assessed, including any allowance for micro-siting and identification of the key environmental	Sections 5.3.3 and 5.4.9

Secretary's Environmental Assessment Requirements	Cross-reference
constraints that have been considered in the design of the pipeline;	
– a strategy for the management, and disposal of excavated and dredged material in the short, medium and long term;	Sections 5.4.7 and 5.4.8, Chapter 11 Appendix E3
– the likely interactions between the project and any other existing, approved or proposed major projects in the vicinity of the site, including the Eastern Gas Pipeline (including the Port Kembla Lateral), the Port Kembla Bulk Liquids Terminal, and the Port Kembla Outer Harbour Development Project, and in particular how the project's activities such as disposal of dredged and excavated materials would be integrated into other approvals;	Section 2.4.2
– details of construction, operation and decommissioning, including any proposed staging of the project or replacement of infrastructure over time;	Sections 5.4, 5.5 and 5.6
• a justification for the proposed project as opposed to other alternatives;	Chapter 4
• the statutory context for the project, including any approvals that must be obtained before the project can commence, including the role/s of the NSW Port Authority, SafeWork NSW and Australian Maritime Safety Authority in regulating hazards and risks;	Chapter 6
• an assessment of the likely impacts of the project on the environment, focusing on the specific issues identified below, including:	
– a description of the existing environment likely to be affected by the project, using sufficient baseline data;	Chapters 9 through 24 Appendices C through Q
– an assessment of the potential impacts of the project, including any cumulative impacts, and taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;	Chapters 9 through 24 Appendices C through Q
– a description of the measures that would be implemented to avoid and minimise impacts of the project;	Chapters 9 through 25 Appendices C through Q
– a description of the measures that would be implemented to monitor and report on the environmental performance of the project if it is approved;	Chapters 9 through 25 Appendices C through Q

Secretary's Environmental Assessment Requirements	Cross-reference
– a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and	Chapter 25
– consideration of the project against all relevant environmental planning instruments;	Section 6.2.2
• an evaluation of the project as a whole having regard to:	
– relevant matters for consideration under the EP&A Act including ecologically sustainable development;	Chapter 26
– the strategic need and justification for the project having regard to gas security and reliability in NSW and the NSW Gas Plan; and	Chapter 3
– the biophysical, economic and social costs and benefits of the project.	Chapter 26
While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of the project.	
The EIS must be accompanied by a signed report from a suitably qualified expert that includes an accurate estimate of the capital investment value (as defined in Clause 3 of the Environmental Planning and Assessment Regulation 2000) of the project, including details of all the assumptions and components from which the capital investment value calculation is derived.	Provided with EIS
Key Issues	
The EIS must address the following specific issues with the level of assessment of likely impacts proportionate to the significance of, or degree, of impact on, the issue, within the context of the project location and the surrounding environment:	
Port Navigation – an assessment of;	
• the project's impacts on vessel navigation within Port Kembla during construction and operation, including consideration of current and future port operations (including expansion and changes to shipping configurations);	Section 9.3 Appendix C
• protocols for safe handling of LNG vessels including under adverse meteorological conditions; and	Chapter 9 Appendix C
• additional and/or upgraded port resources that may be required.	Chapter 9 Appendix C

Secretary's Environmental Assessment Requirements	Cross-reference
Hazards and Risks – including a comprehensive Quantitative Risk Assessment (QRA), covering all aspects of the project which may impose public risks, to be prepared consistent with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines of Hazard Analysis (DPE, 2011). This QRA must include:	Chapter 10 Appendix D
• identification of all potential hazards and associated control measures for all aspects of the project, including but not limited to entry of LNG carriers into port, mooring, refilling of FSRU, regasification, and transfer of LNG into gas network distribution tie in point, and other external threats (such as propagation risks from other facilities and vessel movements and cargoes and impacts from adverse sea conditions on the FSRU);	Section 10.3 Appendix D
• a quantitative risk assessment to estimate the risks from activities of LNG carrier and/or FSRU operation, with reference to applicable International and/or Australian Standards and Industry Best Practice. The risk assessment must consider the worst-case scenarios from all identified potential hazards that may result in off-site impact. It must also consider:	Section 10.3 Appendix D
– the potential risk exposure to all shipping terminal activities at the port, including cruise shipping; and	Section 10.3 Appendix D
– the potential propagation risks to and from neighbouring industrial facilities, such as the steelworks, onshore approved bulk liquid storage facilities and other berth activities (such as loading/unloading of dangerous goods at nearby berths);	Section 10.3 Appendix D
• a quantitative pipeline risk assessment to estimate the risks from the pipeline to the surrounding land uses, with reference to Australian Standards AS2885 Pipelines – Gas and Liquid Petroleum – Operation and Maintenance;	Section 10.3 Appendix D
• demonstration that the risks from the project comply with the criteria set out in Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Safety Planning (DoP, 2011);	Section 10.3 Appendix D
• an assessment of the adequacy of existing firefighting systems on shore and within the harbour (e.g. fire tugs) through a preliminary Fire Safety Study; and	Section 10.4 Appendix D

Secretary's Environmental Assessment Requirements	Cross-reference
• proposed on-going maintenance and safety management of the project inclusive of associated pipeline infrastructure;	Section 10.4 Appendix D
Contamination – including:	Chapter 11 Appendices E1 through E3
• an assessment of the extent and nature of any contaminated materials or acid sulphate soils on site or in dredged material;	Section 11.3 Appendices E1 through E3
• as assessment of potential risks to human health and the receiving environment; and	Section 11.5 Appendices E1 through E3
• a description of the measures that would be implemented to avoid or mitigate impacts;	Section 11.6 Appendices E1 through E3
Air Quality – including:	Chapter 18 Appendix M
• an assessment of the likely air quality impacts of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2016);	Chapter 18 Appendix M
• demonstrated ability to comply with the relevant regulatory framework, specifically the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Clean Air) Regulation 2010; and	Section 18.4 Appendix M
• an assessment of the likely greenhouse gas impacts of the project;	Chapter 22 Appendix P
Water and Soils – including:	
• a description of water demand, a breakdown of water supplies and the measures to minimise water use;	Sections 5.4.3 and 5.5.4
• a statement of the ambient NSW Water Quality Objectives (NSW WQOs) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values;	Section 12.2 Appendix G
• a demonstration of how construction and operation of the project will, to the extent that it can, ensure that:	
– where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and	Sections 12.3 and 12.4 Appendix G

Secretary's Environmental Assessment Requirements	Cross-reference
– where the NSW WQOs are not currently being met, activities will work toward their achievement over time;	Sections 12.3 and 12.4 Appendix G
• an assessment of the likely impacts of the project on the marine environment, watercourses, riparian land, water related infrastructure and other water users, and soil resources - including sediment/turbidity plumes from dredging and reclamation activities, the release of cold water from LNG regasification (including thermal pollution discharge modelling), and the use and discharge of water during construction, commissioning and maintenance of the pipeline infrastructure;	Sections 12.3, 13.4 and 11.5 Appendices G and H
• an assessment of the flood impacts of the project;	Section 12.3 Appendix F
• a hydrodynamic assessment having regard to the hydrodynamic assessment completed for the Port Kembla Outer Harbour Development;	Section 12.3 Appendix F
• identify and estimate the quality and quantity of all pollutants, including dioxins and biocides (particularly tributyltin) from antifouling paints and chemicals used over the life of the project, that may be mobilised by project activities, and describe the nature and degree of impacts that mobilisation may have on the receiving environment and human health;	Section 12.3 Appendix G
• assess the impacts of the project on protected and environmentally sensitive lands and processes, and the impacts of coastal inundation and rising sea levels on the project;	Section 14.3 Chapter 23 Appendices H and Q
• identify sensitive receiving environments and include a strategy to avoid or minimise impacts on these environments;	Chapters 13 and 14 Appendices G and H
• a description of the erosion and sediment control measures that would be implemented to mitigate any impacts during construction; and	Section 11.6
• assessment of any water take requirements that may be relevant under the Water Management Act 2000;	Section 6.3

Secretary's Environmental Assessment Requirements	Cross-reference
Biodiversity – including an assessment of the biodiversity values and the likely biodiversity impacts of the project, including the impacts on the Green Golden Bell Frog, in accordance with the NSW Biodiversity Conservation Act 2016, the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR); an assessment of the impacts of the project on aquatic ecology, including impacts on key fish habitat and threatened species of fish;	Chapter 14 Appendices G and H
Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the project, including adequate consultation with Aboriginal stakeholders having regard to the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (OEH 2010) and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH, 2010);	Chapter 15 Appendices I and J
Noise and Vibration – including:	
• an assessment of the likely construction noise impacts of the project under the Interim Construction Noise Guideline (DECCW, 2009);	Section 17.4 Appendix L
• an assessment of the likely operational noise impacts of the project under the NSW Industrial Noise Policy (EPA, 2000);	Section 17.4 Appendix L
• an assessment of the likely road noise impacts of the project under the NSW Road Noise Policy (EPA, 2011);	Section 17.4 Appendix L
• an assessment of the likely vibration amenity and structural impacts of the project under Assessing Vibration: A Technical Guideline (DEC, 2006) and German Standard DIN 4150-3 Structural Vibration – effects of vibration on structures; and	Section 17.4 Appendix L
• where blasting is required during construction, an assessment of blast impacts in accordance with relevant guidelines (see Attachment 1);	Section 17.4 Appendix L
Transport – including:	Chapter 16 Appendix K
• details of traffic types and volumes likely to be generated by the project;	Section 16.4 Appendix K
• details of the proposed transport routes, site access, rail crossings and safety issues;	Section 16.3 Appendix K

Secretary's Environmental Assessment Requirements	Cross-reference
• an assessment of the likely transport impacts of the project on the capacity, condition, safety and efficiency of the road network, in particular heavy vehicles, oversize/ over-mass vehicles; and	Section 16.4 Appendix K
• details of measures to mitigate and / or manage potential impacts during construction, developed in consultation with the relevant road and rail authorities (if required).	Section 16.5 Appendix K
Visual – including an assessment of the likely visual impacts of the project on the amenity of the surrounding area and private residences in the vicinity of the project.	Chapter 19 Appendix N
Social & Economic – including an assessment of the social and economic impacts and benefits of the project for the region and the State as a whole, including consideration of any increase in demand for community infrastructure and services;	Chapter 20 Appendix O
Waste Management – including identification, quantification and classification of the likely waste streams likely to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste including waste to be used for reclamation or other project activities; and	Chapter 21
Cumulative – including all industrial facilities in the area and other nearby approved and proposed development, particularly in relation to hazards and risk, air quality, noise and vibration, traffic and soil and water	Chapter 24
Consultation	
During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities (including NSW Port Authority), other port stakeholders (including NSW Ports, Port Kembla Coal Terminal and other port users), infrastructure and service providers, community groups and affected landowners.	Chapter 7
The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	Chapter 7
Further consultation after 2 years	
If an EIS for the project is not lodged within 2 years of the issue date of these Environmental Assessment Requirements, the Applicant must consult further with the Secretary in relation to the preparation of the EIS.	—

9. Port navigation

9.1 Introduction

This chapter provides an assessment of the project's impacts to vessel navigation during construction and operation. The existing setting, including navigation within the port, port operations, vessel movements, navigational guidelines and port protocols are described and assessed in the context of the proposed LNG import terminal. Management measures to reduce the impact of the project on vessel navigation have been developed with reference to existing port protocols.

Port navigation has been considered through studies and assessments undertaken as part of the project's development and guidelines set by the industry, including:

- The Feasibility Study (Advisian, 2018) includes a summary of port navigation within Port Kembla.
- Guidelines set by Society of International Gas Tanker and Terminal Operators (SIGTTO) (SIGTTO, 2000) focus on best practice in the liquefied gas shipping and terminal industries. Guidelines relevant to port navigation include vessel turning diameter and channel width.
- Guidelines set by World Association for Waterborne Transport Infrastructure (PIANC) (PIANC, 2014) provide expert guidance, recommendations and technical advice relevant to the shipping industry. Guidelines relevant to port navigation include vessel turning diameter.
- *Navigation Simulation Summary of Outcomes* (Appendix C) provides a summary of the navigation simulations undertaken for the project. The aim of the simulations were to determine if safe passage of an LNG carriers was possible and combined with the interaction of the proposed berth layout on other shipping movements in the Inner Harbour and is included in full in Appendix C.
- The project *Risk Assessment* (Risk Register, 24th April 2018) is a live document that investigates risks associated with the development of the LNG import terminal and identifies mitigation measures. Risks associated with port navigation include damage to ships or facilities from other port users which results in safety and production implications; and Port congestion / interference, impacting reliability and availability.

The above studies, assessments and guidelines have been used to form the basis of this chapter.

9.2 Existing environment

9.2.1 Navigation within the port

The Port Authority of NSW is responsible for the management of shipping operations in Port Kembla, including the provision of Harbour Master functions, pilotage, navigation services and ship scheduling.

The port has a deep-water shipping channel that can accommodate vessels with ship length (LOA) of up to 311 metres and has capacity for Capesize vessels (at nominated berths) (Port Authority of NSW, 2015). Pilotage is compulsory for vessels over 30 metres in length.

Passage from Port Kembla's Outer Harbour to the Inner Harbour requires navigating through a relatively narrow channel known as The Cut and in close proximity to other berthed vessels (Figure 9-1).

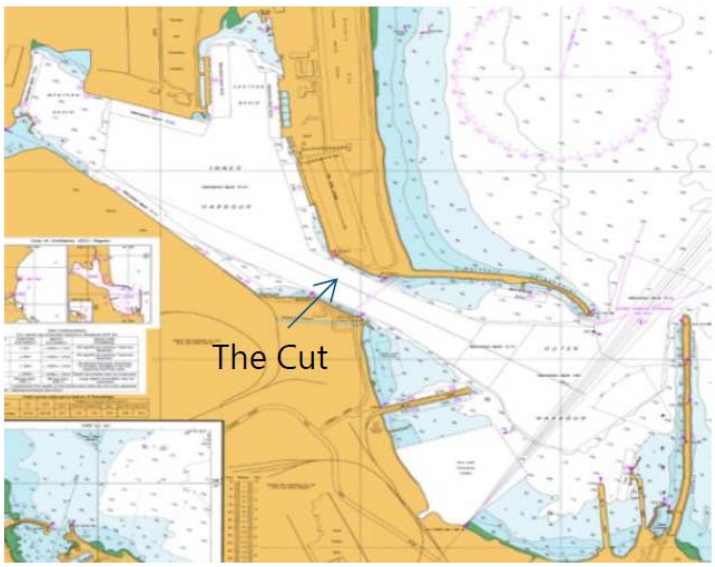


Figure 9-1 Port Kembla's navigational area

As shown in Figure 9-1 the entrance to Port Kembla's Outer Harbour is open to the north-east, which exposes the Outer Harbour to swell and wind. After arriving through the entrance, a 90 degrees turn is required to pass through The Cut into the Inner Harbour. A vessel speed of at least 2.5 knots through The Cut is required to maintain vessel steerage. Ship-to-ship interactions can occur between transiting and berthed vessels depending on vessel speed and proximity.

The channel is well marked with navigational buoys, sector lights and leading marks.

Challenges to navigating the channel include unpredictable currents at the port entrance, as well as strong winds and currents in and around The Cut resulting from waves and vessel or tide induced currents. There is also a localised water level change in the Inner Harbour as vessels enter and exit through The Cut (Advisian, 2018), especially fully laden Panamax and Capesize vessels.

9.2.2 Vessel movements

Historical vessel numbers at Port Kembla provided by NSW Ports include:

- 2010 to 2013 - over 1,000 vessels (over 2,000 vessel movements) per year
- 2015 - 851 vessels (1,702 vessel movements)
- 2016 - 842 vessels (1,684 vessel movements)
- 2017 - 840 vessels (1,680 vessel movements)

The current trend for total number of vessel movements is down from 2015. However, for robustness it is assumed that existing vessel movements are consistent with the past three years:

- 2018 to 2020 - 1,680 to 1,702 vessel movements per year

The 30 year Master Plan (2015) states that Port Kembla vessel numbers forecast for 2025 is:

- around 1,025 – 1,190 vessels (2,050 - 2,380 vessel movements)

This forecast shows an increase in vessel movements by 2025. As a result, it is assumed that the vessel movements for operation are:

- 2020 onwards - 1,680 to 2,380 vessel movements per year

9.2.3 Navigational guidelines

Guidelines set by SIGTTO (SIGTTO, 2000) and PIANC (PIANC, 2014) state that the diameter of the turning basin should be twice the LOA of the maximum vessel length (600 metres). This guideline recognises that the diameter can be rationalised subject to further investigation and study. The diameter of the existing turning basin in the Inner Harbour is 500 metres (Advisian, 2018).

With respect to the channel width, SIGTTO (2000) states that the channel width required is five times the vessel beam (B), which is 250 metres for the 50 metres design beam. PIANC (2014) states the channel width to be at least 3.5 x B, which is 175 metres (Advisian, 2018). Both these required widths are greater than the 160 metres width of The Cut. This guideline recognises that the channel width can be rationalised subject to further investigation and study.

To determine whether safe passage of LNG carriers are possible, navigation simulations for the project were undertaken (refer to Section 9.3.2).

9.2.4 Port protocols

Within Port Kembla, the Harbour Master and the Port Authority of NSW are accountable for the safe navigation of all vessels, including LNG carriers. Emergency response and navigational safety within the port is managed by the Port Authority of NSW and the Harbour Master establishes port operational procedures (port instructions) relating to vessel navigation protocols, ship scheduling, berthing and under keel depth requirements, as well as performance standards to achieve safe, effective, reliable and cost efficient shipping (Port Authority of NSW, 2015).

Detailed Port Kembla protocols are provided in the Port of Kembla - Port Instructions document (Port Authority of NSW, 2015). This document outlines instructions for vessels accessing the port along with general port information. Instructions and protocols relevant to port navigation include those around vessel manoeuvring, anchorage, vessels at anchor, vessel sizes, traffic management, draught requirements, underkeel clearance depths, and mooring arrangements.

Key navigational safety guidelines (Port Authority of NSW, 2015) include:

- Port Parameters (Annex H of *Port of Kembla - Port Instructions*) detail port capacity and maximum vessel size, including maximum LOA, maximum displacement and limiting environmental conditions for the port.
- To allow for safe passage in the port, the underkeel clearance for ships undertaking pilotage in Port Kembla is required to be not less than 1.25 metres, or as required through the use of dynamic underkeel clearance.
- Static underkeel clearance is calculated by the following formula: Depth of channel + height of tide, divided by 1.08 metres (Annex D of *Port of Kembla - Port Instructions*).

- Alongside berth underkeel clearance requirements, vessels are required to have a minimum underkeel clearance of 0.6 metres in the Outer Harbour and 0.3 metres in the Inner Harbour at all times (Annex D of *Port of Kembla - Port Instructions*).

For the additional proposed port protocols developed for the project on the safe handling of LNG carriers during the day, night and in various adverse meteorological conditions, refer to Section 9.4.

9.3 Potential impacts

9.3.1 Construction

During construction, potential impacts on vessel navigation within Port Kembla harbour include:

- Collision of construction vessels (barges) transferring dredged material into structures or other vessels entering and exiting the channel and their berths (as a result of increased traffic), impacting other vessels port navigation and safety, including potential delays to shipping operations.
- Grounding of construction vessels (barges) transferring dredged material from the new berth to the Outer Harbour disposal area, impacting other vessels port navigation and safety, including potential delays to shipping operations.

Collison and grounding

Construction is proposed to commence in 2019 and for a duration of around 10 to 12 months. During construction, the total amount of material that will be dredged and excavated at the new berth is around 600,000 cubic metres. Allowing for typical bulking factors, this volume would equate to around 720,000 cubic metres. A backhoe dredger will be used to dredge the material and then place onto a split hopper barge. This material will then be transported to the disposal area in the Outer Harbour. Two split hopper barges with the capacity of around 1,200 cubic metres each will either be towed by tugs or self-propelled. Tug or work boats would assist with dredger positioning and movement of barges.

It is anticipated that two split hopper barge loads per day (around 4 to 6 vessel movements) would be required to traverse from the Inner Harbour to the Outer Harbour. Based on the number of vessel movements from the existing port operations (refer to Section 9.2.2), it is anticipated that the base case (without the project) vessel movement during 2019 would be between 1,680 and 1,702 vessel movements. This equates to around 5 vessel movements per day. The additional split hopper barge movements are not anticipated to result in significant disruption to other shipping operations in the port.

Accidental collision of the barges with other vessels has potential to result in impact to vessel navigation and disruption to port operations. Dredging barges will be a shorter length than the average shipping vessels using the port and would be able to navigate and manoeuvre with limited interaction with other port users. The operations of the barges will be controlled through a permit system under the control of the Harbour Master (through the VTIC) and Masters will be required to obtain Certificates of Local Knowledge as required by the Harbour Master and *NSW Marine Safety Regulation 2016*.

The movement of barges would be coordinated by the Port Authority Vessel Traffic Information Centre (VTIC). A construction marine traffic management plan is also proposed for the project to manage interactions with other marine traffic.

With the permission of the Harbour Master, split hopper barges may be used at night, however this will be coordinated so as to not impact other vessels and port navigation, with due regard to the port instructions and port protocols (outlined in Section 9.2.4).

Grounding of barges has the potential to occur in the shallow sections of the Outer Harbour disposal area where the dredged material will be deposited. The disposal area would have an increasingly shallow seabed due to ongoing disposal activities of bottom dumping. It is anticipated that, due to the draft of the barges, material can be bottom dumped to a maximum level of minus 3 metres chartered depth (CD). Flat bottom barges may be used when the disposed material is at a height that can longer accommodate a split hopper barge. The material would be pushed off with a dozer (or similar).

Through implementation of the management measures outlined above (and in Section 9.4), along with the adherence of existing navigational protocols (refer to Section 9.2.4), and due to the temporary short term timeframe of the construction phase, impacts on other vessels port navigation and safety from risk of collision and grounding of the barges are expected to be managed and therefore anticipated to be minimal.

9.3.2 Operation

During operation, potential impacts on vessel navigation within Port Kembla harbour include:

- Collision of LNG carriers into structures or other vessels entering and exiting the channel and their berths, therefore impacting other vessels port navigation and safety, as well as safety of personnel on or around vessels, impacts to infrastructure and economic impacts to other businesses.
- Grounding of LNG carriers transferring LNG from the new berth through the navigational channel, therefore impacting other vessels port navigation and safety, and potentially resulting in partial or full port closures.
- Interaction of LNG carriers with other vessels transiting past Berth 101 as they enter or exit the port, impacting their speed and ability navigate the port.
- Reduced visibility from other vessels navigating the port due to the stationed FSRU and LNG carriers side by side at the new berth, therefore impacting other vessels port navigation and safety.

Collision and grounding

The project is proposed to commence in 2020 and will be operational for around 15 years. The route of entry for LNG carriers will be through the Outer Harbour, The Cut and into the Inner Harbour, with the reverse for departures.

Based on the number of vessel movements from the existing port operations (refer to Section 9.2.2), it is anticipated that the base case (without the project) vessel movement during operation would be between 1,680 and 2,380 vessel movements per year.

The project proposes an LNG shipment every two to three weeks which equates to around 4 vessel movements on average per month. There is potential for the supply to be increased further from around 100 PJ of gas per annum to around 140 to 150 PJ per annum through a slight increase in LNG delivery schedules and pipeline upgrades.

The anticipated number of LNG carrier movements are 4 on average per month and 48 on average per year. Proposed LNG carrier movements are low in proportion to the vessels movements anticipated from other operational arrangements at the port (1,680 to 2,380 vessel

movements per year). LNG carrier movements are not expected to significantly increase traffic in the port. To assist with manoeuvring, LNG carriers will require a fourth tug of at least 75 t bollard pull to act as an escort tug.

Grounding of the LNG carriers transferring LNG from the new berth through the navigational channel has the potential to impact other vessels port navigation and safety, resulting in partial or full port closures. However, this is unlikely to occur as Port Kembla has a deep-water shipping channel. The risk of grounding will be analysed and mitigated by the Port Authority in upgrades to Port Parameters and Business Continuity Management Plans.

Through implementation of the management measures outlined above (and in Section 9.4), along with the adherence of existing navigational protocols (refer to Section 9.2.4), impacts on other vessels port navigation and safety from risk of collision and grounding of the LNG carriers are expected to be managed and therefore anticipated to be minimal.

Interaction with passing vessels

Port Kembla handles loaded Capesize and Panamax vessels which would host a total carrying capacity in tonnes of up to 205,000 deadweight tonnage (DWT), including vessels departing Berth 102 where coal loading operations would be taking place. Impacts associated with the LNG carrier's interaction with these passing vessels includes reduced speed of vessels passing Berth 101. A reduced speed of these vessels may require the use of existing Port Kembla tugs for shiphandling, especially when wind speed is over 10 knots.

Results from the navigation simulation study (Advisian, 2018) included as Appendix C in Volume 2 indicated that there will need to be some modifications to the operating practices when turning other vessels in the Inner Harbour to maintain safe clearances. Currently, vessels commence turning once they cross the Eastern Basin (eastern side of the turning basin). When an LNG carrier is in berth, vessel turning will have to occur further towards the north-west quadrant of the turning basin to allow for vessel leeway, particularly under westerly wind conditions. This was successfully tested in the simulators and will require modifications to the current turning circle, extra Pilot training, extra aids to navigation for Pilots (upgraded portable Pilot Unit computers using differential global positioning system (DGPS) and to include the turning circle, and extra monitoring by the VTIC. Additionally, the Harbour Master may need to modify port parameters for vessels using the turning basin in higher wind conditions, which may also involve the use of existing Port Kembla tugs or reduced wind conditions.

Overall, results of the navigational simulation study showed that safe navigation through the channel and in the Inner Harbour is possible for all vessels when combined with the proposed berth layout.

Ship-handling protocols will be developed by the Harbour Master to ensure adequate management measures are implemented for passing vessels which may cause interaction with vessels berthed at Berth 101 (LNG carrier's and FSRU).

Outcomes of the navigation simulation study along with additional management measures outlined above, and in Section 9.4, it is anticipated that the interaction with other vessels will be managed and the project will not impact on existing port operations. It is also anticipated that risk of collision (as discussed in the section above) into structures or other vessels entering and exiting the channel and their berths, therefore impacting other vessels port navigation and safety, as well as safety of personnel on or around vessels, impacts to infrastructure and economic impacts to other businesses, would be minimal.

Visibility from other vessels

The navigation simulation study assessed the visibility of other vessels entering and existing the Inner Harbour with the FSRU and LNG carrier at berth. Results showed that vessels entering the Inner Harbour experienced reduced visibility of the aid to navigation located at the north-western side of The Cut, south of Berth 101, as a result of the bow of the LNG carrier at berth. Results also showed that vessels departing berths in the Eastern Basin experienced reduced visibility of The Cut due to the bow of the LNG carrier at berth.

As such, the aid to navigation (the navigational lead light) located at the north-western side of The Cut will be impacted by the facility and require relocation and/or raised to a new height to increase the visibility and avoid collision (Advisian, 2018). The new navigation light tower will be piled into the water area. The final position to be confirmed with further consultation with the Port Authority of NSW.

Visibility and clearance through The Cut was improved within the design process by refining the layout of the berth. The final layout of the new berth was moved slightly to the north and is aligned to be parallel with Berth 102. The layout provides a 40 metre offset from the Inner Harbour turning basin when the LNG carrier is berthed alongside the FSRU. It should be noted that the LNG carrier would typically be berthed every two to three weeks for a period of around 24 to 36 hours, so additional clearance is available for the majority of the time.

This layout provides suitable clearance from the turning basin whilst improving visibility of the aid to navigation and for transiting vessels through the port. The 40 metre offset layout minimises the impact to existing navigational operations within the port while also minimising the extent of dredging and excavation required during berth construction. This was tested in the simulators with emergency and extreme weather scenarios to the satisfaction of the Harbour Master and attending Pilots, although more detailed training and analysis will be required. Two Pilots will be required for arrival and departure of the LNG carrier until the pilots are familiarised with the LNG carrier manoeuvring or as directed by the Harbour Master.

Through implementation of design improvements as a result of the navigation simulation study along with management measures outlined above and in Section 9.4, it is anticipated that the project will have little impact on existing port operations and the FSRU and LNG carrier at berth will not limit other vessels visibility and therefore their ability to safely navigate the port.

9.4 Management measures

Table 11-5 outlines the management measures proposed to address the port navigation issues associated with project. All management measures would be collated in management plans prepared for construction and operation of the project.

All mitigation measures have been designed and/or considered with the input and support of NSW Ports and the Port Authority of NSW.

Table 9-1 Management measures for port navigation

ID	Issue	Measure	Timing
PN1	Port navigation	Design measures as a result of the navigational simulations include: • The berth pocket has been moved north and rotated to align parallel with Berth 102; • The stern of the LNG carrier will be moved to a 40 metre offset from the turning basin; and • The navigational lead light located at the north-western side of The Cut, south of Berth 101, will require relocation and/or raised to a new height to increase the visibility and avoid collision (Advisian, 2018). The final position to be confirmed with further consultation with the Port Authority of NSW.	Design
PN2	Port navigation	The movement of barges will be coordinated by the Port Authority VTIC. Adherence with existing Port Kembla navigational protocols through close liaison and compliance to directions of the Harbour Master (refer to Section 9.2.4).	Construction
PN3	Port navigation	Development of a construction marine traffic management plan for submission to the Harbour Master.	Construction
PN4	Port navigation	Barge operation will be controlled through a permit system under the control of the Harbour Master (through the VTIC) and Masters will be required to obtain Certificates of Local Knowledge as required by the Harbour Master and NSW Marine Safety Regulation 2016.	Construction
PN5	Port navigation	Permission of the Harbour Master will be sought for split hopper barges to be used at night. Construction will be coordinated so as to not impact other vessels and port navigation, with due regard to the port instructions and port protocols (Port Authority of NSW, 2015) (outlined in Section 9.2.4).	Construction

ID	Issue	Measure	Timing
PN6	Port navigation	Monitoring of the depth of deposited dredged material from the seabed in the disposal area to ensure that the barges transferring dredged material are not at risk of grounding.	Construction
PN7	Port navigation	Adherence with the existing port instructions and port protocols (Port Authority of NSW, 2015) (refer to Section 9.2.4).	Operation
PN8	Port navigation	The existing port wind limitation of 20 to 25 knots for the car carriers is not suitable for the LNG carriers. Reduced wind conditions of 15 to 20 knots will be implemented and will be reviewed by the Harbour Master as operations commence.	Operation
PN9	Port navigation	The use of three existing Port Kembla tugs and one additional tug of at least 75 tonne bollard pull and adequate sea-keeping ability. The additional tug will act as an escort tug. Pending the results of the passing vessel study, other vessel traffic may experience a reduction in speed when passing Berth 101, where additional tugs may be required to maintain vessel manoeuvrability	Operation
PN10	Port navigation	Two Pilots will be required for arrival and departure of the LNG carrier until the pilots are familiarised with the LNG carrier manoeuvring or as directed by the Harbour Master.	Operation
PN11	Port navigation	The Inner Harbour turning circle to be modified and appropriate monitoring contingencies will be implemented.	Operation
PN12	Port navigation	Ship-handling protocols will be developed by the Harbour Master to ensure adequate management measures are implemented for passing vessels which may cause interaction with vessels berthed at Berth 101 (LNG carrier's and FSRU) pending the outcome of the vessel passing study.	Operation

ID	Issue	Measure	Timing
PN13	Port navigation	Modifications to the operating practices when turning other vessels in the Inner Harbour to maintain safe clearances will be determined by the Harbour Master and may include: Extra Pilot training for the 40 metre offset from the turning basin. Extra aids to navigation for Pilots including upgraded portable Pilot Unit computers using DGPS (navigational software) with the turning circle added Extra monitoring by the VTIC. Potential modification of port parameters for vessels using the turning basin in higher wind conditions, which may also involve extra tugs or reduced wind conditions, by the Harbour Master.	Operation
PN14	Port navigation	The risk of grounding will be analysed and mitigated by the Port Authority in upgrades to Port Parameters and Business Continuity Management Plans.	Operation
PN15	Port navigation	As noted in the design measures above, the navigational lead light located at the north-western side of The Cut, south of Berth 101, will require relocation and/or raised to a new height to increase the visibility and avoid collision (Advisian, 2018). The final position to be confirmed with further consultation with the Port Authority of NSW.	Operation

10. Hazard and risk

10.1 Overview

This chapter describes the hazards and risks associated with construction and operation of the project. It summarises the key findings of the preliminary hazard analysis in Appendix D.

The design, construction and operation of the project would be carried out in accordance with a range of global best practice and international, Australian and NSW regulations, standards and guidelines that would mean the risk posed by the project is inherently low.

The 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 preliminary hazard analysis involved the identification of specific hazardous events, the probability of them occurring the consequences for people and property if they did occur. The overall risk associated with the hazards was determined in relation to defined criteria under *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning* (2011b).

The main hazards that were identified related to a loss of containment of liquid natural gas from a LNG carrier or the FSRU, or a loss of containment of natural gas from the FSRU, the gas pipeline or connecting unloading arms and pipes at the berth and wharf facilities. The potential for collision between a LNG carrier and another vessel was also considered.

The potential consequences of those hazardous events, including potential fire and explosion, were then determined in risk modelling software as discussed in Section 10.3.

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 in the Department of Planning and Environment guideline *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning* (2011b). Risk at adjacent industrial areas or open land were also assessed to be low given the low probability of a hazard event occurring.

In addition to various safety features that would be built into the project, a comprehensive safety management system would be implemented in accordance with relevant regulations, standards and guidelines including *Hazardous Industry Planning Advisory Paper No 9 Safety Management* (Department of Planning and Environment 2011c). As identified in Chapter 6, a detailed safety case would be produced for the project in accordance with the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2017*. The safety case would require separate approval from SafeWork NSW and would provide further detailed assessment of safety risks, emergency planning and management systems informed by the detailed design of the project.

10.2 Methodology

A preliminary hazard analysis was carried out in accordance with the NSW Department of Planning and Environment guideline *Hazardous Industry Planning Advisory Paper No 6 Hazard Analysis* (2011a), including quantitative risk assessment of the LNG carriers, FSRU, berth and wharf facilities and the gas pipeline. The assessment involved the following steps:

- Identification of specific hazardous events that have the potential to occur based on prior records, experience or professional judgement as necessary
- Analysis of consequences for people and property including modelling in risk modelling software to determine the extent and intensity of those consequences
- Analysis of the probability of the possible consequences occurring with reference to relevant industry guidance and data on the occurrence of such events
- Determination of the overall risk of the hazard in relation to defined criteria
- Description of relevant safety management measures to address identified risks.

The risk modelling software was utilised to determine consequences for a range of conditions and operating parameters based on the design of the project and the surrounding environment. Loss of containment of gas was modelled for small, medium, large and 'full rupture' scenarios in a range of conditions including calm, average and windy conditions. The modelling also took into account the pressure of the gas for each project component to determine consequence. The modelling determined the extent and intensity of resulting fire, explosions and heat.

The overall risk of the hazards to people and property based on surrounding land uses were then assessed against the quantitative criteria defined in the *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning* (Department of Planning and Environment 2011b). Management measures were then identified with reference to international, Australian and NSW safety regulations, standards and guidelines including *Hazardous Industry Planning Advisory Paper No 9 Safety Management* (Department of Planning and Environment 2011c).

10.3 Potential impacts

10.3.1 Hazard identification

The main hazardous material to be used by the project would be natural gas that would be expected to contain mostly methane and a proportion of ethane and other trace substances such as propane, butane, pentane and nitrogen depending on its particular properties.

In its liquid state LNG is clear, colourless, odourless, non-toxic, non-flammable and non-explosive. It is lighter than water in its liquid form and lighter than air in its vapour or gas form, meaning it dissipates quickly without leaving any residues. LNG is stored at very cold temperatures (around minus 160 degrees Celsius) so that it remains in liquid form, Should the LNG meet air at ambient temperatures it would turn to vapour and dissipate. This vapour is only flammable when a source of ignition is present and methane levels are present in a concentration in the air of about 5–15%. Any lower percentage and there is not enough LNG vapour to ignite, while any greater percentage means there is not enough oxygen for combustion.

These properties minimise the potential for hazards when the gas is stored in liquid form on board the LNG carrier and on board the FSRU. The hazard potential is greater when the LNG is in its gaseous state. This occurs when the LNG is converted to gas on board the FSRU, is transferred at higher pressure from the FSRU to the pipeline and is contained in the pipeline. It is important to note large quantities of gas will not be stored on the FSRU, In each case for a hazardous event to occur there would need to be an uncontrolled release of gas, a failure of leak detection and safety mechanisms, as well as an ignition event such as faulty sparking equipment, hot works occurring in the vicinity or an otherwise sufficient source of heat for ignition.

10.3.2 Probability and consequence

The probability of accidental release of gas occurring from project components was determined with reference to hydrocarbon industry failure rate data. Detailed statistics on probability of leaks per annum for each component of the project, including the various components of the FSRU, are provided in the hazard and risk assessment in Appendix D. Overall, the initial likelihood of releases which have potential for offsite impacts was found to be low for all components.

The probability of uncontrolled release of gas occurring from the gas pipeline was determined with reference to failure rate data from the United Kingdom Onshore Pipeline Operators Association that found a failure rate of about 0.08 failures per 1000 kilometres of gas pipeline. As the proposed gas pipeline would be about 6.3 kilometres, the probability would be very low.

As one potential source of an uncontrolled release of LNG, the potential for ship collisions was also considered with reference to navigation simulations discussed in Chapter 9, which showed that LNG carriers could safely travel to and from Berth 101. The probability of ship collision was estimated based on conservative assumptions and consequences and was found to be very low — in the order of 0.5 and 8 chances in 1 million for the LNG carriers and FSRU respectively.

In addition to an initial uncontrolled loss of gas, the probability of hazard events occurring also depends on release direction, release duration, and the presence of a source of ignition, such as hot works or malfunctioning equipment, and simultaneous a failure of safety mechanisms such as leak detection, isolation and depressurisation. As such the risk of the hazard event occurring would be lower again. Detailed statistics on the probability of fire or explosion at each component were calculated and provided in Appendix D.

Despite the unlikelihood of an initial leak followed by ignition and fire or explosion occurring, the worst case consequences of such hazard events were modelled to determine the extent and intensity of potential consequences to people and property. The type of consequences that could potentially occur have been identified in Table 10-1. The type of consequence would also depend on the size of the release and the nature of the surrounding environment.

As shown, the potential consequences that applied to most project components were jet fire and flash fire that would result where there is potential for an uncontrolled release of gas that is ignited at the same time. Jet fire and flash fire are fires involving the ignition of a release of volatile gas as opposed to liquid gas. A flash fire results from the ignition of vapour cloud while a jet fire results from ignition of a directional release of the gas from a pressurised source like the FSRU.

A pool fire is one in which the LNG would need to be released and pool on the ground or water prior to being ignited, so has the potential to occur in relatively few locations. As discussed in Section 10.3.1, released LNG is likely to vaporise and dissipate, reducing potential of a pool fire.

The potential for an explosion would occur in relatively fewer locations again, where natural gas could become captured in enclosed conditions on the LNG carrier of FSRU. Combustion in such enclosed conditions could lead to pressure build up and explosion.

Table 10-1 Potential hazardous events

Project component	Area or event	Potential consequence			
		Jet fire	Flash fire	Pool fire	Explosion
LNG carrier and FSRU	Ship collision		✓	✓	
	Transfer hoses	✓	✓	✓	
	Loading manifold	✓	✓	✓	
	Cargo tanks	✓	✓	✓	✓
	Headers	✓	✓	✓	
FSRU	Suction drum module	✓	✓	✓	✓
	Regasification module	✓	✓	✓	✓
	Unloading manifold	✓	✓		
Wharf facilities	Unloading arms	✓	✓		
	Gas pipeline connection	✓	✓		
Gas pipeline	Gas pipeline alignment	✓	✓		

10.3.3 Compliance with risk criteria

In the unlikely event these hazardous events occur, the actual consequences to people and property, including radiant heat from fire and overpressure from explosions, would depend on the distance of people and property from the place where the hazardous event occurs.

The terminal itself is located more than two kilometres from the nearest residence. The pipeline is around 6.3 kilometres and runs mainly through industrial land and is more than 200 metres from the nearest residence. Seawall Rd, the road which services the terminal, is a private road and not a through road. Seawall Rd terminates shortly after the terminal, is only open to the public in daylight hours and is often closed due to port operations, such as coal loading/unloading.

Contours showing the level of risk to people and property were prepared for each of the potential hazardous events that were identified, and took into account the proximity to land uses where consequences could occur such as residential, commercial or public open space.

The risk criteria for injury and fatality defined in the *Hazardous Industry Planning Advisor Paper No 4 Risk Criteria for Land Use Safety Planning* (2011b) are reproduced in Table 10-2. As shown the criteria are generally very stringent particularly for residential uses and increasingly so for more sensitive land uses such as hospital, care facilities or schools. Risk criteria are also set for propagation meaning the potential for cumulative effects with other developments.

Table 10-2 Risk criteria

Risk (per annum)	Land use
Fatality	
0.5 in 1 million (5E-07)	Sensitive land uses such as hospitals, care facilities or schools
1 in 1 million (1E-06)	Residential areas including hotels and motels
5 in 1 million (5E-06)	Commercial areas including shops and offices
10 in 1 million (1E-05)	Active open space including sport complexes
50 in 1 million (5E-05)	Industrial areas
Injury	
50 in 1 million (5E-05)	Sensitive land uses and residential areas
Propagation risk	
50 in 1 million (5E-05)	Industrial operations

The contours for fatality risk for sensitive land uses, residential areas, commercial areas, active open space and industrial areas are shown in Figure 10-1. The contours correlate to the risk criteria described in Table 10-2. The contours show that risks to sensitive, residential and commercial areas in the vicinity of the project were well within acceptable risk thresholds defined in *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning* (2011b). In other words, the risks posed by the project in these areas were less than the already stringently defined risk thresholds of 0.5, 1 and 5 chances in a million per annum respectively.

As shown in Figure 10-1, the risk contour for sensitive land use along the gas pipeline does not reach any such land uses, or any residential or commercial areas. Accordingly, the risks associated with the pipeline were found to comply with the relevant risk criteria in Table 10-2. It is also noted that the risk contour for residential land use did not reach the cruise ship terminal, which could be considered a residential use, but is about 550 metres from the FSRU.

The risk contours were instead contained to industrial and open areas adjacent to the project. These areas were limited in size and included a section of Seawall Road about 150 metres east of Berth 101 and parts of the coal terminal and Inner Harbour near of Berth 101. The presence of people, vehicles or vessels in these areas would be expected to be transitory and consequently subject to a very low level of risk in the order of 50 chances in a million per annum or fewer.

Seawall Road has the potential to be utilised by members of the public but is understood to be visited relatively infrequently, leads to the end of the breakwater and is not a through road, and is only open during the day, subject to arrival of shipments, weather, security or other concerns that may lead to the road to being shut by NSW Ports.

Parts of the coal terminal near Berth 101 included the existing truck wash station that may be utilised from time to time by visitors to the coal terminal while parts of the Inner Harbour near Berth 101 included areas that may be traversed by other vessels. These areas could be occupied temporarily, from time to time by passing vehicles or vessels including cruise ships.

The risk contour for injury, due to radiant heat from fire and overpressure from explosions, was contained to the area immediately surrounding the LNG carriers, the FSRU and the berth and wharf facilities and would consequently not affect any sensitive land uses or residential areas.

The risk contour for propagation to other facilities, creating a cumulative hazard, was found to be contained to the LNG carrier and FSRU and did not affect surrounding facilities. The

assessment included the risk of propagation occurring between these other projects and the gas pipeline but found that the risk of propagation would very low in part due to the pipeline being buried.

The potential for hazard events at surrounding facilities to propagate to the project was also assessed based on a review of hazard assessments completed for the approval of those facilities. The review found the project was also outside modelled risk contours for those facilities indicating a low risk. The assessment included potential for propagation of hazard events to or from the proposed Port Kembla Bulk Liquids Terminal about 600—800 metres to the north/north-east of the berth and wharf.

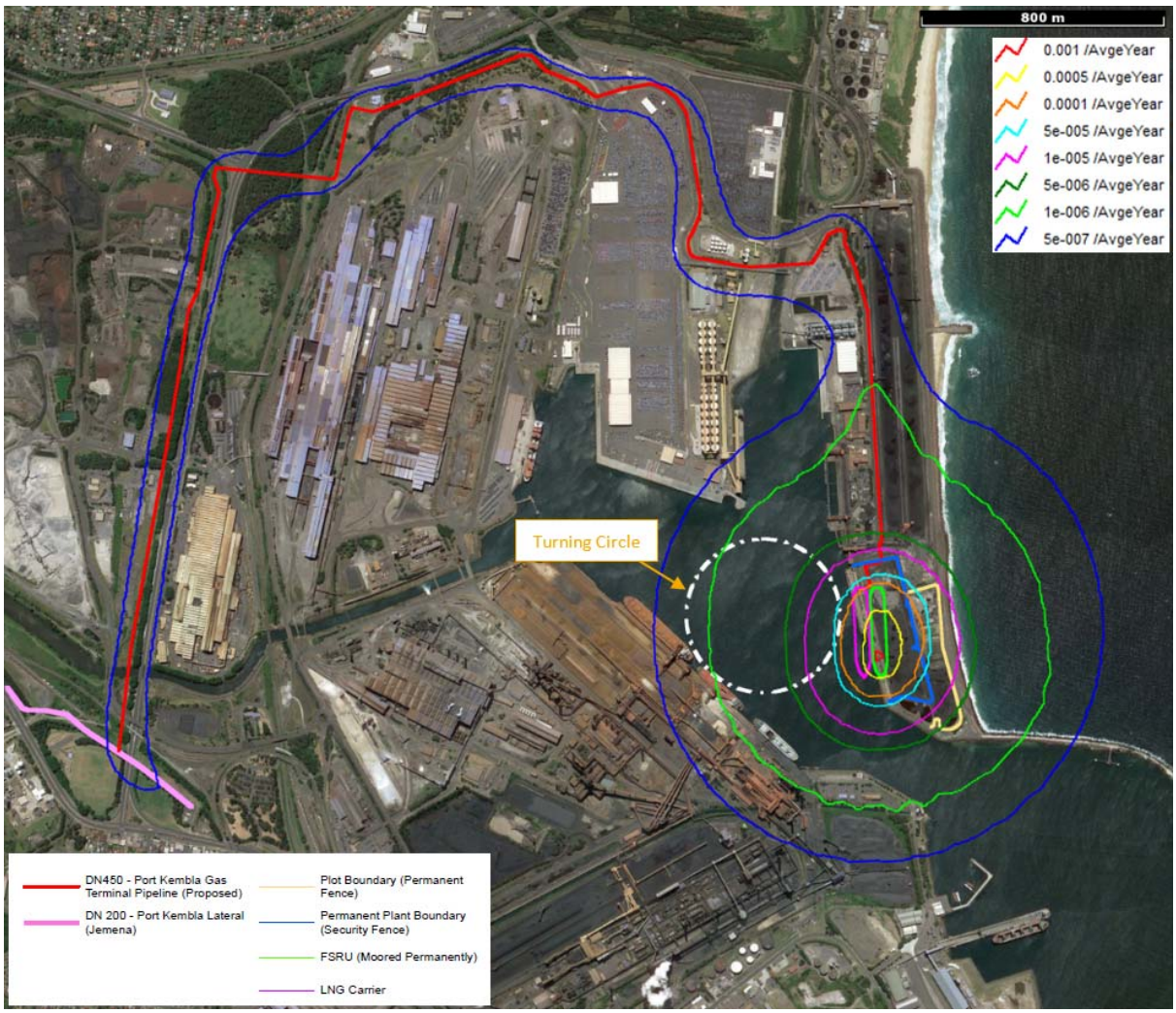


Figure 10-1 Risk contours

10.4 Safety management

10.4.1 Safety in design

The design, construction and operation of the project would be carried out in accordance with global best practice and international, Australian and NSW standards and certifications. This would also include the relevant legislative requirements discussed in Section 6 including those under the *Marine Safety Act 1998* and the *Work Health and Safety Act 2011*.

The FSRU would be designed, constructed and operated in accordance with the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk*. The purposes of which is to provide an international standard for the safe transport by sea in bulk of liquefied gases, by prescribing the design and construction standards of ships involved in such transport and the equipment they should carry so as to minimize the risk to the ship, its crew and to the environment, having regard to the nature of the products involved.

As the exclusive supplier of the FSRU to the project, Höegh LNG have an established safety management system with a strong record in terms of safety and environmental incident. For the 2017 calendar year, Höegh LNG achieved a Lost Time Injury Frequency of 0.4 with zero environmental incidents. For the 2018 calendar year to date, Höegh LNG has achieved a Lost Time Injury Frequency of 0.0 with zero environmental incidents. Over this time period (since January 2017) Hoegh carried out 485 ship-to-ship transfers. Further, the FSRU would be independently certified for its compliance with the relevant standards and certifications, being:

- Rules for Classification of Ships
- Classification Note No.61.3 Regasification Vessels

It is expected that independent certification would be carried out by DNV GL, being one of the largest and internationally leading certification agencies of its kind.

A number of safety features and systems would be built into the FSRU to avoid, mitigate and manage hazardous events. These would include fire and gas detection systems, fire protection and firefighting systems, and LNG drainage systems. Evacuation and rescue systems, procedures and protocols would also be in place in the unlikely event of an emergency. Site security and surveillance would be installed to prevent unauthorised access to the facilities.

The fire and gas detection system would provide continuous automatic monitoring throughout the FSRU in order to alert personnel to the presence of abnormal operating conditions and allow for an immediate response. The system would allow response actions to be initiated automatically or manually to minimise the chance of escalation to a hazard event. These automatic or manual actions could include emergency shutdown or isolation, or initiation of the firewater system.

Similar automatic shutdown or isolation systems would be in place in offloading arms at the berth facilities that would allow for automatic shutoff in the event of abnormal operating conditions.

The fire protection and firefighting systems would work in parallel with the fire and gas detection system and would include a combination of active and passive measures. The system would allow for continuous automatic monitoring and emergency shutdown or isolation of affected areas as well as activation of firefighting systems such as a water deluge system.

The FSRU would include multiple design features to avoid, mitigate and manage potential losses of LNG. Losses of LNG would be avoided in the first instance by minimising the instances of design features where losses could occur, such as at flanged valves. An LNG

drainage system would be installed and would function to contain LNG in the unlikely event of a leak. The safety drainage system would include collection and containment devices at such locations.

The evacuation and rescue system would include defined evacuation routes throughout the FSRU that would maintain the safety of all personnel as they move through the FSRU. It would also incorporate emergency communication systems, including speakers throughout the FSRU, to provide directions to personnel in the unlikely event of an emergency. The FSRU would be designed to enable the operational workforce to seek shelter in situ in the unlikely scenario of a hazard event occurring on board the FSRU. Safe evacuation routes would also be provided. The escape, muster and rescue systems in operation on board the FSRU would be an important component the vessel's independent certification by DNV GL as discussed above.

The LNG carriers delivering cargo to the terminal would also be required to meet maritime global standards and would be similarly equipped with automated leak detection mechanisms and emergency release and shutdown systems, they are purpose-built to safely transport gas and keep it in its liquid form and are double-hulled to provide protection against accidental leaks or ruptures and to give extra protection to cargoes in the event of a collision.

The gas pipeline in would be designed, constructed and operated (including routine testing and maintenance) in accordance with Australian Standard *AS 2885 Pipelines – Gas and Liquid Petroleum*. Typical safety in design parameters that would be required to comply with the standard would include appropriate burial depth, pipeline wall thickness, cathodic protection to prevent corrosion, and concrete slabs above the pipeline where necessary.

Regular safety drills and training would be carried out throughout the operation of the project. A minimum of 15 personnel would stationed on board the FSRU at any one time, including an appropriate number of marine ticketed personnel. This would ensure the project workforce are able and qualified to appropriately respond in the unlikely scenario of a hazard event occurring on board the FSRU or at a nearby facility. If necessary, the response to such an event could include unmooring the FSRU and navigating away from the hazard to minimise risk.

10.4.2 Safety case

As identified in Chapter 6, the project is expected to require completion of a detail safety case in accordance with the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2017*. The safety case would require separate approval from SafeWork NSW and would further detail the safety risks, emergency planning and safety management systems to be put in place.

The safety case would be developed in consultation with SafeWork NSW. The safety case would be a living document that would form the basis for ongoing safety management over the life of the project and would be maintained and updated as necessary. The safety case would include detailed descriptions of the project and identified hazards, safety management systems and related policies, standards, processes, specifications procedures, guidelines and work instructions. It would also provide for routine reporting and auditing of the safety management systems and contain emergency response plans.

10.4.3 Management measures

In addition to various safety features that would be built into the project discussed above, a comprehensive safety management system would be implemented in accordance with relevant regulations, standards and guidelines including the *Hazardous Industry Planning Advisory Paper No 9 Safety Management* (Department of Planning and Environment 2011c).

Table 10-3 outlines the management measures that are proposed to address the hazards and risks of the project. These should be read in conjunction with the safety management features that would be built into the project as discussed in Section 10.4.1. All management measures would be collated in management plans prepared for construction and operation of the project.

Table 10-3 Management measures for hazard and risk

ID	Issue	Measure	Timing
H1	Safety	Hazard identification and design assurance process safety activities such as HAZID, HAZOP and LOPA shall continue in the detailed design phase to ensure that the health and safety risk is reduced to As Low As Reasonably Practicable (ALARP). Major Accident Hazard events and the associated safeguards will be further defined to allow the development of performance standards for safety critical systems and elements.	Design
H2	Safety	A comprehensive safety management system would be developed in line with local standards and industry best practice for facilities handling LNG. The safety management system would address hazards to people and the environment in and around the project. The management system will define how the facility manages all aspects of personnel and process safety from the identification of hazards to the maintenance and testing of safety critical barriers, which either prevent or mitigate releases of LNG, and the emergency response to events from within or external to the project. The safety management system will interface with a computerised maintenance management system to manage facility maintenance of both safety critical and non-safety critical equipment.	Pre-operation
H3	Fire safety	The project would include safety systems including fire detection and firefighting systems in line with *AS 3846-2005 The handling and transport of dangerous cargoes in port areas*. A range of firefighting and protection systems will be installed on board the FSRU including gas detection, emergency shutdown and isolation, and firewater and suppression systems. The wharf area will also host gas detection and firefighting systems.	Pre-operation

11. Soils and contamination

11.1 Overview

This chapter provides a description and assessment of the contamination status of soils, sediments, the potential presence of acid sulphate soils (ASS) and a preliminary waste classification of materials likely to be excavated as part of the project. The potential for contaminated groundwater located within shallow aquifers in the project area to be intersected by the project has also been considered. Investigations were undertaken at the Berth 101 site including an area immediately east of the berth and six anchor points, along the proposed pipeline alignment and within the proposed dredge footprint and disposal area in the Outer Harbour.

This chapter summarises the more detailed contamination assessment reports including:

- Contamination Assessment Report for Berth 101 – Appendix E1
- Sediment Contamination Assessment Report, Preliminary Site Investigation - Pipeline Alignment – Appendix E2
- Sediment Contamination Assessment Report - Appendix E3

The contamination assessments have been undertaken with reference to the NSW EPA approved guidelines.

The scope of the contamination assessment for the Berth 101 site (Appendix E1) broadly includes:

- A description of the existing environment and site history. These were undertaken through a desktop study, which included a review of site history information, and information gathered from a site walkover.
- An assessment of the likelihood for contamination to exist on the site from past or present activities and the potential presence of ASS. The assessment was informed by the desktop study, site walkover and results of soil and groundwater sampling for contaminants of concern. Soil sampling comprised 39 environmental boreholes, opportunistic observations and from the ten geotechnical boreholes. The groundwater sampling program comprised installation of three groundwater monitoring wells, sampling and analysis of groundwater from the newly installed wells and three existing monitoring wells.
- An assessment of the preliminary waste classification of materials likely to be excavated as part of the project.
- Provision of recommendations for further investigation and/or options management in relation to the project (if applicable).

The scope of the contamination assessment for the site of the proposed pipeline alignment (Appendix E2) broadly includes:

- A description of the existing environment and site history. These were undertaken through a desk-top study which included a review of site history information, and information gathered from a site walkover.
- An assessment of the likelihood for contamination to exist on the site from past or present activities and the potential presence of ASS. The assessment was informed by

the results of the desk study, site walkover, search of NSW Environment Protection Authority (EPA) databases, a review of available previous reports conducted within the proposed alignment, field and laboratory testing for key contaminants of potential concern. Laboratory testing comprised opportunistic subsurface sampling (utilising 14 geotechnical boreholes) and analysis for contaminants of concern and acid sulphate soils and preparation of this report.

- Provision of recommendations for further investigation and/or options management in relation to the project (if applicable).

The scope of the contamination assessment for the proposed dredging area and proposed Outer Harbour disposal area (Appendix E3) broadly includes:

- A description of the existing environment including a review of previous contamination assessments, which provide a detailed analysis of the contamination status of the marine sediments of Port Kembla Harbour including assessments of sediments in the dredge area based upon a previously proposed upgrade to Berth 101 in 2012.
- An assessment of the likely contamination based on previous marine sediment investigations, of the sediments and contamination and additional site investigations to supplement the extensive historical baseline date for the project site. This was undertaken through a marine sediment investigation comprising seven sampling locations within the dredge footprint off Berth 101 and two locations at the reclamation area including vibracoring (five locations) and hand coring (four locations). Laboratory analysis was undertaken for 17 samples from the cores for contaminants of potential concern, 28 samples for screening for potential acid sulphate soils and 12 samples for chromium reducible sulphur suite.
- Provision of recommendations for further investigation and/or options management in relation to the project (if applicable).

For detailed contamination assessment methodologies for all three assessments, refer to Appendix E1, E2 and E3.

11.2 The project and potential contamination

Aspects of the project that relate to potential disturbance to contaminated soils and groundwater include excavation activities for establishment of the new berth, dredging and disposal activities and pipeline installation. These are described in detail within Chapter 5 with key activities relating to soils and contamination outlined below for context to the assessment of contamination risks.

11.2.1 Berth 101 and the Outer Harbour disposal site

Excavation of Berth 101 will likely proceed as follows.

Preliminary land based activities will include the following:

- Demolish existing Berth 101
- Remove and stockpile existing rock revetment
- Excavate fill layer across site to remove existing slabs, foundations and services

Once these enabling works are complete the excavation of the in-situ material beyond the new quay wall could proceed using a Long Reach Excavator. Due to the limitation on reach of such excavators currently in use in the area, it is possible that excavation of deeper material may

need to be dredged. 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.

Material will be excavated into heavy haul trucks which will relocate the material into an area at the rear of the Berth 101 site (current Coal Terminal East Stockyard). The area potentially available for stockpiling is around 400 metres long by 50 metres wide. The stockpile will be up to 10 metres high ready for truck transportation.

Material disposal during construction

Stockpiled material from the Berth 101 excavation will be relocated to a disposal site within the Outer Harbour. A perimeter bund will be constructed to ensure the stability of the disposal site. This bund will need to be constructed on relatively stiff material which will necessitate the removal of existing soft sediments that have previously been placed across the disposal site.

Trucks will transport Berth 101 materials to the Outer Harbour site where they will be placed close to the shore line to be pushed out by bulldozers. Material dredged by the backhoe dredger would be put in barges for transport to the Outer Harbour for disposal. The volume of material to be excavated by long reach excavator and transported by haul truck versus the volume of material to be dredged by backhoe dredger and transported by barge may vary depending on the preference and capacity of the construction contractor.

The material removed during dredging off Berth 101, would be disposed on the south side of the Outer Harbour in a designated reclamation area

11.2.2 Proposed pipeline alignment

Trenching and horizontal drilling during construction

The gas pipeline is proposed to be constructed progressively by a combination of trenching and horizontal directional drilling.

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 utilised. 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.

Horizontal directional drilling would be used instead of trenching to avoid impacts to some surface features such as road, rail, waterways and other environmentally sensitive areas. Initially horizontal directional drilling would require the excavation of launch and receive pits at either end of the horizontal directional drill. A horizontal directional drilling rig would then be employed to drill a conduit between the launch and receive pits. The conduit would be drilled by progressively adding drilling head lengths at the drilling rig for the length of the horizontal directional drill. Once drilled, a pre-welded and x-ray inspected section of pipeline is pulled through the open hole.

11.3 Existing environment

11.3.1 Berth 101

Current land use

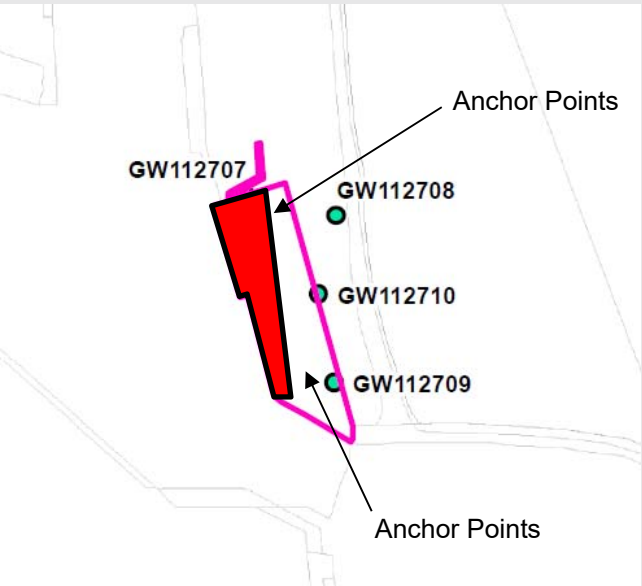
The existing land at Berth 101 the adjoining land uses comprise industrial and coal terminal.

Topography, drainage, soil, geology & hydrogeology

Table 11-1 summarises the topography, drainage, soil, geology and hydrogeology associated with the site of Berth 101.

Table 11-1 Topography, drainage, geology and hydrogeology at Berth 101

Elevation:	Between 3 metres and 5 metres above Australian Height Datum (AHD) (from Google Earth Pro).
General slope direction:	Information obtained from Google Earth Pro indicates that the berth gently slopes down towards the south and west.
Closest surface water body:	Berth 101 is adjacent to the Inner Harbour (Tom Thumb Lagoon) and Port Kembla Harbour. Tom Thumb Lagoon, a remnant saline coastal lagoon, has been progressively reclaimed through pot development; originally 500 hectares in area, the lagoon is now 50 hectares (BES 2010, p. 15).
Drainage:	Surface water is generally directed to the PKCT stormwater system, which includes a number of settlement ponds; one of which is located immediately south-east of Berth 101.
Regional geology:	The 1:100,000 Geological Series Sheet of Wollongong-Port Hacking indicates that the regional underlying geology is Quaternary sediments described as quartz and lithic fluvial sand, silt, and clay.
Site specific geology: (DP, 2014)	The *1:100,000 Geological of the Wollongong-Port Hacking Sheets 9029, 9129* indicates that the site is underlain by Quaternary sediments described as quartz and lithic "fluvial" sand, silt and clay. The site is located on land reclaimed for the establishment of the Inner Harbour and consists of mixed fill of unknown origins.
Acid Sulphate Soils (ASS):	The ASS Risk Map indicates that the Berth (in red outline) is situated in an area mapped as disturbed terrain at an elevation >4 metres (shown in grey shading). Estuarine sediments exist within the harbour and are mapped as high probability of ASS. 
Soil landscape:	Disturbed Terrain

Groundwater bore search:	The four closest registered bores are located within or adjacent to the Berth's eastern boundary and are groundwater monitoring wells installed by Douglas Partners (DP, 2014). 
Depth to groundwater:	Based on previous reports, standing groundwater levels were measured between 3.87 metres and 6.6 metres below ground surface (DP 2014, p. 25)
Inferred groundwater flow direction:	Groundwater is expected to be tidally influenced, with a general flow towards the south-west (DP 2014, p. 24).

Site history

Available site history information indicates Berth 101 (also known as the Bulk Products Berth) was constructed in 1964 and commissioned for the loading of coal, coke and slag. Dredge material from the Inner Harbour and steelworks slag may have been used in the berth's construction, although the source of fill could not be confirmed.

The berth had an array of surface infrastructure including substation, conveyors and a diesel underground storage tank (UST). Majority of the surface infrastructure was removed in around 2011 and the UST was removed in the early 1990's. No evidence of contamination was observed at the time of UST removal.

Relevant historical details identified in the site history searches are shown on Figure 11-4.

Site observations

Key site observations at Berth 101 (19 August and 25 September 2018) were as follows:

- The investigation area comprised Berth 101 and immediately surrounding area to the east. The investigation area largely comprised of near level open concrete surfaces or gravel surfaces. Coal stockpiling was taking place at the time of fieldwork towards the southern end of the investigation area, this area is slightly raised due to the stockpiling activities.
- A decommissioned coal conveyor belt is positioned to the east of the investigation area, aligned in a north-south direction, located behind a concrete wall that broadly separates

the greater area into two halves. Concrete panels were present from structures now partly demolished and steel frames and elevated walking platforms were seen in several areas around the site. An electrical substation was seen on the western side of the site, at the southern end of the berth, this area was largely fenced off with brick structures built around some areas. The substation was in relatively good condition with no leaks or damage observed. Anthropogenic material was observed generally scattered across the whole site, including slag, steel, plastic and wood.

- Several services are present on-site including an above ground water pipe which was observed on the western side of the site positioned in a north-south direction. A buried low pressure oil pipeline was also present along a similar alignment running to the west of the water pipe. An asbestos water pipe is located east of the substation and two fragments of suspected asbestos containing material (ACM) were noted. No suspected ACM was observed within other areas of the site.
- Two large stockpiles, approximately 700 cubic metres to 800 cubic metres of mixed sandy gravel material were observed in the south-western section of site, slag gravel, cobbles and boulders were seen mixed with this stockpiled material. Water was found to be largely captured by internal site drainage except in areas were the coal was stockpiled, ponding was found to occur due to inadequate drainage in these areas. A partitioned pond was observed in the southern portion of Berth 101 and outside the proposed excavation area and anchor points.
- Large industrial equipment and plant including coal loaders were observed on paved areas around the site. The site is actively used by light and heavy vehicles at most times of the day.
- There is no permanent vegetation or trees in the investigation area, only small patches of grasses and weeds.

11.3.2 Proposed pipeline alignment

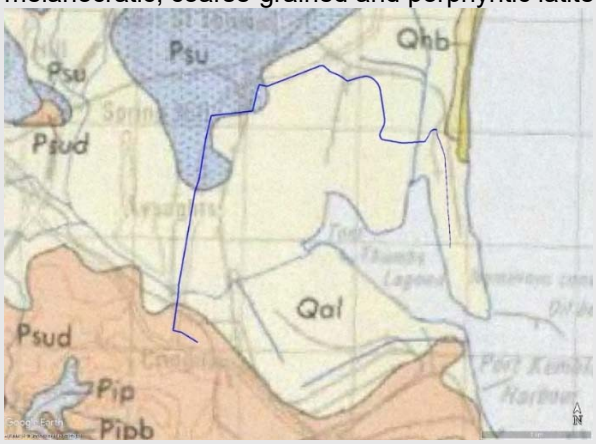
Current land use

The existing land use along the proposed pipeline alignment comprises land currently occupied by PKCT, Bluescope Steel and NSW Ports industrial facilities as well as crossing road and rail infrastructure and public parkland.

Topography, drainage, soil, geology & hydrogeology

Table 11-2 summarises topography, drainage, soil, geology and hydrogeology associated with the site of the proposed pipeline alignment.

Table 11-2 Topography, drainage, geology and hydrogeology of the proposed pipeline alignment

Elevation:	Between 1 metre and 16 metres above Australian Height Datum (AHD) (from NSW Land and Property Information).
General slope direction:	Natural landforms along the pipeline alignment have been heavily altered by human activity. Where residual natural slope remains in the western extent of the alignment the site slopes generally south and / or east towards the nearest waterbody (Allans Creek or Inner Harbour). Areas on the southern side of Allans Creek slope to the north. All other areas and in particular the eastern extent of the alignment are generally level or with a slight grade towards Inner Harbour
Closest surface water body:	The pipeline alignment crosses Allans Creek in the south and Gurungaty Waterway in the north east. All parts of the alignment will ultimately drain into Inner Harbour (Tom Thumb Lagoon) either through surface runoff, stormwater drainage systems. Tom Thumb Lagoon, is a remnant saline coastal lagoon, has been progressively reclaimed by development of the Steelworks and Port Kembla harbour. The Lagoon was originally 500 hectares and now has an extent of 50 hectares (BES 2010, p. 15).
Drainage:	Where ground surfaces have hardstand coverage surface water drainage is generally directed to PKCT, BlueScope or public road stormwater systems, which include a number of settle ponds in PKCT area. Where no hardstand coverage exists it is expected that surface water will penetrate ground surfaces at a rate reflective of local soils. It is expected in high rainfall events, surface water will flow directly into the harbour or connecting tributaries.
Regional geology:	The *1:100,000 Geological of the Wollongong-Port Hacking Sheets 9029, 9129* indicates that the site is underlain by three geological units (Most of the alignment is underlain by Quaternary sediments (Qal) described as quartz and lithic “fluvial” sand, silt and clay. The north western extent of the alignment is underlain by the Budgong Sandstone (Psu) of the Shoalhaven Group, described as red, brown and grey lithic sandstone. The area on the southern side of Allans Creek is underlain by the Dapto Latite Member (Psud) of the Shoalhaven Group, described as melanocratic, coarse-grained and porphyritic latite. 

Soil landscape:	The *Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet* indicates the site is underlain by **Disturbed Terrain**. The topography of this landscape varies from level plains to undulating terrain and has been disturbed by human activity to a depth of at least 100 cm. The original soil has been removed, greatly disturbed or buried. Most of these areas have been levelled to slopes of <5%. Landfill includes soil, rock, building and waste material. The original vegetation has been completely cleared. Limitations of this soil landscape are dependent on the nature of fill material resulting in a mass movement hazard (subsidence), soil impermeability leading to poor drainage, low fertility and toxic material. Care must be taken when these sites are developed.
Site specific geology: (WorleyParsons, 2018)	A concurrent geotechnical investigation of the berth and pipeline route was undertaken by WorleyParsons. To assist with the preparation of this report GHD was supplied with field logs from this investigation which have been summarised below and in Section 11.5.2 with locations shown in Figure 11-1. Fill materials encountered generally contained coal, coal wash and slag with trace fragments of asbestos containing materials and other anthropogenic materials. Residual soils were encountered in all locations and tended towards sand in the east with increasing clay content in the western extents of the alignment. Bedrock was not encountered in the east within the depth of investigation (up to 30.0 metres at BH15) but consisted of predominately siltstone or mudstone in the west
Acid Sulphate Soils:	The *Wollongong 1:25,000 Acid Sulfate Soil Risk Map* indicates that the pipeline alignment is underlain by areas of Disturbed Terrain (grey) from 2 metres to > 4 metres thickness or areas of No Known Occurrence (no colour). Estuarine sediments (dark pink) exist within Allans Creek, Gurungaty Waterway and Inner Harbour and are mapped as having a high probability of occurrence of acid sulphate soils. 

Groundwater bore search:	A search of publically registered groundwater bores within 500 metres of the alignment returned 61 results, of these only a single bore (GW100678) contained standing water level information. This location is on the western extent of the pipeline alignment, approximately 150 metres east of the alignment and had a standing water level of 8.2 metres. Bores with reliable location data are shown in the image below. 
Depth to groundwater:	Based on information obtained during the concurrent WorleyParsons geotechnical investigation and the groundwater bore search groundwater along the western boundary of the site is inferred to be between 4.5 metres and 8.2 metres. Based on the above and recorded ground conditions it is anticipated that groundwater along the alignment will stabilise at approximately sea level. Localised ground conditions such as shallow bedrock, material porosity, material permeability, proximity to surface water bodies and tides are likely to cause variation on geographical and temporal scales.
Inferred groundwater flow direction:	Groundwater is expected to be tidally influenced in areas in close proximity to surface water bodies, with a general flow towards the nearest surface waterbody.