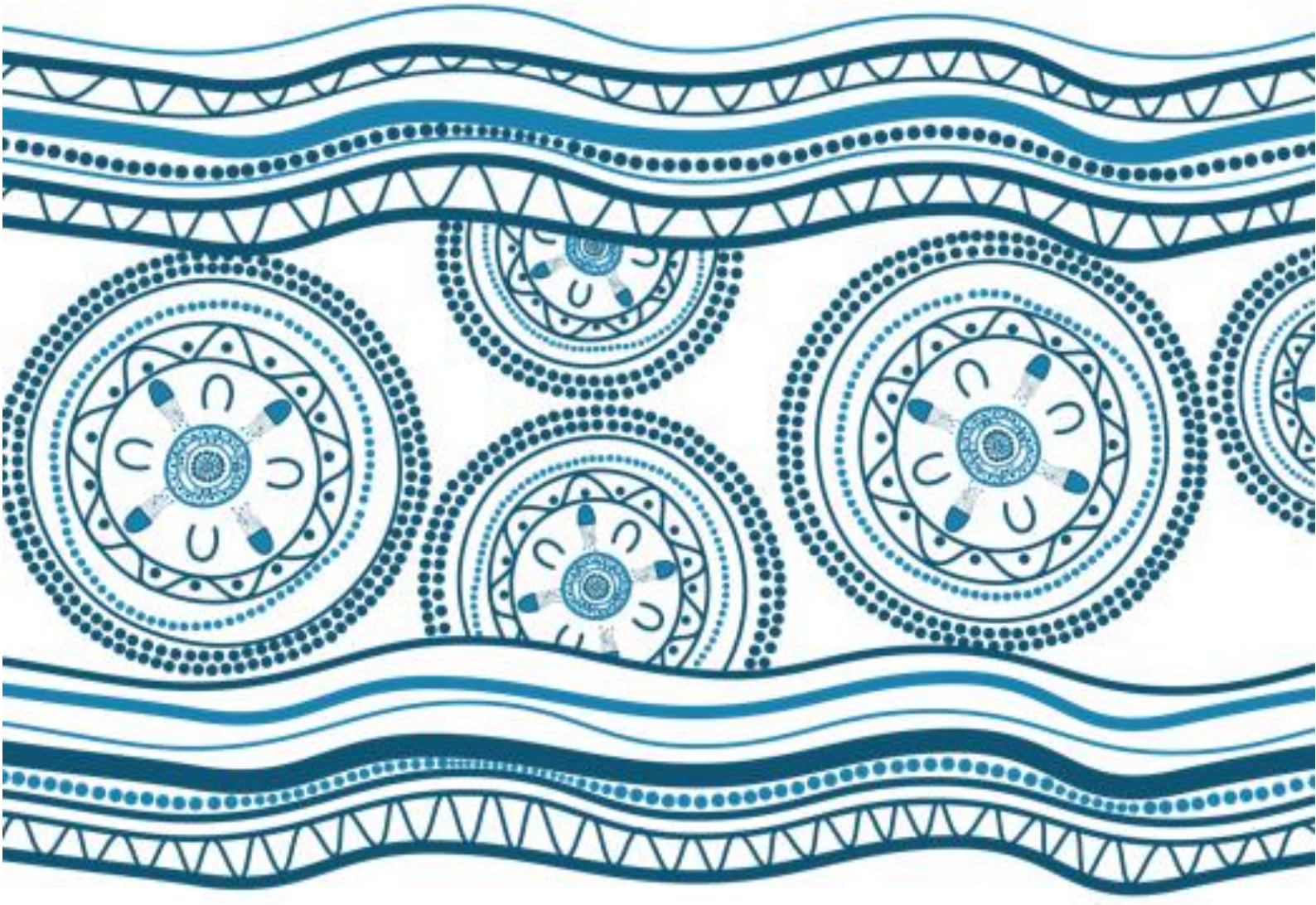
Chapter 15

Surface noise and vibration



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15 Noise and vibration

This chapter presents an assessment of the impacts of the project on surface noise and vibration and identifies mitigation and management measures to minimise and reduce these impacts. The assessment presented in this chapter draws on information from Appendix O (Surface Noise and Vibration Assessment Report).

15.1 Assessment methodology

The methodology for the surface noise and vibration assessment involved:

- Identifying the nearest sensitive receivers
- Identifying the noise levels of construction equipment and likely noise levels for the operation of the project
- Carrying out background noise monitoring to understand existing ambient noise levels
- Identifying noise management levels and vibration criteria in accordance with the relevant guidelines
- Carrying out a quantitative noise assessment of potential noise impacts
- Recommending mitigation measures to further avoid noise impacts.

15.1.1 Policy framework

The terrestrial noise and vibration assessment was carried out in accordance with the following guidelines:

- Interim Construction Noise Guideline (ICNG) (NSW Department of Environment and Climate Change (DECC), 2009)
- Assessing Vibration: a technical guide (Department of Environment and Conservation, 2006)
- German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures (German Institute for Standardisation, 2016)
- British Standard 7385-2 Evaluation and measurement for vibration in buildings – guide to damage levels from ground borne vibration (British Standards Institution, 1993)
- British Standard 6472-1 Guide to evaluation of human exposure to vibration in buildings (British Standards Institution, 2008)
- Road Noise Policy (Department of Environment, Climate Change and Water (DECCW), 2011)
- Noise Policy for Industry (Environment Protection Authority, 2017).

As blasting would not be undertaken as part of this project, the Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (Australian and New Zealand Environment Council, 1990) as identified in the Secretary's Environmental Assessment Requirements (SEARs) has not been included in this assessment.

15.2 Existing environment

The existing noise environment at La Perouse and Kurnell is influenced by the mix of land use activities including residential, commercial, industrial and recreational which are present in the project areas. The following describes the sensitive receivers surrounding the project areas and the noise monitoring that was carried out to determine the existing noise environment.

15.2.1 Noise sensitive receivers

The noise and vibration assessment considered a range of sensitive receivers in the local area, based on land use type and those which were closest to the project area. These receiver types are a representative sample of the land uses around project area and of people who visit and reside in the area. Table 15-1, Figure 15-1 and Figure 15-2 show the sensitive receivers that were identified for the noise assessment. Aboriginal and non-Aboriginal heritage features that could be potentially impacted by vibration are shown in Chapter 7 (Aboriginal heritage) and Chapter 8 (Non-Aboriginal heritage).

Table 15-1: Sensitive receiver locations identified for the noise assessment

Receiver ID	Type of receivers	Location	Approximate distance to the construction boundary (m)
La Perouse			
RES1	People who live in the area	Endeavour Avenue	90
RES2		Goorawahl Avenue	60
RES3		Anzac Parade	100
RES4		Endeavour Avenue	170
COM1	People who work and visit businesses	Anzac Parade	15
ARC1	People who use recreational areas	Frenchmans Bay Reserve Playground, Endeavour Avenue	30
ARC2		Congwong Trail, Henry Head	215
PRC1		Frenchmans Beach	130
CUL1	People who visit cultural sites	La Perouse Museum, Anzac Parade	55
CUL2		Macquarie Watchtower, Anzac Parade	90
CHC1	People who work and children that learn at childcare	Gujaga MACS Childcare Centre, Elaroo Avenue	420
CMU1	People who use community services	La Perouse Local Aboriginal Land Council, Elaroo Avenue	450
Kurnell			
RES1	People who live in the area	Captain Cook Drive	15
RES2		Rangers accommodation, Kamay Botany Bay National Park	155
RES3		Prince Charles Parade	50
RES4		Captain Cook Drive	20
COM1	People who work and visit businesses	Endeavour Coffee and Ice-cream, Prince Charles Parade	15
EDU1	People who work and visit the education centre	Kamay Botany Bay Environmental Education Centre, Cape Solander Drive	315
ACR1	People who use recreational areas	Marton Park, Captain Cook Drive	580
ACR2		Yena Walking Trail, Kamay Botany Bay National Park	330
PCR1		Commemoration Flat, Kamay Botany Bay National Park	400
CHC1	People who work and children that learn at childcare	Kurnell Preschool Kindergarten, Captain Cook Drive	640
PoW1	People who visit a place of worship	St John Fisher Catholic Church	325
IND1	People who work in industrial areas	Caltex Kurnell Terminal, Solander Street	300

Figure 15-1: Nearest noise sensitive receivers at La Perouse

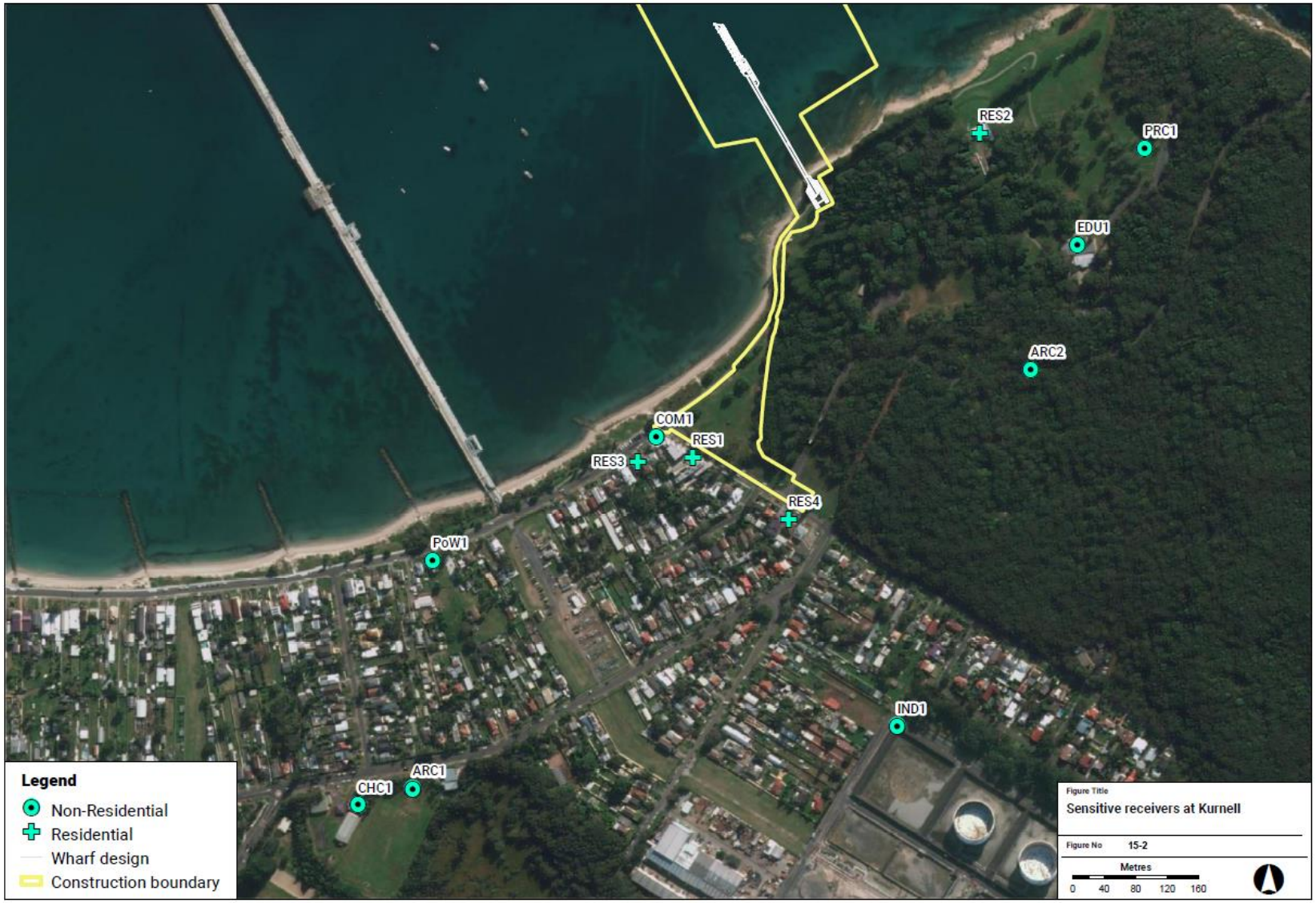

Figure 15-2: Nearest noise sensitive receivers at Kurnell

15.2.2 Noise monitoring

Both short and long-term noise monitoring was carried out to determine the existing noise environment.

Unattended noise loggers were placed at 51-52 Endeavour Avenue, La Perouse and 3/1 Captain Cook Drive, Kurnell (See Figure 4 of Appendix O (Surface Noise and Vibration Assessment Report)). These loggers monitored between Tuesday 3 March and Thursday 2 April 2020. The monitoring results are shown in Table 15-2.

From these noise monitoring results the ambient noise level and rating background level (RBL) are calculated. The RBL represents the background noise level for assessment purposes.

Table 15-2: Long-term noise monitoring results

Location	Time Period[1]	Ambient $dBL_{Aeq(period)}$	Rating background level, $dBL_{A90(period)}$
La Perouse, 51-52 Endeavour Avenue	Day	64	43
	Evening	60	41
	Night	48	38
Kurnell, 3/1 Captain Cook Drive	Day	58	43
	Evening	54	40
	Night	53	38

Notes:
[1] The NPI defines day, evening and night-time periods as:
- Day: the period from 7am to 6pm Monday to Saturday; or 8am to 6pm on Sundays and Public Holidays.
- Evening: the period from 6pm to 10pm.
- Night: the remaining period.

The long-term monitoring results show a typical trend for residential areas, with lower ambient and background noise levels at night than during the day. This is characteristic of suburban areas where the ambient noise environment is primarily influenced by road traffic, occasional overhead plane noise and occasional shipping noise.

Short-term 15-minute attended noise monitoring was carried out on Monday 6 April 2020 at three locations in La Perouse and three in Kurnell (see Figure 5 of Appendix O (Surface Noise and Vibration Assessment Report)). The results from this attended noise monitoring are shown in Table 15-3.

Table 15-3: Short-term noise monitoring results

Location	Date/Time	$dBL_{Aeq,15min}$	$dBL_{A90,\ 15min}$
La Perouse			
Opposite 16 Prince Charles Parade	06/04/20 – 10:28am	54	45
9 Silver Beach Road	06/04/20 – 11:35am	57	43
22 Captain Cook Drive	06/04/20 – 10:57am	62	38
Kurnell			
Behind 11 Goolagong Place	06/04/20 – 2:34pm	52	43
8 Goorawahl Avenue	06/04/20 – 1:46pm	48	35
Corner Elaroo Avenue, 7 Anzac Parade	06/04/20 – 2:10pm	60	59

The noise monitoring results show that the existing noise environment is similar for both La Perouse and Kurnell. On a weekday morning, the noise levels in La Perouse range between 54-62 $dBL_{Aeq15min}$ and in the afternoon at Kurnell the noise levels range from 52-60 $dBL_{Aeq15min}$.

The noise monitoring was carried out during lockdown restrictions due to Covid-19. This may have affected noise monitoring results. However, when compared to previous noise monitoring in the area, the results are representative of the typical noise environment.

15.3 Criteria

15.3.1 Construction noise

The Interim Construction Noise Guideline (DECC, 2009) sets out management levels for construction noise at sensitive receivers. The RBL is used to determine the noise management level (NML) for residential receivers. This allows a permissible level of noise above the monitored background level. The project construction NMLs are shown in Table 15-4.

Table 15-4: Construction noise management levels

Land use ID	Noise management level (NML) $dB_{LAeq(15\ min)}$
RES (standard hours)[1]	53
RES (out of hours)[2]	43
RES (sleep disturbance)	53
ARC	65
PRC	60
COM	70
CUM	45 (internal)
CUL	45 (internal)
CHC	45 (internal)
PoW	45 (internal)
IND	75

[1] Monday to Friday 7am to 6pm, Saturday 8am to 1pm, no work on Sundays or public holidays
[2] Out of standard hours

15.3.2 Construction vibration criteria

British Standard 6472-1:2008 was used to assess vibration impacts on people. These were applied in accordance with Assessing Vibration: A technical guideline (NSW Department of Environment and Conservation, 2006). British Standard 7385-2 (1993) and German Standard DIN4150-3 were used to assess construction vibration impacts on buildings.

15.3.3 Operation noise criteria

There is no specific noise guideline to assess noise impacts from ferry operations; therefore, the Noise Policy for Industry (NSW Environment Protection Authority, 2017) was used as it is often used for fixed infrastructure such as rail stations and rail stops.

15.3.4 Road traffic noise criteria

The Road Noise Policy (NSW DECCW, 2011) was used to assess the road traffic noise impacts. The threshold road traffic criteria for residential receivers on local roads are:

- 55 $L_{Aeq(1hour)}$ between 7am and 10pm
- 50 $L_{Aeq(1hour)}$ between 10pm and 7am.

Any increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

15.4 Assessment of potential impacts

The following summarises the predicted noise and vibration impacts during construction and operation of the project. The construction of the project would take place concurrently at La Perouse and Kurnell, however due to the separation distances between the areas, any cumulative noise impacts would not be heard by the same receivers.

15.4.1 Assessment of construction impacts

Construction noise

The assessment considered the likely noise generating activities taking place during each step of the construction (refer to Chapter 5 (Project description)). These were compared against the NMLs outlined in section 15.3.1 above. The noise assessment provides a 'realistic worst-case' scenario, based on construction works in a 15-minute period which assumes all noise generating activities being carried out simultaneously for the specified activity.

The construction noise predications for the project are shown in Table 15-5 and Table 15-6. The activities that are predicted to exceed the NML are shown in red and those predicted to exceed 75dB are considered highly intrusive and are shown in **bold**.

At La Perouse, the highest predicted noise levels are associated with setting up and removal of the site compound, earthworks, reconfiguring the car parking areas and piling. These activities are predicted to exceed NMLs for residential receivers RES1-4, CUL1 and CUL2. Setting up security fencing, wharf construction, installation of wharf furniture and landscaping would be the least noisy activities.

Piling in the marine environment may be occasionally required to be carried out at night time due to weather conditions. If piling works are required to be carried out at night time, this activity may exceed the sleep disturbance NMLs (53 dBA) for residential receivers by up to 8dB. Piling would take place intermittently and on average, a pile would be vibrated for about five minutes and then hammered for about 10 - 60 minutes (depending on the ground conditions at the pile locations). For piles that are to be drilled into position, the duration of drilling could be between 20 – 120 minutes. Following these activities, there would be a relatively quiet period for a couple of hours whilst relocating and/or setting up equipment at the next location.

At Kurnell, RES1 and RES4 are the closest in proximity to the construction works. All construction activities are shown to exceed the noise management levels at these locations. Earthworks for the footpaths and landscaping are predicted to exceed the highly intrusive noise level by 1dB at RES1. This activity would be undertaken during the day time and is expected to take about one month.

If piling activities were required to be carried out at night, the NMLs for sleep disturbance (53dB $L_{Aeq(15min)}$) would be exceeded by 1db to 4dB for residential receivers. As outlined above, piling works during night time periods would be occasional if works could not be undertaken during the day time due to poor weather.

Where the predicted $L_{Aeq(15min)}$ noise level is greater than the NMLs and where there are predicted exceedances of the highly intrusive noise level of 75dB, all feasible and reasonable work practices should be applied.

The noise generating activities would be temporary and intermittent in duration, rather than a constant noise source. A Construction Noise and Vibration Management Plan and consultation with noise affected receivers would help to mitigate and manage noise impacts during construction. The recommended mitigation measures are outlined in section 15.5.

Table 15-5: Construction noise predications at La Perouse ($L_{Aeq(15min)}$)

ID	Period		NML	Stage 1			Stage 2						Stage 3
				Security and fencing	Setting up site offices and access	Piling	Wharf construction	Carpark reconfiguration	Earthworks for footpaths and landscaping	Installation of wharf furniture	Earthworks & installation of utilities	Landscaping	Removal of site compound
RES1	Standard Hours	Day	53	49	55	61	50	56	62	51	62	52	57
	OOHW[1]	Night	43	-	-	61	-	-	-	-	-	-	-
RES2	Standard Hours	Day	53	51	57	60	50	58	64	51	64	54	59
	OOHW	Night	43	-	-	60	-	-	-	-	-	-	-
RES3	Standard Hours	Day	53	49	55	58	48	56	62	48	62	52	56
	OOHW	Night	43	-	-	58	-	-	-	-	-	-	-
RES4	Standard Hours	Day	53	46	55	60	49	53	59	49	59	49	56
	OOHW	Night	43	-	-	60	-	-	-	-	-	-	-
ARC1	Standard hours	Day	65	51	52	60	49	58	64	49	64	54	58
ARC2	Standard hours	Day	65	40	45	37	36	47	53	35	53	43	47
PRC1	Standard hours	Day	60	43	52	57	46	50	56	47	56	46	53
CHC1	Standard hours	Day	55	38	46	55	43	45	51	43	51	41	48
COM1	Standard hours	Day	70	53	62	65	54	60	66	56	66	56	64
CUL1	Standard hours	Day	55	55	61	61	50	62	68	52	68	58	62
CUL2	Standard hours	Day	55	49	54	41	35	56	62	36	62	52	53
CMU1	Standard hours	Day	55	37	46	53	43	44	50	42	50	40	48

Note:
[1] OOHW (Out of Hours Work) is only for piling works

Table 15-6: Construction noise predictions at Kurnell ($L_{Aeq(15min)}$)

				Stage 1					Stage 2						Stage 3
ID	Period		NML	Security & fencing	Site offices and access	Demolition of Kurnell viewing platform	Establishing temporary causeway	Piling	Wharf construction	Earthworks for footpath and landscaping	Installation of wharf furniture	Installation of utilities	Landscaping	Removal of the work site compound
RES1	Standard Hours	Day	53	63	62	61	59	56	59	**76**	55	63	63	67
	OOHW[1]	Night	43	-	-	-	-	56	-	-	-	-	-	-
RES2	Standard Hours	Day	53	44	44	52	62	57	50	57	50	52	52	52
	OOHW	Night	43	-	-	-	-	57	-	-	-	-	-	-
RES3	Standard Hours	Day	53	46	39	53	57	55	51	59	48	53	53	52
	OOHW	Night	43	-	-	-	-	55	-	-	-	-	-	-
RES4	Standard Hours	Day	53	58	55	58	57	54	56	71	48	65	65	62
	OOHW	Night	43	-	-	-	-	54	-	-	-	-	-	-
EDU1	Standard Hours	Day	55	41	39	43	57	54	41	54	46	54	48	49
PoW1	Standard Hours	Day	55	43	45	51	53	51	51	56	45	55	46	49
ARC1	Standard Hours	Day	65	30	27	36	36	40	34	43	32	43	36	36
ARC2	Standard Hours	Day	65	31	31	35	47	37	33	44	31	44	37	40
PRC1	Standard Hours	Day	60	41	41	42	53	51	40	54	43	54	46	46
CHC1	Standard Hours	Day	55	34	32	45	47	47	43	47	40	46	39	42
COM1	Standard Hours	Day	70	62	61	61	59	58	59	75	65	75	62	66
IND1	Standard Hours	Day	75	40	40	47	46	48	45	53	39	52	44	45

Note:
[1] OOHW (Out of Hours Work) is only for piling works

Construction traffic noise

There is only expected to be around 20 vehicles arriving and leaving each construction site every day during construction. This would increase to around 50 vehicles during the sit establishment period. These traffic numbers are too low to cause any related noise impacts that would exceed the assessment criteria as described in section 4.4 of Appendix O (Surface Noise and Vibration Assessment Report).

Construction vibration

Construction vibration can adversely affect people, animals, buildings (including heritage artefacts) and utilities. Using a vibratory pile driver and pile boring equipment to install the wharf piles could cause a vibration impact, as well as any excavation near sensitive heritage items.

Buildings and people

There is specific guidance for vibration generating equipment which determines minimum safe working distances (refer to section 4.3 of Appendix O (Surface Noise and Vibration Assessment Report)). The minimum working distances are indicative and vary depending on the local ground conditions.

Given the distances between the receivers and the piling works at the wharves, cosmetic damage or disruption to human comfort is not expected for any residential receivers at La Perouse or any sensitive receivers at Kurnell.

The only receiver that is close enough to the works to be potentially impacted by piling is COM1, The Boathouse at La Perouse. The piling activities would be intermittent and would reduce as the wharf is constructed further into Botany Bay. To avoid vibration impacts, selecting and using equipment to limit vibration impacts on this receiver. Where minimum safe working distances cannot be achieved, vibration monitoring would be undertaken to determine real-time vibration during vibration intensive construction activities.

Heritage items

There are heritage structures such as monuments, plaques and buildings within both project areas. BS 7385-2 notes that '*a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*'. There are identified rock engravings (AHIMS listed sites) and heritage plaques within the recommended minimum safe working distances, as well as potentially buried archaeology (refer to Chapter 7 (Aboriginal heritage), Chapter 8 (Non-Aboriginal heritage) and Chapter 9 (Underwater heritage)). Where these items are within the standard safe working distances from vibration intensive equipment (such as those described above being piling and excavation), they could experience cosmetic damage. A pre-construction assessment by a vibration specialist in conjunction with a structural engineer (as required) would be carried out for heritage items within minimum safe working distances or those which could be potentially impacted by the proposed works.

15.4.2 Assessment of operation impacts

The operation of the ferry service (vessels approaching, mooring and departing) and vehicle traffic has the potential to cause noise impacts for nearby sensitive receivers, employees and visitors to the National Park.

The ferry service is likely to operate everyday between 7.00am and 7.00pm, with three crossings expected per hour (dependent on the selected operator). The assessment considered the sound power levels for similar operating services, as well as predictions for commercial/recreational vessels using the wharves. These levels were used to predict the noise levels at the sensitive receivers identified in section 15.2. A worst case scenario was used that assumed, over a 15 minute period the following vessels used the wharves:

- One public ferry
- Two recreational vessels at La Perouse

- Three recreational vessels at Kurnell.

Standard meteorological conditions (ie not windy) and enhanced meteorological conditions (ie windy) were assessed to account for various climatic conditions. The predicted noise levels for each sensitive receiver are presented in section 5.2 of Appendix O (Surface Noise and Vibration Assessment Report).

The predicted noise levels are well below daytime project noise trigger levels for all receivers, except for two receivers at La Perouse (PRC1 Frenchmans Beach and CHC1 Gujaga MACS Childcare Centre) where a 1dB to 2dB exceedance has been predicted for standard meteorological conditions. These exceedances would not be discernible by the average listener and therefore would not affect the comfort of receivers. For enhanced metrological conditions, the results show an exceedance of 6dB for CHC1 Gujaga MACS Childcare Centre. The current ambient noise environment for La Perouse is 64 dbL_{Aeq}, and therefore the operations of the ferry service are unlikely to cause significant change in the existing noise environment for the CHC1 receiver which is located at least 420 metres away from the proposed wharf.

Appendix K (Landside Traffic and Transport Assessment) has forecast that there would be around a one per cent increase in traffic generated by the project each year. The forecast growth rate is applied to the opening year (2024) and design year (2036) to determine the likely noise impacts (refer to section 5.3 of Appendix O (Surface Noise and Vibration Assessment Report)). The traffic generation from the operation of the project would only increase noise levels by less than 2dB over the design life (until 2036). According, to the RNP, any noise level less than or equal to 2dB represents an insignificant effect on the ambient noise environment.

There are no long-term vibration impacts expected from the operation of the project.

15.5 Environmental management measures

Noise and vibration impacts would be managed and mitigated by the measures listed in Table 15-7.

Table 15-7: Environmental management measures for surface noise and vibration

Impact	ID	Environmental management measure	Responsibility	Timing
Construction noise and vibration management	SN1	A Construction Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the Construction Environment Management Plan (CEMP). The plan will generally follow the approach of the Interim Construction Noise Guideline (NSW DECC, 2009) and provide details of construction management measures and procedures. The plan will include: a. An Out of Hours Works Protocol and provision to cover working outside of the standard hours set by the Construction Noise and Vibration Strategy (ST-157/4.1, Transport for NSW, 2020j) b. Identify all potential significant noise and vibration generating activities c. Noise and vibration management measures such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance, equipment selection and controlling the	Contractor	Pre-construction and construction

Impact	ID	Environmental management measure	Responsibility	Timing
		location and use of vibration generating equipment d. A monitoring and reporting program to assess performance against relevant noise and vibration criteria e. Consultation arrangements with affected neighbours and sensitive receivers, including notification and complaint handling procedures f. Consultation with NSW EPA, Randwick City Council, Sutherland Shire Council and National Parks and Wildlife Service for preparation of the NVMP g. Contingency measures in the event of non-compliance with noise and vibration criteria.		
Vibration impacts to heritage items	SN2	A pre-construction building condition assessment of Aboriginal and non-Aboriginal heritage items within 70 metres of the construction boundary will be carried out by a suitably qualified person prior to construction. During construction, inspections of the construction activities and work areas will be undertaken to monitor and review the construction methodology and confirm the integrity of the nearby significant structural elements. For heritage items identified at risk during the pre-construction condition assessment, minimum safe working distances will be established and vibration monitoring be carried out prior to the commencement of construction and monitored throughout construction to identify any construction-related impacts. If impacts are detected, work in the area will stop and appropriate environmental management measures will be implemented such as using alternative construction techniques or installing protection structures in collaboration with a heritage consultant.	Contractor	Pre-construction and construction
Unavoidable noise and vibration impacts	SN3	Any noise or vibration affected sensitive receivers will be notified at least five days before starting work. The notification will include details of: a. Construction periods and working hours b. Contact information for project management staff c. Complaint and incident reporting d. How to obtain further information. This excludes emergency works which will be covered under the CLIP.	Contractor	Construction