

Woolwich Wharf Interchange Upgrade

Review of environmental factors

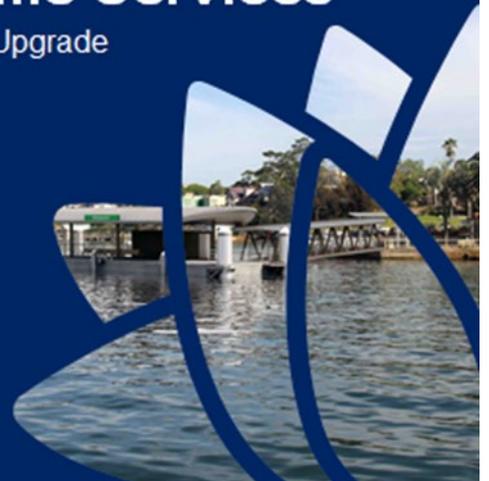
Roads and Maritime Services | October 2019

Roads & Maritime Services

Woolwich Wharf Interchange Upgrade



Transport
Roads & Maritime
Services



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Prepared by WSP Australia Pty Ltd and Roads and Maritime Services

RMS.19.1406

ISBN: 978-1-925891-98-0

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Document controls

Approval and authorisation

| | |
|--|---|
| Title | Woolwich Wharf Upgrade Review of environmental factors |
| Accepted on behalf of Roads and Maritime NSW by | Lisa Monaghan |
| Signed |  |
| Dated | October 2019 |

Document status

| Document status | Date | Prepared by | Reviewed by |
|-----------------------|-------------------|---|--------------|
| Working Draft | 03 July 2019 | Avi Thakur Todd Nguyen Ross Davey Phil Burns | Phil Burns |
| Final Draft | 27 August 2019 | Todd Nguyen Ross Davey | Phil Burns |
| Final | 13 September 2019 | Todd Nguyen | Johan Goosen |
| Final for Publication | 04 October 2019 | Todd Nguyen | Johan Goosen |

Executive summary

The Proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the existing wharf interchange at Woolwich (the Proposal). The Proposal includes both landside and waterside upgrades of the wharf interchange.

The waterside features of the Proposal would include:

- Removal of the existing gangway, pontoon and associated wharf structures, including existing piles and gangway
- Installation of a new three-metre wide by 18-metre long gangway
- Installation of a nine-metre wide by 18-metre long floating covered and glazed pontoon, held in position by four new piles
- Installation of a new shore bridge to connect landside and waterside elements supported by three piles
- Installation of two new protection piles west of the gangway
- Installation of two pivot piles to assist with berthing.

The landside features of the Proposal would include:

- Upgrade the existing heritage waiting shed to improve disability access, remove the existing non-structural internal walls to open up the internal space, install new seating and new wooden framed window. Upgrade of existing toilet amenities to unisex including one accessibility compliant unisex amenity.
- Raise the footpath levels and re-grading of the cul-de-sac from the bus stop and parking to the wharf to achieve compliance with disability access requirements. This would include temporary removal of the “Valencia Street Wharf” sign between the wharf entry and heritage waiting shed.
- The raising of the footpath would be supported by the raising of the seawall by a height of about 500 mm and length of about 30 m and placement of rock apron on the seabed in front of the seawall to improve stability.
- Upgrade of three accessible car parking spaces and footpath to wharf and two kiss and ride spaces
- Installation of five bicycle parking hoops
- Install disability compliant balustrades/fencing along the seawall from the accessible parking to the wharf.

An overview of the Proposal is shown in Figure ES-1.

Construction of the Proposal would be continuous and is anticipated to start in the first quarter of 2020 and take about five months to complete the work.

Plan of proposed new Woolwich Wharf for illustrative purposes

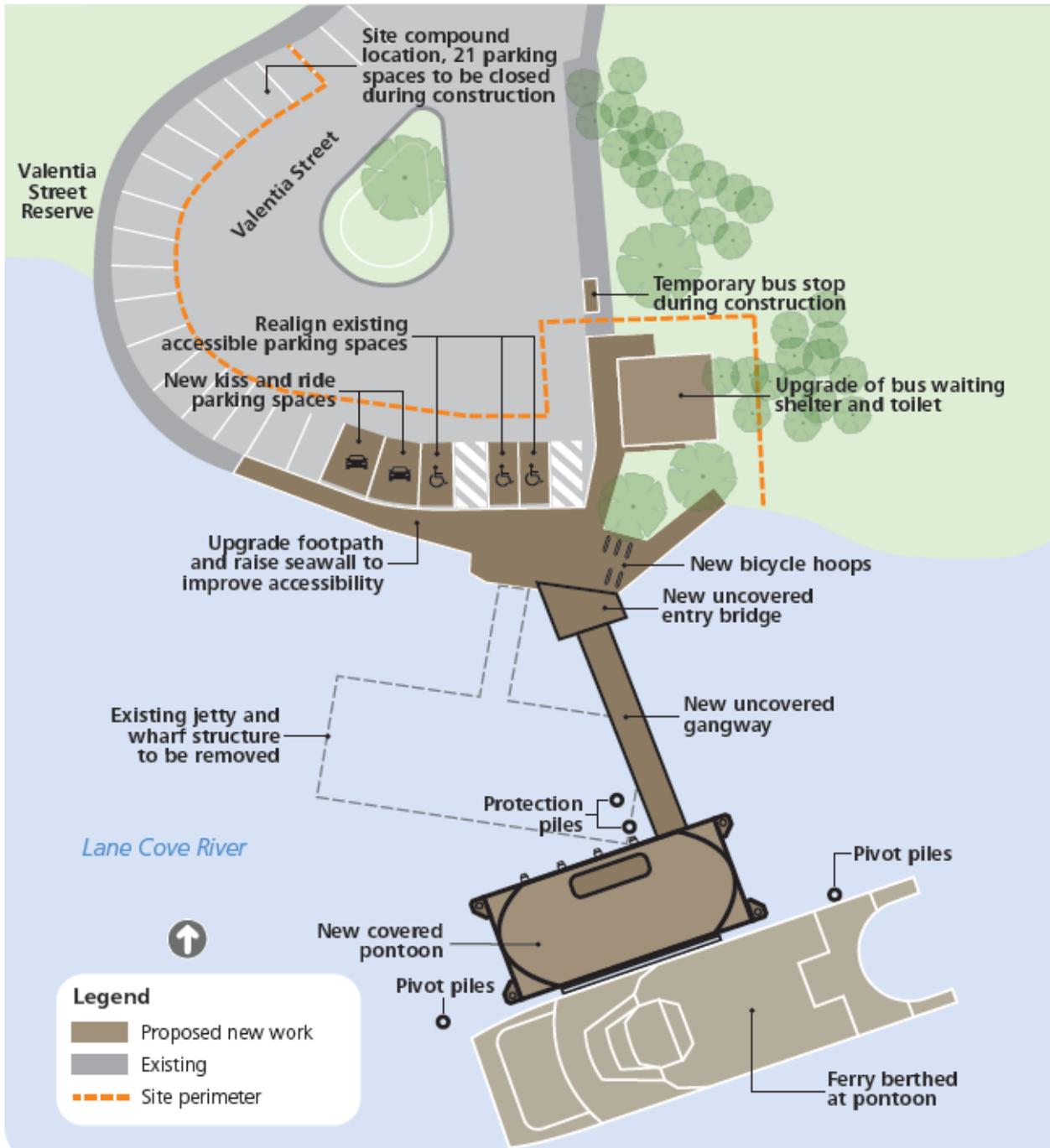


Figure ES-1: Overview of the Proposal

Need for the Proposal

The need for the Proposal was identified in response to Transport for NSW’s Transport Access Program; an initiative to deliver accessible, modern, secure and integrated transport infrastructure.

The Disability Standards for Accessible Public Transport 2002 (DSAPT) and Disability (Access to Premises – Buildings) Standards (2010) (Disability Standards 2010) made under the *Disability Discrimination Act 1992* (DDA), require all public transport infrastructure, including wharves, to have fully compliant disabled access by 2022.

It was concluded that Woolwich Wharf needed upgrading due to the lack of an accessible pathway from the bus and accessible carparks to the wharf for less mobile passengers.

Proposal objectives and development criteria

The objectives for the Woolwich Wharf Interchange upgrade are to improve the operation and general amenity of the wharf, maintain passenger amenity, reduce costs, and prevent unnecessary environmental and social impacts.

The relevant development criteria themes used for this Proposal are as follows:

- Meet customer needs and improve the transport experience
- Optimise public transport access
- Integrate with interchange investment and land use plans
- Anticipate growth and changes in demand
- Ensure sustainability and future public transport network performance.

Options considered

Four waterside options and four landside potential options to upgrade the Woolwich Interchange were identified:

Waterside options considered for Woolwich interchange included:

- 'Do nothing', which involves no upgrade. However, regular maintenance of the existing wharf infrastructure would continue
- Demolishing the existing wharf and building a new wharf in a similar location (realignment) – Wharf location 1
- Demolishing the existing wharf and building a new wharf in an alternate location (relocation) 20 metres east – Wharf location 2
- Demolishing the existing wharf and building a new wharf in an alternate location (relocation) 750 metres east – Wharf location 3.

Landside options considered for Woolwich Interchange included:

- 'Do nothing', which involves no upgrade. However, regular maintenance of the existing landside facilities would continue
- Landside option 1 proposed to raise the footpath and regrade the cul-de-sac, upgrade the toilets and a new canopy structure in front of the existing heritage waiting shed linked to a new wharf entry portal canopy structure
- Landside option 2 proposed to raise the footpath and regrade the cul-de-sac, upgrade the toilets and to extend the new canopies over the footpaths around the Valentia Street cul-de-sac, to the heritage waiting shed, the Kiss and Ride car park and disabled car parking spaces
- Landside option 3 proposed to raise the footpath and regrade the cul-de-sac, upgrade the toilets and upgrade the existing heritage waiting shed to improve disability access and open up the internal space for an accessible sheltered waiting space.

The do-nothing and refurbishment option was discounted as it would not meet the objectives of the Proposal to provide an accessible pathway for less mobile passengers.

Considering the project objectives, the preferred waterside option is to replace and realign the wharf (Wharf location 1). The replacement and realignment option was considered to have the least social and environmental impacts while complying with the operational requirements of Transdev Sydney Ferries, who operate the ferry network. This option also provides improved access for less mobile passengers. The preferred landside and facilities option is option 3, that is to upgrade the heritage waiting shed and toilet facilities and raise the footpath to improve disability access.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 permits development on any land for a wharf or boating facilities to be carried out by or on behalf of a public authority without consent.

As the Proposal is for a wharf or boating facility and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such, development consent from Council is not required. The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974*.

Community and stakeholder consultation

Roads and Maritime first considered the proposed upgrade in April 2015, consulting with key stakeholders, including the Hunters Hill Council, to develop a design which is acceptable to Council as owners and operators of the land based elements of the Proposal. The Proposal did not proceed at the time. Consultation with the Hunters Hill Council was again initiated in 2019 to discuss the preferred concept design. This resulted in refinements to the design, which is detailed in section 2.7 of this REF.

Consultation with Foreshore and Waterways Planning and Development Advisory Committee, Port Authority of NSW and the Department of Primary Industry and Fisheries has also been carried out.

Stakeholder consultation would continue during the public display of this document, with a community information session planned during the REF public display period to capture community feedback. Should the Proposal proceed to construction, consultation with the community and stakeholders would continue throughout the construction phase.

Benefits

The Proposal is expected to deliver the following benefits:

- Meeting the current and future patronage demand
- Minimising maintenance costs
- Provision of a modernised accessible wharf that is consistent in its design with the recent upgrade of the wharves on the network
- Improved passenger comfort and security through weather protection, ample seating, customer information, CCTV and lighting
- Provide a wharf that is resilient to future sea level rises and more extreme weather events.

Environmental impacts

The main environmental impacts of the Proposal and the safeguards and management measures to address the impacts are summarised below:

Land surface, hydrology and water quality

The Proposal would require localised sediment disturbance during construction from removing and installing piles. This disturbance would be limited to a small area around each pile.

Sediments within the Proposal footprint are known to contain elevated concentrations of some heavy metals and pesticides. Acid sulphate soils may also be encountered.

Safeguards have been proposed to prevent potential sediment dispersion during construction including the installation of a floating silt boom and curtain around the construction area for the duration of the work. On the landside additional soil erosion controls and procedures would be implemented to minimise sediment and sediment laden runoff water entering the river.

Water quality in the Parramatta River is known to be generally poor due to impacts from stormwater discharge and altered flow regimes further upstream. With the inclusion of the proposed safeguards, existing water quality is not anticipated to be significantly impacted during construction and operation of the Proposal.

During operation, there would be negligible impacts to the land surface or hydrology as the operation of the Proposal would be consistent with current ferry wharf operations. No further disturbance of the land based environment would occur during operation of the Proposal.

Biodiversity

The Proposal is not likely to significantly impact threatened terrestrial or aquatic species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation 2016* (BC Act) or the *Fisheries Management Act 1994* (FM Act) and therefore a species impact statement (SIS) is not required.

The Proposal is also not likely to significantly impact threatened species, populations, ecological communities or migratory species within the meaning of the EPBC Act. A referral to the Australian Department of the Environment and Energy is therefore not required for biodiversity matters.

The Proposal would have direct impacts on 675 m² of type 2 and type 3 key fish habitat (KFH) through the proposed pile installation, partial shading beneath the pontoon and gangway, removal of existing pontoon and piles and, reclamation from a new rock apron.

However, KFH impact would be offset by the creation of about 644 m² of type 2 and type 3 KFH from new hard surfaces, rocky rubble and newly exposed subtidal substrate suitable for re-establishment of similar species.

Of the impacted KFH area, 108 m² of marine vegetation, including mixed dense microalgae and scattered kelp would be directly and indirectly harmed. Partial shading of microalgae is unlikely to affect many plants as these species are currently surviving under the existing gangway.

Impacts are not significant as habitat would recover over time during operation of the wharf.

The Department of Primary Industries (DPI) Fisheries has been consulted about the proposed works and reclamation (rock apron on the seabed) and has confirmed that; it has no objections to the proposed works and, a permit to harm marine vegetation would not be required.

With regards to the wetlands protection, biodiversity, ecology and environmental protection requirements of the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005, the Proposal would not alter marine vegetation or wetland habitat in the long-term, as it would be providing similar habitat structures. The proposed wharf would be positioned slightly to the east of the existing wharf and therefore would not increase impacts to the wetland habitat.

The main safeguards to minimise the impact of construction on aquatic biodiversity include:

- Use a floating boom with silt curtain to contain sediment plumes during drilling and pile hammering and placement of the rock apron.
- Establishment of no-go zones to avoid damage to nearby habitats.

Noise and vibration

The construction scenario with the highest predicted exceedances is during road and pavement works which would be undertaken during standard hours (7 am to 6pm Monday to Friday and 8 am to 1 pm Saturday). This high result is worst case scenario as it was assessed based on the concurrent use of all high noise level plant and equipment. It is assumed that noise levels would be lower as it is expected that all high noise level equipment would not be used simultaneously during construction activities.

During construction there would be exceedances of the noise criteria for night time periods of construction by up to 33dB for the nearest residential receiver (about 124 properties situated north, west and east of the proposed boundary) whilst hammering in piles required for the new pontoon and gangway. As detailed in chapter 6.4 of this REF, these works are likely to be required to be undertaken during night time hours due to the need for calm water conditions. If night time hammering is required, to minimise the impact, this activity will be restricted to the last two hours of the night time period (5 am to 7 am) and is anticipated to occur for no more than five nights of the 15 night shifts required over the construction period. During these hammering activities, it is anticipated that each pile would be hammered for one minute (about 10 hits with the hammer within one minute). For each pile the activity is likely to occur about five times over a period of one hour.

In addition, it may also be necessary to lay asphalt outside of standard hours to ensure that the cul-de-sac remains open for buses to turn during daily operations.

Exceedances at Noise Monitoring Locations (NMLs) are generally expected for receivers immediately next to the footprint. Multi-storey receivers with clear line of sight to the work site on The Point Road and Mayfield Avenue are also likely to have the highest impacts from the proposed construction work.

Noise exceedances would be minimised through safeguards proposed in the REF section 6.4.5 Safeguards and Management Measures. These include considered implementation of temporary barriers around stationary noise sources, material pre-fabrication and limiting the number of plant used at one time. Additional noise mitigation measures are required for the exceedances and include but are not limited to notification, a noise verification program and pile hammering restricted to between 5 am and 7 am.

The community would be informed of night time construction activities at least five days prior to starting, with a community information email and phone line provided throughout the work to take enquiries and follow up on complaints. For further information on environmental safeguards proposed in the Noise and Vibration Management Plan refer to section 6.4.

There is potential for vibration impacts at the heritage structure, Valentia Street waiting shed due to works being undertaken within safe working distance limits for cosmetic damage (20 metres). To minimise potential for impacts, attended vibration measurement to establish acceptable working distances specific to the plant and site conditions, will be undertaken.

A Noise and Vibration Management Plan would be prepared prior to construction and implemented throughout the construction period. General noise and vibration impacts on the local community would be mitigated by restricting construction works to daytime hours wherever possible. However, as noted above, some activities may need to be carried out during the night, with about 15 night shifts (from 11 pm to 7 am) proposed across the construction period of about 5 months.

Landscape character and visual amenity

The Proposal would have a moderate to low impact on landscape character. The proposed wharf, in shifting location to the East, will produce a moderate impact on the natural character of this foreshore. The small shift in location has a negligible effect on the more broad scale character of the waterways and those areas separated by a greater distance.

The overall impact on views is considered moderate to low as the wharf maintains the scale of the current structure while shifting in location to the east. For some views this is an improvement with the demolition of the current wharf opening up clearer views to water.

The highest impact is in relation to view from the heritage waiting shed due to the shift in location of the wharf to the east causing the proposed wharf to partially block views towards Greenwich Point and the Sydney CBD. However, the removal of the existing wharf would introduce new views from other parts of the waterfront reducing the overall impact. The open structure of the wharf combined with the unroofed gangway and bridge aim to mitigate this impact.

The visual impact of the Proposal has been minimised during detailed design through the use of neutral and transparent materials and a reduction in fixed solid elements as detailed in the Landscape and Character Visual Impact Assessment included as Appendix F.

Non-Aboriginal heritage

The Proposal would have a minor impact on the local heritage item Valentia Street Wharf and waiting shed due to the following construction impacts:

- The Heritage waiting shed proposed upgrades would be non-structural and limited to the interior of the structure, including the removal of non-structural walls and installation of an accessible internal fit out. No impacts on potential archaeological relics are expected
- “Valentia Street Wharf” sign would be temporarily removed during proposed regrading works to the cul-de-sac and footpath.

Impacts during operation would result in a positive heritage outcome as it ensures ongoing viability by continued use of the site for maritime purposes as well as refurbishment of the heritage waiting shed. Minor impacts are considered for the heritage waiting shed as components of it would be refurbished.

No other direct or indirect impacts are expected and non-aboriginal heritage would have a neutral heritage impact overall.

In order to improve the heritage outcome of the Proposal, interpretation in the form of signage to indicate the location and historical context of the existing Woolwich Wharf and historical Street Wharf would be considered.

Socioeconomic, traffic and transport

Surrounding businesses and ferry users would be impacted for about five months during construction.

Existing bus transport would operate for the duration of the Woolwich ferry wharf closure. The bus hours of operation would be temporarily extended to cover the absence of the late night and weekend ferry service, to ensure continuity of transport services. The turning circle would remain functional for bus traffic, but would be space-constrained during construction. Possible short interruptions may occur depending on the nature and timing of construction work being undertaken.

Pedestrian access around the interchange during construction would be maintained, although this would be impacted with some accesses narrowed or closed and pedestrians redirected.

The carpark at the wharf area would be closed during construction as existing car parks are required for construction activities and the site compound; however, the turning circle would remain open for bus operations and have limited mobility.

Safeguards would be implemented to manage vehicle and pedestrian movement throughout construction. However, it is anticipated that the majority of plant and materials would be delivered via barge.

Indirect impacts to local businesses in the broader area would occur from closure of the wharf and during noisy construction activities. Further consultation would be undertaken with the community to identify sensitive periods, and where possible the noisiest activities would be scheduled outside of these.

Delivering plant and materials via barge would increase waterside vessel movements around and within the Proposal footprint; however, the impact of this would be minimised through the preparation of a Marine Traffic Management Plan.

Cumulative impacts

Minor cumulative impacts are associated with the increase in marine traffic during the construction phase of the Proposal. No cumulative impact is expected from other wharves included in the ferry wharf upgrade program as no overlap in construction schedules are proposed.

Roads and Maritime would consult with the relevant proponents prior to the commencement of construction to minimise potential cumulative impacts.

Further consideration of potential cumulative impacts and safeguards associated with the Proposal is provided in section 6.13 of this REF.

Justification and conclusion

The need for the Proposal was justified under the Transport Access Program as the existing structure does not provide access which complies with DDA and DSAPT standards. The assessment of the environmental and social impacts has determined the Proposal is not likely to have a significant impact and therefore assessment under Division 5.2 of the EP&A Act is not required.

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Appendix I CPTED Assessment

1 Introduction

This chapter introduces the Proposal and provides the context of the environmental assessment. The Proposal objectives and development history are outlined and the purpose of the report provided.

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the existing wharf interchange at Woolwich (the Proposal) as part of the NSW Government's Transport Access Program (TAP, <https://www.transport.nsw.gov.au/projects/tap>, refer to section 2.1).

The Proposal is located within the local government area (LGA) of the Hunter's Hill Council. The Woolwich Wharf is located on the eastern side of the Woolwich peninsula, at the mouth of Lane Cove River. The existing wharf is located on Valentia Street at the end of a cul-de-sac, which includes parking spots and bus stop.

Figure 1.1 and Figure 1.2 show the regional and local setting respectively. The wharf is part of the F8 Ferry Service that operates between Circular Quay and Cockatoo Island. The Proposal is to improve access to the wharf and to upgrade and install a gangway and floating pontoon to allow for more efficient passenger services. The key features of the Proposal are shown in Figure 1.3.

The waterside features of the Proposal would include:

- Removal of the existing gangway, pontoon and associated wharf structures, including existing piles and gangway
- Installation of a new three-metre wide by 18-metre long gangway
- Installation of a nine-metre wide by 18-metre long floating covered and glazed pontoon, held in position by four new piles
- Installation of a new shore bridge to connect landside and waterside elements supported by three piles
- Installation of two new protection piles west of the gangway
- Installation of two pivot piles to assist with berthing

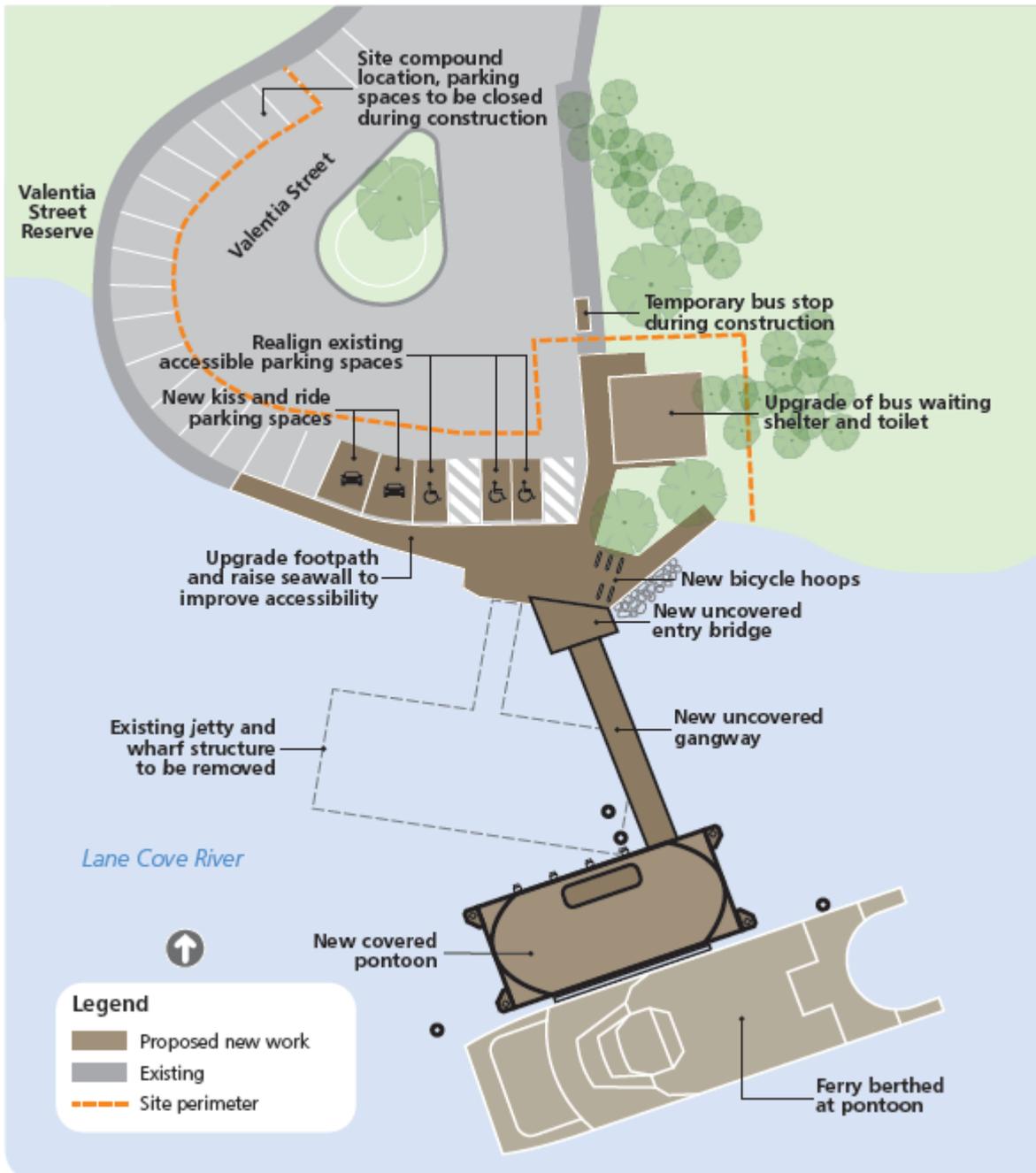
The landside features of the Proposal would include:

- Upgrade the existing heritage waiting shed to improve disability access, remove the existing non-structural internal walls to open up the internal space, install new seating and new wooden framed window.
- Upgrade of existing toilet amenities to unisex including one accessibility compliant unisex amenity.
- Raise the footpath levels and re-grading of the cul-de-sac from the bus stop and parking to the wharf to achieve compliance with disability access requirements. This will include temporary removal of the "Valencia Street Wharf" sign between the wharf entry and bus shed.
- The raising of the footpath would be supported by the raising of the seawall by a height of about 500mm and length of about 30m and placement of rock apron on the seabed in front of the seawall to improve stability.
- Upgrade of three accessible car parking spaces and footpath to the wharf and two kiss and ride spaces.
- Installation of five bicycle parking hoops
- Install disability compliant balustrades/fencing along the seawall from the accessible parking to the wharf



Figure 1.2: Local setting

Plan of proposed new Woolwich Wharf for illustrative purposes



Source: Roads and Maritime

Figure 1.3: Key features of the Proposal

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by WSP Australia Pty Ltd on behalf of Roads and Maritime. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the Proposal, to document the likely impacts of the Proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of the following documents / guidelines:

- Clause 228 of the Environmental Planning and Assessment Regulation 2000
- *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996)
- *Marinas and Related Facilities EIS Guideline* (DUAP, 1996)
- *Biodiversity Conservation Act 2016 (BC Act)*
- *Fisheries Management Act 1994 (FM Act)*
- Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act including that Roads and Maritime examine and consider to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the Proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The potential for the Proposal to significantly impact any matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

This chapter describes the need for the Proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the Proposal.

2.1 Strategic need for the Proposal

The Transport Access Program (TAP) is an ongoing “initiative to deliver modern, safe and accessible transport infrastructure” in NSW (Transport for NSW, 2015). The focus of the program is improving access to the transport network for less mobile passengers. Thus, Roads and Maritime assessed the condition of all ferry wharves across the transport network in 2009 in terms of:

- Safety and structural integrity
- Access for less mobile and disabled passengers
- Existing and predicted future patronage and use.

The Disability Standards for Accessible Public Transport 2002 (DSAPT) and Disability (Access to Premises – Buildings) Standards (2010) (Disability Standards 2010) made under the *Disability Discrimination Act 1992* (DDA), require all public transport infrastructure, including wharves, to have fully compliant disabled access by 2022.

The existing structure was evaluated to be in a good to fair condition overall, considering its age and exposure environment; however, Woolwich Wharf needed upgrading or relocating due to its non-DDA compliant gangway.

The Proposal was also developed to respond to the objectives of various Government policies as described below.

2.1.1 Transport Access Program

The aims behind the above objective of the TAP are to:

- Improve the accessibility for passengers who use wheelchairs and prams by removing stairs and supplying ramps
- Build facilities for all transport modes to meet the needs of a growing population
- Provide an effective and seamless interchange that supports an integrated transport network
- Deliver safety and signage improvements to help with the customer user experience
- Provide other aesthetic improvements.

Ferry Wharf Upgrade Program

The Ferry Wharf Upgrade Program forms part of the TAP. Its objectives are to:

- Improve access for less mobile people
- Improve passenger amenity
- Improve passenger embarking/disembarking times
- Develop an iconic design across the commuting wharf network
- Cater for current and future passenger numbers
- Minimise customer and wharf operator impacts during any refurbishment and upgrade work
- Minimise ownership and maintenance costs
- Ensure the design complies with current safety laws
- Discourage inappropriate activities on public wharves
- Aim to comply with the DDA by 2022.

This Proposal has been developed to respond to, and comply with, these objectives.

2.1.2 Future Transport Strategy 2056

The Future Transport Strategy 2056 (Transport for NSW, 2018) is an update of the Long Term Transport Master Plan for NSW (Transport for NSW, 2012). It is a 40 year strategy, supported by plans for Greater Sydney and Regional NSW, which sets the vision, directions and outcomes for customer mobility. The Future Transport Strategy sets six state-wide outcomes to guide investment, policy and reform and service provision, which includes:

- A customer focus
- Successful places
- Growing the economy
- Safety and performance
- Accessible services
- Financial and environmental sustainability.

The upgrading and expanding the ferry wharf network, as part of the ferry wharf upgrade program, would support meeting the above objectives of this Strategy.

2.1.3 Supporting NSW strategies and policies

The Proposal is also supported under the policies, goals, objectives and targets of several other strategic planning documents as summarised in Table 2.1.

Table 2.1: Supporting NSW strategies and policies

State Infrastructure Strategy 2018-2038

The strategy identifies the NSW Government's infrastructure vision for the state over the next 20 years, across all sectors. It is supported by the Future Transport Strategy 2056. As passenger numbers are expected to notably increase in the future, this Proposal responds to the above by improving the wharf infrastructure and access provisions at Woolwich.

Disability Inclusion Action Plan 2018-2022

The Disability Inclusion Action Plan 2018–2022 is Transport for NSW's plan for delivering high quality services to all customers including those with disability, including compliance with the disability standards outlined below.

Disability standards

The Disability Standards for Accessible Public Transport (DSAPT, 2002) and Disability (Access to Premises – Buildings) Standards (2010) form part of the DDA. Each prescribe the minimum accessibility standards for disabled access to public transport services and infrastructure, including a timetable for implementation. The Proposal meets the above requirements within the timeframes specified in both standards by providing suitable access for people with a disability.

State Priorities: Making it Happen 2015

The Proposal would:

- Improve the existing transport infrastructure, consistent with the *delivering infrastructure* priority
- Be built and would operate under environmental safeguards and management measures to avoid and minimise environmental impacts consistent with the *keeping our environment clean* priority.

2.2 Existing infrastructure

The wharf currently enables Transdev Sydney Ferries to operate a ferry service for passengers between Circular Quay and Cockatoo Island. The existing infrastructure at Woolwich Wharf includes the wharf and landside interchange infrastructure. Some parts are old timber structures with substantial weathering and others of more recent origin comprise concrete, steel and aluminium structures. Overall, all structures that form the wharf facility are generally in good to fair condition considering its age and exposure conditions.

The existing Woolwich Wharf Interchange does not currently meet the DSAPT or DDA requirements, as it does not allow for equitable access to the wharf or for boarding the ferry.

Table 2.2 summarises the existing wharf elements and descriptions of current infrastructure.

Table 2.2: Existing wharf infrastructure

| Element | Description |
|-------------------------|---|
| Existing infrastructure | <p>Existing wharf interchange, comprising:</p> <ul style="list-style-type: none"> • One berth at its southern side with eight tubular steel piles that serve as both fender piles and pontoon restraint piles • A gangway about 1.8 metres wide by nine-metres long • A floating pontoon twenty-four-metres long • Wharf furniture including seating, steel safety barriers, safety ladders, bollards, ferry timetable supports and glazed partitions. <p>Landside infrastructure, including:</p> <ul style="list-style-type: none"> • Footpaths along Valentia Street of varying widths and grades • Bus zone with heritage waiting shed and vehicle turning area • Toilets for men and shared women/disabled facility • A standalone bicycle rack with space for three bicycles located on a grass area near to the bus shed • A commuter parking area with 22 unrestricted parking spaces and three accessible parking spaces • Two kerbside parking spaces with a 5-minute restriction, which informally accommodates kiss and ride users • Unrestricted kerbside street parking along Valentia Street to the north of the commuter car park and interchange • Post office box and public phone booth • Gateway and limited wharf directional signage. |
| Operation | <ul style="list-style-type: none"> • Woolwich Wharf operates as part of the F8 Parramatta River ferry route between Cockatoo Island to Circular Quay service • Weekday ferry services typically operate every 30 minutes towards the city and every 50 minutes towards Cockatoo Island. Supplementary ferry services also operate on Saturday and Sundays to support higher customer demand on this day. Weekend ferry service operates about 60 minutes in either direction. • Used by about 300 passengers per day on average. |
| Land Ownership | <p>Land owned by Roads and Maritime:</p> <ul style="list-style-type: none"> • Waterside elements of the wharf, including the gangway and pontoon (unincorporated land). <p>Registered proprietor – NSW Maritime Title to Sydney Harbour:</p> <ul style="list-style-type: none"> • Pontoon and ancillary structures beyond Mean high water mark (MHWM) |

Existing infrastructure is displayed in Table 2.1



Source: Roads and Maritime

Figure 2.1: Existing infrastructure of Woolwich Wharf Interchange: Wharf (top left), toilet facilities (bottom left), heritage waiting shed (top right) and car park interchange (bottom right)

2.2.1 Future patronage

The ferry patronage data indicates that Woolwich Wharf is primarily used by patrons to travel to and from work during peak periods. Due to lack of train service in the vicinity, over one third (36%) of the Woolwich Wharf patrons use the service to Journey to Work (JTW), which represents the highest ferry mode share for all wharves situated along the F8 route.

Woolwich Wharf will marginally increase in AM peak demand (0.8% increase) and marginally decrease in Sunday demand (0.4% decrease). While forecast growth is not significant, the forecast doesn't take into account customer satisfaction and the ability to retain current demand levels under current service levels and infrastructure provision. Improvements to wharf and interchange facilities may assist to increase future patronage through targeting the recreational user and supporting an aging population within the catchment.

Services run at 30-minute frequency during AM and PM peak periods. Service frequency reduces to an hourly service during off peak and weekend periods.

2.3 Proposal objectives and development criteria

This section lists the Proposal's objectives and development criteria.

2.3.1 Proposal objectives

The objectives for the Woolwich Wharf Interchange upgrade are to:

- Improve:
 - Its operation as an effective transport interchange
 - Access for passengers with disability and meet requirements of DDA
 - Passenger safety
 - Passenger comfort and shelter from the wind, rain and sun
 - Seating and waiting areas on the wharf
 - Boarding, disembarking times, and queueing.
- Maintain:
 - Passenger amenity, enjoyment, and harbour views
 - Pedestrian infrastructure and cycleways
- Reduce:
 - Maintenance frequency and cost through materials selection that allows for easy cleaning and limited repair
 - Vandalism through the appropriate use of materials, surfaces and designs
- Prevent
 - Unnecessary environmental and social impacts.

2.3.2 Development criteria

The Proposal has been developed against the following themes and principles for transport interchange design (Making Interchange Places, Transport for NSW, 2012).

Table 2.3 outlines the relevant development criteria used to help design the proposed wharf and select a preferred option.

Table 2.3: Development criteria for this Proposal

| Theme | Relevant principles |
|--|--|
| Meet customer needs and improve the transport experience | Provide: <ul style="list-style-type: none">• Safe, efficient and convenient passenger access• A comfortable, enjoyable and positive customer experience. |
| Optimise public transport access | Provide: <ul style="list-style-type: none">• Access to employment, services, recreation and education• Seamless interchange• Connection into existing and future transport networks. |
| Integrate with interchange investment and land use plans | Embrace heritage and cultural values. |
| Anticipate growth and changes in demand | Safeguard future extension and property development opportunities based on predicted growth. |

| Theme | Relevant principles |
|---|--|
| Ensure sustainability and future public transport network performance | Deliver sustainable solutions that minimise environmental and community impacts that are adaptable to climate change and include new technologies. |

The Proposal has also been developed against the following priorities (Ferry Wharf Upgrade Program: Business Requirements Specification, TAP, 2014):

- Pedestrian access
- Bicycle access and storage
- Bus access
- Taxi access
- Private car:
 - Drop off and pick-up
 - Park and ride, with accessibility priority.

2.3.3 Urban design objectives

The Proposal's urban design objectives include:

- Minimising:
 - Clutter and visual impacts through careful material selection that responds to the local setting
 - Interruption to views and impacts on the public domain and realm.
- Retaining and enhancing:
 - Pedestrian infrastructure and access
 - Connectivity with active transport (walking and cycling) and public transport modes and provisions
 - Setting and relationship to the foreshore and surrounds, including Valentia Street Reserve, in terms of the public domain and the integration into landscape.

2.4 Alternatives and options considered

This section describes the alternatives and options considered to deliver the Proposal.

2.4.1 Methodology for selection of preferred option

The method by which Roads and Maritime developed options for the Proposal considered:

- Existing and future:
 - Passenger use and accessibility
 - Service demand.
- Existing:
 - Engineering design requirements and current structural integrity
 - Passenger safety
 - Environmental and social constraints
 - Build cost
 - Stakeholder feedback.

2.4.2 Identified options

Four waterside options and three landside potential options to upgrade the Woolwich Interchange were identified:

- ‘Do nothing’, which involves no upgrade. However, regular maintenance of the existing wharf infrastructure would continue
- Demolishing the existing wharf and building a new wharf in a similar location (realignment) – Wharf location 1
- Demolishing the existing wharf and building a new wharf in an alternate location (relocation) 20 metres east – Wharf location 2
- Demolishing the existing wharf and building a new wharf in an alternate location (relocation) 750 metres east - Wharf location 3.

Landside options for Woolwich Interchange include:

- ‘Do nothing’, which involves no upgrade. However, regular maintenance of the existing landside facilities would continue.
- Landside option 1 proposed raising the footpath and regrading the cul-de-sac, upgrade the toilets and a new canopy structure in front of the existing heritage waiting shed linked to a new wharf entry portal canopy structure.
- Landside option 2 proposed raising the footpath and regrading the cul-de-sac, upgrade the toilets and extend the new canopies over the footpaths around the Valentia Street cul-de-sac, to shelter the Kiss and Ride and disabled car parking spaces.
- Landside option 3 proposed raising the footpath and regrading the cul-de-sac, upgrade the toilets and upgrade the existing waiting shed to improve disability access and open up the internal space for an accessible sheltered waiting space.

The suitability of these options was determined through an analysis of existing wharf infrastructure, potential constraints and performance against the Proposal objectives outlined in section 2.3.1

A key constraint for the Proposal is the shallow depth (bathymetry) of the Parramatta River. The present wharf is generally aligned with the depth contours, with vessels berthed over the seabed at -7.5 m depth Lowest Astronomical Tide (LAT) at the berth face. Generally, ferries are currently restricted to operating within a narrow channel to the wharf, with the surrounding area too shallow to allow ferries to operate. The separation distance at Woolwich Wharf is at least 27 m and given the water depth, there is only a low risk of mobilisation of inshore sediments during low tides. No dredging is required for this Proposal.

2.4.3 Analysis of options - wharf

Analysis of the identified wharf options is provided in the sections below. Options and criteria are summarised in Table 2.4. Section 2.4.4 describes the analysis of the landside options.

Do nothing

The option of ‘do nothing’ would be to limit the scope of work to carrying out activities consistent with those required to maintain operation of the existing wharf, including undertaking regular maintenance. As this option would include minimal change, it would present the lowest capital cost and environmental impact. The wharf currently operates with a gangway and pontoon that is not DDA compliant at low tides, and the Proposal objective of improving access for passengers with a disability would not be achieved.

Although it would present minimal capital cost and environmental impact, the ‘do nothing option’ was discounted as it would not meet the objectives of the Proposal; to improve accessibility, passenger safety and comfort for future patronage over the long-term.

The option of ‘do nothing’ would not achieve DDA compliance and/or sustain the long-term operation of the wharf and therefore did not meet the Proposal objectives.

Replacement of the wharf

Three wharf locations were reviewed during key stakeholder workshops and would require decommissioning of the existing wharf:

- Wharf location 1 – realignment
- Wharf location 2 – 20 metres east
- Wharf location 3 – 750 metres west.

All three options would be considered a new wharf with location 1 as a replacement of the wharf and would be designed to achieve DDA compliance and/or sustain the long-term operation of the wharf and generally satisfy the Proposal objectives and development criteria.

Additional environmental impacts compared to wharf location 1 (realigning the existing wharf) are; Location 2 would have potential adverse impact on the view and heritage significance of the existing heritage waiting shed from the waterfront; Location 3 would have the greatest potential environmental impacts including land acquisition, transport bus detour, loss of open space and impact on amenity of the local community. These environmental impacts are deemed as to not align with the project objectives.

Wharf location 1 satisfies the objectives and development criteria along with avoiding any unnecessary environmental impacts (e.g. property acquisition and environmentally sensitive areas, lower capital cost). Wharf location 1 was identified as the preferred option.

Table 2.4 summarises the various waterside options with criteria as defined in section 2.4.1.

2.4.4 Analysis of options - landside

Analysis of the identified landside options is provided in the sections below and only evaluated for Wharf location 1 as it was only considered during the key stakeholder workshop. In addition to the ‘do nothing’, three landside options were considered.

Do nothing

The option of ‘do nothing’ would be to limit the scope of work to; carrying out activities consistent with those required to maintain operation of the existing landside facilities, including undertaking regular maintenance. As this option would include minimal change, it would present the lowest capital cost and environmental impact. For example, there would be preservation of heritage views and heritage via the existing waiting shed building.

Although it would present minimal capital cost and environmental impact, the ‘do nothing option’ was discounted as it would not meet the objectives of the Proposal; to improve accessibility, passenger safety and comfort for future patronage over the long-term.

The option of ‘do nothing’ would not achieve DDA compliance and/or sustain the long-term operation of the wharf and therefore did not meet the Proposal objectives.

Landside upgrades

Landside option 1 and 2 are similar in providing accessible car park spaces, kiss and ride, upgraded waiting shed and facilities. The options differ in that option 2 expands on option 1 design. Landside option 1 proposes a new canopy structure in front of the existing waiting shed linked to a new entry portal canopy structure in which marks the wharf address and provides a recognisable place marker to assist wayfinding. For option 2, the design extends the new canopies over the footpaths around the Valentia Street cul-de-sac, to shelter the Kiss and Ride drop off further up the Valentia Street hill and accessible car parking spaces to the east. Both options provide ample weather protection and an entry point that clearly defines the address to the ferry wharf. Canopies would pose as an environmental impact on current view of the harbour, heritage significance and cost.

Landside option 3 maintains the existing landside conditions of accessible car park spaces, kiss and ride and waiting shed and facilities. Upgrades for this option only include waiting shed and toilet amenities to improve accessibility access requirements. This option proves to be the most cost effective landside option while satisfying environmental, visual impact and Proposal objectives compared to landside option 1 and 2; however, provides limited additional weather protection for users beyond the heritage waiting shed and pontoon.

Landside options focus on passenger amenity and access so assessment development criteria related to land use planning and future performance of network are not applicable. Consideration for DDA compliance is included in landside upgrade options. All landside options would introduce new infrastructure compared to existing conditions and would increase maintenance needs.

Table 2.4 summarises the various landside options with criteria as defined in section 2.4.1.

Facilities upgrades

Alongside landside upgrades, two facility options were considered, Option A and Option B.

Option A focuses on refurbishment of existing heritage waiting shed as well as provide upgrades to the existing toilet facilities to provide one DDA compliant toilet. This option also proposes to install bicycle racks with sufficient capacity for ten spaces adjacent to the wharf and jetty entrance. This option would bring facilities to compliance with DDA and reuse existing services.

Option B would include a new toilet facility and restore the existing heritage waiting shed. This option would reinstate the existing heritage waiting shed to its original design and function, upgrade of new services of toilet facilities and restore the heritage significance of the original building. Upgrades of new and separate facility would have a visual impact on views of the park and be costlier than Option A.

Similar to landside option assessment, Proposal objectives and development criteria for facilities option focus on passenger amenity.

Table 2.4: Summary criteria evaluation of options

| Description | | Waterside | | | | Landside | | | Facilities | |
|---------------------|---|------------|------------------|------------------|------------------|----------|------|------|------------|------|
| | | Do Nothing | Wharf location 1 | Wharf location 2 | Wharf location 3 | Op 1 | Op 2 | Op 3 | Op A | Op B |
| Proposal objectives | <u>Improve:</u> <ul style="list-style-type: none"> operations passenger access, safety and comfort seating and waiting areas boarding, disembarking times and queuing | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | <u>Maintain:</u> <ul style="list-style-type: none"> passenger amenity, enjoyment and harbour views pedestrian infrastructure and cycleways | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | ✓ |
| | <u>Reduce:</u> <ul style="list-style-type: none"> maintenance frequency and cost vandalism | - | ✓ | ✓ | ✓ | - | - | - | - | - |
| | <u>Prevent:</u> <ul style="list-style-type: none"> unnecessary environmental and social impacts | ✓ | ✓ | - | - | - | - | ✓ | ✓ | - |

| Description | | Waterside | | | | Landside | | | Facilities | |
|----------------------|--|------------|------------------|------------------|------------------|----------|------|------|------------|------|
| | | Do Nothing | Wharf location 1 | Wharf location 2 | Wharf location 3 | Op 1 | Op 2 | Op 3 | Op A | Op B |
| Development criteria | Meet customer needs and improve transport experience | - | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ |
| | Optimise access to public transport | - | ✓ | ✓ | ✓ | ✓ | ✓ | - | N/A | N/A |
| | Integrate interchange investment with land use plans | - | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A |
| | Anticipate growth and change in demand | - | ✓ | ✓ | ✓ | ✓ | ✓ | - | N/A | N/A |
| | Ensure the sustainability and future performance of the public transport network | - | ✓ | ✓ | ✓ | N/A | N/A | N/A | N/A | N/A |

2.5 Preferred wharf option

The preferred wharf location proposes location 1 as a new wharf with a single restricted sweep berth facility, replacing the existing pontoon and gangway in a realigned position for optimum orientation for ease and efficiency of ferry berthing operations. The wharf would have a new 18 metre x nine metre pontoon and canopy shelter to accommodate a waiting area, seating and information kiosk. The pontoon would be accessed via a new 18 metre uncovered gangway, connected to the reconfigured uncovered shorebridge edge. Refer to Figure 2.2 for site plan of preferred wharf option.

The option to replace the wharf in a similar location was identified as the preferred option as it achieves the Proposal objectives in section 2.3.1 and summarised in Table 2.4. Selection of the preferred wharf option advantages include:

- Improve operation as an effective transport interchange, access for passengers with a disability, passenger safety and comfort, seating, and boarding and disembarking times
- Retains the visual presence of the existing wharf in Valentia Street (e.g. design of an uncovered entrance and gangway to reduce visual impacts)
- Provides superior wharf identity on the Parramatta River
- Preserve existing harbour views from neighbouring properties and the Valentia Street park reserve by locating the new facility in the same general location as the existing wharf
- Maintain unobstructed views to the foreshore escarpment from the harbour.

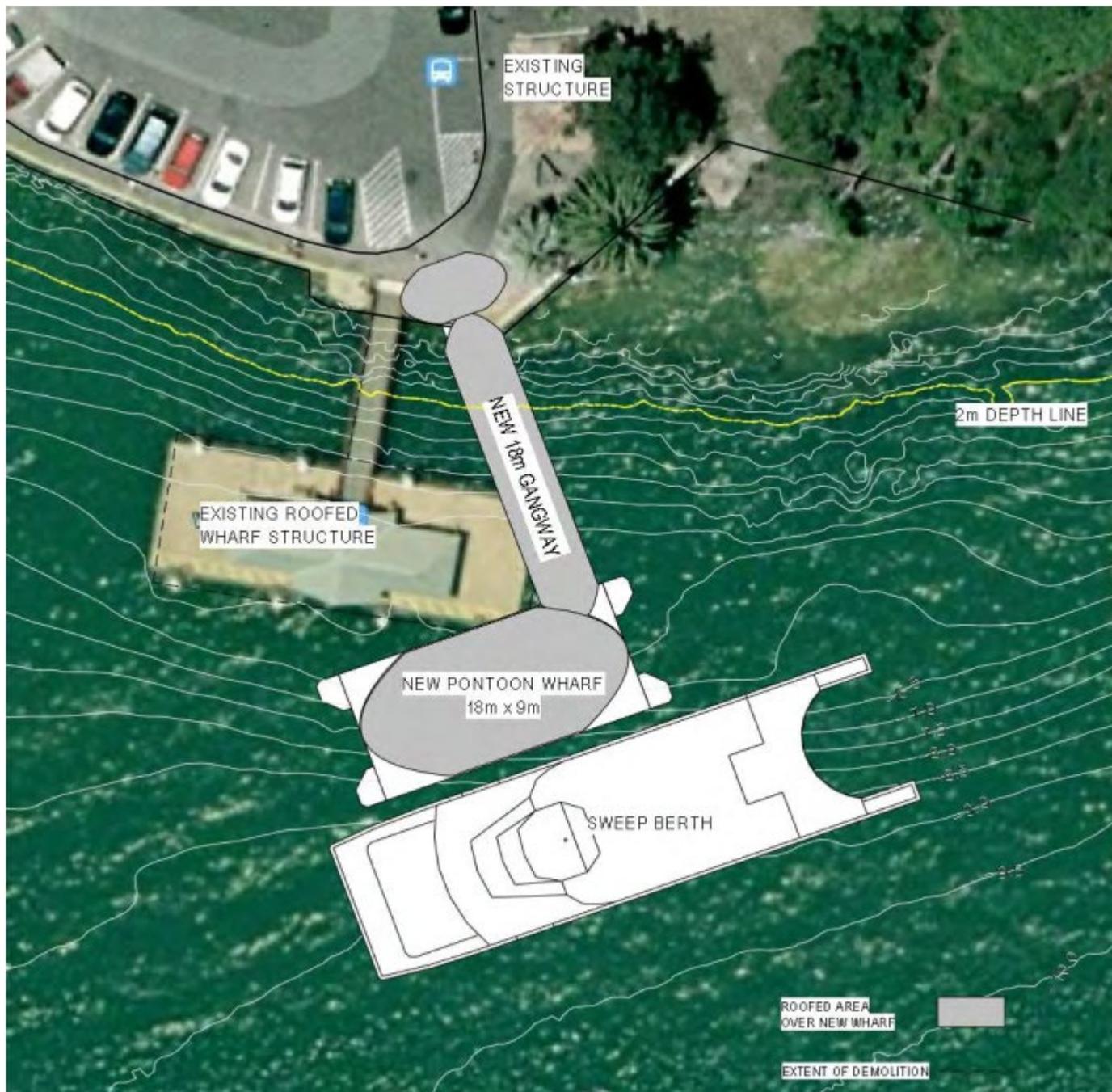


Figure 2.2: Preferred wharf option

2.6 Preferred land based option

The investigation of options for the land based work has been limited due to the selection of the preferred wharf option and preference to avoid unnecessary environmental, property and land use impacts. As such, the land based design was developed to address the identified deficiencies and non-compliances with DDA requirements, as well as meeting the Proposal objectives outlined in section 2.3.

The preferred land based design includes:

- Regrading the pathway from the wharf to accessible car park spaces to comply with DDA requirements
- Upgrading existing parking to include three DDA compliant accessible car parking spaces and two kiss and ride spaces

- Refurbish existing heritage waiting shed and modify to achieve access compliance at the entrance from the footpath and removal of non structural walls to improve accessible flow space
- Installation of five bicycle parking hoops
- Upgrade of toilet amenities to unisex including a DDA compliant unisex amenity
- Enhanced commuter amenity features including upgraded heritage waiting shed and toilets, enhanced connectivity and wayfinding
- Refurbish existing heritage listed item of local significance, the heritage waiting shed. Refer to section 6.8 for details
- Raising of the footpath would be supported by the raising the seawall by a height of about 500 mm and length of about 30 m and placement of rock apron on the seabed in front of the seawall to improve stability.

Preferred facilities option

Option A is the preferred facilities option which proposes to refurbish the existing heritage waiting shed. The existing sandstone and tiled roof shelter building in the park reserve adjacent to the wharf, is of local significance in the Hunters Hill Council heritage building register. Exterior of the building is proposed to be refurbished, with a new timber framed window in character with the appearance of the building, to replace the aluminium framed window.

Upgrade of the toilet facilities and heritage waiting shed facility would achieve DDA compliance with one of the toilets modified as a Unisex Accessible toilet and heritage waiting shed refurbished to improve circulation and accommodate two wheelchair spaces. The footpath outside of the heritage waiting shed to the wharf entry would be regraded to be DDA compliant.

2.7 Design refinements

Once the preferred option was selected, the concept design was updated as an addendum to include design refinements from new stakeholder feedback as part of compliance with Disability Standards for Accessible Public Transport (DSAPT). The preferred option was furthered designed to align more closely with DSAPT objectives. The design was subsequently refined as a result of feedback from Hunter's Hill Council.

2.7.1 Landside modification

Consultation on the preferred concept was carried out in November 2018. After selection of the preferred landside option, the design was modified to include the following elements:

- Re-grading the cul-de-sac near the parking bay area for DDA compliance of the disabled parking spaces and kiss and ride spaces thus requiring to raise the seawall. The existing fence above the seawall upgrade would be replaced
- Upgrade the interchange footpath to be DDA compliant from the bus stop (north of the wharf entrance) to the kiss and ride spaces (west of wharf entrance)
- Removed canopy from the design as its only required when connecting the pontoon from a covered structure
- Removal from original design of handrails for the footpath as re-grading would be sufficiently flat to no longer require handrails.

2.7.2 Seawall modification

Seawall modification works are required to enable compliant access between the footpath and the Wharf. These works required raising of the road level to meet slope requirements, which subsequently require the raising of the seawall. The seawall design is a sandstone seawall extension with half height blockwork which adds about 500 mm height to the existing seawall for a length of about 30 m as shown

3 Description of the Proposal

This chapter describes the Proposal, its design and the construction methods that would be used to build it.

3.1 The Proposal

The Proposal is to upgrade the Woolwich Wharf as part of the TAP.

The waterside features of the Proposal would include:

- Removal of the existing gangway, pontoon and associated wharf structures, including existing piles and gangway
- Installation of a new three-metre wide by 18-metre-long gangway
- Installation of a nine-metre wide by 18-metre-long floating covered and glazed pontoon, held in position by four new piles
- Installation of a new shore bridge to connect landside and waterside elements supported by three piles
- Installation of two new protection piles west of the gangway
- Installation of two pivot piles to assist with berthing.

The landside features of the Proposal would include:

- Three *Disability Discrimination Act 1992* (DDA) compliant accessible car parking spaces, two kiss and ride spaces, DDA compliant toilet, accessible heritage waiting shed, accessible path to the wharf, and five bicycle parking hoops
- Regrading of the cul-de-sac near the parking spaces as well as raising the pavement slab and stone seawall to achieve DDA compliance of car parking spaces and pedestrian footpath.

Figure 3.1 shows the Proposals waterside and landside elements.

Figure 3.2 shows the Proposal footprint.

Plan of proposed new Woolwich Wharf for illustrative purposes

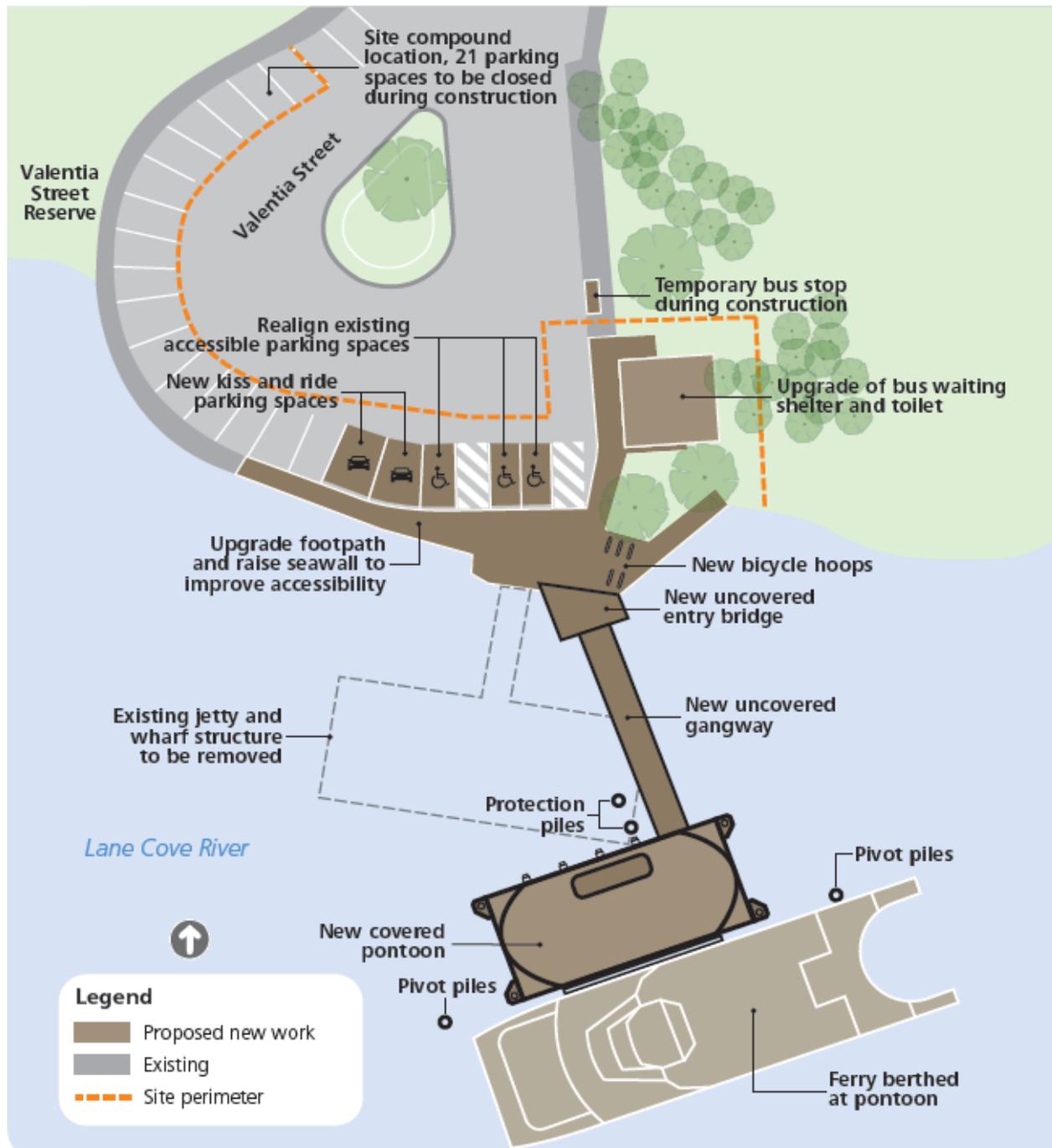


Figure 3.1: Proposal footprint

Source: Roads and Maritime



Figure 3.2 Proposal footprint

3.2 Design

This section describes the Proposal's concept design.

3.2.1 Design criteria

The Proposal has been designed to NSW and Australian maritime engineering and safety standards, including but not limited to the following:

- *Disability Discrimination Act 1992 (DDA)*
- Work, Health and Safety Act 2011 (WHS Act)
- National Construction Code landside and superstructure
- NSW Maritime Engineering Standards & Guidelines for Maritime Structures
- Standards Australia AS4997-2005 Guidelines for the Design of Maritime Structures
- DSAPT and amendments
- Disability (Access to Premises – Buildings) Standards 2010
- AS/NZS 2890.6:2009 Parking facilities – Off-Street Parking for People with Disabilities
- NSW Sustainable Design Guideline for Wharves
- Interchange Places – Design Handbook DRAFT (TfNSW – November 2012)
- Making Interchange Places – Interchange Product DRAFT Strategy (TfNSW – February 2012)
- NSW Government Code of Practice for Procurement
- Work Health Safety (WHS) Management Systems guidelines
- Environmental Management Systems (EMS) guidelines
- Crime Prevention Through Environmental Design (CPTED)
- Wayfinding Planning Guide for Ferry Wharves and Interchanges
- Beyond the Pavement – Urban Design Policy Procedures and Design Principles (Roads and Maritime Jan 2014)
- Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment (EIA-N04) Roads and Maritime March 2013.
- Roads and Maritime: Guidelines for the Assessment of Public Ferry Wharf Safety 2016
- Australian Maritime Safety Authority (ASMA): navigation and safety

The maritime standards describe a summary of the key requirements that should be adopted when building specific maritime structures by providing detail on:

- Overall height above the water to allow operation during extreme low and high tide, while additionally allowing for flooding and climate change adaptation in the future
- Access and safety requirements
- Operation and stability during extreme storms, accounting for wind, wave and current conditions
- Sufficient water depths at extreme low tide to allow ferries to safely berth without the risk of either grounding or causing notable sediment disturbance and scour from propeller wash
- Appropriate materials selection and durability to support the operational design life of the wharf
- Additional safety and security measures consistent with the provisions of Crime Prevention through Environmental Design (DP&E, 2001).

Overall, the wharf has been designed:

- With a 50-year design life
- To cater for low mobility passengers and expected passenger growth in the future
- To operate in all tidal conditions over its life
- To be regarded as an attractive, safe and secure piece of public transport infrastructure.

Figure 3.2 and Figure 3.4 shows a photomontage of the Proposal.



Source: Roads and Maritime

Figure 3.3: Proposed Woolwich ferry wharf - view from waterside



Source: Roads and Maritime

Figure 3.4: Proposed Woolwich ferry wharf - view from landside

3.2.2 Engineering constraints

Table 3.1 lists the main constraints to development and discuss how they have been addressed in the concept design.

Table 3.1: Engineering and development constraints

| Constraint | Concept design provision |
|------------|--------------------------|
|------------|--------------------------|

| Constraint | Concept design provision |
|--|---|
| Heritage values | <ul style="list-style-type: none"> • Ensure the heritage waiting shed is retained and maintained as part of the design • Ensure the design is sensitive to the area's heritage conservation values. |
| Seawall modification | <ul style="list-style-type: none"> • Existing condition of seawall is unknown and confirmed with geotechnical work and excavations. |
| Wind, wave, current, flooding and climate change | <ul style="list-style-type: none"> • The design allows the wharf to be used in all tidal 'states' (i.e. Highest Astronomical Tide (HAT) and Lowest Astronomical Tide LAT, with an additional allowance for flooding and climate change adaptation) • The design has been developed to be resilient to flooding by including pile height designed to enable the structure to remain in position. |

3.2.3 Major design features

This section describes the Proposal's main design features.

Major water based features

Pontoon

The location of the pontoon would be about 20 degrees anti-clockwise to the existing pontoon as a rectangular steel floating pontoon about nine metres wide and 18 m long off the gangway. The pontoon would have one berthing face on its southern side. The pontoon would contain a curved zinc roof, glass and stainless steel balustrades and seating.

The pontoon would be built from pre-fabricated units delivered to site. The pontoon would be held in place by four steel guide piles, drilled and subsequently hammered into the underlying sandstone bedrock. The pontoon height would vary relative to the landfall depending on the state of the tide, with pile heights installed to enable the pontoon to float up and down during flood conditions.

Gangway

The pontoon would be accessed by an 18-metre long and three-metre wide uncovered gangway. The gangway would connect to a concrete headstock, bridge and the floating pontoon. The concrete headstock is 1.2 metres long and up to three metres wide supported by two steel piles and located at the junction of the bridge and the gangway. The gangway would contain lighting and stainless steel balustrades. The gradient of the gangway would vary according to tides. It would allow for disabled and low mobility users for most of the time except during extreme high and low tides, which is consistent with the Transport for NSW Guideline for the Assessment of Public Ferry Wharf Safety (Transport for NSW, 2016). The gangway would be built off site and delivered as one unit to site.

Major land based features

Landside upgrades

- Three DDA compliant accessible car parking spaces including accessible path to the wharf
- Two kiss and ride spaces
- Five bicycle parking hoops
- DDA compliant heritage waiting shed upgrade and two unisex toilets one of which would be accessible
- Accessible path from the bus stop to the wharf
- Refurbishment of existing heritage waiting shed through a new timber framed window
- Seawall and pavement slab to be raised and partial regrade of the cul-de-sac near the parking spaces to provide compliant accessible parking.

- The seawall would be raised by a height of about 500 mm for a length of 30 m. A rock apron would be placed at the base of the seawall about 1.5 m wide by 30 m. Rock and fill would be placed behind the seawall.

Supporting infrastructure

While the details of the supporting infrastructure, lighting, signage, and furniture would be confirmed during the detailed design, they would be consistent with the provisions included on the other wharves on the network. It would therefore include:

- Safety and security lighting on the approaches and throughout the wharf
- Opal Fixed Location Readers (FLRSs) to be installed at the entrance to the wharf at the top of the gangway to enable users to tap on and off
- Safety ladders on the wharf pontoon
- Life ring on the pontoon
- Closed circuit television (CCTV) facing the wharf and bus stop
- Glass weather screen
- Tactile flooring.

The above would be developed in accordance with relevant Roads and Maritime design specifications.

3.3 Construction activities

The appointed contractor would confirm the final construction activities in discussion with Roads and Maritime. As such, this section only indicates a likely method and work plan as it may vary due to; identification of additional constraints before work starts, detailed design refinements, community and stakeholder consultation feedback, and contractor requirements/limitations. Should the work method differ from what is proposed in this REF, Roads and Maritime would determine whether further assessment is needed. Some additional land outside of the construction area would be needed temporarily to support construction amenities and activities, as described in section 3.4. Figure 3.5 shows the overall footprint of the Proposal.

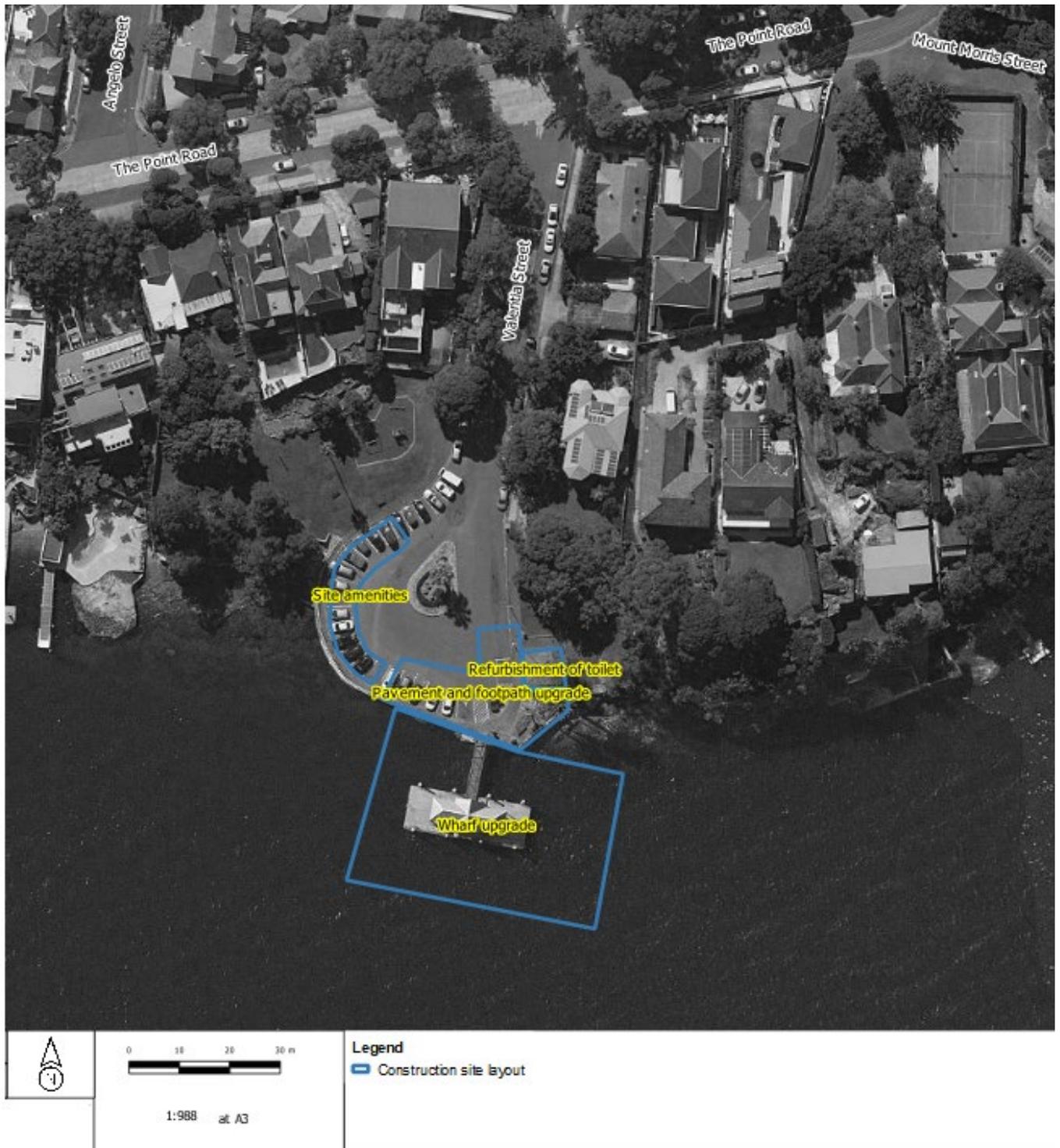


Figure 3.5: Construction site layout

3.3.1 Work methodology

The Proposal would be built under Roads and Maritime specifications as managed by a contractor under a construction environmental management plan (CEMP). These specifications cover environmental performance and management supplemented by aspects such as materials storage and management, and erosion and sediment control. The Proposal would likely comprise a sequence of work activities like that summarised in Table 3.2.

Table 3.2: Construction activities

| Activity | Associated work |
|--|--|
| Site establishment and wharf closure | <ul style="list-style-type: none"> • Obtain leases and licences as required (refer to section 7.3) • Notify the public, public transport companies, local council and other stakeholders before work starts (refer to section 5.7) • Carry out pre-work inspections, pre-condition noise surveys (refer to Chapter 7), and other investigation work • Set out, mark and establish a maritime navigation exclusion zone and no-go zones on land • Establish the site compound and temporary access route(s)/movements • Provide public notices of the wharf closure and the nearest alternatives • Install temporary drainage controls (where needed). |
| Demolition and removal of components of the existing ferry wharf | <ul style="list-style-type: none"> • Dismantle and demolish the existing structure, pontoon and roof gangway using a barge-mounted crane. • Temporary use of jack-ups/anchors during lifting and piling work • Limited earthworks would be required and barged offsite for collection and disposal at a licenced waste management facility unless the waste is classified as non-exempt • Existing wharf, gangway and pontoon would be removed by barge and towed by tug to subcontractors yard for recycling / disposal • Removal of existing ferry wharf distribution board |
| Pile removal | <ul style="list-style-type: none"> • Remove (either fully or cut and cap) the existing piles by crane barge by being pulled and removed from the seabed. |
| Build the new wharf structure | <p>4a: substructure work</p> <ul style="list-style-type: none"> • Drill the new piles for the wharf concrete bridge, pivot, gangway and floating pontoon, and hammer to refusal using equipment mounted to a barge <p>4b: superstructure work</p> <ul style="list-style-type: none"> • Install shorebridge • Install the prefabricated pontoon using a barge mounted crane • Install the prefabricated sections of gangway using a barged mounted crane • Install the supporting infrastructure including barriers and handrails, safety and security facilities, cabling and ducting, water lines, lighting, CCTV, ladders, life buoys, glass shelter weather screens, and tactile flooring. • New communications works installed on the pontoon <p>4c: road and footpath work</p> <ul style="list-style-type: none"> • Demolition and removal of redundant pavement and footpath • Install new roadbase and compact to level. Asphalt and line mark. • Install new concrete footpath to new levels to meet new road pavement. |
| Modification to the existing seawall | <ul style="list-style-type: none"> • Excavation behind the existing seawall • Strengthen seawall with sandstone blocks • Install new drainage behind seawall • Backfill and re-grade pavement to design levels • Placement of rock apron on the seabed in front of existing seawall |

| Activity | Associated work |
|--|---|
| Landside infrastructure (concurrent with building the new wharf structure) | <ul style="list-style-type: none"> • Removal of existing Roads and Maritime communications equipment and signage under existing roofed structure • Install new wayfinding signage around the interchange. • Electrical works would be within the construction footprint, there is some new lighting required in the carpark which needs to satisfy AusGrid requirements as the pavement levels are increasing. • Demolish existing pit lintel and construct new solid cover over existing stormwater pit • Installation of new electrical pillar box and main switch board |
| Site clean-up and opening the upgraded wharf | <p>7a: testing and commissioning</p> <ul style="list-style-type: none"> • Connect power and communications • Re-install opal card readers and television timetable screens • Test and commission all infrastructure. <p>7b: demobilisation</p> <ul style="list-style-type: none"> • Demobilise the site compounds and remove temporary: • Maritime navigation exclusion and no-go zones • Footpath restrictions/closures • Environmental and safety controls (refer to Chapter 7). |

3.3.2 Construction hours and duration

This section describes construction duration of the Proposal and the working hours.

Start date and length of construction

The Proposal would be built over five months. The construction program would also be affected by the need to coordinate with Port Authority of NSW and Hunter's Hill Council.

Working hours

The work would take place within and outside standard working hours. Standard working hours are as follows:

- Monday to Friday, 7 am to 6 pm
- Saturday, 8 am to 1 pm.

For safety reasons the piling, lifting and concrete work in the harbour may need to take place at night when the water is calm and still and the harbour is least busy. Piling is estimated to occur intermittently over a three week period and outside of standard working hours. During piling activities, the following work schedule would be adopted:

- Drilling of piles
 - Setup: 11 pm to 12 am (approximately)
 - Drilling: 12 am to 6 am (approximately)
 - Pack up: 6 am to 7 am. (approximately)
- Hammering of piles
 - Setup: 4 am to 5 am (approximately)
 - Hammering: 5 am to 7 am (approximately).

Pile drilling or hammering, and lifting would take place intermittently during the above periods. On average, a pile would be drilled or hammered for about 10 minutes followed by a relatively quiet period for the next 30 minutes or more before the next stage is progressed.

Due to the requirement for calm water conditions, the new pontoon and gangway would be lifted into position by a barge-mounted crane over a 2 to 3-day period between approximately 11 pm and 7 am.

There may also be a need to undertake after hours work by exception to re-surface the cul-de-sac so that buses may continue to use the turning circle during day time hours. Surrounding residents would be notified at least five days prior to any essential out of hours' work occurring.

3.3.3 Workforce

While about 25 people would be needed to carry out the main construction activities, it is expected that there would be about 10-15 people onsite at any one time on average.

3.3.4 Plant and equipment

The plant and equipment needed to build the Proposal would be typical to any construction site. It would vary depending on the construction activity. The largest and most complex equipment needed would be to lift and install the prefabricated units and undertake the piling work. Table 3.3 indicates the plant and equipment that would be likely used to build the Proposal, however this would be confirmed by the contractor.

Table 3.3: Indicative plant and equipment

| Plant and equipment | |
|---|---------------------------------|
| Waterside construction | |
| Angle grinder | Generator |
| Barge mounted crane | Hand tools (electric) |
| Barge/boat | Light and heavy vehicles |
| Hand tools (electric) | Piling rig (drilling)* |
| Concrete trucks (barge mounted) | Piling rig (hammering)* |
| Compressor | Daymaker* |
| Landside Construction | |
| Backhoe / small excavator (10-20 tonne) | Concrete saw |
| Concrete pump | Concrete trucks (barge mounted) |
| Hand tools (electric) | Jackhammer |
| Asphalt paver | Crane |

*only used at night

3.3.5 Earthworks

There would be limited earthworks associated with the Proposal. No riverbed sediment excavation or dredging would be required.

Landside modifications would have minor earthworks excavations for re-grading of road and footpath upgrade works carried out during the day by civil plant and equipment (e.g. excavators, concrete trucks, trucks and rollers).

Excavation may be required to remove unsuitable material behind the seawall. Suitable rocks and engineering fill would be used for backfill.

3.3.6 Source and quantity of materials

Various standard construction materials that are readily available across the Sydney Metropolitan region would be needed to build the Proposal. They would be shipped (barged) to site as prefabricated units ready for installation, or delivered in small quantities for use as needed (refer to section 3.3.6). The main materials needed to build the Proposal would comprise:

- Marine-grade steel, aluminium and zinc for the superstructure (floating pontoon, wharf gangway, barriers and roof) and substructure
- Precast concrete (25 m²)
- Asphalt pavement (300 m²)
- Concrete path (180 m²)
- Seawall backfill material (up to 100 m³)
- Prefabricated signage, light fittings, barriers and fencing
- Prefabricated glazing units
- Electrical cabling and other electronic infrastructure
- Additional materials such as relatively small quantities of paint, oils, fuels and other materials.

3.3.7 Traffic management and access

Maritime and road traffic management would be required while certain elements of the Proposal are being built and installed. Access through the cul-de-sac and turning circle would remain open. Carparking in the cul-de-sac would not be available as the carparks are required for construction activities. The wharf would be closed during construction.

No private property access would be impacted during construction.

Construction traffic

Most materials and equipment for waterside elements of the Proposal would be shipped (barged) into and out of the area to limit any impact on Valentia Street and surrounds and provide the best method to build the marine components. Public parking would be closed during construction and only construction personnel are anticipated to travel to the site by road.

The marshalling and storage of most equipment, plant and materials, and the pre-fabrication of parts, pre-casting of headstocks and fit outs, would be carried out by a contractor at an offsite facility. Construction and demolition activity would be undertaken from barges on the water and from the landside. Access would be from the road to the wharf and barges are expected to be anchored over night for the duration of construction. Waterside construction contractors would generally arrive at the site via water with only minimal vehicle access to the site required. A maximum of five heavy vehicles for construction and maximum of 10 light and heavy vehicles for deliveries. Road delivery for landside items would be for components like site sheds, fencing, hoarding, concrete, road base, asphalt and civil equipment.

The Proposal would require the Woolwich Wharf to be closed to all ferries, water taxis and other vessels/watercraft for the duration of construction to enable the works to be carried out and would be re-opened of these vessels on completion of construction.

Table 3.4 summarises the expected construction traffic associated with building the Proposal.

Table 3.4: Construction traffic (weekly average)

| Delivery method | Vehicle (weekly average) | Typical travel patterns and limitations |
|------------------------------|--------------------------|---|
| | Average | |
| Waterside site - deliveries | 5 – 10 | Regular movements throughout the day |
| Landside site – construction | 5 | |
| Landside site – deliveries | 10 | |

3.4 Ancillary facilities

It is likely that a temporary compound site would be established including site sheds, amenities, and storage containers for tools and some materials. The compound site would be located to the immediate west of the existing wharf entrance (see Figure 3.5).

Barge delivery is expected for water equipment and materials like major machinery, equipment and prefabricated units.

3.5 Public utility adjustment

The Ausgrid light near the current disabled carparks would need to be removed temporarily and reinstated on the new pavement. A new Ausgrid light may be required. Storm water drain outlets would also need to be raised with the new footpath. No additional utilities would need adjusting, relocating or installing under the Proposal. Any final protection requirements that may be required would be confirmed during the detailed design.

3.6 Property acquisition

No property acquisitions are expected under this Proposal. The additional land needed to support construction would be used under agreement with the Hunter’s Hill Council.

4 Statutory and planning framework

This chapter provides the statutory and planning framework for the Proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State environmental planning policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State,

Clause 68(4) of ISEPP permits development for the purpose of wharf or boating facilities may be carried out by or on behalf of a public authority without consent on any land. However, such development may be carried out on land reserved under the *National Parks and Wildlife Act 1974* only if the development is authorised by or under that Act.

As the Proposal is for the purpose of a wharf or boating facility and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from Council is not required. The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974*.

The Proposal does not affect land or development affected by *State Environmental Planning Policy (Major Development) 2005*.

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) identifies State significant infrastructure and critical State significant infrastructure.

Clause 14(1) of the SRD SEPP declares a development to be State significant infrastructure if the development is, by the operation of a State environmental planning policy, permissible without development consent and the development is specified in schedule 3 of the SEPP.

Schedule 3 specifies that development for the purpose of port and wharf facilities or boating facilities (not including marinas) delivered by or on behalf of a public authority that has a capital investment value of more than \$30 million is State significant infrastructure.

The Proposal has a capital investment value of less than \$30 million so does not become State significant infrastructure as declared by the SRD SEPP.

State Environmental Planning Policy (Coastal Management) 2018

The Coastal Management SEPP aims to update and consolidate into one integrated policy, a series of previous SEPPs including *State Environmental Planning Policy 14 (Coastal Wetlands)*, *State Environmental Planning Policy 26 (Littoral Rainforests)* and *State Environmental Planning Policy 71 (Coastal Protection)*. The Coastal Management SEPP gives effect to the objectives of the new *Coastal Management Act 2016* from a land use planning perspective, specifying how development Proposals are to be assessed if they fall within the coastal zone.

The Proposal does not fall within land identified as coastal wetlands under clause 10 of the Coastal Management SEPP. As such, the provisions of the Coastal Management SEPP have not been considered further.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The Proposal is located within the Sydney Harbour Catchment and is subject to the *Sydney Regional Environmental Plan 2005* (Sydney Harbour SREP), which is a deemed SEPP. The aims of the Sydney Harbour SREP from clause 2 are considered in Table 4.1 below.

Table 4.1: Aims of the Sydney Harbour SREP

| Aim | Comment |
|---|---|
| <p>(a) To ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained:</p> <p>(i) As an outstanding natural asset</p> <p>(ii) As a public asset of national and heritage significance, for existing and future generations.</p> | <p>Chapter 7 of this REF includes safeguards to protect and maintain the area's natural and heritage values, including those associated with the existing wharf (refer to section 6.8). This would ensure the values of Sydney Harbour are recognised, protected, enhanced and maintained.</p> |
| <p>(b) To ensure a healthy, sustainable environment on land and water.</p> | <p>Providing relevant standard controls are implemented and monitored, as set out in Roads and Maritime guidelines (refer to section 7), the Proposal's environmental impact is expected to be minimised.</p> |
| <p>(c) To achieve a high quality and ecologically sustainable urban environment.</p> | <p>The Proposal's urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements. The design also provides thematic consistency across the entire network (refer to section 3). Both factors provide for a sustainable urban environment over its 50-year design life.</p> |
| <p>(d) To ensure a prosperous working harbour and an effective transport corridor.</p> | <p>With a 50-year design life, the Proposal would allow for the operation of a ferry wharf at Woolwich for future generations. The work also forms part of a network-wide upgrade program to help sustain the ferry service in its role as part of an effective and integrated transport corridor and system.</p> <p>The wharf would be closed for five months, during the demolition of the old wharf and construction of the new wharf. It is anticipated that bus transport would remain operational. The turning circle would remain functional for bus traffic, but would be space-constrained during construction. Possible short interruptions may occur depending on the nature of construction work being undertaken.</p> <p>Users would be notified of the proposed closure ahead of time as detailed in Chapter 5.</p> |
| <p>(e) To encourage a culturally rich and vibrant place for people.</p> | <p>The Proposal would continue to provide Woolwich residents with access to the ferry network and interchange with other public transport provisions.</p> <p>This would sustain Woolwich as a vibrant place to live.</p> |
| <p>(f) To ensure accessibility to and along Sydney Harbour and its foreshores.</p> | <p>The Proposal would ensure that Woolwich residents and other users are provided with ongoing access to Sydney Harbour and its foreshore areas over the next 50 years. It would also improve access for low mobility passengers.</p> <p>Ferry transport would be suspended via this wharf for five months during construction. It is anticipated that bus transport would remain operational. The turning circle would remain functional for bus traffic, but would be space-constrained during construction. Possible short interruptions may occur depending on the nature of construction work being undertaken.</p> |

| Aim | Comment |
|---|--|
| (g) To ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity. | The Proposal would have no significant impact on notable terrestrial or marine environments or values in the area. Additional standard controls would be implemented to prevent any indirect impact on the wider ecological environment from spills and sediment disturbance, mobilisation and smothering. |
| (h) To provide a consolidated, simplified and updated legislative framework for future planning. | The Proposal is being delivered under the relevant planning provisions covering waterfront and marine development set at a State and Commonwealth level. |

The Proposal has been considered in respect of the objectives from clause 17 of the Sydney Harbour SREP zone W1 (Maritime Waters) in which the Proposal is located, in Table 4.2.

Table 4.2: Zone W1 Maritime Waters objectives

| Objective | Comment |
|---|---|
| (a) To give preference to and protect waters required for the effective and efficient movement of commercial shipping, public water transport and maritime industrial operations generally. | <p>Navigational exclusion zones would be installed while the work is taking place, and the wharf would close for five months during construction.</p> <p>No commercial shipping or other boat movements occur within the Parramatta River at Woolwich, and no significant impacts are anticipated.</p> <p>The Harbour Master and Ports Authority would be consulted during the works.</p> |
| (b) To allow development only where it is demonstrated that it is compatible with, and will not adversely affect the effective and efficient movement of, commercial shipping, public water transport and maritime industry operations, | <p>Navigational exclusion zones would be installed while the work is taking place.</p> <p>The wharf would close for six months during construction, which would prevent Transdev Sydney Ferries and other marine vessels from using the Woolwich Wharf.</p> <p>The Harbour Master and Ports Authority would be consulted during the works.</p> |
| (c) To promote the equitable use of the waterway, including use by passive recreation craft. | <p>Minor disruption would be caused during construction, which would be communicated to water users before starting work.</p> <p>The Proposal would upgrade the existing wharf at Woolwich allowing for more effective and efficient public water transport for its 50-year design life.</p> |

Under clause 18 of the Sydney Harbour SREP, the Proposal is permissible as a public water transport facility, with consent in the W1 zone. In any case, the development is permissible without development consent pursuant to the provisions of the ISEPP which override the zoning provisions of the Sydney Harbour SREP (see clause 7(5) of the Sydney Harbour SREP).

The matters for consideration listed in Division 2 at clauses 21-27 of the Sydney Harbour SREP are provided in Table 4.3.

Table 4.3: Clause 21 to Clause 27 matters

| Division 2 matter | Comment |
|---|--|
| Clause 21: biodiversity, ecology and environment protection | Chapter 6 describes the terrestrial and aquatic environmental impacts associated with the Proposal. With the implementation of the environmental management measures, impacts would be minimised and/or managed. |
| Clause 22: public access to, and use of, foreshores and waterways | The wharf would close for five months during the construction period. Additionally, access to the foreshore would be partially impeded by the landside works and modification of the seawall over this period (refer to section 6.7). The local community and ferry passengers would be notified ahead of work starting that would affect the above areas. |
| Clause 23: maintenance of a working harbour | The upgrade would ensure that Woolwich residents and other users would be provided with access to a ferry service (and public transport) over the next 50 years. |
| Clause 24: interrelationship of waterway and foreshore uses | The upgrade would retain the heritage, social and cultural association of a wharf in this location. |
| Clause 25: foreshores and waterways scenic quality | Upgrading the wharf in a similar location as the existing wharf would prevent the visual impact of introducing infrastructure in a new location, including any impact on areas zoned as 'scenic waters'. However, there would be a minor adverse visual impact from increasing the mass, scale, form, composition, design and structure of the wharf, as discussed in section 6.2. |
| Clause 26: maintenance, protection and enhancement of views | Section 6.5 describes the landscape character and visual impacts associated with the Proposal. As described above, the upgrade would have a minor visual impact for the surrounding properties that overlook this part of the river. However, the overall impact is likely to be less compared to building a new structure in a different location. |
| Clause 27: boat storage facilities | There is no boat storage work associated with, or impacted by, the Proposal. |

Clause 31 of the Sydney Harbour SREP requires consultation for certain development Proposals not requiring development consent. Consultation, including under the Sydney Harbour SREP, is discussed in chapter 5 of this REF.

Heritage provisions

Part 5 of the Sydney Harbour SREP contains heritage provisions that are to be taken into account in respect of Division 5.1 activities. Heritage items near the Proposal include:

- 'Valencia Street Wharf'
- 'House'
- 'Stone Walls'
- 'House "Drayton", formerly "Valentin"'
- 'House, "Comus villa"'
- 'House, "Cora Lyn"'
- 'The Peninsula'

Heritage items are discussed further in section 6.8. The heritage objectives from the Sydney Harbour SREP in clauses 53(1) and (2) are considered in Table 4.4 below.

Table 4.4: Heritage objectives

| Objective | Comment |
|-----------|---------|
|-----------|---------|

| Objective | Comment |
|---|---|
| 1(a): to conserve the environmental heritage of the land to which this Part applies. | Overall, it is considered that the construction of a new wharf in the proposed new location would safeguard the heritage significance of the location as a ferry wharf precinct (refer to section 6.8). |
| 1(b): to conserve the heritage significance of existing significant fabric, relics, settings and views associated with the heritage significance of heritage items. | As above, the Proposal has been designed for a 50 year lifespan to preserve the heritage and conservation values of surrounding heritage items including the Valentia Street Wharf precinct and waiting shed. |
| 1(c): to ensure that that archaeological sites and places of Aboriginal heritage significance are conserved. | As described in section 6.8 the Proposal would avoid impact on known archaeological sites or places of Aboriginal heritage. No Aboriginal archaeological items are identified. |
| 1(d): to allow for the protection of places which have the potential to have heritage significance but are not identified as heritage items. | There is almost little to no potential for <i>in situ</i> sites to exist in the vicinity of the study area, due to its highly disturbed nature. |
| 2(a) To establish a buffer zone around the Sydney Opera House so as to give added protection to its world heritage value | The Proposal is not located within the Sydney Opera House buffer zone. |
| 2(b) To recognise that views and vistas between the Sydney Opera House and other public places within that zone contribute to its world heritage value. | The Proposal would not impact on the views and vistas from the Sydney Opera House. |

Clause 54 to Clause 60 of the Sydney Harbour SREP provide for the protection of heritage items and places, including requirements for development consent. Due diligence assessment of the Stage 1 Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) for the Proposal was prepared in accordance with Clause 54 to Clause 60 of the Sydney Harbour SREP and provided on November 12, 2013. As noted above, the Proposal would have neutral or lesser impact on heritage items and it would not impact on known archaeological sites or places of Aboriginal heritage. As such, there is no need to either seek permission or secure development consent for the work on heritage-related grounds.

Wetland protection

Part 6 of the Sydney Harbour SREP relates to wetlands protection. The site is identified as being located within a Wetland Protection Area under the SREP and would have potential impacts. Works identified in the Sydney Harbour SREP with potential impacts include public water transport facilities, reclamation and seawalls. Consultation would be required with the Foreshores and Waterways Development Advisory Committee and Minister for Primary Industries. The wetlands objectives from the Sydney Harbour SREP consultation are identified in Chapter 10.

4.1.2 Local Environmental Plans

Hunters Hill Local Environmental Plan 2012

The landside component of the Proposal is located within the Hunters Hill local government area (LGA). Local development control and land use zoning and planning in this LGA is currently governed under the Hunters Hill local environmental plan 2012 (LEP).

As stated above, Clause 68(4) of ISEPP permits the development of public ferry wharves to be carried out by or on behalf of a public authority without consent. As development without consent, the Proposal is not subject to local environmental planning policy or development control. However, the LEP is useful in identifying the Proposal's consistency with its land use and planning policy as described in Table 4.5.

Table 4.5: Relevant Hunters Hill LEP land use zoning policies

| Objectives | Proposal consistency |
|--|--|
| <p>R2 – Low Density Residential: covering the wharf interchange, parking spaces and additional houses along Valentia St</p> | |
| <ul style="list-style-type: none"> • To provide for the housing needs of the community within a low density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents. • To maintain the identity of Hunters Hill by ensuring that new buildings are compatible with the garden suburb character and heritage values that distinguish the low density localities. • To provide for high levels of amenity that are consistent with a low density residential environment. | <ul style="list-style-type: none"> • Has no direct impact on the area's residential function • Provides ongoing access to the ferry network for Woolwich residents after construction therefore meeting their day-to-day travel and community needs. |
| <p>RE1 – Public Recreation: covering heritage waiting shelter, toilet and additional bike racks</p> | |
| <ul style="list-style-type: none"> • To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes. | <ul style="list-style-type: none"> • No significant loss of recreational land • Enhanced recreational amenities of additional bike racks and improved facilities • Short-term access restrictions during wharf construction. |

4.2 Other relevant NSW legislation

Table 4.6 lists the NSW legislation relevant to the Proposal or the land on which the Proposal would be built.

Table 4.6: Other relevant NSW legislation

| Legislation and application | Relevance to the Proposal and further requirements |
|---|--|
| <p>National Parks and Wildlife Act 1974: provides for the protection of Aboriginal heritage values, national parks and ecological values. Makes it an offence to harm Aboriginal objects, places or sites without permission</p> | <p>The due diligence assessment contained within Appendix G concludes that Aboriginal objects are not likely to be harmed, thus an Aboriginal heritage impact permit (AHIP) from OEH under Part 6 of this Act is not required for the Proposal.</p> <p>Section 6.9 provides further discussion.</p> |
| <p>Heritage Act 1977: provides for the protection of conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. Makes it an offence to harm any non-Aboriginal heritage values without permission</p> | <p>The Proposal include works to local heritage item Valentia Street Wharf and waiting shed with works limited for the interior of the building and temporary signage removal of Valentia Street Wharf.</p> <p>Impacts are neutral and there is a low potential to impact other historical archaeological resources.</p> <p>Seawall modifications would not require demolition and impacts are assessed as low-medium potential to affect historical archaeological resources.</p> |
| <p>Roads Act 1993: provides for the construction and maintenance of public roads. Requires consent to dig up, erect a structure or carry out work in, on or over a road</p> | <p>The Proposal may undertake roadwork within Valentia Street, and would therefore require a road closing permit from Hunters Hill Council.</p> |
| <p>Fisheries Management Act 1994: provides for the protection of fishery resources and values for current and future generations. Makes it an offence to harm fisheries and resources without an appropriate assessment, inclusion of safeguards and/or the appropriate permissions to carry out certain work.</p> | <p>The aquatic ecology assessment (refer to section 6.3) carried out to support the REF, concluded that the Proposal would trigger the need for a permit to Harm Marine Vegetation however consultation with DPI Fisheries has confirmed that no permit is required..</p> <p>Appropriate erosion and sediment control are to be used during construction to minimise turbidity impacts in the waterway.</p> <p>The modified seawall design would require notification under s199 reclamation works for the rock apron with the following conditions. Outcomes of consultation with DPI fisheries noted that no objections were raised.</p> |
| <p>Biodiversity Conservation Act 2016: replaced the <i>Threatened Species Conservation Act 1995</i>, <i>Native Vegetation Act 2003</i> and part of the <i>National Parks and Wildlife Act 1974</i> from 25 August 2017.</p> <p>The Act provides for a strategic approach to conservation in NSW.</p> <p>It includes provisions risk-based assessment of native plant and animal impacts, including a Biodiversity Assessment Method (BAM) to assess the impact of actions on threatened species, threatened ecological communities and their habitats.</p> | <p>Under the BC Act, an assessment of significance must be completed to determine the significance of impacts to threatened species, populations and/or communities or their habitat. There are unlikely to be any threatened species, populations or communities within the Proposal, therefore, no impact is expected and an assessment of significance has not been triggered.</p> <p>As no native terrestrial vegetation would be cleared, or harmed, the Proposal does not require further assessment under the Biodiversity Assessment Method.</p> <p>Refer to section 6.3 for detailed assessment.</p> |

| Legislation and application | Relevance to the Proposal and further requirements |
|--|--|
| <p>Protection of the Environment Operations Act 1997: focuses on environmental protection and provisions for the reduction of water, noise and air pollution and the storage, treatment and disposal of waste. Introduces licencing provisions for scheduled activities that are of a nature and scale that have a potential to cause environmental pollution. Also, includes measures to limit pollution and manage waste.</p> | <p>The Proposal would not involve undertaking or carrying out a scheduled activity. As designs are developed, Roads and Maritime would undertake further consultation with the NSW Environmental Protection Agency (EPA) to determine if additional measures are required, potentially including a licence (non-scheduled activity) for the Proposal under section 122 of the Protection of the Environment Operations Act 1997 (POEO Act).</p> <p>If standard controls set out in Roads and Maritime guidelines and quality assurance specification are implemented and monitored, there is unlikely to be any material water, noise or air pollution impact (refer to Chapter 7). Appropriate waste management controls would be introduced to classify, store, transport, and dispose of all construction and work-generated waste.</p> |
| <p>Marine Pollution Act 2012: sets out provisions to prevent pollution in the marine environment.</p> | <p>The Proposal is unlikely to result in any oil, noxious liquid, pollutant, sewage or garbage discharge as controlled under this Act, providing relevant standard controls are implemented and monitored (refer to Chapter 7).</p> |
| <p>Ports and Maritime Administration Regulations 2012: requires Harbour Master permission to alter any structure or disturb the harbour floor within Sydney Port.</p> | <p>Woolwich Wharf does not fall within the definition of Sydney Harbour under the <i>Ports and Maritime Administration Regulations 2012</i> as it is not within four nautical miles from the Hornsby Lighthouse.</p> |
| <p>Marine Safety Act 1998 and Marine Safety Regulation 2016: sets out the requirements for marine safety and the roles of the Harbour Master and marine pilots. Includes provisions relating to marine and navigational safety including: collision prevention, spill limits, no-wash zones, shipping operation restrictions, and controls on reckless, dangerous or negligent navigation.</p> | <p>A navigational exclusion zone would be installed while the work is taking place. This would include updating the Harbour Master and Ports Authority.</p> |

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) a referral is required to the Australian Government for proposed “actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land”. These are considered in Appendix B and Chapter 6 of the REF.

The assessment of the Proposal’s impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the Proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

4.3.2 Disability Discrimination Act 1992

The above Act includes provisions to prevent discrimination based on ability, while also providing equal rights and access for all people. This was supplemented in 2002 by the Disabled Standards for Accessible Public Transport, which were introduced to allow public transport operators and providers to “remove discrimination from public transport services”. The standards provide detailed information on how transport infrastructure should be designed and built to provide disabled access. In NSW, this has been adopted as the Transport Access Program, with the Proposal being designed to comply with the provisions of the above Act.

The Proposal includes upgrading of the wharf and interchange to be DDA compliant.

4.4 Confirmation of statutory position

The Proposal is categorised as development for the purpose of a wharf and is being carried out by or on behalf of a public authority. Under Clause 68 (4) of the ISEPP, the Proposal is permissible without consent. Accordingly, Roads and Maritime is the determining authority for the Proposal, with this REF fulfilling the obligation under section 5.5 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Consultation

This chapter discusses the consultation carried out to date and any future proposed consultation.

5.1 Consultation strategy

Roads and Maritime has prepared a community consultation and stakeholder engagement plan for the Proposal in accordance with the International Association for Public Participation Spectrum (IAP2, 2007) and the Stakeholder Engagement Toolkit (Roads and Maritime, 2015). The overall objectives are:

- To keep the local community and other key stakeholders regularly informed
- To provide the community and stakeholders with regular and targeted information to build awareness
- To be transparent in all that we do
- To encourage participation from communities and other stakeholders
- To listen to feedback, investigate suggestions and report back
- To engage in a manner that is collaborative, innovative, adaptive and sustainable
- To increase stakeholder understanding of the program and its objectives
- To ensure that community and stakeholder enquiries are managed and resolved effectively
- To ensure that project information is distributed in an effective and timely manner.

5.2 Community involvement

A community information session would be organised in Hunters Hill during the REF display period.

The purpose of the information session would be to gain community feedback to help Roads and Maritime understand views about the existing facilities and priorities for improvement. It would also allow Roads and Maritime to explain the possible options for upgrading the existing facilities at Woolwich. This process would assist Roads and Maritime to develop the design.

5.3 Aboriginal community involvement

Aboriginal heritage impacts have been considered under the four-stage PACHCI process. The PACHCI is outlined in Table 5.1 below.

Table 5.1: Summary of Roads and Maritime PACHCI stages

| Stage and description | Consultation |
|--|---|
| Stage 1: initial assessment | An internal Roads and Maritime assessment to determine whether a project is likely to affect Aboriginal cultural heritage. |
| Stage 2: a preliminary external assessment | Including a site survey and further assessment to determine whether a project requires Part 6 approval from the NSW Office of Environment and Heritage under the <i>National Parks and Wildlife Act 1974</i> . |
| Stage 3 | If a Part 6 approval is required, Aboriginal community consultation and investigation is required. Preparation of cultural and archaeological assessments to be completed with the involvement of the Aboriginal community. |
| Stage 4 | Implementation of the assessment recommendations. |

Stage 1 of the PACHCI process was completed for the Proposal, which confirmed that there is unlikely to be any effect on Aboriginal cultural heritage (refer to section 6.9).

Impacts to items of Aboriginal significance are not anticipated for the Proposal (refer to section 6.9).

The Roads and Maritime Aboriginal Cultural Heritage Advisor (ACHA) has issued Stage 1 clearance letter for the Proposal in accordance with PACHCI, included with Appendix G. An AHIP under the *National Parks and Wildlife Act 1974* is not required for the Proposal.

5.4 ISEPP consultation

Under the provisions of Part 2 of ISEPP, Roads and Maritime is required to notify local councils and other relevant Government agencies where development has the potential to impact on assets or environmental values managed by these authorities. These issues are identified through the checklist included as Appendix C. In the case of the Proposal, it triggers the notification requirements under Clause 13, 14 and Clause 16 of ISEPP as it:

- Would involve the installation of a temporary structure in the form of the construction compound
- Would involve affecting a local heritage item.
- Would involve works within the foreshore area.

Roads and Maritime has been consulting with The Hunter's Hill Council since 2015 to develop a design which is acceptable to Hunter's Hill Council as owners and operators of the landside elements of the Proposal. Formal ISEPP letters were issued for the Proposal in July 2019 to Hunter's Hill Council, DPI&E Property NSW, Foreshore and Waterways Planning and Development advisory committee, Ausgrid and Sydney Water. No responses have been received from these identified agencies at the time of publication.

5.5 Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 notification

The Foreshores and Waterways Planning and Development Advisory Committee and relevant utility authorities have been consulted about the Proposal as per the requirements of clause 31 of the Sydney Harbour SREP. Appendix C contains a Sydney Harbour SREP consultation checklist that documents how the SREP consultation requirements have been considered.

No issues have been raised as a result of this consultation at the time of publication.

5.6 Government agency and stakeholder involvement

Key Government agency and public authority consultation was used to develop the options and concept design. It was also used to scope the environmental assessment. This involved written correspondence, meetings and workshops. The following key stakeholders were consulted through this process:

- Transport for NSW
- Transdev Sydney Ferries
- Hunters Hill Council
- Emergency services
- Community groups
- Port Authority of NSW

Table 5.2 defines key stakeholders with relevant interests of issues as related to this Proposal:

Table 5.2 Stakeholder list

| Stakeholder group | Stakeholder | Interests |
|-------------------------|---|--|
| State government | Minister for Transport – Andrew Constance | <ul style="list-style-type: none"> Community complaints Media enquiries Project impacts |
| | Member for Lane Cove – Anthony Roberts | |
| Local government | Hunter’s Hill Council | <ul style="list-style-type: none"> Project impacts and design Community concerns Construction progress |
| Other government bodies | Cockatoo Island and Harbour Trust | <ul style="list-style-type: none"> Impacts on travel to and from Cockatoo Island from Woolwich |
| Transport operators | Transdev Sydney Ferries | <ul style="list-style-type: none"> Impacts on construction on transport operations including bus operation to the wharf Wharf design Scope of the project |
| | STA | |
| Local schools | Marists Sisters College, Woolwich | <ul style="list-style-type: none"> Construction impacts on bus routes Wharf design Wharf closure for construction Scope of the project |
| | Hunters Hill High School | |
| | St Joseph’s College, Hunters Hill | |
| | Hunters Hill Public School | |
| | Hunters Hill Pre School | |
| Local churches | St Peter Chanel | <ul style="list-style-type: none"> Wharf closure for construction – many weddings are held at these churches. |
| | Hunter’s Hill Anglican Parish | |
| Medical facilities | Hunter’s Hill private hospital | <ul style="list-style-type: none"> - |
| Local business | Hunters Hill Sailing Club | <ul style="list-style-type: none"> Wharf closure for construction Wharf design Project scope Noise associated with construction |
| | Deckhouse | |
| | Woolwich Dock | |
| | Woolwich Marina | |
| | Woolwich Pier Hotel | |
| | Iron Wood Coffee Company | |
| | Cucinetta | |
| | IRT Woolwich | |
| | Hunters Hill Tennis Club | |
| | Bistro 54 | |
| | Ottimo Italian Kitchen | |

| Stakeholder group | Stakeholder | Interests |
|-------------------|------------------------------------|--|
| | Le Village | |
| | Hunters Hill Club | |
| | Hunters Hill Hotel | |
| | Sydney hospital Stays | |
| | Vienna Cottage | |
| | McGrath Estate Agents Hunters Hill | |
| | The Village Florist | |
| | The lost and found department | |
| | Parker Time | |
| Interest groups | Ferry users | <ul style="list-style-type: none"> • Wharf closure for construction • Wharf design • Scope of the project • Noise associated with construction • Construction impacts on bus routes |
| | Local community | |
| | Rowing NSW | |
| | Discover Hunters Hill | |
| | Friends of Kelly's Bush | |
| | Harbour Sculpture | |
| | Disability groups | |

5.7 Ongoing or future consultation

5.7.1 Response to submissions

This REF would be placed on public display for comment by Government agencies, stakeholders and the community. Following the public display period, Roads and Maritime would collate and consider the submissions received then determine whether the Proposal should proceed as described or whether any changes are required. It would also decide if any additional environmental assessment, safeguards or management measures are needed.

This REF would be placed on public display for comment by Government agencies, stakeholders and the community as part of the consultation strategy. Hard copy versions would be made available at:

- Hunter's Hill Council, 22 Alexandra Street, Hunters Hill, NSW 2110
- Roads and Maritime Services, 20-44 Ennis Road, Milsons Point NSW 2059

A community information drop-in session will be held at Garibaldi Village Square where members of the project team will be available to provide information about the project. There will be no formal presentation. Details of the information session are provided below:

- Where: Garibaldi Village Square, 37 Alexandra Street Hunters Hill, NSW 2110
- When: Saturday 19 October 2019 between 10 am and 12 pm

A submissions report would be published, which would respond to comments received. Roads and Maritime would notify those who made submissions and distribute a community update. The update would summarise the submissions report process and the actions Roads and Maritime took to address these comments. Detailed design and pre-construction consultation would be ongoing.

If the Proposal is approved, the community consultation and stakeholder engagement plan would be updated to support the detailed design and pre-construction stages to ensure:

- There would be provision for emergency vehicle access while the Proposal is being built
- Any necessary traffic management and maritime navigation controls would be developed to reduce impacts
- Suitable and appropriate environmental safeguards and management measures are made to account for design changes and refinements
- The work is scheduled to avoid conflicts with other projects that are being developed in the area at the same time (refer to section 6.13).

5.7.2 Construction consultation

The appointed work contractor(s) would also be required to consult with the local community before and while the Proposal is being built. This process would be managed through the construction environmental management plan (CEMP, refer to section 3.3.1). It would include:

- Issuing notices before starting work and relaying information on traffic management and maritime navigation controls, out of hours works, temporary access restrictions, and planned noisy activities
- Undertaking door-knocking with affected residents
- Undertaking ongoing consultation with affected parties comprising meetings, letter-drops, posters and notifications.

In addition, Roads and Maritime would:

- Provide regular website updates
- Make a 24-hour project information line available while implementing its complaints handling and management process (refer to Chapter 7).

6 Environmental assessment

This chapter provides a detailed description of the potential environmental impacts associated with the Proposal's construction and operation. All aspects of the environment potentially impacted upon by the Proposal are considered. This includes consideration of the factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under clause 228 (1) of the Environmental Planning and Assessment Regulation 2000 and the Marinas and Related Facilities EIS Guideline (DUAP 1996). The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate against identified potential impacts.

6.1 Land surface and hydrology

This section describes the hydrodynamic and physical environmental impacts on the aquatic and terrestrial environment associated with the Proposal.

6.1.1 Methodology

Water based

Published mapping and data were used to define the hydrodynamic and physical characteristics of the aquatic environment. This included:

- Hydrographic and bathymetric mapping and data, including navigational charts
- Parramatta River Estuary Data Compilation and Review Study (Cardno, 2008)
- NSW Tide Tables (Bureau of Meteorology, 2019)
- Stage 2 Contamination Assessment (Coffey, 2016a)
- Geotechnical Assessment (Coffey, 2016b).

Land based

Published mapping and data were used to define physical characteristics of the terrestrial environment. This included review of:

- Sydney 1:100,000 Geological Series Sheet 9130 (Herbert C., 1983)
- NSW Planning Portal
- NSW EPA online contaminated land register
- Environmental Protection Licences (EPL) under the *Protection of the Environment Operations Act 1997*.

Construction assessment

The assessment considered how the proposed construction activities, work methods, and required management controls (refer to section 3.3) would temporarily affect the physical characteristics of the aquatic environment including localised sediment and pollutant disturbance and dispersion.

Operational assessment

The operational assessment considered how the final aquatic infrastructure would potentially result in hydrodynamic changes in terms of erosion, scour, and water quality changes.

6.1.2 Existing environment

Water based

Sea levels

The Proposal is located at the mouth of Lane Cove River, close to its interface with Parramatta River. The closest location to the Proposal footprint where the sea levels are measured is at Fort Denison where the conditions are as follows:

- Mean sea level is 0.935 metres Australian Height Datum (AHD, between 1914 and 2019)
- Maximum recorded sea level of 2.4 metres AHD
- Minimum recorded sea level of -0.2 metres AHD.

Water depth (bathymetry)

Bathymetry contours show a steep grade from the shore to the wharf, followed by a more-gentle decline into deeper water. A low horizontal intertidal zone prevents establishment of mangroves and saltmarsh. The bathymetry at the proposed ferry wharf site slopes steeply down from 0.5 metres Chart Datum (CD) at the seawall to -7.5 metres CD about 27 metres off the seawall at the southern end of the proposed pontoon location. From the wharf structure the seabed continues to gently slope down to maximum depth of -10.0 metres CD at a distance of about 50 metres.

Sedimentation

Sedimentation of the river occurs through natural processes of weathering and erosion, which deposit sediments in the river through alluvial processes. The rate of sedimentation is also influenced by storm events and flooding. During such events, the rate of sedimentation would typically increase and result in deposition due to increased sediment loads.

The Parramatta River Estuary Data Compilation and Review Study (Cardno, 2008) provides an overview of the main findings of previous studies for the Parramatta River estuary which extends from Charles Street Weir in Parramatta to Yurulbin Point, Birchgrove (located approximately 500 metres south of the Woolwich Wharf Interchange). The study included details on the catchment characteristics, hydrodynamics, water quality, bathymetry and estuary sediments.

As identified in the above study, marine sediments can enter coastal estuaries and embankments due to oceanographic processes such as tidal currents or wave action. Sources of sediment within the Parramatta River include bank or bed erosion within tributaries, or catchment erosion, whereby sediments are mobilised via overland flow across sparsely vegetated lands.

Currents and circulation

Two separate processes provide the main influence on water movement within the Proposal footprint.

Tidally influenced water movement occurs in the main channel. Closer to the edge of the river, tidal generated current speeds reduce due to the shallower waters, and this gives way to greater influence from river inflow. As such, the water circulation and currents around the Proposal footprint are very low (i.e. the waters are typically calm).

The second influence on water movement locally is the mixing of the freshwaters from the Parramatta River and the saline waters from Sydney Harbour. This can create localised water movement and disturbance at the surface. This is distinct from the regional tidal current patterns and river inflows described above. Water flow from the Parramatta River is regulated by the Charles Street Weir, which impacts natural flow characteristics within the Proposal footprint. Water levels overtop the weir during flooding events.

The above conditions offer a degree of surface mixing in the local environment. However, the exchange of water due to tidal movement is limited. The result is that the river waters are likely to be locally mixed however, unlikely to be regularly replaced.

Wind conditions

Three dominant wind patterns affect the Sydney Harbour region, with the strongest winds blowing from the south. The most common wind direction is from the north-east. These winds occur about 22 per cent of the time. The next most common wind direction is from the west, which occurs about 17 per cent of the time mainly during the winter. More extreme winds (and therefore surface disturbance) occur during storm events. These may cause water to occasionally overtop (break across) the wharf. The 100 year storm surge level at Fort Denison in Sydney Harbour is 1.5 m AHD based on measurements taken during the severe 1974 storms.

Geology and soils

The *Sydney 1:100,000 Geological Series Sheet 9130* indicates that the Proposal is underlain by the Hawkesbury Sandstone Formation, described as medium to coarse-grained quartz sandstone with very minor shale and laminate lenses. Localised alluvial deposits (anticipated to be unconsolidated clays and sands) would be expected in the vicinity of the Lane Cove River. The geotechnical assessment undertaken for this site identified the general subsurface conditions as Alluvium overlying Sandstone bedrock (Coffey, 2016b).

There are three dominant soil materials within this soil landscape:

1. Loose, coarse quartz sand
 - This is a sand to sandy loam with loose, apedal single-grained structure and porous sandy fabric. It generally occurs as topsoil.
2. Earthy, yellowish-brown sandy clay loam
 - This is a clayey sand to sandy clay loam with apedal massive or occasionally weakly pedal structure and a distinctly porous, earthy fabric. It generally occurs as subsoil.
3. Pale, strongly pedal light clay
 - This is fine sandy clay loam to medium clay with strongly-pedal structure and rough-faced ped fabric. It commonly occurs as subsoil.

Acid sulphate soils

Acid sulphate soil (ASS) occurs in areas rich in iron sulphide. These soils generate sulphuric acid if exposed to the air (oxygen). The acid is an issue as well as causing the mobilisation of metals (e.g. aluminium, iron, manganese). This can also have a detrimental environmental impact. ASS can also decrease the amount of dissolved oxygen in surface waters, leading to eutrophic conditions and fish kills.

A review of the *Prospect Parramatta 1:100,000 Acid Sulphate Soil Risk Map 9130-N3* indicates that the sediment beneath the Proposal has a high probability occurrence of acid sulphate soils materials. Should acid sulphate soil conditions be confirmed, environmental impact may occur via acidification should sediments be disturbed (Coffey, 2016a).

Contaminated land

Based on the analytical results, the shallow sediments within the top 20 cm of the investigation area reported elevated contamination, with respect to *ANZECC (2000) Interim Sediment Quality Guidelines (ISQG)*, with lead detected at concentration above the ISQG Low level criteria in sediment sample WOOL1_0.2. No other Chemical of potential concern (COPC) were detected at levels above the investigation criteria. The findings are similar to those reported in published studies (Birch et al, 1998).

There are no notices issued by the NSW EPA under the *Contaminated Land Management Act 1997* within the Proposal footprint or within a one-kilometre radius of the surrounds.

A search of licenses held under the *Protection of the Environment (Operations) Act 1997* revealed that there is one site located within a one-kilometre radius of the Proposal currently operating under a POEO license. The site number is 661, named Viva Energy Australia Pty Ltd, and located approximately 700 metres away at Manns Avenue, Greenwich.

Woolwich is located on the mouth of the Lane Cove River which discharges into the Port Jackson (Sydney Harbour) estuary. The estuary has a long history of contamination which results in extensive areas of polluted sediments mainly associated with the most industrialised part of the catchment Coffey (2016a).

Pollutants which may be encountered include:

- Surfactants, oils, fuels, diesels and metals due to stormwater runoff
- Pesticides and heavy metals from stormwater runoff from the surrounding areas
- Residual tributyltin (as described below).

Tributyltin forms a group of tin-derivatives that were used extensively in antifouling paint in the shipping industry until an international ban in 2003 prevented their application on vessels less than 25 metres in length. However, tributyltin has an exceptionally long residence time in the aquatic environment, and if disturbed, can still have water quality and ecotoxicology effects over many years.

Land based

As above, a review of the *Sydney 1:100,000 Geological Series Sheet 9130* indicates that the Proposal falls within the Hawkesbury soil landscape and is underlain by Hawkesbury Sandstone, described as medium to coarse-grained quartz sandstone with minor shale and laminate lenses.

Woolwich Wharf sits at the southern end of Valentia Street, a short gently sloping street connecting to Point Road, the main ridgeline street through the Eastern end of the Woolwich Peninsula. Valentia Street Reserve is generally level near the foreshore. The land starts to slope up at the northern end. Residential houses on Valentia Street step down the slope with those closest to the wharf sitting at a raised level due to sandstone benches which underpin the side of the ridge.

6.1.3 Potential impacts

Construction – water based

The consideration of aquatic impacts during construction has included waterside infrastructure, including the removal and replacement of the existing wharf. Modification of the seawall would include placement of new rock apron on the seabed at the face of the seawall below the waterline, however as the work would be undertaken from the landside, this has been considered under the land based section below.

Hydrodynamic effects

The Proposal involves activities that would cause physical disturbance to the aquatic environment. These include removal of the existing wharf structure, piling and the installation of the prefabricated superstructure elements using a barge mounted crane. If it is not possible to pull out piles, then they would be cut-off at the riverbed. The scale of the disturbance would be minimal and insufficient to cause any dynamic changes in current speed, wave characteristics, saline/freshwater mixing or flushing.

Localised sediment disturbance and smothering

Potential impacts would be limited by the requirement to undertake the piling work (including removal of the existing piles) during calm conditions, when there would be the least water movement in the harbour (refer to section 3.3.2). Potential disturbance of seabed sediments during placement of rock apron on the seabed would be localised and temporary in nature.

Locally, the finer sediments could mobilise over a greater area as they would remain buoyant in the water column. Disturbance of sediments would be minimised through the work methodology, including progressing the work in sections which would allow sediments to settle between works.

A silt boom and curtain would be deployed around the waterside works of the construction footprint, with further additional safeguards to be detailed environmental work method statement (EWMS) and implemented during the work, discussed further in section 6.1.4.

Erosion and scour

Any work taking place in the aquatic environment has the potential to cause erosion and scour impacts. This is caused from introducing new structures typically on, or close to, the riverbed, as this may alter sediment transport patterns. No scour was identified in existing conditions.

Under construction of the Proposal, the temporary use of jack-ups/anchors during lifting and piling work would be the only equipment that would impact on the riverbed. However, the associated equipment would typically only be in place for a few weeks. Some localised impacts are expected within a few metres of where jack and/or anchor point would be temporarily installed, however this would be an insufficient amount of time to cause any material scour or erosional impacts. The number of jack-ups/anchors would be reduced to the minimum required, with the placement of these locations selected to avoid any areas of sensitive habitat. With the introduction of this safeguard and the other standard safeguards described in section 6.1.4, it is concluded that any impacts and be avoided and/or minimised.

Sedimentation

There is inadequate information on the existing and potential rate of sedimentation. However, it is not anticipated that a significant amount of sediment would accumulate within the channel over the five-month closure period. The area around the wharf would be intermittently accessed by barges delivering and moving construction equipment. While this could potentially limit sediment accumulation, it would generate less turbulence and wake at a much lower frequency compared to the current ferry service.

It should be noted that sedimentation rates have also been modified by human activities along the Parramatta River and the potential for a flood event to mobilise a significant amount of sediment cannot be discounted. However, previous flooding of the Parramatta River is not known to have resulted in the disruption of ferry operations due to sedimentation of the channel.

Mitigation measures for sedimentation have been included in section 6.1.4 with no significant impacts anticipated.

Acid sulphate soils

While there is the risk of acid sulphate soil there are no plans to remove any sediments, or bring them to the surface. Any sediment attached to the extracted piles would be removed in the water. As such, there is no possibility for these sediments to dry and oxidise.

Contamination

Based on a stage 2 contamination assessment undertaken by Coffey (2016a) for the Proposal area, contamination risk arising from proposed ferry wharf construction works is considered to be low.

Localised pollutant disturbance

Notwithstanding the potential presence of contaminated sediments at the Proposal, any impact would be minor due to the limited disturbance of the riverbed sediments from piling and the limited sediment depth on the riverbed across the Proposal footprint. Therefore, disposal and treatment would not be required.

Also, the extent of disturbance would be consistent with the small-scale activities that routinely take place in the harbour, even including the propeller wash from the many ships in the area. As such, the scale of disturbance would mean that any additional impacts would be negligible with the implementation of safeguards in section 6.1.4.

Construction – land based

Erosion and sedimentation

The proposed modification of the seawall would include excavation of fill material behind the seawall of up to 100m³. There is potential for causing soil erosion or sediment laden runoff which can enter the river, causing pollution.

Potential impacts from erosion and sediment control would be prevented with the implementation of safeguards in section 6.1.4.

Acid sulphate soils

The below information has been sourced from the contamination assessment prepared by Coffey (2016a).

Excavations undertaken as part of the modification of the seawall may encounter ASS at depths below the water level.

The disturbance of potential ASS should be kept to a minimum to lower the risk of exposing these sediments to oxygen. Should ASS conditions be confirmed, environmental impact may occur via acidification should the sediments be disturbed by activities.

Contamination

A search of the EPA contaminated lands register undertaken on the 26th of June identified no records within 1 kilometre of the Proposal. Geotechnical assessment did not identify any contaminated material behind the seawall; however, unexpected finds procedures would be implemented if required.

Excavated soil and rock for the road and footpath upgrade works would be temporarily stockpiled on site and backfilled upon completion provided it is not contaminated or weed infested.

Operation – water based

Erosion and scour

Under the Proposal, additional piles and piers for the jetty would be installed. As water flows around these structures there is the potential to create local scour and erosion. In this location, the only expected impacts would be limited to within a few metres of each pile given that:

- There is an existing wharf at the Proposal
- The low dynamic character close to the riverbed around the piles located within the sub-benthic sediments
- The limited amount of sediment substrate locally.

Any potential impact would be temporary, with local sediment conditions adjusting over time.

Sedimentation

Ferry services would resume during operation, with no change in ferry movements required to service the new wharf. It is not anticipated that significant impacts from sedimentation during operation would occur.

Flooding

The Proposal has been designed to withstand a 1:100 year ARI flood event and ensure the safe closure of the wharf in higher flood conditions. The height of piles enables the pontoon to rise and fall with flood levels and safely disconnect from the shore bridge.

Roads and Maritime inspect wharves after flooding events. This would continue during operation of the Proposal. No significant impacts from flooding are anticipated during operation of the Proposal.

Operation – land based

As described in section 2.5, there are various landside site modifications proposed including

- Re-grading the cul-de-sac near the parking area to achieve the required footpath levels from the new accessible carparks to the wharf which will include raising the height of the seawall. The existing fence above the seawall would be upgraded to be DDA compliant.
- Upgrade the interchange footpath to be DDA compliant from the bus stop (north of the wharf entrance) to the kiss and ride spaces (west of wharf entrance)
- No operational impacts to terrestrial soils are anticipated, as no significant change to existing operations is proposed.

No significant impacts to the terrestrial land surface are anticipated.

6.1.4 Safeguards and management measures

Table 6.1 lists the safeguards and management measures that would be implemented to protect the land surface and hydrology to account for the impacts identified in section 6.1.3.

Table 6.1: Aquatic and terrestrial environment safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|----------------|---|----------------|----------------------------------|---------------------------------|
| Soil and water | <p>A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks would be addressed during construction.</p> <p>Erosion and sediment control measures are to be implemented and maintained (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site. | Contractor | Pre-construction | Additional safeguard E1 |
| Flooding | <p>In case of flood events, the SWMP would include measures to address potential flood threats and evacuation requirements. The measures would include:</p> <ul style="list-style-type: none"> • Regular consultation of the Bureau of Meteorology website for weather forecasts and flood warnings • Scheduling of activities on land and water subject to flooding to avoid high flow periods • Develop a process for removing equipment and materials off site and out of flood risk areas quickly • Storing and use of fuels and chemicals away from the flood zone, in bunded areas. | Contractor | Preconstruction/ Construction | Additional safeguard |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|---------------------------|--|----------------|-----------------------------------|---------------------------------|
| Acid sulphate soils | An Acid Sulphate Soil Management Plan (ASSMP) would be prepared as part of the Contaminated Land Management Plan to address the potential for acidity to be generated from ASS and PASS disturbed during the construction phase. Potential or actual acid sulphate soils are to be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005. | Contractor | Pre-construction | Additional safeguard |
| Acid sulphate soils | The disturbance of sediment and/or the underlying soils should be kept to a minimum to lower the risk of exposing these sediments to oxygen. If ASS are to be exposed to oxidation or spoil is to be generated during construction activities requiring disposal, further assessment for ASS and waste classification should be undertaken. | Contractor | Construction | Additional safeguard |
| Contaminated land | If contaminated areas are encountered during construction, appropriate control measures would be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area would cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA. | Contractor | Construction | Additional safeguard |
| Erosion and sedimentation | <p>Prior to commencement of construction activities, sediment control device (such as sediment boom and curtain) should be installed around the work area to contain disturbed sediment from water surface by allowing suspended sediments to settle back on the bottom of the seabed overtime. The silt boom and curtain would extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work.</p> <p>Installation should be undertaken during high tide periods from a boat. The device should be designed to rise and fall with the tide to prevent disturbance. Inspection of the device should be undertaken on a daily basis after ebbing tides, with additional inspection be carried following storm events. Monitoring of turbidity inside and outside of the device should also be performed, using a portable turbidity meter/logger. As with installation, decommissioning should be carried out by boat during high tide periods.</p> <p>Prior to removing the device, conditions within the curtain would be assessed visually and with field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.</p> | Contractor | Pre-construction/ Construction | Additional safeguard E1 |
| Waste | Should spoil be generated during construction activities, further sampling and analysis should be undertaken to confirm the waste classification prior to disposal. | Contractor | Construction | Additional safeguard |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|---------------------------|---|----------------|-------------------------------|---------------------------------|
| Soil and water | <p>A detailed environmental work method statement (EWMS) would be prepared and implemented for the following high-risk activities:</p> <ul style="list-style-type: none"> • Modification of the seawall <p>The content of the EWMS would include, but not limited to:</p> <ul style="list-style-type: none"> • Description of the works/activities including machinery to be used • Outline of the sequence of the work/activities, including interfaces with other construction activities • Identification of potential environmental risks/impacts due to the works/activities and associated with wet weather events • Evaluation of methods to eliminate/reduce the environmental risk • Mitigation measures to reduce environmental risk • Any safeguards resulting from consultation with public authorities and other stakeholders, when appropriate • A map indicating the locations of sensitive locations (such as threatened species or heritage items), likely potential environmental impacts, and work area • Identification of work area and exclusion areas • A process for progressive review, eg monitoring processes and methods to eliminate/reduce environmental risks/impacts. | Contractor | Pre-construction/Construction | Additional safeguard |
| Erosion and sedimentation | <p>Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.</p> <p>Results of the observations of the integrity of the silt curtain are required to be recorded and maintained specifically for the purpose. Records are required to be kept on the site and to be made available for inspection by persons authorised by Roads and Maritime.</p> | Contractor | Construction | Additional safeguard W2 |
| Erosion and scour | <p>The number of jack-ups/anchor points would be minimised where possible. The locations would be selected to avoid areas of sensitive habitat, as discussed further in section 6.1.4.</p> | Contractor | Construction | Additional safeguard |
| Erosion and scour | <p>Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts.</p> | Contractor | Construction | Additional safeguard |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|----------------|--|----------------|--------------|---------------------------------|
| Soil and water | In consultation with DPI Fisheries, appropriate erosion and sediment control measures are to be used during construction to minimise turbidity impacts in the waterway | Contractor | Construction | Additional safeguard |

6.2 Water quality

This section describes the existing water quality and potential impacts associated with the Proposal.

6.2.1 Methodology

Published mapping and data were used to define the existing water quality. This included

- Parramatta River Estuary Data Compilation and Review Study (Cardno, 2008)
- Sydney Harbour Catchment Water Quality Improvement Plan: Data Compilation and Review. (Water Research Laboratory (WRL), 2011).

6.2.2 Existing environment

The Parramatta River catchment extends from Blacktown Creek in the west, about 22 kilometres to Sydney Harbour in the east. Much of the catchment has been developed for urban and agricultural purposes, with the existing water quality impacted by stormwater discharge and altered flow regimes. Pollutants commonly associated with stormwater discharge include:

- Sediment from erosion and stormwater inflows, impacting turbidity
- Pathogens such as faecal coliforms
- Litter and other wastes
- Pesticides from agricultural land uses
- Nutrients and pathogens from fertilizers and sewage overflows
- Heavy metals (in river sediments)
- Other contaminants such as hydrocarbons from oil and fuel leaks.

A review of the available information on water quality in the Parramatta River was undertaken by Cardno (2008). The study area ranged from Parramatta Weir to Clarkes Point, Woolwich in the north and Yurilbin Point, Birchgrove in the south. The results indicated that water quality parameters often exceed aquatic ecosystem health guidelines. Based on this information, water quality within the Proposal footprint is inferred to be of poor quality.

6.2.3 Potential impacts

Construction

Pollutants

The main impact to water quality would be from the disturbance to sediments during piling (including removal of existing piles) and seawall works as discussed in section 6.1.3,

Sediments would generally settle out of suspension within the work area, however finer sediments could mobilise over a greater area as they would remain buoyant in the water column. A silt boom and curtain would be installed around the work area for the duration of the waterside works to collect any sediments.

Further mitigation would be implemented through the safeguards details in section 6.1.4 and section 6.2.4 Notwithstanding, the construction of the Proposal has the potential to result in minor impacts to water quality from encountering contaminants or ASS.

Water quality within the Parramatta River is known to be generally poor within highly urbanised areas such as surrounding the Proposal, and the residual impacts are not considered significant in the context of the receiving waters. Contamination testing and classification of soils behind the seawall would be undertaken prior to and during construction.

Accidental spills

The materials required to upgrade the wharf would be generally inert and harmless except for the small quantities of welding materials, lubricants, solvents, fuels and oils. As such, there would be some potential for:

- Accidental spills, including:
 - Accidents during loading, unloading and installation work
 - Leaks and drips from poorly maintained machinery and equipment
 - The mismanaged storage of waste materials, including potential for debris to enter the water.
- These risks would be greater when undertaking work over, or in, the river namely:
 - Removing the existing structure
 - Demolition of the seawall
 - Drilling / hammering the piles
 - Transferring equipment and machinery
 - Installing the substructures and superstructures.

The primary impact from spills would be a decline in water quality which would have an impact upon the aquatic environment. The impact would depend on the quantity and type of material spilt. However, providing relevant standard controls, such as those identified in section 6.1.4 and 6.2.4, are implemented the impacts are expected to be minimised.

Accidental material spill within the ancillary facility may occur from storing, handing and/or transferring the required small volumes of welding materials, lubricants, solvents, fuels, oils and diesels. Potential impacts would be mitigated through the appropriate management of the storage of such materials, and inclusion of spill kits as noted in section 6.1.4

Operation

No significant impacts to water quality are anticipated for operation of the Proposal, as ferries would operate similarly to current movements, and no additional sediment disturbance is anticipated.

Any impacted stormwater drainage would be reinstated within the interchange to maintain the existing drainage regime, with no impact to stormwater quality is anticipated.

There is always the potential for an accidental spill or discharge during operation. This would be most likely during berthing at the wharf. While this is the case, the same potential exists from the current operational wharf and would be managed under the standard controls already in place across the ferry network. As such, the impacts are expected to be safeguarded against and therefore minimised.

6.2.4 Safeguards and management measures

Table 6.2 lists the safeguards and management measures that would be implemented to protect water quality to account for the impacts identified in section 6.2.3.

Table 6.2: Water quality safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|------------------|--|----------------|-----------------------------------|---------------------------------|
| Water quality | A spill management plan will be developed and communicated to all staff working on site. Any aquatic spill (whether spill occurs on water on land and subsequently enters the water) is to be immediately reported to Roads and Maritime and Sydney Ports VTS and VHF Channel 13. | Contractor | Pre-construction/ Construction | Additional safeguard |
| Water quality | All machinery and equipment will be maintained in good working order and regularly visually inspected for leaks. | Contractor | Construction | Additional safeguard R11 |
| Water quality | Any chemicals or fuels stored at the site or equipment barges will be stored in a bunded area to prevent chemical leaks or spills entering the water. | Contractor | Construction | Additional safeguard R1 |
| Accidental spill | A land based and aquatic emergency spill kit is to be kept on site at all times and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site. | Contractor | Construction | Additional safeguard R6 |
| Accidental spill | If an incident (e.g. spill) occurs, the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure is to be followed and the Roads and Maritime Services Contract Manager notified as soon as practicable. | Contractor | Construction | Additional safeguard R7 |
| Accidental spill | Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures. | Contractor | Construction | Additional safeguard R8 |
| Accidental spill | Spill kits for construction barges must be specific for working within the marine environment and be stored and maintained on the barge | Contractor | Construction | Additional safeguard R9 |
| Accidental spill | All workers will be advised of the location of the spill kit and trained in its use. | Contractor | Construction | Additional safeguard R10 |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|------------------|---|----------------|--------------|---------------------------------|
| Accidental spill | Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks. | Contractor | Construction | Additional safeguard R11 |
| Accidental spill | No vehicle or vessel wash-down or re-fuelling would occur on-site. | Contractor | Construction | Additional safeguard R12 |
| Accidental spill | In the event of a maritime spill, the incident emergency plan would be implemented in accordance with Sydney Ports Corporation's response to shipping incidents and emergencies outlined in the 'NSW State Waters Marine Oil and Chemical Spill Contingency Plan' (Maritime, 2012). | Contractor | Construction | Additional safeguard R13 |
| Accidental spill | Refuelling of plant and equipment and storage of hazardous materials on the land or barges is to occur within a double-bunded area. | Contractor | Construction | Additional safeguard R3 |

6.3 Biodiversity

This section summarises the Proposal's aquatic and terrestrial biodiversity. Appendix D contains a supporting paper prepared by Eco Logical Australia in April 2019.

6.3.1 Methodology

The assessment included a desktop review of published State and Commonwealth records, data and literature to confirm the likely presence of threatened flora, fauna and endangered communities in the local environment. This was followed by a site walkover and aquatic survey of the marine environment covering an area extending to about 20 metres from the Proposal. The Proposal area is defined as the water side aspects of the Proposal i.e the wharf and associated elements.

The following published records were reviewed:

- NSW Fisheries species profiles, 'Primefact' publications and expected distribution maps
- Protected Matters Search Tool: containing information on Commonwealth protected species
- PlantNet Database: containing information on sensitive and rare plants
- BioNet Atlas of Wildlife: containing information on threatened and protected species
- List of Noxious Weeds: containing information on non-native plant species that are listed as noxious weeds
- Zoological Collections of Australian Museums: to search individual species and determine the potential for threatened species to be present locally.

The impact assessment was prepared in accordance with Environmental Impact Assessment Practice Note: Biodiversity Assessment (EIA-N06, Roads and Maritime Services, 2016 (c)) with consideration of the:

- Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (Roads and Maritime, 2011)
- Guidelines for Biodiversity Offsets (Roads and Maritime, 2011).

Further detail on the methodology for the assessment of aquatic biodiversity is provided in Appendix D.

6.3.2 Existing environment

Aquatic biodiversity

Protected areas

Map 9 of the 'Sydney Harbour - Foreshores and Waterways Area Development Control Plan 2005: Ecological Communities and Landscape Characters', identifies the Proposal as 'Mixed Rocky Intertidal and Sand', with riparian land mapped as 'Open Forest (Type A)' (Figure 6.1).

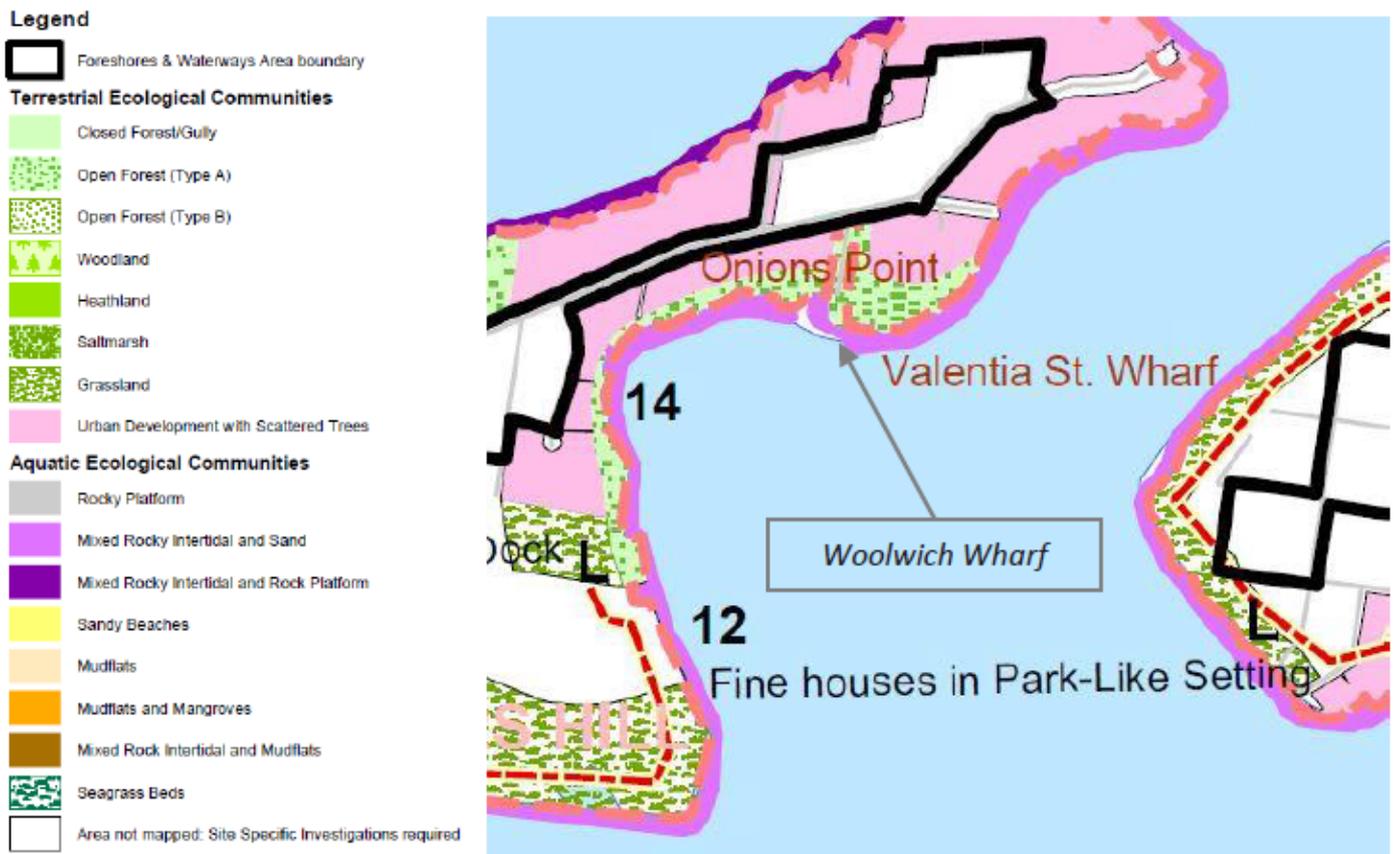


Figure 6.1: Sydney Harbour – Foreshores and Waterways Area Development Control Plan: Ecological Communities and Landscape Characters (map sheet 9)

Wetlands

Sheet 5 of the 'Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area', identifies the site as a 'Wetlands Protection Area', as shown in Figure 6.2. These wetland protection areas cover distinct important habitat plus an additional buffer of 40 metres to 'address movement, growth and seasonal variations'. Potential habitats within the Proposal area are defined in the later sections.

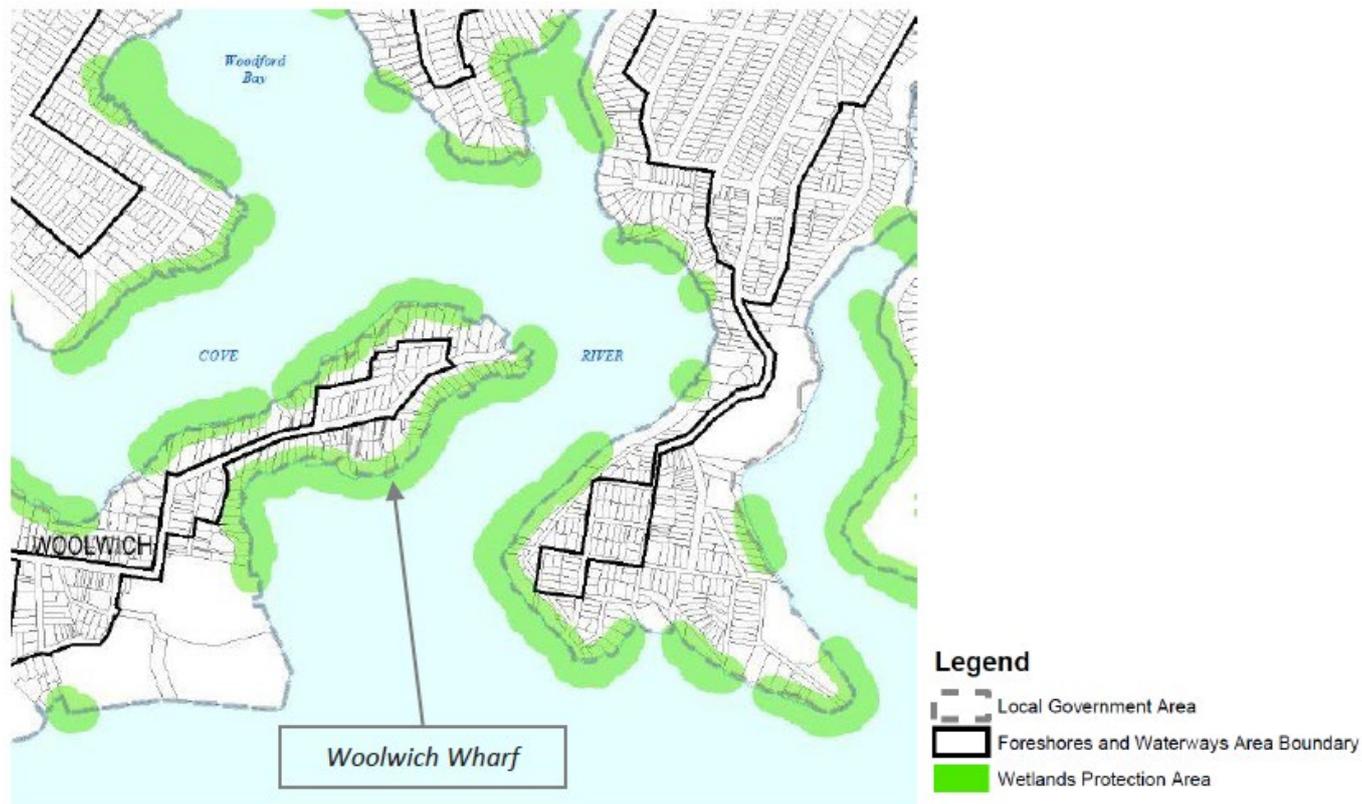


Figure 6.2: Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area

Mangroves

The State-wide mapping of estuarine macrophytes (mangroves, saltmarsh and seagrass) by DPI Fisheries identifies the nearest patch of marine vegetation as *zostera* (seagrass), being located approximately 45 m to the north west of the existing wharf (Creese et al 2009), refer to Figure 6.3. There are no local records of the threatened *Posidonia* seagrass population.



Figure 6.3: DPI Fisheries mapping of estuarine *macrophytes* (Creese et al 2009)

Habitat

NSW Fisheries identify three types of key fish habitat (KFH) in their *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) comprising:

- Type 1 (highly sensitive KFH) – none present within the Proposal footprint
- Type 2 (moderately KFH) – habitat is represented by mangroves
- Type 3 (minimally sensitive KFH) – habitat is represented as unvegetated subtidal sediment, intertidal mudflat with sparse infauna and intertidal seawall.

A summary of marine habitat identified within the Proposal, and corresponding KFH type, is provided in Table 6.3. The extent of each habitat type is shown in Figure 6.10.

Table 6.3: Marine habitat present within the Proposal

| Habitat identified within the Proposal footprint | Description | Key Fish Habitat Type |
|--|---|-----------------------|
| Manmade structures (Figure 6.4) and (Figure 6.5) | Present as the vertical stone seawall, existing piles and pontoon. These areas provide habitat for molluscs and other encrusting organisms, as well as algae. | Type 3 |
| Intertidal rock platform (Figure 6.6) | This area is partially exposed at lower tides, and supports encrusting organisms such as molluscs. | Type 3 |
| Subtidal rock and rubble with dense macroalgae (Figure 6.7) | The subtidal rock covers an area to about 2m depth and contains dense macroalgae. The understorey rock habitat supports turfing algae and other encrusting organisms. | Type 2 |
| Subtidal sand and rubble with scattered kelp (Figure 6.8) | Present at greater depths, where sand, gravel and shell substrate has collected. Scattered hard substrate provides habitat for kelp. Infauna burrows was observed to be moderate. | Type 2 |
| Subtidal unvegetated sand (Figure 6.9) | Silty sand with is present at depths greater than 5 m, with moderate levels of infauna burrowing observed. | Type 3 |



Figure 6.4: Sandstone Seawall west of wharf



Figure 6.5: Existing pile habitat with encrusting organisms



Figure 6.6: Intertidal rock platform east of wharf



Figure 6.7: Dense macroalgae

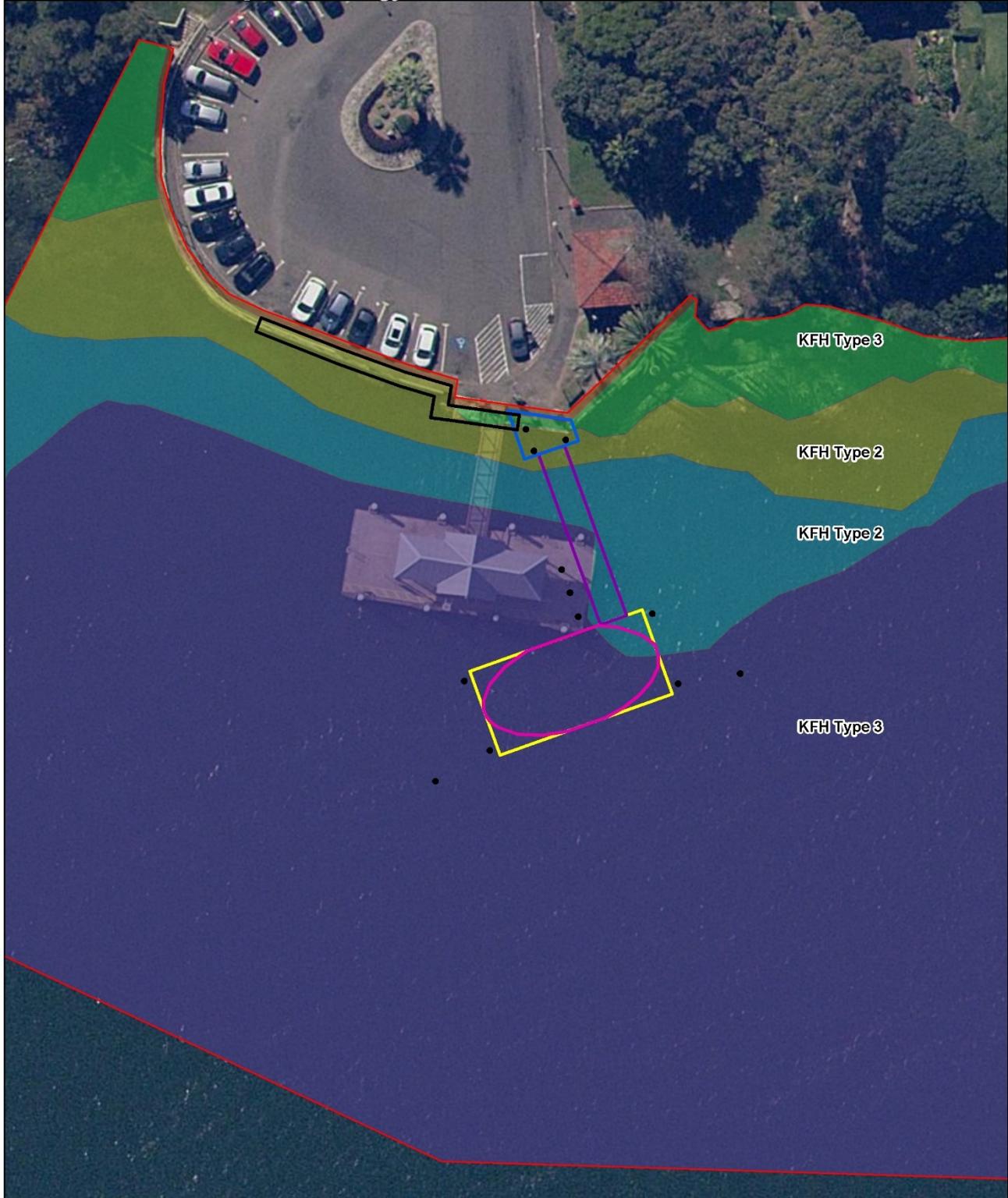


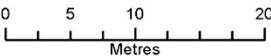
Figure 6.8: Scattered Kelp



Figure 6.9: Subtidal unvegetated sand

Woolwich Wharf: Aquatic Ecology



| | | | |
|---|--|---|---|
| Footprint (Revision 26-Mar-19 Royal Haskoning DHV) | |  |  GDA 1994 MGA Zone 56 |
| <ul style="list-style-type: none">  Seawall stabilisation (1.5 m rubble)  Bridge  Gangway  Pontoon  Shelter  Pile | <ul style="list-style-type: none">  Study Area Woolwich Habitat (October 2016) <ul style="list-style-type: none">  Sandstone seawall  Intertidal rock platform  Subtidal rock and rubble, moderate to dense macroalgae (kelp & sargassum) and turfing algae  Scattered kelp (1 plant per 16 m²) and bare sand, moderate infauna  Bare sand, moderate infauna, scattered shells in shallows | | |



Prepared by: ID Date: 13/09/2019

Figure 6.10: Field validated habitat (October 2016)

Threatened flora

No threatened flora was identified within the Proposal.

The threatened seagrass population, *Posidonia australis*, occurs in the harbour and is known to grow on subtidal sand up to 10 m deep. However, there are no records of this seagrass occurring upstream of Darling Point or in the vicinity of the Proposal.

The threatened ecological community, coastal saltmarsh, was not observed in the Proposal area.

Marine vegetation is protected under the FM Act and includes seagrass, mangroves and *macroalgae* (seaweeds). Seagrass requires soft sediments and adequate light penetration through the water column. In Sydney Harbour, this zone is usually less than three metres deep. Soft sediments in the Proposal occur at depths less than three metres, but no seagrass was observed on site. Although DPI has previously mapped seagrass immediately west of the wharf, the field survey confirmed this was a *macroalgae* bed attached to bedrock. *Macroalgae* also occurred in the along rocky fringes and deeper scatted cobble. No mangroves occurred on site, due to the steep and rocky intertidal area which is not suitable for the establishment of this vegetation.

Threatened fauna

No threatened species, populations or communities were observed in the Proposal, or are expected to use the site (refer to section 4.3 and likelihood of occurrence assessment in Appendix D). Seahorses and their relatives (*syngnathiformes*) were not observed, nor are they expected west of a line between Birchgrove and Greenwich, or in high wash environments such as the seawall, rubble and piles at Woolwich Wharf.

Species of threatened sharks and rays may pass through the Proposal on occasion, however would not remain in the area for prolonged periods.

Pests

No marine pests, including *Caulerpa taxifolia* (Caulerpa), were identified within the Proposal footprint.

Caulerpa and other significant pests are not known to occur in the upper Parramatta River based on mapping provided by the Department of Primary Industries.

Terrestrial biodiversity

The Proposal footprint and surrounding area is largely devoid of vegetation, with the exception of planted palm trees and other landscaping. The foreshore areas of Woolwich, including Valentia Street Reserve, contain numerous semi-mature and mature trees. These include a variety of locally-indigenous, non-local native and exotic (introduced) species, the majority of which appear to have been planted.

No significant habitat trees were identified. The surrounding trees and vegetation may provide a limited foraging resource, however overall, the fragmented habitat is only likely to provide for native and introduced fauna species potentially including *Trichoglossus moluccanus* (Rainbow Lorikeets), *Vanellus miles* (Masked lapwing) and *Manorina melanocephala* (Noisy Miner), which are known to have adapted to open environments and are tolerant of major human disturbance.

Manmade structures such as wharves can provide habitat for species such as bats. However, a bat survey completed at Woolwich Wharf (Biosphere Environmental Consultants, 2014) did not identify the presence of bats within the Proposal footprint.

Threatened species

A search of the NSW Bionet Atlas identified records of 179 threatened species listed under the BC Act within a 10-kilometre radius of the Proposal footprint. However, no records were identified within the Proposal footprint, or immediate surrounds.

A search of the EPBC Act Protected Matters Search Tool identified one wetland of international importance, 89 threatened species, 69 migratory species and nine threatened ecological communities within a 10-kilometre radius of the Proposal footprint. However, no records were identified within the Proposal footprint, or immediate surrounds.

As discussed above, the Proposal footprint and immediate surrounds are not considered likely to provide suitable habitat for any of the species identified.

Threatened shore, wetland, migratory and pelagic birds may use the area to forage but are unlikely to rely on the Proposal footprint, as they generally avoid areas with concentrated human activities. Aerial foragers may follow a coastal route, fly over open water or hunt over decomposing wrack.

6.3.3 Potential impacts

Protected areas

The proposed piling work includes removal of existing piles and the installation of the prefabricated superstructure elements, which may require the use of jack-ups or temporary anchor moorings to stabilise the cranes and equipment, which would directly impact on the riverbed within the limits of the protected wetland.

Despite the definition and limit of this wetland being mapped, the Proposal would not impact on the ecological value associated with these areas. As such, with the implementation of mitigation detailed in section 6.2.4, no impact to this protected area is anticipated.

Direct loss of vegetation and habitat

Direct impact from construction of the Proposal would result from the installation of new piles. Impacts from any jack-up/anchor points would be temporary with the habitat recovering over time with no quantifiable impacts anticipated. The removal of KFH has been conservatively estimated in Table 6.4. These impacts also consider loss of vegetation from shading.

Table 6.4: Direct habitat loss

| Habitat | Direct Loss (m²) |
|---|------------------------------------|
| Existing piles (eight removed) Minimally sensitive Type 3 KFH | 72.57 |
| New piles (11 piles) Minimally sensitive Type 3 KFH | 0 |
| Existing pontoon Minimally sensitive Type 3 KFH | 320 |
| New pontoon Minimally sensitive Type 3 KFH | 0 |
| Sandstone seawall Minimally sensitive Type 3 KFH | 2.30 |
| Intertidal rock and rubble Minimally sensitive Type 3 KFH | 10.88 |
| Subtidal rock and rubble with macroalgae Moderately sensitive Type 2 KFH | 55.92 |
| Scattered kelp | 73.96 |

| Habitat | Direct Loss (m ²) |
|---------------------------------|-------------------------------|
| Moderately sensitive Type 2 KFH | |
| Subtidal sediment | 161.73 |
| Minimally sensitive Type 3 KFH | |
| Total | 675.32 |

About 675 m² of KFH would be directly impacted by the Proposal.

However, this impact would be offset by the creation of about 644m² of new hard surfaces provided by the new piles, pontoon, and newly exposed areas. This would result in a minimal habitat loss of moderately sensitive (Type 2) KFH from partial shading of scattered macroalgae. A permit to harm marine vegetation would not be required for these works as confirmed by DPI Fisheries.

This small area would be insufficient to affect the survival of any fish species in the area as they would still be able to inhabit the remaining areas.

In the case of impact from the removal of the piles and pontoon, this habitat would re-establish over time during operation of the wharf.

For works related to the seawall modification, additional rock placed at the base of the existing seawall would result in a direct impact to a small amount of macroalgae and benthic habitat. Impacts are likely temporary as the new rock is suitable for colonisation by marine biota. Works related to seawall stabilisation would have low and temporary impact to marine biota and water quality.

Injury and mortality

The absence of any threatened flora or fauna local to the Proposal footprint reduces the potential for associated impacts on ecologically significant species. However, as the potential for certain larger types of fauna to occasionally pass through the local area cannot be fully discounted, there is still the potential for injury risks from propeller or ship strikes. Providing standard measures are introduced while the wharf is being upgraded, any impacts are expected to be safeguarded and minimised.

There is also the potential for any immobile or semi-mobile species that occur locally to be killed as a result of the piling work and/or use of jack-ups and anchors. However, the potential for injury and mortality during construction would be minimal and would be managed through safeguards and management detailed in section 6.3.4. Providing these safeguards and the other standard measures are implemented and remain effective, then any associated impacts would be avoided or minimised.

Entrapment and impingement

A silt curtain would be used to prevent sediment dispersion. As such, there is the potential for aquatic/marine mammals and fish to become entrapped in the curtain.

During construction, fish may be temporarily trapped by the silt curtain within the works area, especially as the area is very shallow. Further safeguards, including regularly inspecting the silt curtain, would minimise the potential impacts.

Advice from DPI Fisheries indicates that a permit to obstruct fish passage under Section 219 of the FM Act would not be required for the Proposal.

Underwater noise

Underwater noise from hammering piles has the potential to cause disturbance or physical impact to marine fauna in the area. Fish in the vicinity would be affected by excessive underwater noise, ranging from mortality to interruption of communication, depending on species anatomy (eg fish with swim bladders closer to the ear are more sensitive to acoustic impact than species with swim bladders further

from the ear). If water depth allows, fish would be able to escape under the silt curtain as hammering starts, otherwise some impact could occur. However, any excessive underwater noise like the removal and installation of piling, including hammering would occur intermittently, with gentle start-up to works further reducing underwater noise impacts as identified in section 6.2.4.

Key threatening process

The Proposal would not include a key threatening process listed under Part 7A of the FM Act.

Indirect and secondary impacts

As described in section 6.1.3 there is the potential for sediment discharge, accidental spills and/or localised scour and erosion to occur while the Proposal is being built. However, by including standard safeguards it is concluded that such impacts could be minimised to the point of having no material indirect impact on aquatic or inter-tidal habitat.

Sediment movement could also smother infauna burrows. Again, it is unlikely that large volumes of sediment would be moved, and that the thin layer of silt or sand that does settle on infauna burrows would not cause significant damage.

Pest species

The introduction of pest species could occur through vessel movements into and out of the local area. However, providing relevant standard controls are implemented and monitored, the impacts are expected to be minimised.

Construction – terrestrial ecology

Loss of vegetation and impact to threatened species

There is no proposal to remove any trees, as such, there is expected to be negligible terrestrial habitat loss or impact under the Proposal.

As there is no proposed vegetation loss or tree removal then there are not any expected impacts on threatened species listed under the BC Act and/or EPBC Act.

Injury and mortality

The avoidance of any vegetation or habitat removal would avoid any significant risk of direct injury or mortality impacts. Mitigation measures would be implemented to eliminate risk of accidental injury to fauna.

Noise, vibration and lighting

Adverse noise and temporary vibration would be introduced while the Proposal is being built (refer to section 6.3). However, this is unlikely to affect any native species due to the highly disturbed nature of the existing environment and the fact the area is already lit. Standard safeguards and management measures would be implemented to reduce impacts from noise and vibration (discussed in section 6.4). Providing these are implemented and remain effective then impacts would be avoided and/or minimised.

Weed invasion

There is minimal potential for the Proposal to introduce weeds into the area, and the mitigation measures detailed in section 6.3.4 would be implemented to minimise risk of weed invasion as a result of construction activities.

Operation – marine ecology

Impacts from ferry operations

Potential impacts which could occur during operation of the Proposal are associated with ferry wash, disturbance of sediments, and a potential increase in pollutants and litter entering the marine environment. The Proposal does not include a significant change from operation of the existing wharf. Given the location and existing use the following impacts are considered minor:

- Ferry wash would not change significantly, and would not impact the foreshore, which is stabilised by a large stone seawall
- Changes from propeller/thrust disturbance to sediments is unlikely to increase given the frequent use by ferries currently
- There is not anticipated to be a change in the type or quantity of litter from users of the wharf, which would continue to be managed through bins, signage, fencing and glazed screens.

Impacts from seawall modification

The new rock apron at the base of the seawall would provide like-for-like habitat. Direct impact from piling and new rock apron at the base of the seawall would harm 38m² of moderate to dense macroalgae. Macroalgae is expected to recolonise so impacts to marine vegetation is considered low and temporary.

Modification to the seawall is considered reclamation due to new the rock apron at base of seawall. As such consultation with DPI under section 199 of the FM Act has been undertaken. No objections were raised from DPI.

Shading

Partial shading (70m²) from the new pontoon and gangway would have an indirect impact on Type 2 and Type 3 KFH (refer to Table 6.4).

In consultation with NSW Fisheries, this type of impact (partial shading) is considered to be very minor and does not warrant the need for further offsets or compensation and confirmed in consultation with DPI Fisheries.

Operation – land based

As there is not expected to be any change to passenger numbers or operational activities around the wharf there is limited potential for any operational terrestrial ecology impacts.

Conclusion on significance of impacts

The Proposal is not likely to significantly impact threatened terrestrial or aquatic species, populations or ecological communities or their habitats, within the meaning of the BC Act or the FM Act and therefore a species impact statement (SIS) is not required.

The Proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act. A referral to the Australian Department of the Environment and Energy is therefore not required for biodiversity matters.

6.3.4 Safeguards and management measures

Table 6.5 lists the aquatic biodiversity safeguards and management measures that would be implemented to account for the impacts identified in section 6.3.3.

Table 6.5: Biodiversity safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|----------------------|--|----------------|-----------------------------------|---------------------------------|
| Aquatic biodiversity | <p>A Marine Ecology Management Plan would be prepared as part of the CEMP. This would include, but not be limited to, measures relating to the following activities to minimise the risk for pollution:</p> <ul style="list-style-type: none"> • Sediment and rock debris control • Oil/fuel/chemical storage and spill management • Machinery and engine maintenance schedule to reduce oil/fuel leakage • Low impact barge positioning to prevent propeller scouring and thrust wash onto sensitive habitats, such as the mangroves • Minimise footprint and establish no-go zones in sensitive habitats (eg key fish habitat) • Accidental waste/material overboard response (eg construction materials dropped into the harbour) • Biological hygiene (eg prevent spread of noxious species on and off the site) • Aquatic fauna management. | Contractor | Pre-construction | Additional Safeguard B1 |
| | No-go zones would be established to avoid damage to all terrestrial and nearby aquatic habitats. No-go zones should be marked on a map and displayed inside the construction barge and office. All staff responsible for manoeuvring the barge should check the map before selecting a new position. | Contractor | Pre-construction/ Construction | Additional Safeguard B2 |
| | No anchors or mooring blocks/lines should be placed on the Type 2 KFH. All lines should be suspended off the seafloor to minimise drag across areas of habitat. | Contractor | Construction | Additional Safeguard B3 |
| | A floating boom with silt curtain would be installed to contain sediment plumes during drilling and pile hammering and placement of the rock apron. The silt curtain should encompass the aquatic construction zone fully, rather than being anchored to the shore and regularly inspected for entrainment and impingement of aquatic/marine wildlife. | Contractor | Construction | Additional Safeguard B4 |
| | Work positioning barges, drilling and pile driving should occur during calm conditions. | Contractor | Construction | Additional Safeguard B5 |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|----------------------|--|----------------|-----------------------------------|---------------------------------|
| | Gentle start-up hammering is to be implemented to allow undetected aquatic fauna to leave the area and avoid hearing damage. Work should be stopped if large fauna is observed nearby. | Contractor | Construction | Additional Safeguard B6 |
| Unexpected bats find | <p>If in the case bats are discovered on site, the CEMP will detail unexpected bat find mitigation measures. Protocol procedures are from the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) must be followed.</p> <p>This includes a stop work procedure if a threatened microbat species is found, and may include the requirement for a Microbat Management Plan.</p> | Contractor | Pre-construction/ Construction | Additional Safeguard B7 |
| Pest species | <p>Measures should be identified as part of the Marine Ecology Management Plan to minimise the potential to introduce <i>Caulerpa taxifolia</i> to the area.</p> <p>This should include measures to minimise contamination. For example, a drill head or anchor used at another site with <i>Caulerpa</i> should be thoroughly cleaned of plant propagules and sediment before being used at another location. Fragments of <i>Caulerpa</i> can remain viable for up to three days out of the water. Best hygiene practices are outlined in the NSW Control Plan for the Noxious Marine Alga <i>Caulerpa taxifolia</i> (NSW I&I 2009).</p> | Contractor | Pre-construction/ Construction | Additional Safeguard B10 |

6.4 Noise and vibration

This section summarises the Proposal's noise and vibration impacts. Appendix E contains additional details on noise and vibration assessment.

6.4.1 Methodology

Construction assessment

The construction assessment reviewed how the proposed activities, methods and scheduling described in Chapter 3 would affect noise and vibration sensitive receivers in the local area. The assessment was completed in accordance with the Construction Noise and Vibration Guideline (CNVG, Roads and Maritime, 2016b). Noise levels from construction works were predicted using 3D noise modelling software (SoundPLAN) and calculated using CONCAWE™ prediction algorithm.

Operational assessment

The operational assessment was limited to a qualified consideration of any amenity noise change from using the upgraded wharf in its current location.

6.4.2 Existing environment

Topography

Woolwich Wharf sits at the southern end of Valentia Street, a short gently sloping street connecting to Point Road, the main ridgeline street through the Eastern end of the Woolwich Peninsula. Valentia Street Reserve is generally level near the foreshore. The land starts to slope up at the northern end. Residential houses on Valentia Street step down the slope with those closest to the wharf sitting at a raised level due to sandstone benches which underpin the side of the ridge.

Noise monitoring and ambient noise levels

The existing noise levels surrounding the Proposal were determined through a combination of unattended and operator attended noise surveys with the Australian Standard 1055-1997- Acoustics-Description and Measurement of Environmental Noise (AS 1055) and NSW Noise Policy for Industry (NPfI, EPA 2017). Unattended noise survey was performed the 24th and 31st May 2019 while operator attended noise survey was performed on 24th May 2019 and 20th- 27th July 2017.

Main activities and sources that contribute to the ambient noise in the area are the following:

- Plant operating on the wharf and harbour (e.g. ferries, boat pass-by, marina works, ship generator)
- Intermittent sources such as airplanes and helicopters passing overhead
- Wider day-to-day landside sources like birds, trucks and cars.

There are two identified noise monitoring (NM) locations. Details of noise monitoring locations and results are identified in Table 6.6. Monitoring was performed across three time spans: day, evening and night.

Table 6.6: Noise monitoring locations and results

| ID | Survey Method | Location | Noise Level (RBL ¹ , Dba) | | |
|------|---------------|-------------------------------|--------------------------------------|----------------------|--------------------|
| | | | Day ² | Evening ² | Night ² |
| NM01 | Unattended | Valentia Street Reserve | 41 | 40 | 33 |
| | Attended | | | | |
| NM02 | Attended | 9 O'Connell Street, Greenwich | 44 | 43 | 42 |

¹RBL – rating background level. The overall single-figure background level representing each assessment period (daytime/evening/night-time) as defined in the NPfl.

²Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening: 6pm to 10pm; Night: 10pm to 7am Monday to Saturday, 10pm to 8am Sunday.

Sensitive receivers

The Proposal would be built within proximity to residential receivers near the Proposal. As the sensitive receivers are confined to several distinct areas, they have been split into catchments. These noise catchment areas (NCAs) contain similar key receivers as summarised in Table 6.7. Identified sensitive receivers surrounding the Proposal and noise catchment areas are shown in Figure 6.5.

Table 6.7: Noise catchment areas and receivers

| NCA | Receiver type | Minimum distance from the Proposal footprint (m)* | Description |
|-------|-------------------|---|--|
| NCA01 | Residential | 30 | Multi-storey, medium density residential receivers north and west of the Proposal boundary at Woolwich |
| | Active recreation | 0 (adjacent) | Valentia Street Reserve is located adjacent to the Proposal to the north. |
| | Commercial | 310 | Commercial receivers located on Clarke Road to the west of the Proposal. |
| NCA02 | Residential | 370 | Multi-storey, medium density residential receivers east of the Proposal boundary at Woolwich. |

*Minimum distance of the sensitive receiver buildings to the limits of the construction footprint (i.e. the nearest point to works at wharf).

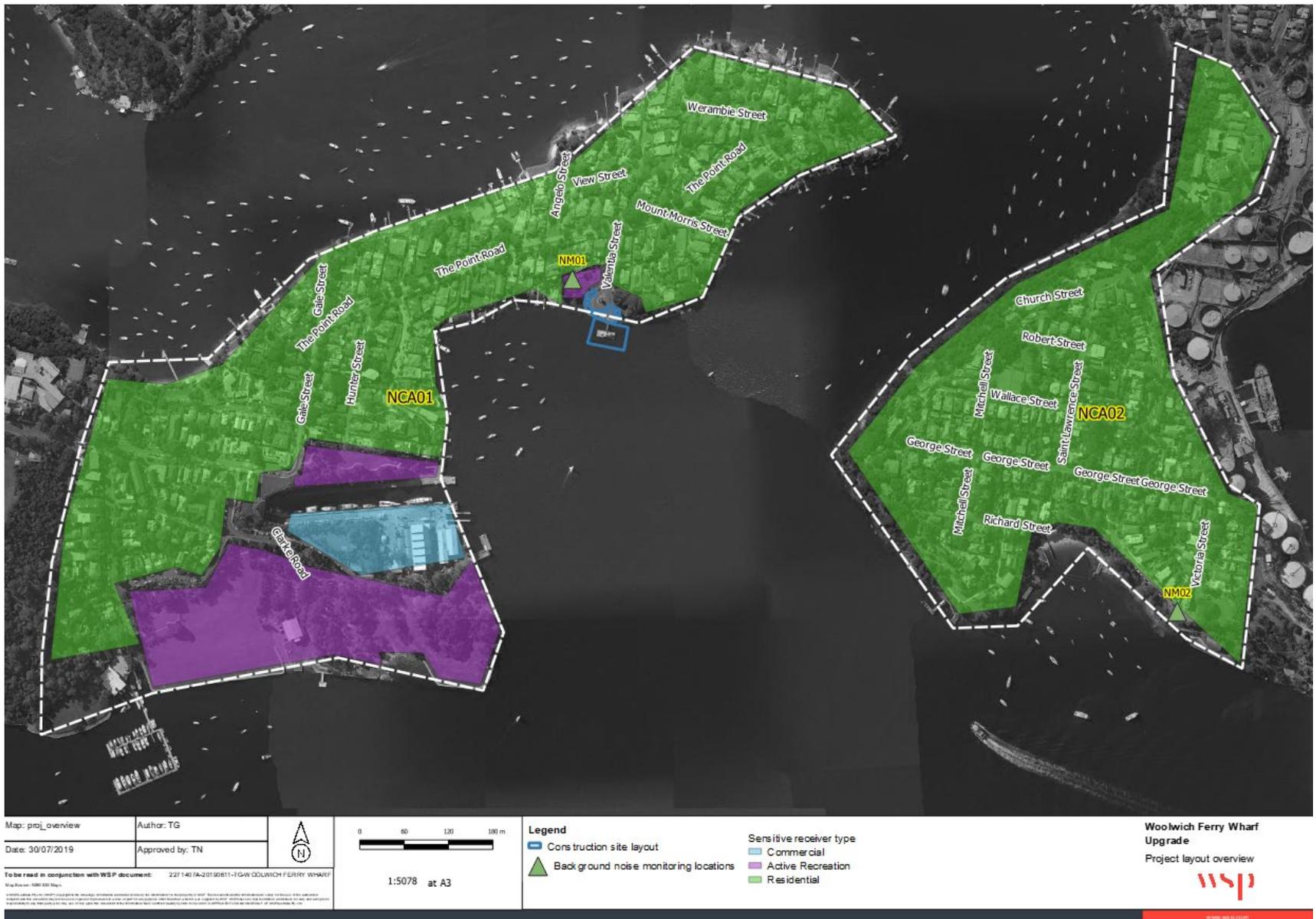


Figure 6.11: Noise catchment areas

6.4.3 Criteria

During construction, equipment and material deliveries are carried out by waterside transportation and a small number of light and heavy vehicles to limit any traffic impacts to The Point Road. As traffic noise generation is not considered to be acoustically significant, construction traffic noise has not been assessed further.

Construction periods for this Proposal are shown in Table 6.8 below.

Table 6.8: Construction periods

| Period | Time |
|---------------------------------------|--|
| Standard hours (SH) | Monday to Friday – 7 am to 6 pm Saturday – 8 am to 1 pm Sunday/Public Holiday – Nil |
| Out of hours work – period 2 (OOHW 2) | Monday to Friday – 10 pm to 7 am Saturday – 10 pm to 8 am Sunday/Public Holiday – 6 pm to 7 am |

Out of hours construction

Out of hours piling is expected to occur over 15 nights (about 3 weeks), with drilling occurring from 1 am to 6 am and hammering from 5 am to 7 am. The noisiest out of hours work, hammering the piles, is to be restricted to the last two hours of the night-time period to minimise the impact. During these hammering activities, it is anticipated that each pile would be hammered for one minute (about 10 hits with the hammer within one minute). For each pile the activity is likely to occur about five times over a period of one hour. Installation of the pontoon and gangway is expected to occur out of hours for a period of two weeks.

It may also be necessary to lay asphalt with a low noise impact outside of standard hours to ensure that the cul-de-sac remains open for buses to turn during daily operations.

Construction noise assessment criteria

In reference to the CNVG, construction noise management levels (NMLs) are defined using the method specified in the Interim Construction Noise Guideline (ICNG, EPA 2009). They are based on the measured rating background level (RBL) as defined in the Noise Policy for Industry (NPfI) plus an additional allowance of 10 dB during standard hours and 5dB outside of standard hours. The ICNG also states that where construction noise levels are above 75 dBA at residential receivers during standard hours, they are considered 'highly noise affected' and require additional considerations to mitigate potential impacts. Table 6.9 presents the construction NMLs for each assessment period for residential receivers in each NCA and lists NMLs adopted for non-residential receivers.

Noise management levels at non-residential receivers including commercial and active recreation are defined at 70 and 65 DBA $L_{EQ(15MIN)}$, respectively. Commercial receivers for external noise levels assessed at the most affected occupied point on the premises.

Table 6.9: NMLs for residential receivers

| NCA | ID | dBA RBL | | NML DBA $L_{EQ(15MIN)}$ ¹ | |
|-------|------|----------------|--------|--------------------------------------|--------|
| | | Standard Hours | OOHW 2 | Standard Hours | OOHW 2 |
| NCA01 | NM01 | 41 | 33 | 51 | 38 |
| NCA02 | NM02 | 44 | 42 | 54 | 47 |

¹Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening: 6pm to 10pm; Night: 10pm to 7am Monday to Saturday, 10pm to 8am Sunday.

Sleep disturbance

Some of the proposed construction work would be required to take place during the night-time periods (11 pm to 7 am) as these works require calmer water conditions to undertake installation from the water. section 4.3 of the ICNG discusses the method for quantifying and assessing sleep disturbance (sleep awakening). This guidance references further information in the NSW Road Noise Policy (RNP, NSW EPA, 2013) that discusses criteria for the assessment of sleep disturbance.

The RNP suggests a screening level of $L_{1(1min)}$ dBA, equivalent to the RBL + 15 dB. Where this level is exceeded, further analysis should be carried out. In addition, section 5.4 of the RNP also states that:

- Maximum internal noise levels below 50-55 dBA would be unlikely to result in people’s sleep being disturbed
- If the noise exceeds 65-70 dBA once or twice each night-time the disturbance would be unlikely to have any notable health or wellbeing effects.

The guidance within the RNP indicates that internal noise levels of 50-55 dBA are unlikely to cause sleep awakenings. Therefore, at levels above 55 dBA, sleep disturbance would be considered likely. Assuming that receivers may have windows partially open for ventilation, a 10 dB outside to inside correction has been adopted as indicated in the ICNG.

Based on the above, the noise level 65 dBA Lmax (external) has been adopted as sleep disturbance screening criterion for assessment purposes.

Construction vibration assessment criteria

Construction vibration can lead to cosmetic and structural building damage as well as loss of amenity due to perceptible vibration. The construction vibration assessment criteria comprise minimum safe working distances determined from an assessment of peak vibration velocities based on the British Standard BS 7358-2: *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*

Assessment criteria for cosmetic building damage is identified in Table 6.10.

Table 6.10: Assessment criteria for cosmetic building damage

| Group | Type of structure | Peak component particle velocity, mm/s ¹ | | |
|-------|---|---|----------|-----------------|
| | | 4-15 Hz | 15-40 Hz | 40 Hz and above |
| 1 | Reinforced or framed structures Industrial or heavy commercial buildings | 50 | | |
| 2 | Un-reinforced or light framed structures Residential or light commercial buildings | 15 – 20 ² | 20 – 50 | 50 |

¹Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

²At frequencies below 4Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

These peak vibration limits are set so that the risk of cosmetic damage is minimal. They have been set at the lowest level above which damage has been credibly demonstrated. The limits also assume that the equipment causing the vibration is only used intermittently. For ‘minor’ or ‘major’ vibrational damage to occur, the standard states that vibration need to be two times and four times (respectively for group 1 and group 2) the values shown as above.

Vibration assessment for heritage structures are considered on a case by case basis and where it is deemed to be sensitive to damage from vibration following inspection by a qualified structural and / or civil engineers. A conservative vibration damage screening (trigger) PPV level of 7.5 mm/s is recommended for the heritage item listed in the Proposal and has been established with reference to the minor cosmetic damage criteria in BS 7385-2. The vibration levels specified in this standard are

designed to minimise the risk of threshold or cosmetic surface cracks, and are set well below the levels that have potential to cause damage to the main structure.

Vibration generated by impact piling construction work is generally classified as impulsive and has the potential to affect human comfort. Table 6.11 defines criteria for impulsive vibration for human comfort (amenity).

Table 6.11: Human comfort (amenity) vibration limits

| Location | Assessment period | Peak velocity (mm/s) | |
|------------|-------------------|----------------------|----------------|
| | | Preferred values | Maximum values |
| Residences | Daytime | 8.6 | 17.0 |
| | Night | 2.8 | 5.6 |

Assessment for recommended safe working distances for vibration intensive plant are detailed in Table 6.12. The distances are primarily based on the safe working distance provided in the CNVG. For driven piles, the distance was calculated based on meeting the most stringent cosmetic damage criteria in BS 7358-2 for residential properties and Assessing Vibration: A Technical Guideline.

Table 6.12: Recommended safe working distances for vibration intensive plant

| Plant item | Rating / description | Safe working distance | |
|------------------|----------------------------------|-----------------------|------------------------------|
| | | Cosmetic damage | Human response |
| Pile boring | ≤ 800mm | 2 m (nominal) | 4 m |
| Driven piles | Typical driven pile ¹ | 20 m | 30-50 m |
| Vibratory roller | < 200 kN (typically 4-6 t) | 12 m | 40 m |
| Jackhammer | Hand held | 1m (nominal) | Avoid contact with structure |

¹Vibration levels for driven piling modelled in line with FTA Noise and vibration manual. Driven piles plant item to represent impact piling rig.

6.4.4 Potential impacts

Construction stages

For assessment of construction and vibration impacts, six scenarios were determined to identify various construction stages. Table 6.13 identifies the construction stage and associated period.

Table 6.13: Construction stage, scenario, and period

| Scenario | Construction stage | Period |
|----------|--|---|
| S01 | General wharf construction and demobilisation | Standard hours |
| S02 | Demolition and removal of piles | Standard hours |
| S03 | Road, footpath and seawall works | Standard hours |
| S04 | Lifting pre-fabricated units including the pontoon and gangway | Standard hours Out of hours – period 2 |
| S05 | Pile installation (drilling) | Out of hours – period 2 |
| S06 | Pile installation (hammering) | Out of hours – period 2 |

Activity based noise

Each level of construction staging would include various types of equipment and be used during various times of the day. Table 6.14 lists the types of equipment and relevant sound power levels that would occur during construction and identify what scenario equipment would be used. The table also identifies the scenario total SWL and total maximum noise levels measured in dBA.

Table 6.14: Equipment and associated dBA

| Equipment | Sound power level (dBA) | Scenario | | | | | |
|--|-------------------------|------------|------------|------------|------------|------------|------------|
| | | S01 | S02 | S03 | S04 | S05 | S06 |
| Angle grinders ^{1,4} | 119 | | ✓ | | | | |
| Barge ³ | 95 | ✓ | ✓ | | | | |
| Boat ³ | 100 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Compressor ⁴ | 109 | ✓ | | | ✓ | | |
| Crane ⁴ | 104 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Generator ⁴ | 103 | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Hand tools (electric) ⁴ | 110 | ✓ | ✓ | | ✓ | | |
| Piling rig (boring) ⁴ | 112 | | | | | ✓ | |
| Piling rig (impact) ^{1,4} | 121 | | | | | | ✓ |
| Light vehicle ⁴ | 88 | ✓ | | | | | |
| Daymaker ² | 80 | | | | ✓ | ✓ | ✓ |
| Jack hammer ^{1,4} | 118 | | | ✓ | | | |
| Smooth drum roller ^{1,4} | 112 | | | ✓ | | | |
| Pavement laying machine ⁴ | 114 | | | ✓ | | | |
| Asphalt truck ⁴ | 103 | | | ✓ | | | |
| Concrete truck ⁴ | 109 | | | ✓ | | | |
| Concrete pump ⁴ | 102 | | | ✓ | | | |
| Scenario total SWL (dBA) | | 112 | 114 | 119 | 112 | 109 | 116 |
| Scenario total maximum noise levels L_{max} (dBA) | | - | - | - | 117 | 114 | 121 |

¹To account for the annoying characteristics of the plant, a +5 dB correction has been added to the sound power level of the plant item.

²Sound power level extracted from TfNSW "Construction Noise and Vibration Strategy (2018)"

³Sound power level provided based on a previous study of the Proposal and approved by Roads and Maritime

⁴Sound power level extracted from the CNVG

This information has been used to define the combined noise output (sound power level) generated in each location at a given time. Further detail is provided in Appendix E.

Activity based noise impact

Modelling inputs for each scenario included ground contours, locations of sensitive receptors, noise-generating equipment as well as any other inputs which have an effect on the noise environment, such as the buildings surrounding the Proposal.

Noise impacts were assessed within each NCA, receiver type and closest distance. Conservative calculations were performed as they include all equipment operating simultaneously at a typical distance to the receiver. Actual noise levels from the construction site would be expected to be lower. Table 6.15 identifies the modelled construction noise levels for each scenario and identifies exceedances of noise in daytime, night-time and highly noise affected receivers.

Table 6.15: Noise impact summary

| Construction stage | Receiver | Noise catchment area | Highest noise level (dBA L _{eq(15min)} (Standard hours)) ¹ |
|--|-------------------|----------------------|--|
| S01: General wharf construction and demobilisation | Residential | NCA01 | 67 |
| | Residential | NCA02 | 49 |
| | Active recreation | NCA01 | 70 |
| | Commercial | NCA01 | 49 |
| S02: Demolition and removal of piles | Residential | NCA01 | 69 |
| | Residential | NCA02 | 51 |
| | Active recreation | NCA01 | 69 |
| | Commercial | NCA01 | 51 |
| S03: Road and footpath works | Residential | NCA01 | 79 |
| | Residential | NCA02 | 54 |
| | Active recreation | NCA01 | 79 |
| | Commercial | NCA01 | 55 |
| S04: Lifting pre-fabricated units including the pontoon and gangway | Residential | NCA01 | 67 |
| | Residential | NCA02 | 49 |
| | Active recreation | NCA01 | 67 |
| | Commercial | NCA01 | 49 |
| S05: Pile installation (drilling) | Residential | NCA01 | 64 |
| | Residential | NCA02 | 47 |
| | Active recreation | NCA01 | 64 |
| | Commercial | NCA01 | 49 |
| S06: Pile installation (hammering) | Residential | NCA01 | 71 |
| | Residential | NCA02 | 53 |
| | Active recreation | NCA01 | 71 |
| | Commercial | NCA01 | 56 |

Exceedances of daytime

Exceedances of night time

Highly noise affected receivers

Construction noise impacts at the residential receivers indicates that there are exceedances at NCA01 and NCA02. For NCA01 receivers, exceedances will occur during all scenarios with a maximum exceedance of 27dB during road and pavement works (S03) while during night time, S04 and S06 have a maximum exceedance of 33dB during pile installation of hammering at S06. Exceedances of highly noise affected receivers at NCA01 during S03. For NCA02 receivers, exceedances of night time occurs at S04 of 2dB S06 of 6dB.

The assessment of construction noise impacts at the non-residential receivers indicate that NMLs are exceeded during all scenarios except S05 at active recreation receivers, and no NMLs are exceeded at nearby commercial sensitive receivers.

In summary, exceedances of NMLs are generally expected for receivers immediately next to the footprint. Multi-storey receivers with clear line of sight to the work site on The Point Road and Mayfield Avenue are likely to have the highest impacts from the proposed construction work.

The landside construction scenario with the highest predicted exceedances is during road and pavement works (S03). This is due to use of multiple items of high noise level plant being used as part of the scenario. It is assumed that noise levels would be lower as it is expected that all high noise level equipment would not be used simultaneously during the activity.

Noise mitigation and management measures have been outlined in Section 6.4.5 to reduce the noise impact. These include standard mitigation measures and other measures to reduce noise impacts, and additional mitigation such as notifying impacted receiver.

Sleep disturbance assessment

Some construction activities would be required to take place out of hours for safe working reasons. Work carried out during the night has the potential to lower sleep quality of the residents adjacent to the construction footprints due to peak noise events. The potential sleep impacts include decrease ability to fall asleep, waking up during sleep and waking up too early.

An assessment for sleep disturbance has been carried out based on the maximum noise (L_{max} , dBA) from construction plant. The maximum noise level from the equipment was assumed to be 5 dB more than the $L_{eq,15min}$ noise level based on previous observations. The predicted maximum noise events with the potential to cause sleep disturbance and locations are presented in Table 6.16.

Table 6.16: Sleep disturbance assessment

| Construction stage | NCA | Predicted noise level (dBA L_{MAX}) |
|---|-------|--|
| S04 Lifting pre-fabricated units including the pontoon and gangway | NCA01 | 72 |
| | NCA02 | 54 |
| S05 Pile installation (drilling) | NCA01 | 69 |
| | NCA02 | 51 |
| S06 Pile installation (hammering) | NCA01 | 76 |
| | NCA02 | 58 |

Exceedances of night time noise levels

The predicted maximum noise levels indicates that sleep disturbance for residential receivers may occur at receivers along The Point Road, Woolwich during the drilling of piles, hammering of piles, and lifting of the pontoon and gangway into position (S03, S04, and S06).

The drilling of piles is expected to occur between 1am and 6am, and hammering of piles between 5 am to 7 am. Piling is estimated to take around three weeks (15 nights) to complete.

This would potentially result in maximum noise level events occurring multiple times during this period in NCA01, resulting in a potential impact to sleep quality with residents being woken up.

The potential for work to generate maximum noise level events should be considered as part of the construction noise management strategy. Noise mitigation measures are discussed further in section 6.4.5.

Activity based vibration impact

As mentioned in section 6.4.3 criteria for vibration impacts, minimum safe working distances were established varying based on plant item and type of impact between cosmetic damage and human response.

Given the distances and potential work areas of vibratory intensive plant, residential and commercial receivers are anticipated to be located outside the safe working distance limits and therefore no further action is required.

The identified heritage structure would be within safe working distance limits for cosmetic damage, and therefore would exceed the more stringent heritage screening criteria. No potential vibration impacts were predicted at nearby residential or commercial receivers.

Mitigation summary

Mitigation for construction noise and vibration includes mitigation incorporated into the design of the Proposal and construction methodology, as well as additional mitigation for noise where exceedances of criteria are predicted.

Potential noise impacts have been minimised through the design of the Proposal which involves undertaking as much construction work as possible at a contractors off-site facility rather than at site, including assemblage of pre-fabricated components, and constructing the wharf during standard hours.

Piling, lifting and installation of the pontoons and gangways work for the Proposal is estimated to take about three weeks to complete. Installation of the piles would require calm environmental conditions (still water and minimal wind) so that the floating barge used for the piling can remain still for the piles to be installed accurately and would be performed out of standard hours. Calm conditions are also required to ensure safe conditions for construction personnel. The waterway is usually calmer early in the morning, with wind and wind chop increasing throughout the day.

Further consultation with the community would be undertaken to identify and avoid piling during sensitive hours to reduce the impacts for the surrounding receivers. It is anticipated that sensitive hours may include school hours, and peak hours of operation for nearby commercial receivers such as cafes.

It may also be necessary to lay asphalt with a low noise impact outside of standard hours to ensure that the cul-de-sac remains open for buses to turn during daily operations.

Additional noise mitigation measures

To further minimise the noise impact of construction activities, the additional mitigation measures are taken from the Construction Noise and Vibration Guideline (Roads and Maritime 2016b), and detailed in the following sections and considered where an exceedance of construction noise levels would be present after implementation of standard measures described in section 6.4.5.

Notification (N)

Notification, in the form a letter to all potentially affected receivers, would be undertaken at least five days prior to the each of the proposed activities detailed above. The notification area is shown in purple in Figure 6.12.

Verification (V)

Verification would include measurements of the background noise level already captured as part of the Noise and Vibration Impact Assessment report (Appendix E), and actual construction noise levels monitored using hand-held devices during periods associated with high noise impacts.

Application of additional noise mitigation

The mitigation measures required during the construction scenarios for the Proposal are detailed in Table 6.17 below.

Table 6.17: Additional noise mitigation measures (airborne)

| NCA | S01 | S02 | S03 | S04 | S05 | S06 |
|-------|------|-----|--------------|------------------------------------|------------------------------------|------------------------------------|
| NCA01 | N, V | N,V | N, V, PC, RO | AA, V, IB, N, PC, SN, R2, DR | AA, V, IB, N, PC, SN, R2, DR | AA, V, IB, N, PC, SN, R2, DR |
| NCA02 | - | - | - | N | - | V, N, R2, DR |

Notes:

1: No additional mitigation is required for exceedances within the standard hours below 10 dB of the NMLs

2: AA = alternative accommodation, V = verification, IB = individual briefing, N = notification, R2 = respite period, DR = duration respite, R1 = respite period 1, PC = phone calls, SN = specific notifications.

As notification of the proposed construction activities would be undertaken prior to activities commencing, this advance warning would provide opportunity for residences to undertake precautions to further reduce noise such as notification of working times, duration of works, outline of activities and potential impacts from the works. Community should be notified at least two weeks prior to works commencing on site.

A complaint handling procedure should be implemented. Guidance on methods of complaints handling and additional community engagement strategies are outlined in section 8.3.2 of the TfNSW Construction Noise and Vibration Strategy (TfNSW, 2018).

Operation

The upgraded wharf would continue to enable the operation of the F8 Ferry Service between Circular Quay and Cockatoo Island. Ferry services typically operate every 60 minutes per direction. Operations is expected to return similarly to existing conditions.

As such, there is not expected to be any change in amenity noise under the Proposal. Also, no noise-generating equipment would be installed under the upgrade. Further, no change in operational traffic is anticipated.

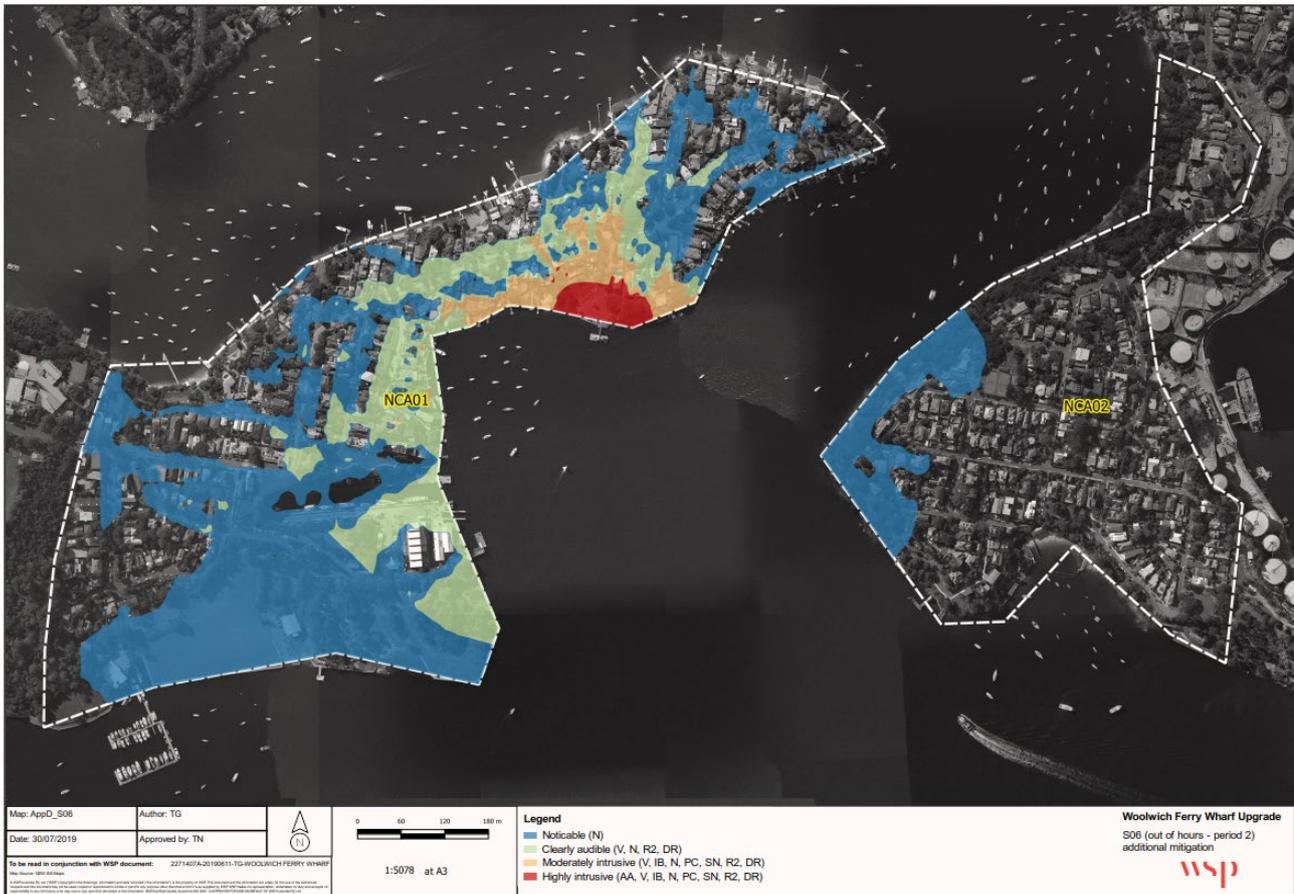
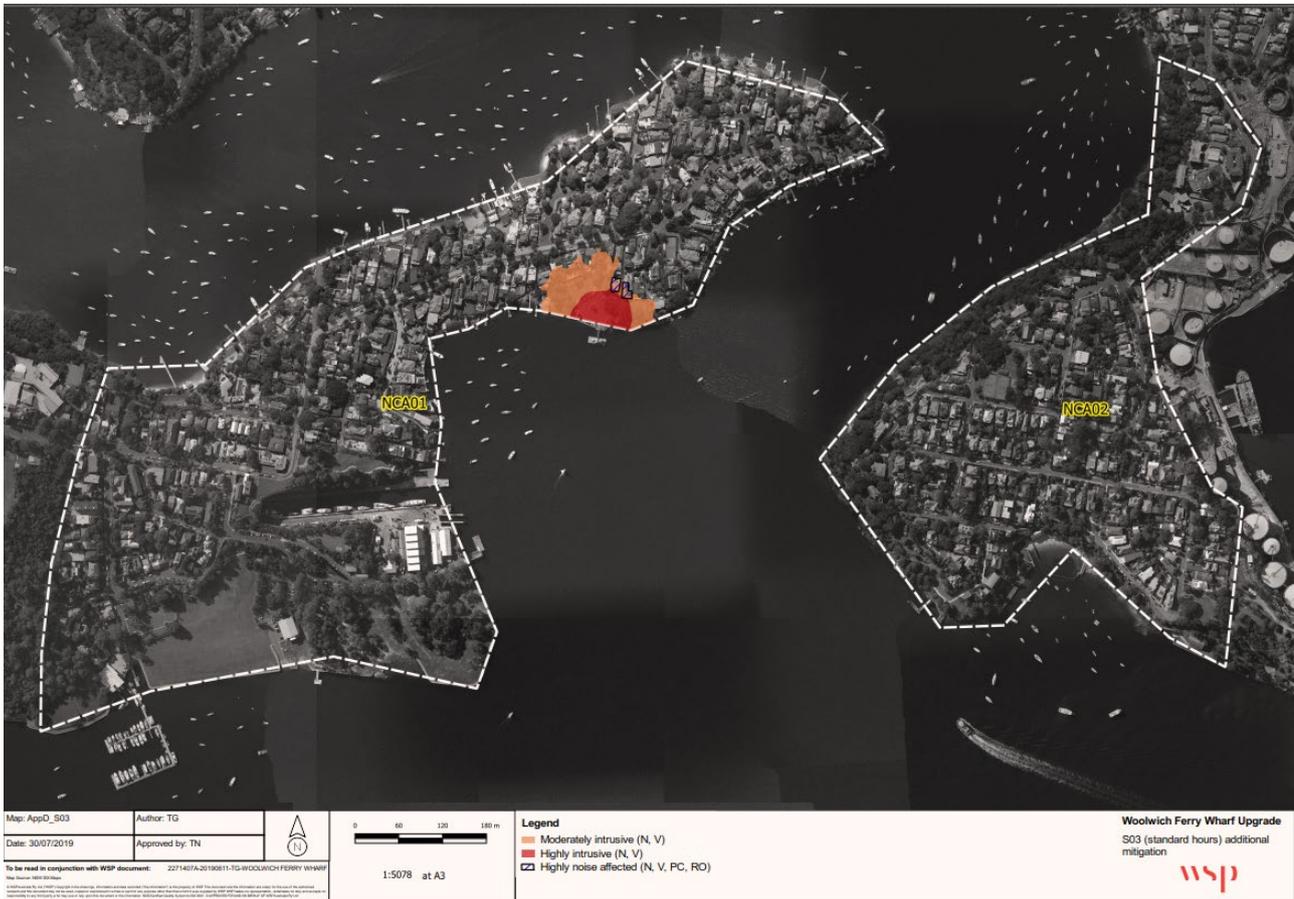


Figure 6.12: Proposed notification area: standard hours (top), out of hours (below)

6.4.5 Safeguards and management measures

Table 6.18 lists the noise and vibration safeguards and management measures that would be implemented to account for the impacts identified in section 6.4.4

Table 6.18: Noise and vibration safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|--|---|----------------|-----------------------------------|---------------------------------|
| Site Specific Mitigation Measures | | | | |
| Airborne noise Ground-borne noise and vibration | Limiting number of plant, use of alternative equipment and /or using a different, quieter method to carry out the work. Where feasible, limit the amount of plant equipment operating at any one time. For particularly noisy plant items (e.g. jackhammer), the use of such plant should be minimised where feasible. | Contractor | Construction | Additional safeguard |
| Airborne noise | Where feasible and reasonable, any site hoarding or fences erected should be constructed with thick plywood or fitted with temporary acoustic barriers to provide additional noise reduction at the immediate receivers. | Contractor | Construction | Additional safeguard |
| Airborne noise | Considered implementation of temporary barriers around the stationary sources or use of alternative quieter equipment. Where temporary noise barriers are used to block line of sight between stationary works and equipment (paving, jackhammering, compressor and generator) and the receivers, a reduction of around 5 dB to 10 dB could be expected. | Contractor | Construction | Additional safeguard |
| Airborne noise Ground-borne vibration | Potential noise impacts have been minimised through the design of the Proposal which involves undertaking as much construction work as possible at a contractor's off-site facility rather than at site, including assemblage of pre-fabricated components. | Contractor | Construction | Additional safeguard |
| Vibration on Heritage building | To minimise vibration impacts related to the heritage building, the following management measures are required: <ul style="list-style-type: none"> Attended vibration measurement to be undertaken to establish acceptable working distances specific to the plant and site conditions. Pre and post construction dilapidation survey to be undertaken at the heritage listed Valentia Street Wharf and waiting shed. | Contractor | Pre-construction/ construction | Additional safeguard |

| CNVG Standard Mitigation Measures | | | | |
|--|--|--------------------------------|-----------------------------------|----------------------|
| Airborne noise Ground-borne noise and vibration | Notifications of noisy activities will be issued detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 5 days prior to the start of works. | Roads and Maritime/ Contractor | Pre-construction/ Construction | Additional safeguard |
| Airborne noise Ground-borne noise and vibration | All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures. | Roads and Maritime/ Contractor | Pre-construction | Additional safeguard |
| Airborne noise | No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. | Contractor | Construction | Additional safeguard |
| Airborne noise Ground-borne noise and vibration | Where specified a noise verification program is to be carried out for the duration of the noisy activities in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions. | Contractor | Construction | Additional safeguard |
| Ground-borne vibration | Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. | Contractor | Construction | Additional safeguard |
| Airborne noise Ground-borne noise and vibration | The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies. | Contractor | Pre-construction/ Construction | Additional safeguard |

| CNVG Standard Mitigation Measures | | | | |
|--|--|------------|--------------|-------------------------|
| Airborne noise Ground-borne noise and vibration | Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained. | Contractor | Construction | Additional safeguard |
| Airborne-noise | Where possible, the noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Table 4.2 of Appendix E Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Table 4.2 of Appendix E | Contractor | Construction | Additional safeguard N2 |
| Airborne-noise | The noise levels of plant and equipment items are to be considered in rental decisions and in any case, cannot be used on site unless compliant with the criteria in Table 4.2 of Appendix E. | Contractor | Construction | Additional safeguard |
| Airborne-noise | The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently is to be throttled down or shut down. Noise-emitting plant is to be directed away from sensitive receivers. Only have necessary equipment on site. | Contractor | Construction | Standard safeguard N3 |
| Airborne noise Ground-borne vibration | Where possible, locate compound away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00pm where possible. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again. | Contractor | Construction | Additional safeguard |

| CNVG Standard Mitigation Measures | | | | |
|--|---|------------|--------------|----------------------|
| Airborne noise Ground-borne vibration | Use only the necessary size and power | Contractor | Construction | Additional safeguard |
| Airborne noise | Where possible, non-tonal reversing beepers (or an equivalent mechanism) are to be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level. | Contractor | Construction | Additional safeguard |
| Airborne noise | Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise out of hours movements where possible. | Contractor | Construction | Additional safeguard |
| Construction vehicles | Limit the use of engine compression brakes at night and in residential areas. Where possible, ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard. | Contractor | Construction | Additional safeguard |
| Airborne noise | Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding. | Contractor | Construction | Additional safeguard |
| Airborne noise | Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when siting plant. | Contractor | Construction | Additional safeguard |

6.5 Landscape character and visual impact

This section summarises the Proposal’s landscape character and visual impacts. Appendix F contains a supporting paper (landscape and visual impact assessment, LCVIA) prepared by Jane Irwin Landscape Architecture (JILA).

6.5.1 Methodology

This report has been prepared based on the structure outlined in the RMS Environmental Impact Assessment Practice Note EIA-N04 - Guideline for landscape character and visual impact assessment. (EIA- No4 Guidelines) March 2013b. The RMS document ‘Beyond the Pavement’ 2014, also addresses the design and impact of wharves. Tasks outlined in the guide include:

- Analyse landscape character.
- Identify landscape character zones.
- Assess landscape character impacts.
- Assess the visibility of the Proposal.
- Identify key viewpoints.
- Assess visual impacts.
- Refine the concept design to avoid and minimise landscape character and visual impacts.
- Develop a mitigation strategy to minimise landscape character and visual impacts.

According to the terms defined within the EIA-N04 Guideline, both a landscape character and a visual impact assessment have been conducted to determine impacts of the Proposal on the character of the place and the views within that place.

| | | Magnitude | | | |
|-------------|------------|---------------|---------------|--------------|------------|
| | | High | Moderate | Low | Negligible |
| Sensitivity | High | High | High-Moderate | Moderate | Negligible |
| | Moderate | High-Moderate | Moderate | Moderate-low | Negligible |
| | Low | Moderate | Moderate-low | Low | Negligible |
| | Negligible | Negligible | Negligible | Negligible | Negligible |
| | Negligible | Negligible | Negligible | Negligible | Negligible |

Source: Roads and Maritime

Figure 6.13: Landscape character and visual impact grading matrix.

6.5.2 Existing environment

Landscape context and character of the Wharf in its Setting

The wharf is located at the end of Valentia Street within the residential suburb of Woolwich and sits on the South Eastern foreshore of the Woolwich Peninsula. Woolwich Peninsula is a natural sandstone landform modified in part by industrial and shipping uses. It forms the head of the Lane Cove River which lies along its northern shore. The Parramatta River is the waterbody on the Southern side of the Peninsula. The Greenwich Peninsula lies directly East of the wharf, Birchgrove Peninsula to the South and Cockatoo Island to the South West.

Woolwich wharf sits at the terminus of Valencia Street, a short gently sloping street connecting to Point Road, through the eastern end of the Woolwich Peninsula. The suburb is residential with some mixed use located at the Eastern end of Woolwich Road. The built form is predominantly detached housing of two to three storeys on large blocks. Both streets and gardens contain mature trees, broad avenues, and distinctive specimen trees.

Valencia Street terminates with a bus turning area, perpendicular parking bays and a roundabout planted with a single Canary Island palm. The Western side of the street has sandstone steps providing access to a small beach and a small park above with play equipment. The Eastern side of the street has a small reserve which is currently overgrown and has limited access. Residential houses on Valencia Street step down the slope with those closest to the wharf sitting at a raised level due to sandstone benches which underpin the side of the ridge.

The existing wharf aligns with Valencia Street and is viewed in conjunction with an adjacent heritage waiting shed. This wharf was constructed in 1993 and consists of a steel and timber gangway and concrete pontoon with a partially enclosed waiting area over the water. The roof structure is a steel frame pitched roof with corrugated iron covering. The heritage sandstone waiting shed and amenities block sits on the Eastern side of Valencia Street, next to the bus stop and close to the current wharf entry. The existing wharf connects to the foreshore edge and sandstone seawall at the end of Valencia Street. The heritage description and significance is further described in section 6.8.

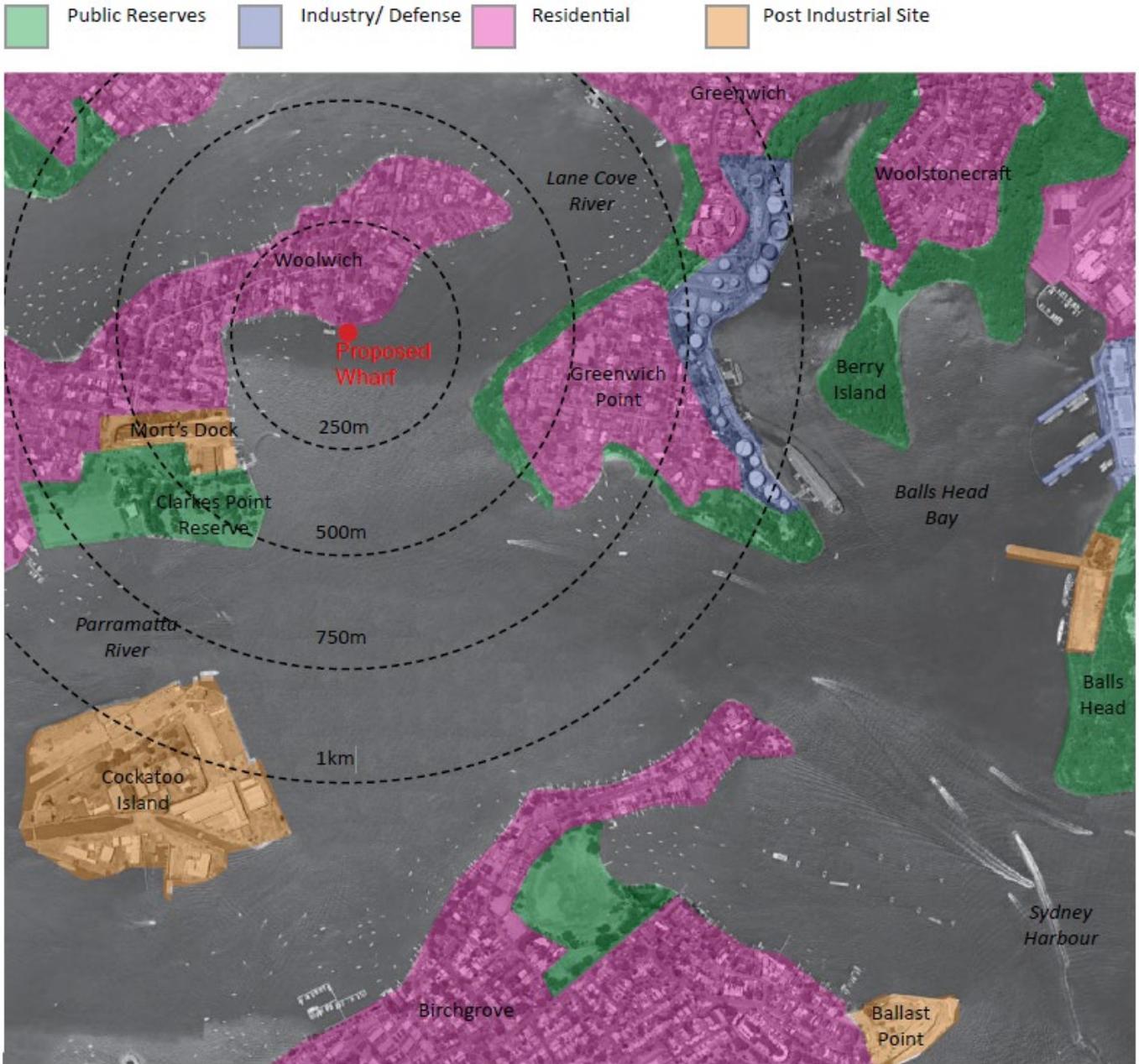
Landscape Character and context

In assessing the landscape character of Woolwich and how the proposed wharf will fit within this the surrounding landscape has been divided into seven identified landscape character zones as identified in Figure 6.14.

- Woolwich
- Greenwich Point
- Clarkes Point and Mort's Dock
- Cockatoo Island
- Birchgrove
- Lane Cove River
- Sydney Harbour.

These landscape character zones included the following for consideration in the visual assessment:

- Character of Woolwich is a residential and parkland edge
- Existing character from the water is a layering of elements beginning from the wharf toward the slope behind the mixed scale residential buildings
- Material character of Woolwich is sandstone
- Role of topography by opening vistas to the harbor at the end of streets and consideration for steep terrain
- Iconic visual elements within the surrounding landscape including the Sydney CBD skyline, Cockatoo Island and Mort's Dock.



Source: JILA

Figure 6.14: Landscape character zones

Viewpoints

Figure 6.15 shows the key view point locations. Distance zones have been established within the visual catchment. Distance for zones are the following:

- Foreground zone (FZ): 0 to 250 m from the viewer
- Middle ground zone (MZ): 250 m to 500 m from the viewer
- Background zone (BZ): greater than 500 m from viewer.

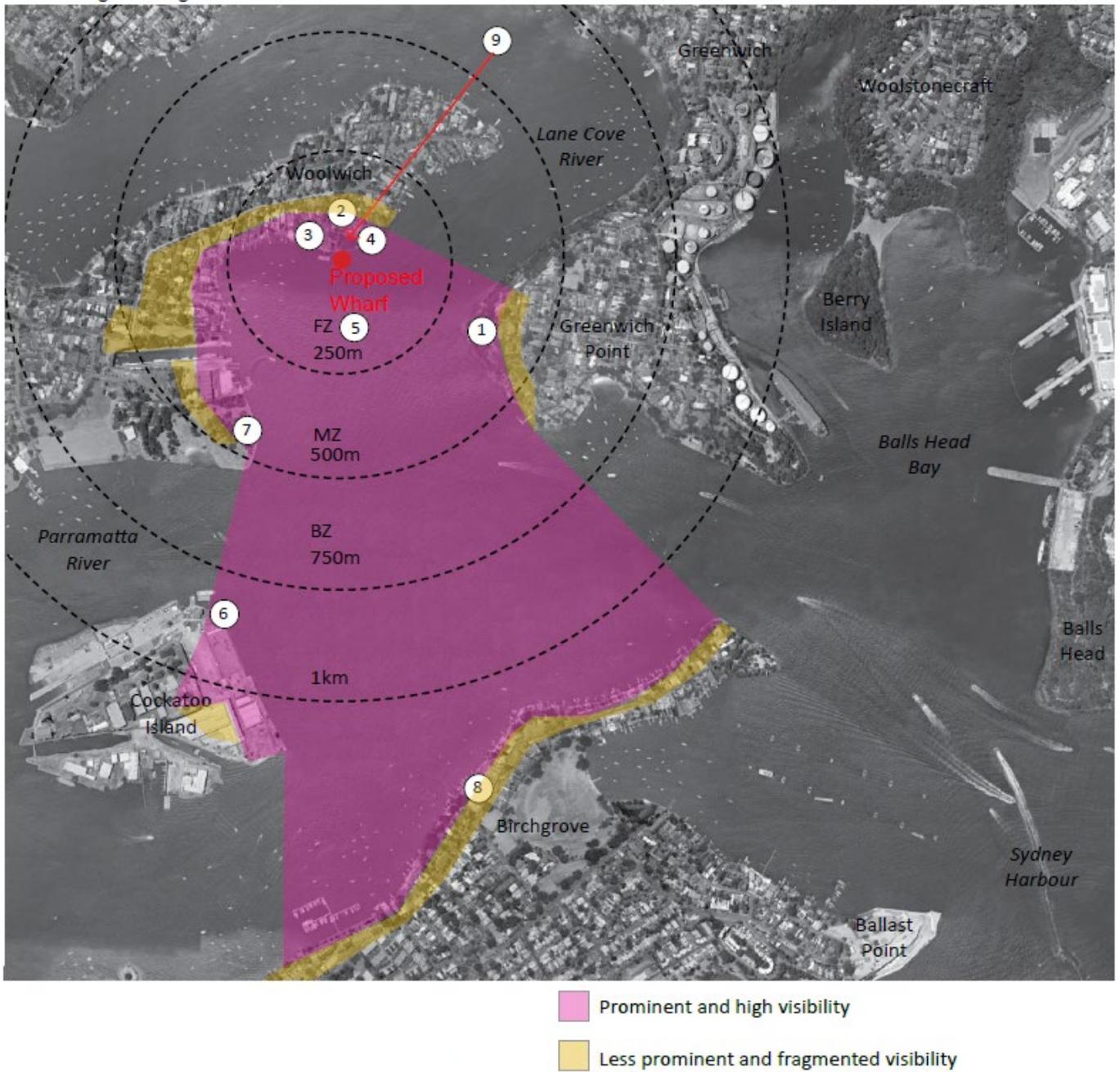


Figure 6.15: Visibility of Proposal and key viewpoints

Nine viewpoints were selected to perform this assessment in which are identified and described in Table 6.19.

Table 6.19: Key viewpoints

| Viewpoint | Setting | Distance Zone |
|--|---|----------------------|
| 1. Greenwich Point Reserve (Figure 6.16) | Woolwich Peninsula | MZ |
| 2. Valencia Street (Figure 6.17) and (Figure 6.18) | Cockatoo island, Mort's and Dock and Clarke's Point, Birchgrove, Sydney CBD | FZ |
| 3. Valencia Street Reserve (Figure 6.19) | Birchgrove, Sydney CBD, Greenwich Point | FZ |
| 4. Reserve on eastern side of wharf (Figure 6.20) | Cockatoo Island, Mort's Dock and Clarke's Point | FZ |
| 5. Approach by water (Figure 6.21) and (Figure 6.22) | Woolwich Peninsula | FZ |
| 6. Cockatoo island (Figure 6.23) | Woolwich Peninsula, Clarkes Point Reserve, Greenwich Peninsula | BZ |
| 7. Clarkes Point Reserve (Figure 6.24) | Woolwich Peninsula, Woolstonecraft, Waverton, North Sydney CBD | MZ |
| 8. Birchgrove Peninsula (Figure 6.25) | Woolwich Peninsula, Loungeville (behind) | BZ |
| 9. Heritage waiting shed (Figure 6.26) | Greenwich Peninsula, Sydney CBD, Birchgrove | FZ |



Figure 6.16: View from Greenwich Point Reserve looking towards Woolwich wharf



Figure 6.17: View down Valentia Street towards the current wharf



Figure 6.18: Heritage building and current wharf



Figure 6.19: View from Valentia Street Reserve looking towards the wharf and heritage building



Figure 6.20: View from foreshore to the East of the current wharf



Figure 6.21: View on approach from the water towards the heritage building and the proposed wharf location



Figure 6.22: View from water towards Woolwich wharf



Figure 6.23: View from Cockatoo Island towards Woolwich wharf



Figure 6.24: View from Clarkes Reserve towards Woolwich wharf



Figure 6.25: View from Birchgrove towards Woolwich wharf



Figure 6.26: View from within heritage waiting building

6.5.3 Potential impacts

Construction

Certain landscape character and visual impacts would initially take place when the Proposal is built as a result of the introduction and use of:

- Equipment, barges and piling equipment around the wharf
- Removal of the existing wharf structure and construction of a new wharf
- Landside construction of regraded footpath and retrofit of landside facilities (e.g. toilets, heritage waiting shed)
- Established temporary compound site (30 m by 5 m) to include site sheds, amenities shed and storage containers for tools and materials

Landscape character zones as defined in section 6.5.2 generally have low to moderate sensitivity and magnitude. Construction works are not expected to impact landscape character zones.

Viewpoint impacts are assessed similarly as viewpoints within the foreground zone (0-250 m from the viewer) including 2 through 5 would have the highest view exposure to construction activities. Other viewpoints beyond the foreground zone would view construction in the distance and intermittently see wharf deliveries. Impacts for works would be:

- Change in the composition and setting of the wharf by its removal
- Temporary introduction of equipment into the landscape, affecting overall amenity and setting.

The scale of the impact on river users would be contained and localised due to the topography and location of the Parramatta River.

Operation

Landscape Character

Table 6.20 summarises the landscape impact assessment on the landscape character zones identified in section 6.5.2. Appendix F provides additional detail on the landscape character zones.

Table 6.20: Landscape character impacts

| Landscape Character Zone | Description of impact | Impact |
|------------------------------|--|-----------------|
| Woolwich | <ul style="list-style-type: none"> • Function of wharf is maintained, while form and location is changing • Eastern alignment shift impacts association of the wharf as terminus of Valencia Street and greater impacts of the Eastern foreshore with higher sensitivity due to being largely unbuilt with a natural sandstone edge. | Moderate to low |
| Greenwich Point | <ul style="list-style-type: none"> • Close association between peninsulas along ferry route • Western slopes share distinct similarities with Woolwich including architecture, garden styles and property sizes. | Moderate to low |
| Clarks Point and Mort's Dock | <ul style="list-style-type: none"> • Remains separated by a residential foreshore of buildings and boat moorings • Character association maintained of industrial past and legacy through transport to the workers and residents of Woolwich | Low |
| Cockatoo Island | <ul style="list-style-type: none"> • Island has its own distinct character and history. • Next stop along the ferry route creates a close association between the proposed wharf and the island. | Low |

| Landscape Character Zone | Description of impact | Impact |
|--------------------------|--|------------|
| Birchgrove | <ul style="list-style-type: none"> Landscape character is predominantly residential with the foreshore used for recreational boating. The wharf forms part of the wider landscape of Sydney Harbor, which although visible from around the suburb is not its defining feature. | Negligible |
| Lane Cove River | <ul style="list-style-type: none"> The character of the river is defined by its dominant condition of large natural reserves and forests. The wharf lines at the junction of the Lane Cove and Parramatta Rivers and therefore relates more broadly to the condition of Sydney Harbour. | Negligible |
| Sydney Harbour | <ul style="list-style-type: none"> The character of Sydney Harbour is set by its unique landform and history of industrial and working harbour use. Woolwich Peninsula has a strong link to the industrial use of the Harbour through Mort's Dock and other former sites of industry along Clarkes Point. The retention of the ferry wharf use at this location is a link to this history. Function of the wharf is to be retained. | Negligible |

The landscape character zones surrounding Woolwich Wharf have a moderate to low sensitivity to change. The immediate surrounds to the wharf include a built residential foreshore with private boat moorings to the West, and an unbuilt foreshore with natural sandstone edge to the East. The proposed wharf signals a shift in materiality as well as alignment from the foreshore. However the magnitude of the change proposed is limited by distance and the fact that the wharf remains largely the same size.

Within its immediate character zone the impact of the proposed wharf is considered moderate to low. The greatest impact is the shift in location which generates a closer association between the heritage waiting shed and the proposed wharf, and impacts on the character of the foreshore to the East of the wharf, defined by its natural edge of sandstone. The shift in location also impacts on the association of the wharf with Valencia Street as its terminus point at the water.

The impact of the wharf on broader character zones and the surrounding peninsulas and island is considered low to negligible. Distance reduces the magnitude of change and the sensitivity of these zones is also reduced with the wharf forming part of a broad harbour backdrop to the more immediate character of these places. While the proposed wharf signals a shift in materials and location it does represent a link to a family of wharves throughout the harbour which share the same language and form.

Overall the impact on landscape character is moderate to low. The proposed wharf in shifting location to the East would produce a moderate impact on the natural character of this foreshore. Overall the surrounding landscape character zones have a low sensitivity to change. The small shift in location has a negligible effect on the more broad scale character of the waterways and those areas separated by a greater distance.

Visual impacts

Visual impact from each key viewpoint is established through an assessment of the sensitivity of the view combined with the magnitude of the Proposal within that view point. Table 6.21 summarises the visual impact assessment.

Table 6.21: Visual impact assessment

| Viewpoint | Visible elements | Sensitivity | Magnitude | Impact |
|---|-----------------------------|--------------|--------------|---------------|
| 1. Greenwich Point Reserve | Pontoon | Moderate | Moderate | Moderate |
| 2. Valencia Street | Bridge and part of pontoon | Moderate | Low | Moderate-low |
| 3. Valencia Street Reserve | Bridge, gangway and pontoon | Moderate-low | Moderate-low | Moderate-low |
| 4. Woolwich foreshore East of the wharf | Bridge, gangway and pontoon | Low | Moderate-low | Moderate-low |
| 5. Approach by water | Bridge, gangway and pontoon | Moderate-low | Moderate | Moderate |
| 6. Cockatoo island | Pontoon | Low | Low | Low |
| 7. Clarkes Point Reserve | Pontoon | Low | Moderate-low | Moderate-low |
| 8. Birchgrove Peninsula | Pontoon | Negligible | Negligible | Negligible |
| 9. Heritage waiting shed | Bridge, gangway and pontoon | High | Moderate | High-moderate |

The overall impact on views is considered moderate to low. The greatest impact comes from the shift in location of the wharf to the east. For some views this signals and improvement with the demolition of the current wharf opening up clearer views to water. The highest impact is in relation to view from the heritage waiting shed due to the shift in location of the wharf to the east, causing the proposed wharf to partially block views towards Greenwich Point and the Sydney CBD. Views towards this building are impacted particularly on approach by water and from Greenwich Point. However, the removal of the existing wharf would introduce new views from other parts of the waterfront reducing the overall impact as shown in Figure 6.27. Views within the building through the window at its southern end are highly impacted. The open structure of the wharf combined with the unroofed gangway and bridge aim to mitigate this impact. Figure 6.28 depicts a view from the landside looking toward the wharf.



Figure 6.27: Photomontage of Woolwich Wharf Interchange from waterside



Figure 6.28: Photomontage of Woolwich Wharf Interchange from landside

6.5.4 Safeguards and management measures

Table 6.22 lists the Landscape character and visual amenity safeguards and management measures that would be implemented to account for the impacts identified in section 6.5.3.

Table 6.22: Landscape character and visual amenity safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|-----------------------------|---|--------------------|--------------------------------------|---------------------------------|
| Landscape and visual impact | <p>Urban design principles would be integrated throughout the detailed design and construction of the Proposal. The urban design principles would:</p> <ul style="list-style-type: none"> • Provide a unified and consistent design both with the proposed structure and existing built elements along the foreshore. • Maintain views through the proposed structure. • Ensure that the iconic elements of Mort's Dock, Cockatoo Island and Greenwich Point maintain their character zones and are not adversely affected by the replacement wharf. | Roads and Maritime | Detailed design and pre-construction | Additional safeguard LV1 |
| | <p>The size of the proposed wharf in catering to the future commuter demand and user amenity maintains the scale of the wharf along the waterfront. Proposed elements have been designed to retain simple clear lines that do not diminish its visual strength on views towards the foreshore.</p> | Roads and Maritime | Detailed design and pre-construction | Additional safeguard LV2 |
| | <p>Material selection, location of services, and a standardised family of elements form the key design strategies for mitigating the impact of the proposed wharf. Attention has been made to upgrade access ramps and path connections on land and ramps and walkways within the proposed wharf to meet access standards. The proposed wharf has been designed for amenity through covered walkways and protection screens to minimise impacts of weather on ferry users.</p> | Roads and Maritime | Detailed design and pre-construction | Additional safeguard LV3 |
| | <p>Colour plays an important role in mitigating the impact on views and landscape character. Selection of materials and paint colour respond to the surrounding palette, are low in reflectivity, and complement the surrounding urban fabric through neutral tones. Overall the proposed wharf would promote a unified palette of materials which, while responding to the maritime heritage and surrounding character, also separates the structure as a piece of architectural design.</p> | Roads and Maritime | Detailed design and pre-construction | Additional safeguard LV4 |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|--------|---|--------------------|--------------------------------------|---------------------------------|
| | <p>Mitigation strategies employed through detailed design:</p> <ul style="list-style-type: none"> • Minimise impact on the foreshore through a single point of entry. • Reduction of fixed solid elements on the pontoon to maintain views through the structure. • Proposed gangway to remain unroofed to allow clear views to the harbour. • Pontoon will sit at water level. | Roads and Maritime | Detailed design and pre-construction | Additional safeguard LV3 |

6.6 Socioeconomic

This section describes the Proposal's socioeconomic impacts.

6.6.1 Methodology

The assessment considered the community, business and industry impacts and benefits from building and operating the Proposal. Specifically, it considered impacts on:

- Social amenity and infrastructure in the area
- The community's values such as amenity, character, health and safety, cohesion, environment, sense of place, fears and aspirations
- Local and regional business, including the aquatic based companies that use the harbour and ferry passenger services.

This assessment involved reviewing published 2011 and 2016 Census data, council information and records, literature, as well as community and stakeholder feedback received for the Proposal (refer to Chapter 5). Other assessments included in the REF that contain socioeconomic themes were also reviewed, namely:

- Noise and vibration
- Non-Aboriginal heritage
- Landscape character and visual impacts.

A basic level of assessment was carried out in accordance with Environmental Impact Assessment Practice Note: Socio-Economic Assessment (EIA-N05, Roads and Maritime, 2014). Unless otherwise stated, the referenced Census data covered is based on the Woolwich State Suburb.

6.6.2 Existing environment

Demographic and socioeconomic profile

The Proposal is situated within the state suburb of Woolwich. Table 6.23 summarises the key social and economic characteristics of the people that live in Woolwich, and how this has changed over the past five years.

Table 6.23: Statistical data for Woolwich State Suburb

| Demographic Indicator | 2011 | | 2016 | | % Change |
|--------------------------------|--|---------|--|---------|----------|
| Population | | 815 | | 814 | -0.1 |
| Population by age bracket | 0-19 | 168 | 0-19 | 158 | -6.0 |
| | 20-34 | 109 | 20-34 | 115 | +5.5 |
| | 35-49 | 131 | 35-49 | 113 | -13.7 |
| | 50-64 | 196 | 50-64 | 178 | -9.2 |
| | 65+ | 210 | 65+ | 250 | +19.0 |
| Method of travel to work | Car (as driver or passenger) | 217 | Car (as driver or passenger) | 236 | +8.8 |
| | Ferry | 31 | Ferry | 33 | +6.5 |
| | Bus | 11 | Bus | 20 | +81.8 |
| Median weekly household income | | \$2,359 | | \$3,211 | +36.1 |
| Home ownership/rentals | Home owners (outright and with a mortgage) | 205 | Home owners (outright and with a mortgage) | 221 | +7.8 |
| | Home renters | 64 | Home renters | 60 | -6.3 |
| | Other | 9 | Other | 10 | +11.1 |

It was concluded from the above information that:

- Weekly household incomes were \$1,733 higher than the national average for 2016 (\$1,438)
- Residents of the area are predominantly home owners (75.9 per cent), with 20.6 per cent of the area renting and remaining percentage is other.
- Most people in Woolwich drive (63.8 per cent) or take the ferry (9.2 per cent) to work.

Community values

Community values are those socioeconomic aspects that people hold important to their quality of life and wellbeing. They include physical assets, such as parks and recreational areas, as well as social factors such as a sense of safety and wellbeing, belonging and community diversity.

There is landscaping around the wharf that provides some green space and shade at the river front, as well as a limited recreational area in the vicinity of the existing wharf (Valencia Street Reserve).

Community values are likely dominated by people who live in the area. These values likely include:

- Local amenity and a sense of place, as provided by Valencia Street Reserve opposite the wharf and the setting along Parramatta River
- Liveability due to river and harbour access and waterfront living and working.

Social infrastructure

Social infrastructure refers to the community facilities, services and networks that help individuals, families, groups and communities meet their social needs, maximise their potential for development, and enhance their community well-being. It includes such things as: educational facilities; health, emergency and aged-care services; sports, recreational and cultural facilities; community support services; and transport facilities.

The social infrastructure within 500 metres of the Proposal includes:

- The existing ferry wharf, which provides a means for passengers to travel between key locations in Sydney Harbour and along the Parramatta River
- Parks and reserves including Valencia Street Reserve, View Street Reserve, Onions Point Reserve, the Goat Paddock, and Clarkes Point Reserve
- Educational institution and outdoor passive recreation associated with Marist Sister's College.

Local businesses

Local businesses within 500 metres of the wharf include:

- Deckhouse
- Woolwich Pier Hotel, and
- Woolwich Open Air Cinema.

Crime Risk Issues

- The Bureau of Crime Statistics and Research (BOSCAR) statistics indicate:
 - Crime levels across Woolwich are low when comparing to Hunters Hill and NSW
 - The top three offences in Woolwich over the last two years related to theft, followed by drug offences and malicious damage to property. All other crime levels were relatively low in comparison
 - The top three offences in Hunters Hill were similar to Woolwich and also related to theft, followed by malicious damage to property and assault (non-domestic violence)
 - There were no incidents recorded by NSW Police occurring at public transport facilities in Woolwich over the last two years.
- The Ryde Local Area Command (LAC) advised the Woolwich Wharf was generally quiet and crime issues were relatively low, with no significant vandalism issues
- NSW Roads and Maritime (RMS) data indicated that there were two complaints made regarding anti-social behaviour and four complaints relating to cleanliness of Woolwich Wharf over the last two years
- Transdev Sydney Ferries advised that there had been no crime incidents such as assaults, antisocial behaviour, vandalism etc at Woolwich Ferry Wharf over the last year.

6.6.3 Potential impacts

Construction

Woolwich Wharf would be closed throughout the construction period as described in Chapter 3.

It is anticipated that bus transport would remain operational with bus hours of operation temporarily extended during construction to cover the absence of the late night and weekend ferry service, to ensure continuity of transport services. The turning circle would remain functional for bus traffic, but would be space-constrained during construction. Short interruptions may occur depending on the nature of construction work being undertaken.

There would be disruption to ferry commuters (approximately 9.2 per cent) in Woolwich. Any disruption would be minimised through the provision of additional bus services, notifications ahead of construction and consequent updates.

Access to the interchange except for public transport buses and passengers, including seating within the heritage waiting shelter, would be closed during construction. This area may be utilised as a resting area for recreational users and workers from surrounding businesses and closure during construction may cause disruption to these users. However, Woolwich is well serviced by other seating and foreshore areas, and the temporary loss of use of the interchange is not considered to be significant, as alternative locations in close vicinity would be able to be utilised.

Indirect impacts to residents in the broader area may occur due to noise and visual impacts. As such, there would be temporary loss of amenity in the area surrounding the wharf due to the construction works and presence of barge mounted cranes and other plant and equipment. Landside construction would result in a temporary loss of amenity along Parramatta River. The temporary loss of amenity may discourage use of these areas in the vicinity of the wharf during construction. As discussed in section 6.4, further consultation with the community would be undertaken to determine sensitive periods for nearby businesses and other receivers. This may include peak hours for cafés and businesses in the Proposal's vicinity. The noisiest activities would be scheduled outside of these sensitive periods, wherever practical. Management measures described below and elsewhere in Chapter 6 would aim to minimise these impacts.

Operation

Benefits to passenger experience would be provided by the Proposal through design of the wharf that includes:

- Improved amenity at the wharf
- Quicker and more effective embarking and disembarking
- Improved access to the ferry network for passengers, including low mobility passengers through a wharf design that provides disabled and low-mobility access
- A covered pontoon, enabling passengers to wait close to ferries in an area with weather protection, ample seating and customer information.

The above benefits would be in context of the limited loss in character and sense of place at the wharf from introducing new infrastructure. Visual impacts during operation of the Proposal are considered to be moderate to low, as discussed in section 6.5, and moderate to low impact on the landscape character. The design of the wharf is also consistent with other recently upgraded wharves across the network. The visual impact is not anticipated to result in any socioeconomic impacts.

During operation, there is the potential for the diagonal poles along the gangway to be used by people to climb upon the roof. Closed Circuit Television (CCTV) would be present to deter antisocial behaviour from occurring and provide a safer night-time environment. Generally, the design of the ferry wharf is legible, creates a clear hierarchy of space, enable safe access/egress and enables formal and passive surveillance (Elton Consulting, 2016). As defined in section 6.8.3 crime risks are relatively low with no foreseen impacts. Refer to section 6.7.3 for safeguards in relation to deterring crime. Other indirect socioeconomic benefits may be provided by the improved services and amenity at Woolwich Wharf Interchange.

6.6.4 Safeguards and management measures

Table 6.24 lists the socioeconomic safeguards and management measures that would be implemented to account for the impacts identified in section 6.6.3.

Table 6.24: Socioeconomic safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard/additional safeguard |
|--------------------------------|---|-------------------------------|-----------------------------------|-------------------------------|
| General socio-economic impacts | <p>A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to stakeholders during construction. The CP would include (as a minimum):</p> <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changed traffic and access conditions • Contact name and number for complaints. <p>The CP would be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p> | Roads and Maritime/Contractor | Pre-construction/ Construction | Additional safeguard |
| General socio-economic impacts | <p>An internet site and free-call number would be established for enquiries regarding the Proposal for the entirety of construction.</p> <p>Contact details would be clearly displayed at the entrance to the site.</p> <p>All enquiries and complaints would be tracked through a tracking system, and acknowledged within 24 hours of being received.</p> | Roads and Maritime | Pre-construction/ Construction | Standard safeguard C1 |
| Social impacts | The construction area would be secured at all times. | Contractor | Construction | Additional safeguard |
| Crime risk | It is recommended that materials and fixtures do not create opportunities for vandalism (by colour and long wearing paint). | Roads and Maritime | Detailed design | Additional safeguard |
| | Closed Circuit Television (CCTV) should be used to deter anti-social behaviour. | Roads and Maritime/Contractor | Detailed design/ construction | Additional safeguard |
| | Installation of Light Emitting Diode (LED) lighting is recommended at the heritage waiting shed and toilets. The proposed footpath should also be appropriately lit. | Roads and Maritime/Contractor | Detailed design/ construction | Additional safeguard |

6.7 Transport, traffic and access

This section describes the land and maritime based traffic, transport and access impacts associated with the Proposal.

6.7.1 Existing environment

The Proposal is located within Woolwich, which can be accessed from Valencia Street. Designated commuter parking is provided on Valencia Street as well as parking on The Point Road about 100 metres from the wharf.

The road network within the vicinity of the wharf is characterised by local roads with limited on-street parking. Speed limits are generally 50 kilometres per hour in the vicinity of the Proposal.

The nearest bus stop is located directly opposite the wharf and is serviced predominantly by the 538 route number. The service runs every 30 minutes during peak times, and every 60 minutes outside of these times.

Pedestrians can access the wharf via the footpath on The Point Road, which leads to the footpath on Valencia Street.

Maritime transport

Ferry service and frequency

Woolwich Wharf is serviced by the F8 Cockatoo Island ferry route, which operates between Circular Quay and Cockatoo Island Wharf. The ferry route also services wharves at Greenwich Point, Birchgrove, and Balmain.

The F8 Cockatoo Island ferry route operates at Woolwich between about 6 am and 12:30 am daily. Ferry services typically operate every 30 minutes during peak hours. At other times, the ferry service operates every 60 minutes.

Transport Performance and Analytics (TPA) Opal data exported in April 2018 indicates that the average weekday patronage for Woolwich is about 300 passengers per day.

6.7.2 Potential impacts

Construction

Land transport

It is anticipated that construction vehicles would access the Proposal via The Point Road and Valencia Street. As detailed in section 3.3.7, up to five heavy vehicles would be used for construction and maximum of 10 light and heavy vehicles would be used for deliveries to site. The addition of light and heavy vehicles required throughout construction would not place any additional strain on the surrounding road due to the minimal construction related traffic movements.

The carpark area would be closed for the duration of the works. Works would predominantly be carried out during standard construction hours. Should any works be required to be carried out at night, such as road re-surfacing, the Out of Hours Approval and Notification procedure would be followed. The turning circle at Valencia Street would remain functional for bus traffic, but would be space-constrained during construction. This could result in short interruptions depending on the nature of construction work being undertaken.

As described above, carparking in the wharf area would be closed for the duration of the works. The ancillary facilities identified in section 3.4 do not include provision for light vehicle parking. It is anticipated that any parking requirements during construction would utilise the existing parking arrangements available locally. Alternatively, the construction contractor may seek Council approval to implement a work zone to provide parking. Typically, this process would also involve consultation with adjacent properties and commercial premises. Final access and parking arrangements would be confirmed by the construction contractor.

The bus hours of operation would be temporarily extended, operating between Woolwich and Sydney CBD to cover the absence of the late night and weekend ferry service to ensure continuity of transport services. Commuters may also choose to use private vehicles for five months during construction. Based on patronage data for the wharf, this could include around 33 vehicles over an average weekday. This traffic would be spaced over the day, and from different locations within the wharf catchment, and is not considered to be a significant impact over that absorbed by the existing road network.

Maritime transport

Woolwich Wharf would be closed for about five months throughout the construction period. As the wharf is exclusively used by the Transdev Sydney Ferries it would not impact any recreational or commercial users of the river.

Construction of the Proposal would result in up to 10 vessels travelling between an off-site facility and the wharf each day. The minor increase in vessel movements is not considered to be significant in the context of the harbour, Parramatta, and Lane Cove River. Vessel movements may need to be coordinated to avoid conflict with other vessels operating in the river during construction. Cumulative impacts are discussed further in section 6.3.

There would be disruption of about 300 passengers per day due to closure of the wharf. It is anticipated that bus transport would remain operational and additional services provided as noted above. The turning circle would remain functional for bus traffic, but would be space-constrained during construction. Possible short interruptions may occur depending on the nature of construction work being undertaken.

Operation

Minor impacts to traffic and transport are anticipated for operation of the Proposal. The potential benefits of the Proposal are outlined in the sections below:

Land transport

Ferry services would recommence once the new wharf is operational. The Proposal would result in the improvement of efficiency and user experience of ferry services from the wharf. This may result in an increase to patronage of the wharf and ferry service and additional commuter traffic travelling to and from the wharf. However, this is not considered to be significant based on the existing patronage of the wharf. There would also be improvements to bus stops in Valencia Street and the heritage waiting shed in Valencia Street Reserve.

Maritime transport

Ferry operations to Woolwich would resume after the Proposal is built and no change in the movement of ferries would be required to access the new wharf.

The Proposal would enable the continuation of a ferry service for the period of its 50-year operational life and would also improve the efficiency and user experience of the wharf.

6.7.3 Safeguards and management measures

Table 6.25 lists the traffic, transport and access safeguards and management measures that would be implemented to account for the impacts identified in section 6.7.2.

Table 6.25: Traffic, transport and access safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|--------------------------|--|----------------|-----------------------------------|---------------------------------|
| Land and water transport | Where possible, transport of equipment and materials to site via boat and barge would be utilised over land transport where possible to limit impacts to the local road network. | Contractor | Construction | Additional safeguard T2 |
| Water transport | <p>A Maritime Traffic Management Plan would be prepared and implemented during the water based construction work. The Maritime Traffic Management Plan would be prepared consultation with NSW Maritime and approved by the Harbourmaster.</p> <p>In addition, the Proposal would:</p> <ul style="list-style-type: none"> • Fit all buoys with lights • Prepare Response Plans for emergencies and spills for all construction vessels • Fit at least one vessel with an Automatic Identification System (AIS) • Retrieve any material associated with the construction of the development that enters the water to prevent the obstruction of vessel movements • Prepare a Communications Plan for implementation during the work which must include 24/7 contact details, protocols for enquiries, complaints and emergencies. <p>Any variation to the above would be agreed in advance with the Harbourmaster.</p> | Contractor | Pre-construction/ construction | Additional safeguard T3 |

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|---------------------------------|---|--------------------|------------------|---------------------------------|
| Water transport | Passengers would be notified of the alternative transport ahead of construction. | Roads and Maritime | Pre-construction | Additional safeguard C1 |
| Construction access and parking | Final access and parking arrangements would be included in a Traffic Management Plan. The Traffic Management Plan would also include measures to ensure light vehicle parking is strictly in accordance with Hunters Hill Council requirements and prevents parking on footpaths and grassed areas adjacent the site. | Contractor | Pre-construction | Additional safeguard T3 |

6.8 Non-Aboriginal heritage

This section summarises the Proposal's non-Aboriginal heritage impacts. Appendix G contains a supporting technical paper (statement of heritage impact, SOHI) prepared by City Plan in September 2019.

6.8.1 Methodology

The assessment included a desktop review of published records, data and literature, in the form of local, State, national and world heritage registers, to confirm the likely presence of non-Aboriginal heritage values in the local area as well as a site inspection undertaken on 18 July 2019.

The following references were used in this assessment to prepare this assessment:

- OEH Heritage Division - Assessing Heritage Significance
- Woolwich City local studies – 'Woolwich Heritage Centre'
- References from State Library of NSW and National Library of Australia's Trove database
- Hunter's Hill LEP 2012
- State Heritage Inventory (SHI)
- Sydney regional planning instruments and maps
- Roads and Maritime's 'Section 170 Register'
- Commonwealth Heritage list
- Historical and aerial photographs.

Findings were summarised in the SOHI which also includes Aboriginal heritage (refer to section 6.9). The purpose of a SoHI is to assess heritage significance and the impact proposed works would have on that significance, to identify measures proposed to mitigate any negative impact, and, where applicable, why more sympathetic options are not viable (Heritage Office and Department of Urban Affairs and Planning 2002:2).

6.8.2 Existing environment

Historical sources indicate that a timber jetty was present at the subject site prior to the erection of the Valentia Street Wharf (or 'Onions Wharf') in 1861. Historical maps and aerials have confirmed that the footprint of the historical Valentia Street Wharf was roughly equivalent to the existing wharf structure. A 1925 subdivision plan and photographs from the same period indicate that the wharf was extended during this period and a landside heritage waiting shed constructed to the east. Land reclamation is also evident to the west of the wharf, which was contained behind a rubble seawall. In 1993 the historical Valentia Street Wharf was removed and the existing Woolwich Wharf installed at the same location. The headland has also been further widened through land reclamation and installation of the turning circle.

Recorded Historic Heritage

World Heritage

There are no World Heritage Sites located within the Proposal area.

National and Commonwealth Heritage

There is one Commonwealth Heritage Item (Woolwich Dock – Item ID no. 105244) located within the vicinity of the Proposal Area.

State Heritage

No State Heritage Listed Items were found within the vicinity of the Proposal Area.

Section 170 Registers

'Valentia Street Wharf and waiting shed' (Item no. 490086) has been identified within the Proposal area.

Local Heritage

Heritage Items within the vicinity of the Proposal area are identified in Table 6.26

Table 6.26: Non-aboriginal heritage items

| Item # | Name | Heritage listing/protection | Location | Heritage significance |
|--------|---|---|---|-----------------------|
| 1 | Woolwich Dock | Commonwealth Heritage List (Item ID no. 105244) | Valentia Street | National |
| 2 | House | Hunters Hill LEP 2012 (item no. I29) | 29 The Point Road | Local |
| 3 | Stone Walls | Hunters Hill LEP 2012 (item no. I287) | - | Local |
| 4 | House, "Drayton", formerly "Valentin" | Hunters Hill LEP 2012 (item no. I313) | 25 The Point Road | Local |
| 5 | House, "Comus Villa" | Hunters Hill LEP 2012 (item no. I317) | 39 The Point Road | Local |
| 6 | House, "Cora Lyn" | Hunters Hill LEP 2012 (item no. I318) | 41–43 The Point Road | Local |
| 7 | Valentia Street Wharf and waiting shed | NSW s.170 Register & Hunters Hill LEP 2012 (item no. I318) | Hunters Hill Conservation Area No. 1 | Local |
| 8 | 'Hunters Hill Conservation Area No 1 – The Peninsula' | C1 | Clarke Road | Local |

Sydney Regional Environmental Plan (Sydney Harbour Catchment)

There are no heritage items listed on the Sydney Regional Environmental Plan (SREP) 2005 located within proximity of the Proposal area

6.8.3 Potential impacts

Construction

As identified in Table 6.26, local heritage item Valentia Street Wharf and waiting shed is expected to have an impact from the Proposal. This is defined in the Hunter's Hill LEP 2012 and potential impacts are assessed at low-medium impact to local heritage.

Impacts during construction include the following:

- Heritage waiting shed proposed upgrade would include the removal of non-structural walls and installation of an accessible internal fit out. No impacts on potential archaeological relics are expected.
- "Valentia Street Wharf" sign would be temporarily removed during proposed regrading works to the cul-de-sac and footpath. This sign would be reinstated at the end of the works.

Other heritage items identified in Table 6.26 have no impacts and do not require ISEPP consultation; however, there is a low potential to impact other historical archaeological resources. Removal of the existing wharf has some elements from the heritage listed Valentia Street wharf components like section

of seawall, stone stairs and timbers embedded in the seawall. Submerged piles and footings may have also survived. There is some potential for archaeological relics associated with the historical wharf to be impacted by the removal of the existing structure and modification of the seawall. There is low potential for submerged timbers and footings associated with the pre-1861 timber jetty to be impacted by the Proposal, given the subsequent disturbance caused by land reclamation and the installation of the later wharf structures. No works associated with demolishing the existing seawall would occur nor would there be any removal of heritage fabric associated with the historical Valentia Street Wharf. No heritage impacts are expected due to works from the seawall.

Operation

Although the works would result in a minor impact to the fabric of local heritage waiting shed item, it would not be significantly impacted as the works will not be structural. Modification of the existing seawall would not require demolition and is assessed to have low-medium potential to affect historical archaeological resources. No heritage detractment would occur as the Proposal replaces the existing wharf with another or similar form and scale and retains the existing, aesthetically significant landside heritage waiting shed. There is a low potential on other historical archaeological resources.

The current Woolwich Wharf Interchange is not heritage listed as its heritage value is not associated with its fabric or composition, but with its function. The Proposal would result in a positive heritage outcome as it would ensure ongoing viability by continued use of the site for maritime purposes. The heritage waiting shed upgrade works would include a refurbished interior with a new wooden-framed window sympathetic with the Federation character of the heritage waiting shed and consistent with the Hunter's Hill Conservation Area. Some minor impacts to the heritage waiting shed is expected as components of it would be integrated with the updated refurbishment. The Proposal would enhance heritage outcomes by considering interpretation, in the form of upgraded signage, to indicate the location and historical context of the area.

As stated in construction impacts, there are no other expected direct or indirect impacts to local heritage items located within the Proposal including the Commonwealth heritage item "Woolwich dock" as the significant views toward heritage item from subject site would not be impacted by the proposed new wharf structure, as it would be oriented further to the east than the existing.

It has been concluded that the Proposal would have a neutral heritage impact overall. ISEPP notification has been undertaken and no further consultation is required with Hunter's Hill Council prior to proceeding.

6.8.4 Safeguards and management measures

Table 6.27 lists the non-Aboriginal heritage safeguards and management measures that would be implemented to account for the impacts identified in section 6.8.3.

Table 6.27: Non-Aboriginal heritage safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard/ additional safeguard |
|-------------------------|--|----------------|------------------------------|--------------------------------|
| Non-Aboriginal heritage | The “Valentia Street Wharf” sign would be temporarily removed during proposed regrading works to the cul-de-sac and footpath. It is understood that it would be reinstated in the same location once the works are complete. | Contractor | Construction | Additional safeguard |
| Non-Aboriginal heritage | In the event that Aboriginal or historical archaeological resources are encountered, the Roads and Maritime’s Standard Management Procedure: Unexpected Heritage Items (2015)20 is to be strictly adhered to. | Contractor | Construction | Additional safeguard |
| Non-Aboriginal heritage | Interpretation in the form of signage to indicate the location and historical context of the existing Woolwich Wharf and historical Valentia Street Wharf would improve the heritage outcome of the proposed new works. | RMS/Contractor | Detailed Design/Construction | Additional safeguard |

6.9 Aboriginal heritage

This section summarises the Proposal's Aboriginal heritage impacts. Appendix G contains a supporting technical paper (statement of heritage impact, SOHI) prepared by City Plan in August 2019 under stage one of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The Roads and Maritime Aboriginal Cultural Heritage Advisor (ACHA) has issued a Stage 1 clearance letter for the Proposal in accordance with PACHCI on 5 June 2019, included with Appendix I.

6.9.1 Methodology

The assessment included the following:

- Desktop assessment via Hunter's Hill Museum website
- Basic and extensive AHIMS database search
- PACHCI was completed for Aboriginal heritage assessment in reference to the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011), the Code of Practice for the Protection of Aboriginal Objects (DECCW, 2010), and the Code of Practice of Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010).

6.9.2 Existing environment

Previously Recorded Aboriginal Sites

In Stage 1 PACHCI Assessment, the proposed work assessed as being unlikely to have an impact on Aboriginal cultural heritage due to the following considerations:

- Unlikely to harm Aboriginal objects or places
- No known Aboriginal objects or places identified in the immediate study area
- Study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's Due Diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Roads and Maritime Services' procedure
- Study area appears to be severely reduced due to past disturbance.

A search in AHIMS for the area surrounding the Woolwich Wharf Interchange identified 72 Aboriginal sites located within a 50-metre buffer. An extensive AHIMS search revealed no recorded Aboriginal sites.

6.9.3 Potential impacts

Construction

The proposed works are unlikely to result in harm to Aboriginal objects and sites, as the works are limited to the existing wharf structure, sea wall and minor public domain works; all of which are within heavily disturbed land. Stage 1 of the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) was completed for the Proposal, which concluded the Proposal was unlikely to have an impact on Aboriginal cultural heritage and did not require further investigations or assessment.

The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) would be followed in the event that unrecorded Aboriginal object(s) are identified during construction.

Operation

The Woolwich Wharf would continue to operate as a wharf, served by the same vessels, so it is not expected that there would be any change in the nature or severity of impact to unknown Aboriginal objects or sites.

An AHIP under the *National Parks and Wildlife Act 1974* is not required for the Proposal.

No impacts to Aboriginal heritage items are anticipated during operation of the Proposal as no significant change to the existing operation is proposed.

6.9.4 Safeguards and management measures

Table 6.28 lists the Aboriginal heritage safeguards and management measures that would be implemented to account for the impacts identified in section 6.9.3.

Table 6.28: Aboriginal heritage safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard/ additional safeguard |
|---------------------------|--|--------------------|-----------------------------------|--------------------------------|
| Aboriginal heritage | Should the scope of the proposed work change, further consultation with Roads and Maritime's Aboriginal Cultural Heritage Officer and regional environmental staff should be undertaken to reassess any potential impacts on Aboriginal cultural heritage. | Roads and Maritime | Pre-construction/ Construction | Additional safeguard |
| Unexpected heritage finds | The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) would be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Roads and Maritime does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work would only restart once the requirements of that procedure have been satisfied. | Contractor | Construction | Additional safeguard H2 |

6.10 Waste management and resource use

This section describes the Proposal's waste management and resource use impacts.

6.10.1 Methodology

The assessment considered the impacts associated with:

- Resource use and materials management during construction
- Waste generation, management and disposal during construction
- The Proposal's ability to respond to waste management and resource conservation plans, policies and guidelines.

The basis of assessment was to consider the hierarchy of avoiding waste generation and primary resource use in favour of reduction, reuse and recycling, consistent with the NSW *Waste Avoidance and Resource Recovery Act 2001*.

6.10.2 Existing environment

Existing waste management measures in the local area include:

- Rubbish is collected from the wharf by Roads and Maritime as part of the maintenance and operation of the existing structure
- Cleaning of the wharf is undertaken by Roads and Maritime on a weekly basis.

No other waste generating activities are associated with the wharf or ferry service.

In terms of resource use, the wharf has required ongoing maintenance, repair and upgrade over time. This has required the use of small quantities of replacement materials such as timber and metal.

Based on the Stage 2 Contamination Assessment undertaken by Coffey (2016a), the preliminary waste classification for the shallow sediments within the top 20 cm of the investigation area is General Solid Waste. It should be noted that this classification is of preliminary nature only.

Coffey recommends further sampling to be undertaken in order to confirm the final waste classification. This would generally require additional samples to be collected directly from the spoil generated during construction activities.

6.10.3 Potential impacts

Construction

Resource use

Roads and Maritime adopts a resource reduction strategy based on using:

- Alternative low-energy, high recycled content materials where they are cost and performance competitive and comparable in environmental performance
- Locally sourced materials, noting that most of the materials needed to build the Proposal are widely available and typically in abundant supply in the local market
- Alternative forms of material sourcing to reduce the distances or methods travelled to supply materials.

Waste generation and management

The Proposal would generate about 100m³ of waste material associated with the seawall modification, as identified in Chapter 3. Any excavated material including any seawall material would be reused where suitable or classified before being disposed to an appropriately licenced facility in accordance with *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA 2014). Where necessary, this would include sampling and analysis. The main waste sources would come from decommissioning and dismantling the existing wharf and the seawall modification, which would include:

- Concrete and scrap metal – this would be reused where possible depending on its condition
- Backfilled rock, gabion ballast rock and other material from the seawall which is not suitable for reuse
- Ancillary equipment such as signs, lighting, notice boards, and electronic display boards – some of which may be reusable either on the upgraded wharf or elsewhere depending on its age and condition.

The other wastes generated in building the Proposal would be typical to any construction site. They would include:

- Material offcuts (eg glass, wood and metal) that could be reused or recycled
- Inert unrestricted packaging waste (eg plastic, paper, wood) that could be recycled
- Potential restricted wastes (eg oily rags, empty paint tins, used lubricant tube) that would need collecting and transferring offsite to a licenced facility
- Food waste, which would be collected.

Landside ancillary facilities would be contained within the site compound(s), and include a portable toilet and small shipping container/shed. Minimal storage of materials is anticipated, but may include precast materials and some plant and equipment. Where feasible, materials would be barged, including fuels, oils and other required liquids which would be stored in bunded containers. All waste removed from the Proposal footprint would be transferred by a licenced contractor to a licenced receiving facility.

Operation

The waste generation and resource use associated with the operational wharf would be broadly consistent with the current wharf including small amounts of passenger litter and maintenance materials.

As noted in the previous section, the expectation is that the amount of ongoing resources needed to maintain the wharf would reduce due to its more durable design.

6.10.4 Safeguards and management measures

Table 6.29 lists the waste management and resource use safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.10.3.

Table 6.29: Waste and resource safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|-----------------------|--|--------------------|-----------------|---------------------------------|
| Waste | Waste management, littering and general tidiness would be monitored during routine site inspections. | Contractor | Construction | Additional safeguard M10 |
| Waste | Appropriate measures to avoid and minimise waste associated with the Proposal should be investigated and implemented where possible | Contractor | Construction | Additional safeguard M3 |
| Waste | Waste would be classified before being disposed to an appropriately licenced facility in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014). Where necessary, this would include sampling and analysis. | Contractor | Construction | Additional safeguard M11 |
| Resource minimisation | Recycled, durable, and low embodied energy products would be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (eg where quality control specifications allow). | Roads and Maritime | Detailed design | Additional safeguard M3 |

6.11 Hazards and risks

This section describes the Proposal's impacts to hazards and risks.

6.11.1 Existing environment

The main sources of potential hazards or risks at the wharf site are from the disturbance of ASS, stormwater discharge, and surface water runoff.

No flooding issues, or other hazards and risks are expected at the site.

6.11.2 Potential impacts

Construction

The following hazards and risks would be associated with the Proposal during construction:

- Construction materials, wastes and/or other objects have the potential to fall from the landside construction area into Parramatta River causing water pollution and risk to human health
- Construction materials, waste and/or objects have the potential to fall from the construction barge or other construction vessels into the Parramatta River causing water pollution and risk to human health
- Construction plant, materials, waste and/or objects have the potential to enter the Parramatta River during a flood event causing water pollution and risk to human health
- Physical injury to construction workers due to various hazards and risks associated with the construction activities
- Physical injury to public due to various hazards and risks associated with the construction activities
- Risk to human health or the environment from spillage of materials and/or wastes into the water
- Risk to human health or the environment from the dispersion of potentially contaminated sediments, discussed further in section 6.1
- Risk to human health or the environment from air quality related impacts from dust generated during construction activities
- Risk to human health or the environment during flooding, discussed further in section 6.1.

Operation

The new wharf has been designed to comply with relevant standards, minimising risks to passenger welfare during operation of the wharf, and improving accessibility.

The installation of protection and manoeuvring piles, and a debris deflector adjacent to the wharf, would reduce the potential risks associated with the berthing of ferries and other vessels at the wharf.

Vessel movements to the wharf would continue to be managed through standard maritime procedures.

The wharf has been designed to accommodate a 1:100-year annual recurrence interval (ARI) flood event, Roads and Maritime inspect wharves after flood events prior to recommencing ferry operations, and this would continue for operation of the Proposal.

6.11.3 Safeguards and management measures

Table 6.30 lists the hazard and risk safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.11.2.

Table 6.30: Hazard and risk safeguards and management measures

| Environmental factor | Environmental safeguard | Responsibility | Timing | Standard/ additional safeguard |
|----------------------|--|----------------|--------------|--------------------------------|
| Hazards and risks | Appropriate emergency equipment such as flotation devices and first aid kits would be kept within the construction area. | Contractor | Construction | Additional safeguard |
| Hazards and risks | All utilities within and adjacent to the Proposal footprint would be located prior to the start of the works. | Contractor | Construction | Additional safeguard |
| Hazards and risks | Safe work method statements or similar would be implemented to manage health and safety risks for the works. | Contractor | Construction | Additional safeguard |
| Hazard and risks | Weather forecasts and flood warnings would be monitored during construction. In the unlikely event of a major flood event, equipment and materials would be temporarily removed from the site, where possible. | Contractor | Construction | Additional safeguard |

6.12 Other impacts

The Proposal is expected to have a negligible to minor impact in relation to:

- Air quality
- Greenhouse gas
- Climate change adaptation.

6.12.1 Existing environment and potential impacts

This section describes existing environment and potential impacts associated with the other environmental aspects where there is expected to be a negligible to minor impact. These are outlined in Table 6.31 below.

Table 6.31: Other impacts

| Environmental factor | Existing environment | Potential impacts |
|---------------------------|---|---|
| Air quality | The nearest OEH air monitoring site to the Proposal is Rozelle, which forms part of the Sydney east monitoring network. A review of air quality data for the month of June 2019 indicates air quality is generally categorised as good (OEH, 2019). | <ul style="list-style-type: none"> • Temporary impacts may occur during construction, including minor amounts of construction generated dust, and plant, equipment and construction vehicle emissions • No additional impacts are anticipated for operation of the Proposal with the management of storage and inclusion of spill kits as noted in the safeguards below. |
| Greenhouse gas | Operation of the existing wharf would contribute in a continuation in the emission of greenhouse gasses such as carbon dioxide, due to ongoing maintenance and operation of the wharf. | <ul style="list-style-type: none"> • Building the Proposal would result in minor greenhouse gas emissions through material consumption (including embodied emissions in the production of materials), and using associated plant and equipment • The ferry wharf is designed to operate for 50-years by adopting a low maintenance design. As such, the greenhouse gas emissions expected during maintenance would be lower due to the greater maintenance requirements associated with the wharf in its current condition • No additional mitigation is required. |
| Climate change adaptation | Operation of the wharf would continue for its 50-year design life, during periods of predicted sea level rise. | <p>The wharf includes climate change adaptation in its design including:</p> <ul style="list-style-type: none"> • Enough clearance above the water to allow for a nominated sea level rise of 500 millimetres over 50 years • Shading and heritage waiting shed provisions to protect passengers during extreme weather events • A streamlined design, enabling the wharf to withstand high winds during extreme weather events • No additional mitigation is required. |

6.12.2 Safeguards and management measures

Table 6.32 lists the additional safeguards and management measures that would be implemented to account for the impacts identified in section 6.12.1.

Table 6.32: Other safeguards and management measures

| Environmental factor | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|-----------------------------|--|-----------------------|------------------|--|
| Air quality | Air quality during construction would be considered and addressed within the CEMP and would include methods to manage work during strong winds or other adverse weather conditions as required | Contractor | Pre-construction | Additional safeguard A1 |

6.13 Cumulative impacts

Cumulative impact relates to any combined impact resulting from multiple individual sources. These sources can occur in the past, present or future in comparison to the construction and operation of the Proposal. The consideration of cumulative impacts is required to assess this combined impact in the context of the region.

The Proposal is part of a broader program of work to upgrade the commuter ferry wharves in Sydney, referred to as the Ferry Wharf Upgrade Program. Further consideration of potential cumulative impacts associated with the Proposal and upgrade of other wharves as part of the ferry wharf upgrade program is provided in Table 6.33.

6.13.1 Study area

A search of the following databases was completed to identify any projects which might result in a cumulative impact with the Proposal:

- Department of Planning, Industry and Environment – major project register
- Sydney North Planning Panel Development and Planning Register
- Hunter's Hill Council Development Application Register.

Projects identified on the above registers that would impact the Proposal have been identified in Table 6.33.

6.13.2 Past, present and future projects

Potential impacts from the construction and operation of identified past, present and future projects are summarised in Table 6.33.

In addition, other minor residential alterations and development applications have been identified. No significant construction related traffic would be generated for these projects outside of light vehicles travelling to the site and minor deliveries of equipment and materials.

Table 6.33: Past, present and future projects

| Project | Construction impacts | Operational impacts |
|---|---|---|
| <p>Ferry wharf upgrade program</p> <p>The Ferry Wharf Upgrade Program includes upgrades to wharves across Sydney. The Proposal is located at Woolwich, which is part of the F8 Cockatoo Island ferry route.</p> <p>The Ferry Wharf Upgrade Program includes planned upgrades to multiple wharves which service the F8 Woolwich River ferry route, including Cockatoo Island Birchgrove,</p> <p>Woolwich Wharf Upgrade is expected to start in the first quarter 2020 and to be closed for a period of five months.</p> | <p>Upgrade of Woolwich wharf would require additional movements along the Parramatta River. Construction of Woolwich wharf may conflict with other wharf upgrades</p> | <p>The Ferry Wharf Upgrade Program would have a beneficial cumulative impact through improved passenger amenity and consistent ferry wharf design across the network.</p> |

6.13.3 Potential impacts

Table 6.34 outlines the possible cumulative impacts.

Table 6.34: Potential cumulative impacts

| Environmental factor | Construction impacts | Operational impacts |
|-----------------------|--|---|
| Socioeconomic | Cumulative impacts to patrons of the F8 Parramatta River ferry service due to closure of Woolwich Wharf Interchange. | No operational impacts are anticipated. |
| Traffic and transport | Minor increase in marine traffic. | No operational impacts are anticipated. |

6.13.4 Safeguards and management measures

Table 6.35 lists the cumulative impact safeguards and management measures that would be implemented to account for the impacts identified in section 6.13.3. Other safeguards and management measures that would address cumulative impacts are identified in section 7.2.

Table 6.35: Cumulative impact safeguards and management measures

| Impact | Environmental safeguard | Responsibility | Timing | Standard / additional safeguard |
|---------------------------------|--|--------------------|---------------------------------|---------------------------------|
| Cumulative construction impacts | <ul style="list-style-type: none"> Consultation would include notification prior to the start of the works Updates on any delays or changes to the construction period would also be communicated. | Roads and Maritime | Pre-construction / construction | Standard safeguard C1 |

7 Environmental management

This chapter describes how the Proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the Proposal. Should the Proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the Proposal.

A Construction Environmental Management Plan (CEMP) would be prepared to describe the safeguards and management measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP would be prepared prior to construction of the Proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Greater Sydney Project Office prior to the commencement of any on-site work. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would be incorporated into the detailed design phase of the Proposal and during construction and operation of the Proposal, should it proceed. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in Table 7.1.

Table 7.1: Summary of site specific environmental safeguards

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------|---|----------------|-----------------------------------|
| 1 | Soil and water | <p>A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks would be addressed during construction.</p> <p>Erosion and sediment control measures are to be implemented and maintained (in accordance with the Landcom / Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site. | Contractor | Pre-construction |
| 2 | Flooding | <p>In the unlikely case of flood events, the SWMP would include measures to address potential flood threats and evacuation requirements. The measures would include:</p> <ul style="list-style-type: none"> • Regular consultation of the Bureau of Meteorology website for weather forecasts and flood warnings • Scheduling of activities on land (including compound site) and water subject to flooding to avoid high flow periods • A process for removing equipment and materials off site and out of flood risk areas quickly • Storing and use of fuels and chemicals away from the flood zone, in bunded areas. | Contractor | Pre-construction/ Construction |
| 3 | Acid sulphate soils | <ul style="list-style-type: none"> • An Acid Sulphate Soil Management Plan (ASSMP) would be prepared as part of the Contaminated Land Management Plan to address the potential for acidity to be generated from ASS and PASS disturbed during the construction phase. Potential or actual acid sulphate soils are to be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005. | Contractor | Pre-construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------------|--|----------------|-----------------------------------|
| 4 | Acid sulphate soils | <ul style="list-style-type: none"> The disturbance of sediment and/or the underlying soils should be kept to a minimum to lower the risk of exposing these sediments to oxygen. If ASS are to be exposed to oxidation or spoil is to be generated during construction activities requiring disposal, further assessment for ASS and waste classification should be undertaken. | Contractor | Construction |
| 5 | Contaminated land | If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA. | Contractor | Construction |
| 6 | Erosion and sedimentation | <p>Prior to commencement of construction activities, sediment control device (such as sediment boom and curtain) should be installed around the work area to contain disturbed sediment from water surface by allowing suspended sediments to settle back on the bottom of the seabed overtime. The silt boom and curtain would extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work.</p> <p>Installation should be undertaken during high tide periods from a boat. The device should be designed to rise and fall with the tide to prevent disturbance. Inspection of the device should be undertaken on a daily basis after ebbing tides, with additional inspection be carried following storm events. Monitoring of turbidity inside and outside of the device should also be performed, using a portable turbidity meter/logger. As with installation, decommissioning should be carried out by boat during high tide periods.</p> <p>Prior to removing the device, conditions within the curtain will be assessed visually and field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.</p> | Contractor | Pre-construction/ Construction |
| 7 | Waste | Should spoil be generated during construction activities, further sampling and analysis should be undertaken to confirm the waste classification prior to disposal. | Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------------|--|----------------|-----------------------------------|
| 8 | Soil and water | <p>A detailed environmental work method statement (EWMS) will be prepared and implemented for the following high-risk activities:</p> <ul style="list-style-type: none"> • Modification of the seawall <p>The content of the EWMS would include, but not limited to:</p> <ul style="list-style-type: none"> • Description of the works/activities including machinery to be used • Outline of the sequence of the work/activities, including interfaces with other construction activities • Identification of potential environmental risks/impacts due to the works/activities and associated with wet weather events • Evaluation of methods to eliminate/reduce the environmental risk • Mitigation measures to reduce environmental risk • Any safeguards resulting from consultation with public authorities and other stakeholders, when appropriate • A map indicating the locations of sensitive locations (such as threatened species or heritage items), likely potential environmental impacts, and work area • Identification of work area and exclusion areas • A process for progressive review, eg monitoring processes and methods to eliminate/reduce environmental risks/impacts. | Contractor | Pre-construction/ construction |
| 9 | Erosion and sedimentation | <p>Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. Results of the observations of the integrity of the silt curtain are required to be recorded and maintained specifically for the purpose. Records are required to be kept on the site and to be made available for inspection by persons authorised by Roads and Maritime.</p> | Contractor | Construction |
| 10 | Erosion and scour | The number of jack-ups/anchor points would be minimised where possible. The locations would be selected to avoid areas of sensitive habitat, as discussed further in section 6.1.4. | Contractor | Construction |
| 11 | Erosion and scour | Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts. | Contractor | Construction |
| 12 | Soil and water | In consultation with DPI Fisheries, appropriate erosion and sediment control measures are to be used during construction to minimise turbidity impacts in the waterway | Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|------------------|---|----------------|-----------------------------------|
| 13 | Water quality | A spill management plan would be developed and communicated to all staff working on site. Any aquatic spill (whether spill occurs on water on land and subsequently enters the water) is to be immediately reported to Roads and Maritime and Sydney Ports VTS and VHF Channel 13. | Contractor | Pre-construction/ Construction |
| 14 | Water quality | All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks. | Contractor | Construction |
| 15 | Water quality | Any chemicals or fuels stored at the site or equipment barges would be stored in a bunded area to prevent chemical leaks or spills entering the water. | Contractor | Construction |
| 16 | Accidental spill | A land based and aquatic emergency spill kit is to be kept on site at all times and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site. | Contractor | Construction |
| 17 | Accidental spill | If an incident (e.g. spill) occurs, the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure is to be followed and the Roads and Maritime Services Contract Manager notified as soon as practicable. | Contractor | Construction |
| 18 | Accidental spill | Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures. | Contractor | Construction |
| 19 | Accidental spill | Spill kits for construction barges must be specific for working within the marine environment and be stored and maintained on the barge | Contractor | Construction |
| 20 | Accidental spill | All workers will be advised of the location of the spill kit and trained in its use. | Contractor | Construction |
| 21 | Accidental spill | Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks. | Contractor | Construction |
| 22 | Accidental spill | No vehicle or vessel wash-down or re-fuelling would occur on-site. | Contractor | Construction |
| 23 | Accidental spill | In the event of a maritime spill, the incident emergency plan would be implemented in accordance with Sydney Ports Corporation's response to shipping incidents and emergencies outlined in the 'NSW State Waters Marine Oil and Chemical Spill Contingency Plan' (Maritime, 2012). | Contractor | Construction |
| 24 | Accidental spill | Refuelling of plant and equipment and storage of hazardous materials on land and on barges is to occur within a double-bunded area. | Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|----------------------|--|----------------|-----------------------------------|
| 25 | Aquatic biodiversity | <p>A Marine Ecology Management Plan would be prepared as part of the CEMP. This would include, but not be limited to, measures relating to the following activities to minimise the risk for pollution:</p> <ul style="list-style-type: none"> • Sediment and rock debris control • Oil/fuel/chemical storage and spill management • Machinery and engine maintenance schedule to reduce oil/fuel leakage • Low impact barge positioning to prevent propeller scouring and thrust wash onto sensitive habitats, such as the mangroves • Minimise footprint and establish no-go zones in sensitive habitats (eg key fish habitat) • Accidental waste/material overboard response (eg construction materials dropped into the harbour) • Biological hygiene (eg prevent spread of noxious species on and off the site) • Aquatic fauna management. | Contractor | Pre-construction |
| 26 | | No-go zones would be established to avoid damage to all terrestrial and nearby aquatic habitats. No-go zones should be marked on a map and displayed inside the construction barge and office. All staff responsible for manoeuvring the barge should check the map before selecting a new position. | Contractor | Pre-construction/ construction |
| 27 | | No anchors or mooring blocks/lines should be placed on the Type 2 KFH. All lines should be suspended off the seafloor to minimise drag across areas of habitat. | Contractor | Construction |
| 28 | | A floating boom with silt curtain would be installed to contain sediment plumes during drilling and pile hammering and placement of the rock apron. The silt curtain should encompass the aquatic construction zone fully, rather than being anchored to the shore and regularly inspected for entrainment and impingement of aquatic/marine wildlife. | Contractor | Construction |
| 29 | | Work positioning barges, drilling and pile driving should occur during calm conditions. | Contractor | Construction |
| 30 | | Gentle start-up hammering is to be implemented to allow undetected aquatic fauna to leave the area and avoid hearing damage. Work should be stopped if large fauna is observed nearby. | Contractor | Construction |
| 31 | Unexpected bats find | <p>If in the case bats are discovered on site, the CEMP will detail unexpected bat find mitigation measures. Protocol procedures are from the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) must be followed.</p> <p>This includes a stop work procedure if a threatened microbat species is found, and may include the requirement for a Microbat Management Plan.</p> | Contractor | Pre-construction/ Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|--|--|-------------------------------|-----------------------------------|
| 32 | Pest species | <p>Measures should be identified as part of the Marine Ecology Management Plan to minimise the potential to introduce <i>Caulerpa taxifolia</i> to the area.</p> <p>This should include measures to minimise contamination. For example, a drill head or anchor used at another site with <i>Caulerpa</i> should be thoroughly cleaned of plant propagules and sediment before being used at another location. Fragments of <i>Caulerpa</i> can remain viable for up to three days out of the water. Best hygiene practices are outlined in the NSW Control Plan for the Noxious Marine Alga <i>Caulerpa taxifolia</i> (NSW I&I 2009).</p> | Contractor | Pre-construction/ Construction |
| 33 | Airborne noise Ground-borne noise and vibration | <p>Limiting number of plant, use of alternative equipment and /or using a different, quieter method to carry out the work.</p> <p>Where feasible, limit the amount of plant equipment operating at any one time. For particularly noisy plant items (e.g. jackhammer), the use of such plant should be minimised where feasible.</p> | Contractor | Construction |
| 34 | Airborne noise | Where feasible and reasonable, any site hording or fences erected should be constructed with thick plywood or fitted with temporary acoustic barriers to provide additional noise reduction at the immediate receivers. | Contractor | Construction |
| 35 | Airborne noise | Considered implementation of temporary barriers around the stationary sources or use of alternative quieter equipment. Where temporary noise barriers are used to block line of sight between stationary works and equipment (paving, jackhammering, compressor and generator) and the receivers, a reduction of around 5 dB to 10 dB could be expected. | Contractor | Construction |
| 36 | Airborne noise Ground-borne vibration | Potential noise impacts have been minimised through the design of the Proposal which involves undertaking as much construction work as possible at a contractor's off-site facility rather than at site, including assemblage of pre-fabricated components. | Contractor | Construction |
| 37 | Vibration on Heritage building | <p>To minimise vibration impacts related to the heritage building, the following management measures are relevant:</p> <ul style="list-style-type: none"> Attended vibration measurement to be undertaken to establish acceptable working distances specific to the plant and site conditions. Pre-construction and post construction dilapidation survey undertaken at heritage structure and Valentia Street waiting shed | Contractor | Pre-construction/ Construction |
| 38 | Airborne noise Ground-borne noise and vibration | <p>Notifications will be distributed detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number.</p> <p>Notification should be a minimum of 5 days prior to the start of works.</p> | Roads and Maritime/Contractor | Pre-construction/ Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|--|--|-------------------------------|-----------------------------------|
| 39 | Airborne noise Ground-borne noise and vibration | All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> all project specific and relevant standard noise and vibration mitigation measures relevant licence and approval conditions permissible hours of work any limitations on high noise generating activities location of nearest sensitive receivers construction employee parking areas designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures. | Roads and Maritime/Contractor | Pre-construction |
| 40 | Airborne noise | No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. | Contractor | Construction |
| 41 | Airborne noise Ground-borne noise and vibration | Where specified a noise verification program is to be carried out for the duration of the activity in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions. | Contractor | Construction |
| 42 | Ground-borne vibration | Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. | Contractor | Construction |
| 43 | Airborne noise Ground-borne noise and vibration | The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies. | Contractor | Pre-construction/ Construction |
| 44 | Airborne noise Ground-borne noise and vibration | Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained. | Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|--|---|----------------|--------------|
| 45 | Airborne-noise | Where possible, the noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Table 4.2 of Appendix E. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Table 4.2 of Appendix E. | Contractor | Construction |
| 46 | Airborne-noise | The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 4.2 of Appendix E. | Contractor | Construction |
| 47 | Airborne-noise | The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site. | Contractor | Construction |
| 48 | Airborne noise Ground-borne vibration | Where possible locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00pm. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again. | Contractor | Construction |
| 49 | Airborne noise Ground-borne vibration | Use only the necessary size and power | Contractor | Construction |
| 50 | Airborne noise | Where possible, non-tonal reversing beepers (or an equivalent mechanism) is to be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level. | Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|-----------------------------|---|--------------------|--------------------------------------|
| 51 | Airborne noise | <p>Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</p> <p>Select site access points and roads as far as possible away from sensitive receivers.</p> <p>Dedicated loading/unloading areas to be shielded if close to sensitive receivers.</p> <p>Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.</p> <p>Avoid or minimise these out of hours movements where possible.</p> | Contractor | Construction |
| 52 | Construction vehicles | <p>Limit the use of engine compression brakes at night and in residential areas.</p> <p>Where possible, ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.</p> | Contractor | Construction |
| 53 | Airborne noise | <p>Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.</p> | Contractor | Construction |
| 54 | Airborne noise | <p>Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when siting plant.</p> | Contractor | Construction |
| 55 | Landscape and visual impact | <p>Urban design principles would be integrated throughout the detailed design and construction of the Proposal. The urban design principles would:</p> <ul style="list-style-type: none"> • Provide a unified and consistent design both with the proposed structure and existing built elements along the foreshore. • Maintain views through the proposed structure. • Ensure that the iconic elements of Mort's Dock, Cockatoo Island and Greenwich Point maintain their character zones and are not adversely affected by the replacement wharf. | Roads and Maritime | Detailed design and pre-construction |
| 56 | | <p>The size of the proposed wharf in catering to the future commuter demand and user amenity maintains the scale of the wharf along the waterfront. Proposed elements have been designed to retain simple clear lines that do not diminish its visual strength on views towards the foreshore.</p> | Roads and Maritime | Detailed design and pre-construction |
| 57 | | <p>Material selection, location of services, and a standardised family of elements form the key design strategies for mitigating the impact of the proposed wharf. Attention has been made to upgrade access ramps and path connections on land and ramps and walkways within the proposed wharf to meet access standards. The proposed wharf has been designed for amenity through protection screens to minimise impacts of weather on ferry users.</p> | Roads and Maritime | Detailed design and pre-construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|--------------------------------|---|-------------------------------|--------------------------------------|
| 58 | | Colour plays an important role in mitigating the impact on views and landscape character. Selection of materials and paint colour respond to the surrounding palette, are low in reflectivity, and complement the surrounding urban fabric through neutral tones. Overall the proposed wharf would promote a unified palette of materials which, while responding to the maritime heritage and surrounding character, also separates the structure as a piece of architectural design. | Roads and Maritime | Detailed design and pre-construction |
| 59 | | Mitigation strategies employed through detailed design: <ul style="list-style-type: none"> • Minimise impact on the foreshore through a single point of entry. • Reduction of fixed solid elements on the pontoon to maintain views through the structure. • Proposed gangway to remain unroofed to allow clear views to the harbour. • Pontoon will sit at water level. | Roads and Maritime | Detailed design and pre-construction |
| 60 | General socio-economic impacts | A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to stakeholders during construction. The CP would include (as a minimum): <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changed traffic and access conditions • Contact name and number for complaints. The CP would be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008). | Roads and Maritime/Contractor | Pre-construction/ Construction |
| 61 | General socio-economic impacts | An internet site and free-call number would be established for enquiries regarding the Proposal for the entirety of construction. Contact details would be clearly displayed at the entrance to the site. All enquiries and complaints would be tracked through a tracking system, and acknowledged within 24 hours of being received. | Roads and Maritime | Pre-construction |
| 62 | Social impacts | The construction area would be secured at all times. | Contractor | Construction |
| 63 | Crime risk | It is recommended that materials and fixtures do not create opportunities for vandalism (by colour and long wearing paint). | Roads and Maritime | Detailed design |
| 64 | | Closed Circuit Television (CCTV) should be used to deter anti-social behaviour. | Roads and Maritime/Contractor | Detailed design/construction |
| 65 | | Installation of Light Emitting Diode (LED) lighting is recommended at the heritage waiting shed and toilets. The proposed footpath canopy should also be appropriately lit. | Roads and Maritime/Contractor | Detailed design/construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------------------|--|-------------------------------|---------------------------------|
| 66 | Land and water transport | Where possible, transport of equipment and materials to site via boat and barge would be utilised over land transport to limit impacts to the local road network. | Contractor | Construction |
| 67 | Water transport | <p>A Maritime Traffic Management Plan would be prepared and implemented during the water based construction work. The Maritime Traffic Management Plan would be prepared consultation with NSW Maritime and approved by the Harbourmaster.</p> <p>In addition, the Proposal would:</p> <ul style="list-style-type: none"> • Fit all buoys with lights • Prepare Response Plans for emergencies and spills for all construction vessels • Fit at least one vessel with an Automatic Identification System (AIS) • Retrieve any material associated with the construction of the development that enters the water to prevent the obstruction of vessel movements • Prepare a Communications Plan for implementation during the work which must include 24/7 contact details, protocols for enquiries, complaints and emergencies. <p>Any variation to the above would be agreed in advance with the Harbourmaster.</p> | Contractor | Pre-construction / construction |
| 68 | Water transport | Passengers would be notified of the alternative transport ahead of construction. | Roads and Maritime | Pre-construction |
| 69 | Construction access and parking | Final access and parking arrangements would be included a Traffic Management Plan. The Traffic Management Plan would also include measures to ensure light vehicle parking is strictly in accordance with Hunters Hill Council requirements and prevents parking on footpaths and grassed areas adjacent the site. | Contractor | Pre-construction / construction |
| 70 | Non-Aboriginal heritage | The “Valentia Street Wharf” sign would be temporarily removed during proposed regrading works to the cul-de-sac and footpath. It will be reinstated in the same location once the works are complete. | Contractor | Construction |
| 71 | Non-Aboriginal heritage | In the event that Aboriginal or historical archaeological resources are encountered, the Roads and Maritime’s Standard Management Procedure: Unexpected Heritage Items (2015) ²⁰ is to be strictly adhered to. | Contractor | Construction |
| 72 | Non-Aboriginal heritage | Interpretation in the form of signage to indicate the location and historical context of the existing Woolwich Wharf and historical Valentia Street Wharf would improve the heritage outcome of the proposed new works. | Roads and Maritime/Contractor | Construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------------|--|--------------------|------------------|
| 73 | Aboriginal heritage | Should the scope of the proposed work change, further consultation with Roads and Maritime's Aboriginal Cultural Heritage Officer and regional environmental staff should be undertaken to reassess any potential impacts on Aboriginal cultural heritage. | Roads and Maritime | Construction |
| 74 | Unexpected heritage finds | The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) would be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Roads and Maritime does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work would only restart once the requirements of that procedure have been satisfied. | Contractor | Construction |
| 75 | Waste | Waste management, littering and general tidiness would be monitored during routine site inspections. | Contractor | Construction |
| 76 | Waste | Appropriate measures to avoid and minimise waste associated with the Proposal should be investigated and implemented where possible | Contractor | Construction |
| 77 | Waste | Waste would be classified before being disposed to an appropriately licenced facility in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014). Where necessary, this would include sampling and analysis. | Contractor | Construction |
| 78 | Resource minimisation | Recycled, durable, and low embodied energy products would be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (eg where quality control specifications allow). | Roads and Maritime | Detailed design |
| 79 | Hazards and risks | Appropriate emergency equipment such as flotation devices and first aid kits would be kept within the construction area. | Contractor | Construction |
| 80 | Hazards and risks | All utilities within and adjacent to the Proposal footprint would be located prior to the start of the works. | Contractor | Construction |
| 81 | Hazards and risks | Safe work method statements or similar would be implemented to manage health and safety risks for the works. | Contractor | Construction |
| 82 | Hazard and risks | Weather forecasts and flood warnings would be monitored during construction. In the unlikely event of a major flood event, equipment and materials would be temporarily removed from the site, where possible. | Contractor | Construction |
| 83 | Air quality | Air quality during construction would be considered and addressed within the CEMP and would include methods to manage work during strong winds or other adverse weather conditions as required | Contractor | Pre-construction |

| No | Impact | Environmental safeguards | Responsibility | Timing |
|----|---------------------------------|--|--------------------|---------------------------------|
| 84 | Cumulative construction impacts | Consultation would include notification prior to the start of the works Updates on any delays or changes to the construction period would also be communicated. | Roads and Maritime | Pre-construction / construction |

7.3 Licensing and approvals

A summary of licenses and approvals required (or to be obtained) is provided in Table 7.2.

Table 7.2: Summary of licensing and approvals required

| Instrument | Requirement | Timing |
|---|---|---|
| Approval from the Deputy Harbour Master | Approval from the Deputy Harbour Master for any work that disturb the seafloor. | Prior to the commencement of any works that disturb the seafloor. |

8 Justification and conclusion

This chapter provides the justification for the Proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the Proposal is in the public interest. The Proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

8.1 Justification

The Proposal forms part of the TAP, which is an ongoing “initiative to deliver modern, safe and accessible transport infrastructure” in New South Wales (NSW, Transport for NSW, 2015). As part of the TAP, Roads and Maritime assessed the condition of all ferry wharves across the transport network in 2009 in terms of:

- Safety and structural integrity
- Access for less mobile and disabled passengers
- Existing and predicted future patronage and use.

Initial justification for the Proposal was provided through an assessment of the existing wharf, which was identified as needing upgrading due to its lack of accessible pathway throughout the interchange and non-DDA compliant wharf.

Consideration of alternatives and options was then carried out. The preferred design of the Proposal selected to best achieve the objectives outlined in section 2.7, which included providing improvements in access, user experience including passenger comfort and amenity, and safety through meeting the objectives. This was compared to the option of doing nothing and other options to relocate the wharf.

Potential environmental and social impacts resulting from construction and operation of the Proposal have been minimised through the safeguards and management measures outlined in Chapter 7.

The following sub-headings provide justification through considering the impacts and benefits of the Proposal.

8.1.1 Social factors

The Proposal would result in temporary social impacts whilst being built such as noise and visual impacts. However, all construction related impacts would be appropriately managed prior to and during construction.

Operation of the Proposal provides justification over the above temporary impacts, as it would benefit the community through improving passenger amenity, safety and overall user experience. It is anticipated that the Proposal would also have indirect wider community benefits, through ensuring continuation of the wharf for its expected lifespan (50 years). This extends to the cultural and amenity benefit of continuing to operate a wharf in this location.

8.1.2 Biophysical factors

As discussed in Chapter 6, no significant impacts have been identified. Minor impacts would be managed through the safeguards and management measures outlined in these sections.

The design of the Proposal includes tolerances to allow for sea level rise and extreme weather events, which would ensure the wharf continues to be operational throughout its 50-year design life.

8.1.3 Economic factors

Upgrade of the wharf would generate economic benefits over the next 50-years, with the wharf being an attractor for people to live in the area due to the recreational value of the ferry service and ability to access the city centre.

Design of the wharf has also incorporated measures to decrease the maintenance required for operation which are standardised across all newly constructed wharves. The implementation of these measures would result in cost savings for the ongoing operation of the ferry network.

8.2 Objects of the EP&A Act

Table 8.1: Objects of the EP&A Act

| Object | Comment |
|--|--|
| 1.3 (a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. | Through the assessment in Chapter 6, it has been identified that the Proposal would not significantly impact on any natural or artificial resources. The Proposal would result in community benefits through facilitation of a safe and reliable ferry service to Woolwich for the next 50 years. |
| 1.3 (b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. | The Proposal's urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements. The design also provides thematic consistency across the entire network (refer to section 3). Both factors provide for a sustainable urban environment over its 50-year design life. |
| 1.3 (c) To promote the orderly and economic use and development of land. | The Proposal includes continuation of the use of the Proposal location as a ferry wharf. |
| 1.3 (d) To promote the delivery and maintenance of affordable housing. | Not relevant to the Proposal. |
| 1.3 (e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats. | An aquatic ecology assessment has been prepared for the Proposal, which is summarised in section 6.3. The assessment concluded that no significant impact to aquatic ecology would be caused by the Proposal. Tree removal would not be required for the Proposal. |
| 1.3 (f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). | The Proposal would have minimal or no impact upon Aboriginal and non-Aboriginal heritage items. |
| 1.3 (g) To promote good design and amenity of the built environment. | The Proposal has been designed to be consistent with the urban design objectives identified in section 2.4.3. |
| 1.3 (h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants. | The Proposal would benefit the community through improving passenger amenity, safety and overall user experience. It is anticipated that the Proposal would also have indirect wider community benefits, through ensuring continuation of the wharf for its expected lifespan (50 years). |
| 1.3 (i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. | Not relevant to the Proposal. |

| Object | Comment |
|--|--|
| 1.3 (j) To provide increased opportunity for community participation in environmental planning and assessment. | Stakeholder consultation would continue during the public display of this document, with a community information session planned during the public display period to capture feedback. Should the Proposal proceed to construction, consultation with the community and stakeholders would continue throughout the work. |

8.2.1 The precautionary principle

The precautionary principle includes the premise that full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

Through the assessment of the potential impacts of the Proposal in Chapter 6, it has been demonstrated that threats of serious or irreversible environmental damage do not exist for the Proposal.

Notwithstanding, to account for the subjectivity of professional judgement applied in environmental assessment and modelling uncertainty, worst-case assumptions have been incorporated into the assessment, including the following:

- Specialist assessments of noise and vibration, aquatic ecology, landscape character and visual impact have been completed
- The worst-case assumption of all noise generating construction equipment operating at the same time, at its maximum output, at a location closest to the nearest of the sensitive receivers.
- Assessing impacts and including safeguards for impacts which are exceptionally unlikely to happen such as major spills
- Undertaking verification monitoring to validate results and allow modification of safeguards and mitigation controls accordingly.

8.2.2 Intergenerational equity

To achieve intergenerational equity, the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The Proposal would result in benefit to the community through improvements to passenger amenity, safety and overall user experience of the ferry wharf for the next 50 years.

No potential impacts to future generations would be generated by the Proposal.

8.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered through the assessment of aquatic ecology provided in section 6.3, and Appendix D.

Providing the safeguard measures are implemented, the Proposal would not have a material or significant impact on biological diversity and ecological integrity within the Proposal footprint or surrounds.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle includes integrating long-term and short-term economic, environmental, social and fairness considerations into decision-making. This principle requires that environmental resources should be appropriately valued.

Environmental, economic and social issues were considered in the rationale for the Proposal and design options. Construction planning for the Proposal would also be progressed in the most cost-effective way.

Safeguards and management measures detailed in Chapter 6, including avoiding, reusing, recycling, managing waste during construction and operation, would be implemented.

8.3 Conclusion

The proposed Woolwich Wharf Upgrade is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the Proposal have been avoided or reduced during the concept design development and options assessment. The Proposal as described in the REF best meets the project objectives but would still result in some impacts on noise, water quality, aquatic ecology, traffic and transport and landscape character and visual impact. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The Proposal would provide better commuter experience through improvements to passenger amenity, safety, access for people with a disability and overall user experience of the ferry wharf for the next 50 years, as well as contributing to unifying and standardising wharves in Sydney Harbour and Parramatta River. On balance the Proposal is considered justified and the following conclusions are made.

8.3.1 Significance of impact under NSW legislation

The Proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The Proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.3.2 Significance of impact under Australian legislation

The Proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment and Energy is not required.

9 Certification

This review of environmental factors provides a true and fair review of the Proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the Proposal.



Johan Goosen
Principal Environmental Planner
WSP

Date: 04 October 2019

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.

Lisa Monaghan
Project Manager
Greater Sydney Program Office, Roads and Maritime Services

Date:

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Terms and acronyms

| Term/Acronym | Description |
|--------------|--|
| ABS | Australian Bureau of Statistics |
| ACHA | Aboriginal Cultural Heritage Advisor |
| ACHCRs | Aboriginal Cultural Heritage Consultation Requirements |
| AHD | Australian Height Datum |
| AHIMS | Aboriginal heritage information management service |
| AHIP | Aboriginal heritage impact permit |
| ARI | Average Recurrence Interval |
| ASS | Acid sulphate soil |
| ASMA | Australian Maritime Safety Authority |
| ASSMP | Acid Sulphate Soil Management Plan |
| BAM | Biodiversity Assessment Method |
| BC Act | <i>Biodiversity Conservation Act 1994 (NSW)</i> |
| BCA | Building Code of Australia |
| Berthing | A place for a vessel to dock |
| BOSCAR | Bureau of Crime Statistics and Research |
| CLM Plan | Contaminated Land Management Plan |
| CCTV | Close circuit television |
| CD | Chart Datum |
| CEMP | Construction environmental management plan |
| CNVG | Construction Noise and Vibration Guideline |
| COPC | Chemical of Potential Concern |
| CP | Communication Plan |
| DDA | <i>Disability Discrimination Act 1992</i> |
| DECCW | Department of Environment, Climate Change and Water |
| DPI | Department of Primary Industries |
| DSAPT | Disability Standards for Accessible Public Transport 2002 |
| EIS | Environmental impact statement |
| EP&A Act | <i>Environmental Planning and Assessment Act 1979 (NSW)</i> . Provides the legislative framework for land use planning and development assessment in NSW |

| Term/Acronym | Description |
|--------------|--|
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process |
| EWMS | Environmental Work Method Statement |
| FLRSs | Opal Fixed Location Readers |
| FM Act | <i>Fisheries Management Act 1994</i> (NSW) |
| Gangway | A landing used by passengers to board or exit ships/vessels |
| HAT | Highest Astronomical Tide |
| Heritage Act | Heritage Act 1977 (NSW) |
| ISEPP | <i>State Environmental Planning Policy (Infrastructure) 2007</i> |
| ISQG | Interim Sediment Quality Guidelines |
| Jetty | A structure extending into the harbour as part of a wharf |
| JTW | Journey to Work |
| KFH | Key Fish Habitat types as defined by NSW Fisheries |
| LAC | Ryde Local Area Command |
| LAT | Lowest Astronomical Tide |
| LCVIA | Landscape Character and Visual Impact Assessment |
| LGA | Local Government Area |
| LEP | Local Environmental Plan. A type of planning instrument made under the EP&A Act |
| MHWM | Mean high water mark |
| NCAs | Noise Catchment Areas |
| NPW Act | <i>National Parks and Wildlife Act 1974</i> (NSW) |
| OEH | NSW Office of Environment and Heritage |
| PACHCI | Roads and Maritime procedure for Aboriginal Heritage Cultural Heritage Consultation and Investigation |
| PASS | Potential Acid Sulphate Soils |
| Piles | Foundations used to support marine structures and offshore platforms |
| POEO Act | <i>Protection of the Environment Operations Act 1997</i> |
| Pontoon | A floating structure serving as a dock |
| REF | Review of Environmental Factors |
| SEPP | State Environmental Planning Policy. A type of planning instrument made under the EP&A Act |

| Term/Acronym | Description |
|---------------------|---|
| SOHI | Statement of Heritage Impact |
| SRD SEPP | State Environmental Planning Policy (State and Regional Development) 2011 |
| SWMP | Soil and Water Management Plan |
| Sydney Harbour SREP | Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 |
| Transport for NSW | Transport for New South Wales |
| TAP | NSW Government's Transport Access Program |
| Wharf | A landing place or pier where ships may tie up and load or unload |
| WRL | Water Research Laboratory |

Appendix A

Proposal drawings

Appendix B

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

d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?

| Impact | Level of impact |
|--|---|
| There would be temporary aesthetic impacts during construction of the Proposal. | Moderate, short-term impact. |
| Landscape character and visual impacts have been assessed as moderate to low. Impacts have been reduced through design of the wharf, including retention of the wharf in its location. | Moderate to minor, long-term impact. |
| Impacts to environmental quality and value have been assessed as low to moderate, and would be limited to short-term impacts during construction of the Proposal. No long-term impacts to environmental quality and value are anticipated. | Moderate, short-term negative impact. Minor, long-term impact. |

e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?

| Impact | Level of impact |
|---|----------------------------------|
| Non-Aboriginal heritage items would be impacted by the Proposal. It is not anticipated that listed Aboriginal sites would be impacted by the Proposal. | Low to medium, long-term impact. |

f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?

| Impact | Level of impact |
|---|-----------------|
| The results of the biodiversity assessment in section 6.3 indicate there would be no impacts to any habitat of protected fauna as a result of the Proposal. | No impact. |

g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?

| Impact | Level of impact |
|---|---|
| The Proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air. | Moderate, short-term negative impact. Minor, long-term impact. |

h. Any long-term effects on the environment?

| Impact | Level of impact |
|---|-------------------------------------|
| The Proposal would not result in any long-term negative effects on the environment. | Minor, long-term negligible impact. |
| The Proposal would result in improvements in user amenity for the wharf. | Long-term, positive impact. |

i. Any degradation of the quality of the environment?

| Impact | Level of impact |
|--|------------------------------------|
| The Proposal would result in localised sediment disturbance during piling activities and seawall modification works, which would result in temporary impacts to water quality. | Minor, short-term negative impact. |
| There is potential for accidental spills / leaks of fuel, oil or other chemicals to impact water quality during construction. | Minor, short-term negative impact. |
| Impacts would be minor with implementation of the safeguards and management measures identified in section 7.1 of the REF. | |

j. Any risk to the safety of the environment?

| Impact | Level of impact |
|---|------------------------------------|
| Construction related activities pose potential risks to the safety of the environment through spills / leaks of fuel, oil or other chemicals. | Minor, short-term negative impact. |
| Impacts would be minor with implementation of the safeguards and management measures identified in section 7.1 of the REF. | |

k. Any reduction in the range of beneficial uses of the environment?

| Impact | Level of impact |
|--|-----------------|
| The Proposal would not reduce the range of beneficial uses of the environment. | No impact. |

l. Any pollution of the environment?

| Impact | Level of impact |
|--|------------------------------------|
| Construction related activities may result in pollution of the environment through spills / leaks of fuel, oil or other chemicals. | Minor, short-term negative impact. |
| Impacts would be minor with implementation of the safeguards and management measures identified in section 7.1 of the REF. | |

m. Any environmental problems associated with the disposal of waste?

| Impact | Level of impact |
|--|------------------------------------|
| All wastes generated by the Proposal would be disposed of at an off-site facility which is licenced to receive such waste. | Minor, short-term negative impact. |
| There would be no significant environmental problems associated with waste disposal. | |

n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?

| Impact | Level of impact |
|--|-----------------|
| All resources required by the Proposal are readily available and are not likely to become in short supply. | No impact. |

o. Any cumulative environmental effect with other existing or likely future activities?

| Impact | Level of impact |
|--|-----------------|
| Assessment of cumulative impacts for the Proposal is provided in section 6.12 No significant cumulative impacts have been identified for the Proposal. The Proposal design includes an allowance for sea level rise. | No impact. |

p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?

| Impact | Level of impact |
|--|-----------------|
| Consideration of coastal processes and coastal hazards is detailed in section 6.12 No impacts to these issues are anticipated for the Proposal. | No impact. |

Matters of national environmental significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the Proposal should be referred to the Australian Government Department of the Environment.

a. Any impact on a World Heritage property?

| Impact | Level of impact |
|--|-----------------|
| There would be no impact on World Heritage property. | No impact. |

b. Any impact on a National Heritage place?

| Impact | Level of impact |
|---|-----------------|
| There would be no impact on National Heritage place | No impact. |

c. Any impact on a wetland of international importance?

| Impact | Level of impact |
|--|-----------------|
| There would be no impact on wetlands of international importance | No impact. |

d. Any impact on a listed threatened species or ecological communities?

| Impact | Level of impact |
|---|-----------------|
| There would be no impact on listed threatened species or ecological communities | No impact. |

e. Any impacts on listed migratory species?

| Impact | Level of impact |
|---|-----------------|
| There would be no impact on listed migratory species. | No impact. |

f. Any impact on a Commonwealth marine area?

| Impact | Level of impact |
|---|-----------------|
| There would be no impact on Commonwealth marine area. | No impact. |

g. Does the Proposal involve a nuclear action (including uranium mining)?

| Impact | Level of impact |
|---|-----------------|
| The Proposal does not involve a nuclear action. | No impact. |

Additionally, any impact (direct or indirect) on Commonwealth land?

| Impact | Level of impact |
|---|-----------------|
| There would be no impact (direct or indirect) on Commonwealth land. | No impact. |

Appendix C

Statutory consultation checklists and published community updates

ISEPP consultation

Council related infrastructure or services

| Issue | Potential impact | Yes / No | If 'yes' consult with | ISEPP clause |
|----------------------------|---|----------|-----------------------|-------------------|
| Stormwater | Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council? | No | - | ISEPP cl.13(1)(a) |
| Traffic | Are the works likely to generate traffic to an extent that will <i>strain</i> the existing road system in a local government area? | No | - | ISEPP cl.13(1)(b) |
| Sewerage system | Will the works involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system? | No | - | ISEPP cl.13(1)(c) |
| Water usage | Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water? | No | - | ISEPP cl.13(1)(d) |
| Temporary structures | Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor or inconsequential</i> disruption to pedestrian or vehicular flow? | Yes | Hunters Hill Council | ISEPP cl.13(1)(e) |
| Road & footpath excavation | Will the works involve more than <i>minor or inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? | Yes | Hunters Hill Council | ISEPP cl.13(1)(f) |

Local heritage items

| Issue | Potential impact | Yes / No | If 'yes' consult with | ISEPP clause |
|----------------|---|----------|-----------------------|--------------|
| Local heritage | Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than <i>minor or inconsequential</i> ? | Yes | Hunters Hill Council | ISEPP cl.14 |

Flood liable land

| Issue | Potential impact | Yes / No | If 'yes' consult with | ISEPP clause |
|-------------------|---|----------|-----------------------|--------------|
| Flood liable land | Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent? | No | - | ISEPP cl. 15 |

Public authorities other than councils

| Issue | Potential impact | Yes / No | If 'yes' consult with | ISEPP clause |
|-----------------------------|--|----------|-----------------------|-------------------|
| National parks and reserves | Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> ? | No | - | ISEPP cl.16(2)(a) |
| Marine parks | Are the works adjacent to a declared marine park under the <i>Marine Parks Act 1997</i> ? | No | - | ISEPP cl.16(2)(b) |
| Aquatic reserves | Are the works adjacent to a declared aquatic reserve under the <i>Fisheries Management Act 1994</i> ? | No | - | ISEPP cl.16(2)(c) |
| Sydney Harbour foreshore | Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ? | Yes | Property NSW | ISEPP cl.16(2)(d) |
| Bush fire prone land | Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land? | No | - | ISEPP cl.16(2)(f) |

Sydney Harbour SREP consultation

| Issue | Potential impact | Yes / No | If 'yes' consult with | SREP clause |
|--|---|----------|-----------------------|----------------------------------|
| Provision of services | Do the works require the provision of services (including water, sewerage or stormwater systems)? | No | - | SREP cl.31(2)(a)(ii) |
| Advertising | Do the works include advertisements or advertising structures? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Aviation | Do the works include aviation facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Boat launching | Do the works include boat launching facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Boat lifts | Do the works include boat lifts? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Boat repair | Do the works include boat repair facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Boat sheds | Do the works include a boat shed or sheds? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Charter and tourism boating facilities | Do the works include charter and tourism boating facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Marinas | Do the works include a commercial or private marina? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Commercial port facilities | Do the works include commercial port facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Commercial or retail use of land | Do the works include the commercial or retail use of land below or partly below mean high water mark? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Dredging | Do the works involve any dredging? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Flora and fauna enclosures | Do the works include any flora and/or fauna enclosures? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Houseboats | Do the works include a houseboat or houseboats? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Inclinators | Do the works include an inclinators? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Private landing facilities | Do the works include private landing facilities (including jetties, wharves and pontoons)? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |

| Issue | Potential impact | Yes / No | If 'yes' consult with | SREP clause |
|--|--|----------|---|----------------------------------|
| Public boardwalks | Do the works include a public boardwalk? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Public water recreational facilities | Do the works include any public water recreational facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Public water transport facilities | Do the works include public water transport facilities? | Yes | Foreshores and Waterways Development Advisory Committee | SREP cl.31(2)(a)(i) & Schedule 2 |
| Reclamation works | Do the works require any reclamation works? | Yes | Foreshores and Waterways Development Advisory Committee | SREP cl.31(2)(a)(i) & Schedule 2 |
| Recreational or club facilities | Do the works include any recreational or club facilities? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Residential | Do the works include any residential use of land below or partly below mean high water mark? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Retaining walls | Do the works include retaining walls? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Seawalls | Do the works include sea walls? | Yes | Foreshores and Waterways Development Advisory Committee | SREP cl.31(2)(a)(i) & Schedule 2 |
| Skids | Do the works include skids (ie an inclined ramp used for the manual launching of small craft but not including a slipway)? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Swimming enclosures | Do the works include a swimming enclosure? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Water based restaurants and entertainment facilities | Do the works include water-based restaurants and/or entertainment facilities? (ie a vessel or structure that floats on, or is fixed in, the waterway, that is used as a club or restaurant or for entertainment (on a commercial basis) and that has a direct structural connection between the foreshore and the waterway). | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Stairs | Do the works include waterfront access stairs? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |
| Demolition | Do the works include demolition – including demolition in relation to heritage items? | No | - | SREP cl.31(2)(a)(i) & Schedule 2 |

Appendix D

Aquatic ecology assessment

Appendix E

Noise and vibration assessment

Appendix F

Landscape character and visual impact assessment

Appendix G

Statement of heritage impact and PACHCI letter

Appendix H

Bat survey

Appendix I

CPTED Assessment