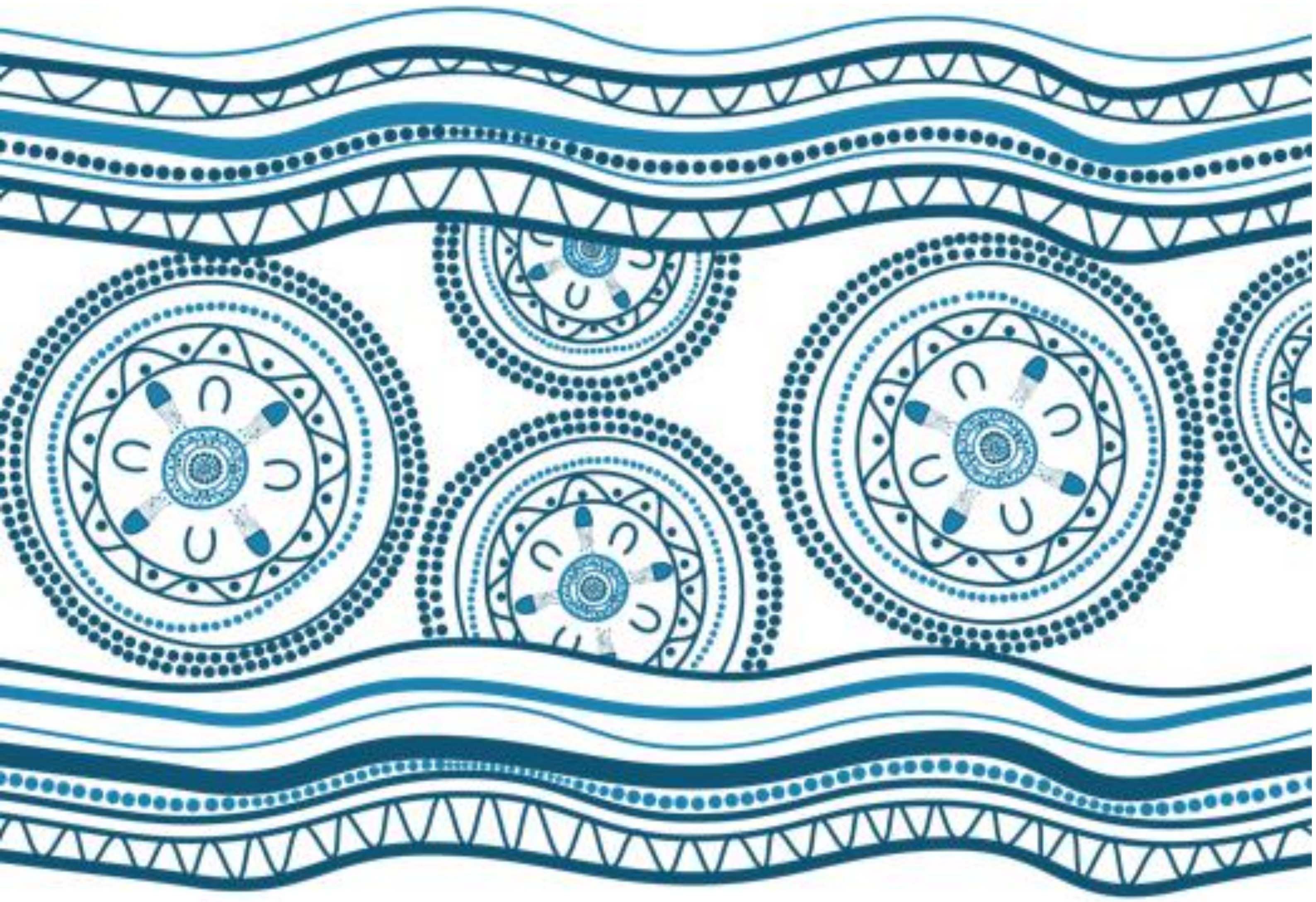
Appendix V

Air Quality Assessment Report



BLANK PAGE

Transport for NSW

Kamay Ferry Wharves Project

Air Quality Assessment Report

KFW01-ARUP-BPW-AH-RPT-000061

Final | 8 April 2021

Job number 273023-00

Arup Australia Pty Ltd, ABN 76 625 912 665

Arup
Level 5
151 Clarence Street
Sydney NSW 2000
Australia
www.arup.com

ARUP

Executive summary

Transport for New South Wales (Transport for NSW) are seeking approval to reinstate the ferry wharves at La Perouse and Kurnell in Botany Bay. This project would allow for an alternative connection between La Perouse and Kurnell and bring multiple benefits to the local community. As part of this project, an Environmental Impact Statement (EIS) has been prepared to assess the impact on the surrounding environment due to the project. This report supports this EIS to assess the impact on air quality and provide recommendations for mitigating and managing the potential impacts.

A desktop study was undertaken to determine the existing air quality. Air quality in Sydney is generally good with occasional exceedances of standards for particulate matter (PM_{10} and $PM_{2.5}$). In 2019, the air quality conditions recorded at the closest monitoring station about 6.3 kilometres north of La Perouse project area found no exceedances of the annual average standards for NO_2, PM_{10} or SO_2. However, the 24-hour standards for PM_{10} and $PM_{2.5}$ were exceeded, likely due to the bushfires in northern NSW between October and the end of the year.

During the construction phase, the impact to surrounding air quality from dust and particulate matter is likely to be low to medium. This is due to the amount of construction work required and the distance between the proposed works and sensitive receivers (commercial, recreational and residential receivers). The odour impact during the construction phase is expected to be negligible as the sensitive receivers are quite far from the likely odour generating activities (main wharf site and disturbance of marine sediments).

During the operation phase of the project, the emissions from the ferries and traffic travelling to the wharves are unlikely to have a direct or measurable impact on air quality. This is due to the small number of extra vehicle movements expected and the number of ferry movements per day (average of 36). It is also due to the distance between the ferry berth where vessels will be located and the closest sensitive receivers (about 300m away). Pollution drops off rapidly from the source so it is unlikely that pollutants and odour from idling vessels would impact air quality at the sensitive receivers.

To mitigate these potential impacts a variety of management measures have been recommended. This includes preparation of air quality management measures to be incorporated into the Construction Environmental Management Plan (CEMP) during construction (see Table 7-1), notifying sensitive receivers likely to be affected, and to maintain ferry vessels to avoid excessive emissions. The likely residual impacts to air quality are expected to be negligible following the implementation of these management measures.

Contents

1 Introduction

This section introduces the project and describes the purpose of this report.

1.1 Purpose of this report

The purpose of this report is to identify and assess the air quality impacts from constructing and operating the project.

The assessment has considered the existing air quality conditions and estimating the generation of airborne pollutants during the project's construction and operation. These considerations have been made by:

- Reviewing air quality legislation in NSW that applies to the project
- Defining existing air quality conditions in the study area using publicly available information from Government-operated air quality monitoring stations
- Confirming the local meteorological (weather) conditions to understand how dispersion may occur
- Carrying out a qualitative assessment of potential local air quality impacts relating to dust, odour and emissions to air
- Recommending management and mitigation measures to avoid, reduce and monitor likely project-related local air quality impacts.

1.2 Project overview

Transport for New South Wales (Transport for NSW) is seeking approval to reinstate the ferry wharves at La Perouse and Kurnell in Botany Bay (the project) under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as State significant infrastructure. The project would allow for an alternative connection between La Perouse and Kurnell rather than by road. The primary purpose of this infrastructure would be to operate a public ferry service to service visitors to the area and by the local community for cultural and recreational purposes. It would also provide supplementary temporary mooring for tourism-related commercial vessels and recreational boating.

The project provides opportunities for significant cultural and economic benefits to the local Aboriginal community by providing improved access to culturally significant sites. It is also expected to deliver benefits and opportunities to wider communities on either side of Botany Bay such as investment opportunities in a ferry service and other new visitor/tourist experiences.

Key features of the project include:

- Two new wharves, one at La Perouse and one at Kurnell that would include:
  - Berth for ferries (to accommodate vessels up to 40m long)

    - Berth for recreational and commercial vessels (to accommodate vessels up to 20m long)
    - Sheltered waiting areas and associated furniture
    - Additional space within waiting areas to accommodate other users such as fishing and those using recreational vessels
    - Signage and lighting
- Landside paving, access ramps, seating and landscaping at the entrance to the wharves
- Reconfiguration of existing car parking areas at La Perouse to increase the number of spaces (including provision of accessible parking and kiss-and-ride bays)
- Reconfiguration of footpaths around the new car parking area at La Perouse
- Provision for bike racks at La Perouse
- Installation of utilities to service the wharves.

The total construction period is anticipated to take up to 13 months, starting in early 2022. The construction of the two wharves will occur at the same time with landside and waterside works occurring simultaneously.

A concept design has been developed for the project, which forms the basis of this assessment. This air quality assessment supports the Environmental Impact Statement (EIS) prepared for the project.

1.3 SEARs relevant to this report

Table 1-1 identifies the SEARs relevant to this technical assessment.

Table 1-1: SEARs for air quality

SEARs relevant to this technical report	Where addressed in this technical report
11. **Other Issues**	
1. An assessment of the following issues must be undertaken in accordance with the commitments in Section 5 of the Kamay Ferry Wharves State Significant Infrastructure Scoping Report (Transport for NSW, May 2020): - Air quality	The assessment outlined in this technical report has assessed all issues raised in the Kamay Ferry Wharves State Significant Infrastructure Scoping Report (Transport for NSW, May 2020)
Agency comments	
Sutherland Shire Council	
Air quality impacts Air quality impacts on local residents and open space areas in the vicinity, include PM2.5 and SOx, NOx. All potential shipping utilising the wharves needs to be considered.	Section 2.1 outlines the pollutants of concern that may be generated by the project that aligns with the requirements from Sutherland Shire Council. Section 6.1 considers air quality impacts from all vessels, ferries, commercial and recreational vessels.

2 Policy and planning context

This section identifies the pollutants that may be generated during the construction and operation of the project and the legislative context for air quality in NSW.

2.1 Sources of pollution

The SEARs require an air quality assessment to be carried out to understand the local air quality impacts during construction and operation of the project. Existing pollution sources in the area surrounding the project include minor roads, light industry in both Kurnell and La Perouse, Sydney (Kingsford Smith) Airport and maritime traffic travelling through the headland to and from Port Botany. All these sources contribute to existing air quality conditions in the area.

The project has the potential to generate dust, odour and particulate matter (PM) on a temporary basis during construction.

During operation, air emissions (including odour) would be generated from the operation of ferries. More information regarding the pollutants of concern for the project is provided below.

2.1.1 Particulate matter

Health impacts from PM are generally associated with PM_{10} (PM with an aerodynamic diameter of less than 10µm) and $PM_{2.5}$ (PM with an aerodynamic diameter of less than 2.5µm). As this PM is so small, it has the potential to enter the respiratory system and can penetrate the lungs, leading to respiratory illness or affecting people with existing conditions

PM is likely to be generated during construction but is also generated by road and ferry traffic. It can also be formed from natural sources; key of which are dust, soil, pollen, sea spray and smoke (from bushfires). These sources can impact urban areas due to the way PM is dispersed through the atmosphere.

Exceedances of the PM standards are common across NSW and other States/Territories in Australia. It is increasing due to long-running drought conditions, climate change and significant bushfires.

2.1.2 Nitrogen oxide

Oxides of nitrogen (NOx) are generated by the combustion of fuel and is therefore generated by road and ferry traffic. NOx oxidises in the atmosphere in the presence of ozone (O_3) to generate nitrogen dioxide (NO_2). About 80 per cent of the NO_2 in urban areas comes from motor vehicles.

NO_2 is the primary NOx of concern for health. In elevated concentrations it can lead to respiratory problems, including asthma and lung infections. This is the reason the approved methods set criteria for NO_2 rather than NOx.

No exceedances of the annual average NO_2 standards have been recorded in Sydney in recent years. Occasional exceedances of the 1-hour NO_2 standard have been recorded.

2.1.3 Sulphur dioxide

Due to improvements in motor vehicle fuel technology, sulphur dioxide (SO_2) is no longer generated at levels to cause concern in road traffic, however marine diesel can contain higher sulphur concentrations. Therefore, this pollutant was included due to the Project's proximity to emissions from maritime transport travelling to Port Botany as well as the operation of the ferries themselves.

In January 2020, the International Maritime Organisation tightened regulations for sulphur content of fuel (International Maritime Organisation, 2020a) used in maritime transport. The change in SO_2 emission limits will result in a 77 per cent reduction (International Maritime Organisation, 2020b) in SO_2 emissions from ships and vessels including those that travel to and from Port Botany.

SO_2 affects health over a short-term exposure period and can irritate the nose, throat and airways.

No exceedances of the SO_2 standards have been recorded in Sydney in recent years.

2.1.4 Total suspended particulates/dust

Total suspended particulates (TSP)/dust are generated by demolition/construction works across Sydney and some industrial processes.

Elevated concentrations of TSP/dust generally contribute to amenity/nuisance concerns rather than the health impacts described above for other pollutants. The project is likely to generate TSP/dust during the construction phase. This would need to be managed to prevent amenity or nuisance complaints from the surrounding area.

2.1.5 Odour

Odour is the result of a mixture of volatile chemical compounds or a single compound trigging a reaction in the nose. Odour is generated by several sources. Any odour, whether considered to be pleasant or unpleasant, can result in a loss of amenity for people if it is unwanted.

2.2 Legislation

The National Environment Protection (Ambient Air Quality) Measure 2016 (National Environment Protection Council [NEPM], 2016) sets standards to provide adequate protection for human health and wellbeing.

In NSW, the Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (NSW Environment Protection Authority, 2016) (hereafter referred to as the 'Approved Methods') provide criteria for assessing air pollution impacts. These criteria are generally adopted from the NEPM. The impact assessment criteria in the Approved Methods have been used to determine the impact of the project on local air quality. Table 2-1 lists the impact assessment criteria for those pollutants relevant to this project.

The NEPM includes more stringent limits for $PM_{2.5}$ that will apply from 2025. As the project would continue to operate beyond 2025, these more stringent limits were considered as part of this assessment.

Some pollutants have criteria expressed as annual average concentrations due to the chronic way in which they potentially affect human health. Others have criteria expressed as 24-hour, one-hour or 15-minute averaging periods due to the acute way in which they affect human health or the natural environment. Those pollutants assessed here have standards expressed in terms of both long-term and short-term concentrations.

Table 2-1: Approved methods impact assessment criteria

Pollutant	Standard (µg/m^3)	Averaging period
PM_{10}	50	24-hour
	25	Annual
$PM_{2.5}$	25	24-hour
	20	24-hour (2025 onwards)
	8	Annual
	7	Annual (2025 onwards)
NO_2	246	1-hour
	62	Annual
SO_2	712	10-minute
	570	1-hour
	228	24-hour
	60	Annual
Total suspended particulates (TSP)	90	Annual
Deposited dust	2 g/m^2/month a)	Annual
	4 g/m^2/month b)	

Note: µg/m^3 – micrograms per cubic metre.

a) Maximum increase in deposited dust

b) Maximum total deposited dust

The Approved Methods also outline impact assessment criteria for odour, as shown in Table 2-2. The impact assessment criteria are based on the population that might be impacted rather than the scale of odour generation. If the impacted area is densely populated a more stringent criterion would be applied than if the development was located in an area that was sparsely populated.

Table 2-2: Approved methods odour impact assessment criteria

Population of affected community	Impact assessment criterion for complex mixtures of odorous air pollutants (Odour Units)
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

3 Methodology

This section outlines the method used for the air quality assessment.

3.1 Study area

The project's main risks are dust impacts during construction, which without mitigation, may affect receptors offsite. The assessment therefore considered a recommended study area included in the guidance used for the assessment of dust from construction; namely 350m from the construction boundary. Figure 3-1 shows the assessment study area.

Figure 3-1: Air quality study area

3.2 Existing environmental conditions and values

Existing or baseline ambient air quality refers to the concentration of relevant pollutants that are already present in the environment due to natural sources and/or human activity. This includes industrial processes, commercial and domestic activities, traffic and natural sources such as bushfires.

The receivers identified as being most sensitive to changes in air quality pollutants are defined as locations where people are likely to work, live or spend prolonged periods. This includes dwellings, schools, hospitals, offices and/or public recreational areas. Sensitive receivers near the project have been identified through reviewing aerial photography and land use mapping/zoning.

Local meteorology conditions have been determined using Australian Bureau of Meteorology (BoM) data accessed in 2020. The BoM station at Sydney (Kingsford Smith) Airport was used to determine typical meteorological conditions for the area. This is about seven kilometres northwest of the project.

While the main emissions source near the project is likely traffic, light industrial land uses and the Sydney (Kingsford Smith) Airport, the National Pollution Inventory (NPI) was also reviewed. The NPI tool gives information about known air emissions sources from over 4,000 facilities across Australia. It contains two types of data; emissions from facilities, and diffuse emissions.

Facilities must report any emission that exceeds a reporting threshold set by the NPI. Therefore, facilities reporting to the NPI are not insignificant in terms of their contribution to local air quality. Facilities within two kilometres of the construction boundary have been identified, as these sources have the potential to contribute to local air quality in the vicinity of the project.

A desktop review of the NSW Government website (NSW Government, 2020),which hosts publicly available air quality data, was carried out to determine baseline ambient air quality conditions in the local area and to understand the potential risk of exceeding the assessment criteria shown in Table 2-1. The closest Government operated monitoring station is at Randwick, located about 6.3km north of the project. Figure 3-2 shows the location of the Randwick monitoring station in the context of the project. This station was commissioned in 1995 and monitors all key pollutants discussed in Section 2.1.

Data for the most recent full year of data at the time of assessment (2019) were obtained to determine existing air quality conditions.

Figure 3-2: Air quality monitoring

3.3 Construction

Given the scale and duration of construction, the main potential impact would be amenity-related due to the risk of dust generation, equipment and machinery emissions and odour generated by fuel combustion and the disturbance of marine sediments.

The method for assessing dust-generation, emission and odour impacts is outlined in Section 3.3.1, Section 3.3.2 and Section 3.3.3 respectively.

3.3.1 Dust generation

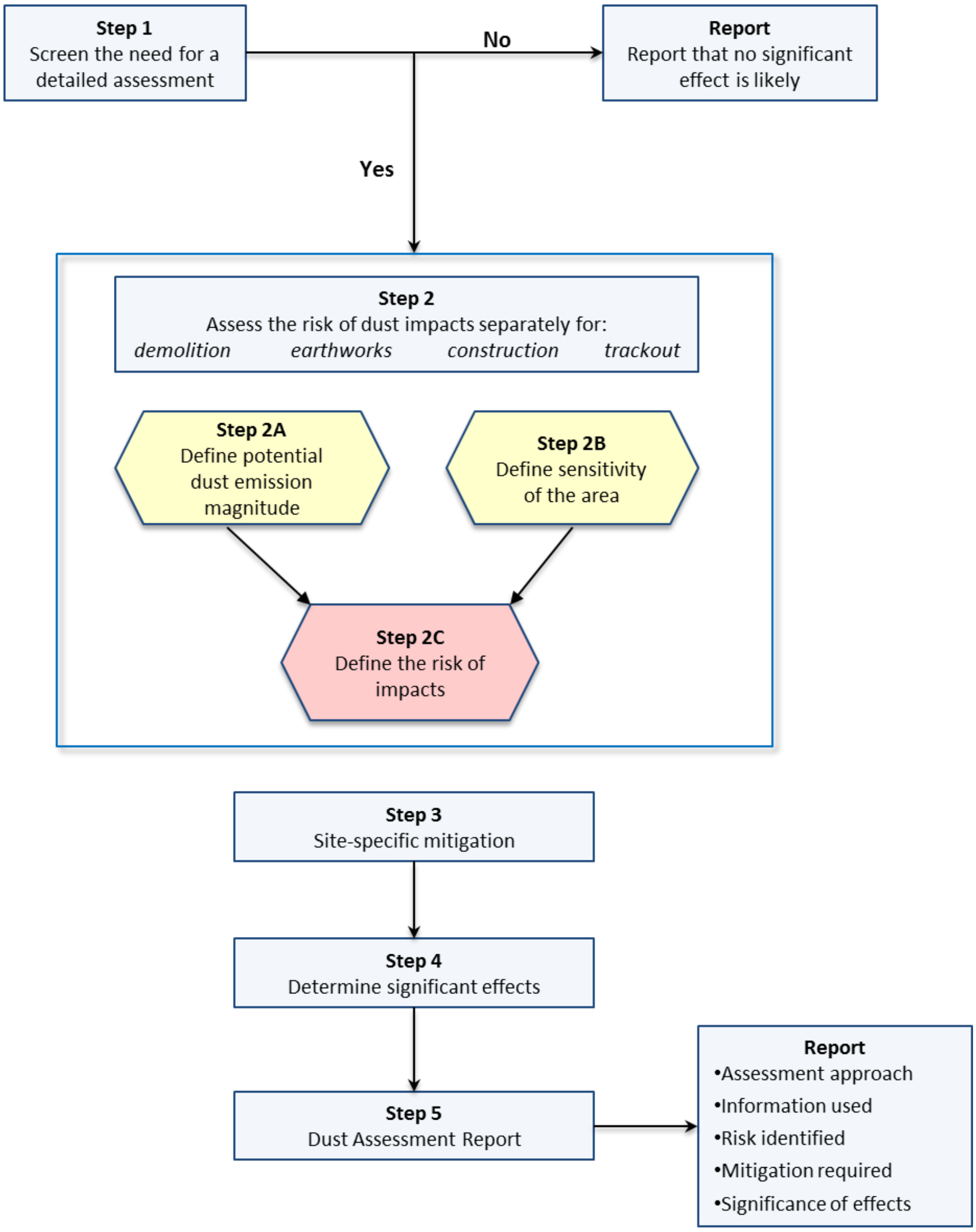
The Approved Methods (refer to Section 2.2) were developed to assess emissions from stationary sources. They are therefore not appropriate to assess uncontrolled dust emission impacts.

A common alternative assessment method is the latest Institute of Air Quality Management (IAQM) guidance (Institute of Air Quality Management, 2014) published in the UK. This comprises a five-step risk assessment approach as summarised in Figure 3-3. Further description of each step is provided in the following sections.

Step 1: need for assessment

The first step is the initial screening for the need for a detailed assessment.

According to the IAQM guidance, an assessment is required where there are sensitive receivers within 350m of the construction boundary, within 50m of the haulage and access route(s), and/or 500m from site entrances.



Source: Institute of Air Quality Management

Figure 3-3: Assessment of impacts arising from the construction phase of the project

Step 2: assess risk of dust impacts

This step is split into three:

- 2A. Define the potential dust emission magnitude
- 2B. Define the sensitivity of the area
- 2C. Define the risk of impacts.

Step 2A: magnitude assessment

Each of the dust-generating sources, split between demolition, earthworks, construction and trackout[1] was given an 'emissions magnitude' depending on the scale and nature of the works based on the criteria in Table 3-1.

Table 3-1: Categorisation of dust emission magnitude

Dust emission magnitude		
Small	**Medium**	**Large**
Demolition		
• Total building volume <20,000m^3 • Construction material with low potential for dust release, (eg metal cladding or timber) • Demolition activities <10m above ground • Demolition during wetter months.	• Total building volume 20,000-50,000m^3 • Potentially dusty construction material • Demolition activities 10-20m above ground level.	• Total building volume >50,000m^3 • Potentially dusty construction material (eg concrete) • On-site crushing and screening • Demolition activities >20m above ground level.
Earthworks		
• Total site area <2,500m^2 • Soil type with large grain size (eg sand) • <5 heavy earth moving vehicles active at any one time • Formation of bunds <4m in height • Total material moved <10,000tonnes • Earthworks during wetter months.	• Total site area 2,500m^2-10,000m^2 • Moderately dusty soil type (eg silt) • 5–10 heavy earth moving vehicles active at any one time • Formation of bunds 4 - 8m in height • Total material moved 20,000-100,000 tonnes.	• Total site area >10,000m^2 • Potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • Formation of bunds >8m in height • Total material moved >100,000 tonnes.
Construction		
• Total building volume <25,000m^3 • Construction material with low potential for dust release (eg metal cladding or timber).	• Total building volume 25,000 - 100,000m^3 • Potentially dusty construction material (eg concrete) • Onsite concrete batching.	• Total building volume >100,000m^3 • Onsite concrete batching • Sandblasting.

[1] The transport of dust and dirt from a demolition/construction site onto the public road network where it may be deposited and then re-suspended into the air by vehicles using the network.

Dust emission magnitude		
Small	**Medium**	**Large**
Trackout		
• <10 HDV (>3.5t) outward movements in any one day • Surface material with low potential for dust release • Unpaved road length <50m.	• 10–50 HDV (>3.5t) outward movements in any one day • Moderately dusty surface material (eg high clay content) • Unpaved road length 50–100m.	• >50 HDV (>3.5t) outward movements in any one day • Potentially dusty surface material (eg high clay content) • Unpaved road length >100m.

Step 2B: site sensitivity

This step defines the area's sensitivity to dust impacts. This is defined as 'low', 'medium' or 'high' depending on:

- The specific sensitivities of receivers in the area
- Proximity and number of those receptors
- Local existing PM_{10} concentrations.

The sensitivity of an area was determined based on the guidance and professional judgement and split between amenity impacts associated with nuisance from dust deposition as well as health impacts from elevated concentrations of PM_{10}. Table 3-2 lists the general principles used to assess sensitivity.

Table 3-2: Examples of factors defining the sensitivity of receivers

Sensitivity of receiver	Examples	
	Sensitivity of people to dust deposition effects	**Sensitivities of people to the health effects of PM_{10}**
• **High**	Users can reasonably expect enjoyment of a high level of amenity. The appearance, aesthetics or values of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative examples include dwellings, locations with sensitive equipment, medium and long-term car parks and car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality standard for PM_{10}. Indicative examples include residential properties. Hospitals and schools and residential care homes should also be considered as having equal sensitivity to residential areas.
• **Medium**	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to	Locations where people exposed are workers, and exposure is over a period relevant to the air quality standard for PM_{10}.

Sensitivity of receiver	Examples	
	Sensitivity of people to dust deposition effects	Sensitivities of people to the health effects of PM_{10}
	enjoy the same levels of amenity as in their home. The appearance, aesthetics or value of their property could be diminished by soiling. Indicative examples include parks and places of work.	Indicative examples may include offices and shops but would generally not include workers occupationally exposed to PM_{10} as potential is covered by Health and Safety at Work legislation.
• **Low**	Enjoyment of amenity would not reasonably be expected. There is property that would not reasonably be expected to be diminished in appearance, aesthetics or values by soiling. There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples include playing fields, farmland (unless commercially sensitive horticulture), footpaths, short term car parks and roads.	Locations where human exposure is transient. Indicative examples public footpaths, playing fields, parks and shopping streets.

Once the specific receivers next to the construction boundary were identified, the sensitivity was determined based on the area's susceptibility to dust deposition effects on people, property and vegetation and on the potential for human health impacts. Table 3-3 and Table 3-4 describe these two factors.

Table 3-3: Sensitivity of the area to dust deposition effects on people, property and vegetation

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
• High	>100	• High	• High	• Medium	• Low
	10-100	• High	• Medium	• Low	• Low
	1-10	• Medium	• Low	• Low	• Low
• Medium	>1	• Medium	• Low	• Low	• Low
• Low	>1	• Low	• Low	• Low	• Low

Table 3-4: Sensitivity of the area to human health impacts

Receptor sensitivity	Annual mean PM_{10} concentration[2]	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<300
• High	>20 µg/m³	>100	• High	• High	• High	• Medium	• Low
		10-100	• High	• High	• Medium	• Low	• Low
		1-10	• High	• Medium	• Low	• Low	• Low
	18-20 µg/m³	>100	• High	• High	• Medium	• Low	• Low
		10-100	• High	• Medium	• Low	• Low	• Low
		1-10	• High	• Medium	• Low	• Low	• Low
	15-18 µg/m³	>100	• High	• Medium	• Low	• Low	• Low
		10-100	• High	• Medium	• Low	• Low	• Low
		1-10	• Medium	• Low	• Low	• Low	• Low
	<15 µg/m³	>100	• Medium	• Low	• Low	• Low	• Low
		10-100	• Low	• Low	• Low	• Low	• Low
		1-10	• Low	• Low	• Low	• Low	• Low
• Medium	>20 µg/m³	>10	• High	• Medium	• Low	• Low	• Low
		1-10	• Medium	• Low	• Low	• Low	• Low
	18-20 µg/m³	>10	• Medium	• Low	• Low	• Low	• Low
		1-10	• Low	• Low	• Low	• Low	• Low

[2] The annual mean PM_{10} concentration thresholds included in the IAQM guidance have been revised to account for the difference between UK and Australian PM_{10} standards.

Receptor sensitivity	Annual mean PM_{10} concentration[2]	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<300
	15-18 $\mu g/m^3$	>10	• Low	• Low	• Low	• Low	• Low
		1-10	• Low	• Low	• Low	• Low	• Low
	<15 $\mu g/m^3$	>10	• Low	• Low	• Low	• Low	• Low
		1-10	• Low	• Low	• Low	• Low	• Low
• Low	-	>1	• Low	• Low	• Low	• Low	• Low

Step 2C: impact risk

The final stage combined Stage 2a and Stage 2b to define the risk of impacts as shown in Table 3-5.

Table 3-5: Risk of dust impacts

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
Demolition			
• High	• High risk	• Medium risk	• Medium risk
• Medium	• High risk	• Medium risk	• Low risk
• Low	• Medium risk	• Low risk	• Negligible
Earthworks			
• High	• High risk	• Medium risk	• Low risk
• Medium	• Medium risk	• Medium risk	• Low risk
• Low	• Low risk	• Low risk	• Negligible
Construction			
• High	• High risk	• Medium risk	• Low risk
• Medium	• Medium risk	• Medium risk	• Low risk
• Low	• Low risk	• Low risk	• Negligible
Trackout			
• High	• High risk	• Medium risk	• Low risk
• Medium	• Medium risk	• Low risk	• Negligible
• Low	• Low risk	• Low risk	• Negligible

Step 3: determine mitigation

Once each of the activities was assigned a risk rating, appropriate mitigation and management measures were identified. Where the risk was assessed negligible, no management measures beyond standard best practice were considered necessary.

Step 4: determine any significant residual effects

Once the risk was determined and the appropriate management measures identified, the final step was to determine whether there were any residual impacts. The guidance notes that with the implementation of standard management measures, the residual impact would be not significant.

Step 5: prepare a dust assessment report

The last step involved preparing a dust assessment (refer to Section 5.1).

3.3.2 Odour

The project may generate odour during construction due to the combustion of fuel from equipment and machinery and the disturbance of marine sediments during piling. This has the potential to generate amenity or nuisance concerns at nearby receivers. A risk-based qualitative assessment was carried out to determine the risk of exposure to odour.

The IAQM in the UK produced guidance in 2018 (Institute of Air Quality Management, 2018) to provide advice for "assessing odour impacts for planning purposes". The guidance recommends a source-pathway-receptor (SPR) model approach for such a situation. The risk of an adverse odour impact is determined by examining the source characteristics, how effectively the odours can travel from the source to a receptor (i.e. the pathway) and examining the sensitivity of the receptor. Example risk factors presented in the guidance are shown in Table 3-6. A qualitative appraisal of the potential impacts from the source is then determined by professional judgement.

This method was followed as described in Section 5.2.

Table 3-6: Guidance for the SPR Assessment Methodology

Source odour potential	Pathway effectiveness	Receptor
Factors affecting the source odour potential include: • The magnitude of the odour release • How inherently odorous the compounds are • The unpleasantness of the odour.	Factors affecting the odour flux to the receptor are: • Distance from source to receptor • The frequency of winds from source to receptor • The effectiveness of any mitigation in reducing flux to the receptor • The effectiveness of dispersion/dilution in reducing the odour flux to the receptor • Topography and terrain.	Professional judgement based on the expectation of the users at the receptor location.

3.3.3 Equipment, machinery and traffic

The impact of exhaust emissions from construction vehicles and onsite machinery and equipment would depend on the types and numbers required during construction. It would also depend on the program and how long the equipment would be in use or the distances travelled onsite and offsite to support the project.

A qualitative risk-based assessment was carried out, using the anticipated equipment and machinery and construction vehicle movements (refer to Chapter 5 of the EIS (Project description)). This allowed potential impacts to be identified and mitigation and management measures to be recommended.

3.4 Operation

Potential operational air quality impacts are outlined in Section 3.4.1 and Section 3.4.2 below. A qualitative risk-based assessment was carried out for each aspect based on the likely scale of local air quality impacts from these sources,

3.4.1 Ferries

The operational ferries would generate emissions to air through fuel combustion. The exact model of ferry to service the proposed route would be confirmed at a later stage however it is likely to be similar to those within the existing fleet (eg the Manly fast ferry). The qualitative assessment considered the frequency of service, fuel type, and proportion of time spent idling at the wharves. This determined if the ferry emissions would significantly contribute to pollution in the local airshed.

3.4.2 Traffic

Should the project result in an increase in road traffic, this has the potential to impact local air quality. A review of the Traffic and Transport Assessment Report has been undertaken to determine likely changes in road traffic, and therefore any subsequent impact on local air quality, as a result of the project..

4 Existing environment

This section outlines the ambient air quality and location of sensitive receivers in the existing environment.

4.1 Sensitive Receivers

The land uses surrounding the project are mainly residential and recreational (eg beachfront, museum, visitors to the National Parks etc.) at both La Perouse and Kurnell. These are sensitive areas based on the protection of human health.

At La Perouse, residential dwellings are within 160m of the proposed wharf. There are also commercial and recreational uses (eg The Boatshed and the La Perouse Museum) within and next to the construction boundary.

At Kurnell, residential dwellings are about 200 metres from the proposed wharf, with dwellings next to the construction boundary. There are also recreational and commercial uses near the project (eg Captain Cook's landing place and the Kurnell Visitor Centre). Construction at Kurnell would occur near the residential and commercial properties on Prince Charles Parade and Captain Cook Drive.

The sensitive receiver locations near the project and construction boundary are shown in Figure 4-1 and Figure 4-2.

Figure 4-1: Sensitive receiver locations at La Perouse

Figure 4-2: Sensitive receiver locations at Kurnell

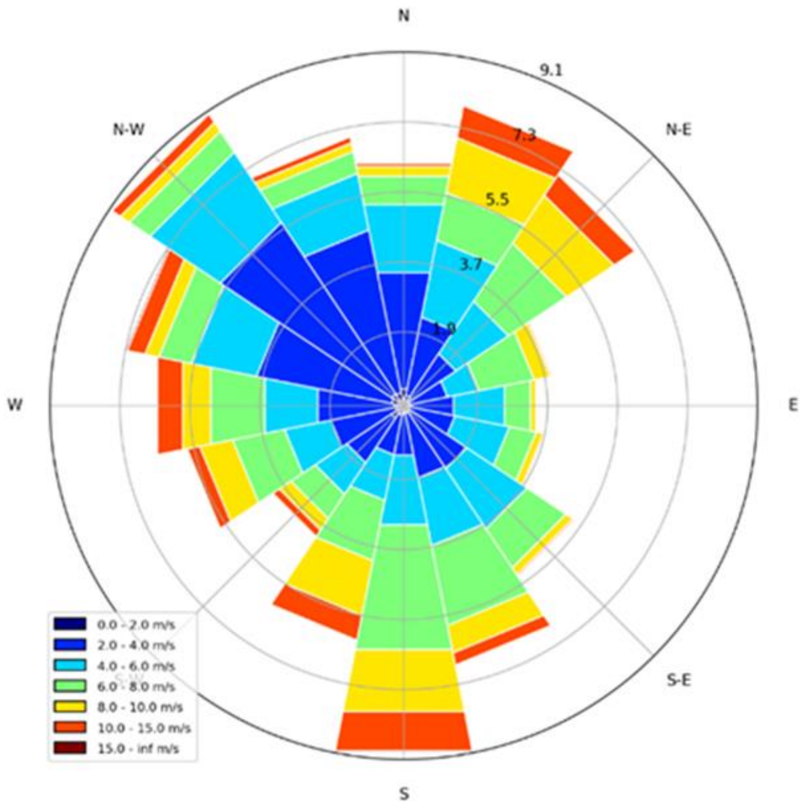
4.2 Local meteorological conditions

The dispersion of air pollutants, dust and odour is affected by meteorological (weather) conditions.

Wind speed and direction is the biggest factor affecting air pollutant, dust and odour dispersion. The wind speed influences how far a pollutant travels downwind and the rate of dilution. The wind direction, including the amount of variation, determines the general path pollutants, dust and odour will travel. The amount of rainfall an area typically receives also influences dust generation, with limited rainfall creating drier soils, allowing wind to pick up soil particles much more easily.

The Australian Government Bureau of Meteorology (BoM) has monitoring stations situated across Australia. The station located nearest to the project is at Sydney (Kingsford Smith) Airport. The wind rose for typical historic conditions at the Airport is presented in Figure 4-3.

The predominant wind direction is north-westerly/westerly for light-to-moderate wind speeds (< 6 m/s). A low percentage (around one per cent) of calms (wind speeds < 0.5 m/s) have been recorded. This indicates that pollutants can be dispersed effectively during operation however dust deposition due to wind erosion would need to be managed during construction.



Source: Arup – data from Sydney Airport BoM station

Figure 4-3: Wind rose from Sydney Airport station

Table 4-1 shows long-term climate averages recorded at Sydney (Kingsford Smith) Airport. This shows that the average maximum temperature (26.7°C) at the site is recorded in January. Average minimum temperatures (7.3°C) are recorded in July. Rainfall is also generally highest during June.

Table 4-1: Climate averages for Sydney Airport

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
9am Mean Maximum Temperatures (°C) and Relative Humidity (%)													
Temperature	22.4	22.3	21.1	18.2	14.6	11.9	10.8	12.5	15.7	18.4	19.9	21.6	17.4
Humidity	70	73	73	71	73	74	71	65	62	61	64	66	69
3pm Mean Maximum Temperatures (°C) and Relative Humidity (%)													
Temperature	24.8	24.8	23.9	21.7	19.0	16.6	16.1	17.2	19.0	20.7	22.1	23.9	20.8
Humidity	60	63	61	59	58	57	52	49	51	54	56	58	57
Daily Maximum Temperature (°C)													
Mean	26.7	26.5	25.4	23.0	20.2	17.6	17.2	18.4	20.7	22.7	24.2	25.9	22.4
Daily Minimum Temperature (°C)													
Mean	19.0	19.1	17.6	14.3	11.0	8.7	7.3	8.2	10.6	13.3	15.5	17.6	13.5
Rainfall (mm)													
Mean	94.5	111.1	117.9	106.8	95.1	125.3	68.6	75.7	60.0	70.1	79.9	72.8	1077.4
Rain days (Number)													
Mean	8.1	8.6	9.4	8.4	8.3	8.9	6.6	6.7	6.8	7.8	8.3	7.7	95.6

Station number: 066037; Commenced 1929; Status: Open; Elevation: 6m AHD
Latitude: 33.95 °S; Longitude: 151.17 °E

4.3 Background air quality

Background air quality was determined following a review of nearby emission and local air quality monitoring information.

4.3.1 Surrounding emission sources

The National Pollutant Inventory (NPI) website (accessed August 2020) demonstrates that there are 11 industrial facilities or significant sources of emissions to air within two kilometres of the project (see Table 4-2). These are primarily made up of organic chemical manufacturers or liquid chemical storage facilities located within Port Botany industrial estate and the Kurnell Peninsula. Emissions from these locations contribute to local air quality at the site.

Table 4-2: NPI listed facilities

Facility	Process	Emissions	Distance and direction from project
La Perouse			
Qenos Pty Ltd	Basic organic chemical manufacturing. Liquefied petroleum gas liquefication and storage	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.6km north west at La Perouse
Origin Energy LPG Limited	Petroleum product wholesaling	Emissions to air	1.7km north west at La Perouse
Elgas Limited	Gas supply	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.8km north west at La Perouse
Terminals Pty Ltd	Petroleum product wholesaling. Bulk liquid storage	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.8km north west at La Perouse
Vopak Terminals Sydney Pty Ltd	Bulk storage and distribution of petroleum products (including jet fuel) and road tanker loading	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.9km north west at La Perouse
Knauf Plasterboard Pty Limited	Plaster product manufacturing	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.9km north at La Perouse
DP World Sydney Ltd	Port and water transport terminal operations	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	2km north west at La Perouse

Facility	Process	Emissions	Distance and direction from project
Veolia Environmental Services (Australia) Pty Ltd	Waste treatment and disposal services. Hazardous waste treatment or disposal service.	Emissions to air	2km north at La Perouse
Kurnell			
Caltex Kurnell Terminal	Petroleum Refining	Emissions to air and water	1.3km south west at Kurnell
H.C Extractions Pty Ltd	Organic chemical manufacturing	Emissions to air, including NOx, PM_{10}, $PM_{2.5}$, SO_2	1.6km south west at Kurnell
Veolia Water Australia	Desalination	Emissions to water only	2km south west at Kurnell

4.3.2 Air quality monitoring

Air quality in Sydney is generally good with only occasional exceedances of the standards, which primarily relate to PM_{10} and $PM_{2.5}$. Table 4-3 provides data from the Randwick monitoring station for 2019 for comparison with the standards. A review indicated:

- An exceedance of the annual average $PM_{2.5}$ standard, which is common for locations across Sydney due to high background concentrations under particular meteorological conditions.
- No exceedances of the annual average NO_2, PM_{10} or SO_2 standards were measured at Randwick monitoring stations during 2019.
- Exceedances of the 24-hour standard for PM_{10} and $PM_{2.5}$ were recorded at Randwick, these were predominantly related to elevated particulate matter concentrations across Sydney at the end of October through to the end of the year due to bushfires in northern NSW affecting atmospheric conditions within the Sydney airshed.

Table 4-3: Existing air quality at Randwick monitoring station, 2019

Pollutant	Averaging period	Standard µg/m^3	Randwick µg/m^3	% of the standard
NO_2	1-hour average	246	95.9	39%
	Annual average	62	18.3	30%
Sulphur dioxide (SO_2)	1-hour average	570	75.9	13%
	24-hour average	228	13.1	6%

Pollutant	Averaging period	Standard µg/m³	Randwick µg/m³	% of the standard
	Annual average	60	2.6	4%
PM_{10}	24-hour average	**50**	**127.7**	**255%**
	Annual average	25	24.1	96%
$PM_{2.5}$	24-hour average	**25**	**95.2**	**381%**
	Annual average	**8**	**10.8**	**135%**

Note: Exceedances of the standards are shown in **bold**

In summary, air quality meets the relevant air quality standards with the exception of PM_{10} and $PM_{2.5}$, which are commonly exceeded across Sydney and other urban centres across Australia. This is due to both natural and anthropogenic sources including bushfires, dust storms, shipping and transportation.

It is likely that pollutant concentrations at the project site would be similar or lower than those monitored at Randwick, as the surrounding area is more suburban.

4.3.3 Odour

The existing odour environment at La Perouse is influenced, under westerly wind conditions, by Port Botany and associated industrial activities. More locally, the odour environment is dominated by the marine environment as well as commercial kitchens in local restaurants/cafes.

At Kurnell, the existing odour environment is influenced by the Kurnell desalination plant and light industrial land uses. Local to the project, the odour environment is also dominated by the marine environment as well as commercial kitchens in local restaurants/cafes.

5 Assessment of potential construction impacts

Potential impacts are uncontrolled fugitive dust emissions, odour and exhaust (fuel combustion) emissions from construction plant, machinery and vehicles.

Fugitive dust emissions are likely to contribute to local PM_{10} and $PM_{2.5}$ concentrations, which have been shown to occasionally exceed the standards (refer to Section 4.3.2). Section 5.1 therefore describes the assessment steps discussed in Section 3.3.1.

5.1 Dust Generation

This section presents the impact assessment for dust generation.

5.1.1 Step 1: need for assessment

As there are sensitive receivers within 350m of the construction boundary (refer to Section 4.1) and 50m of haulage routes extending 500m from site entrances this confirms the need for a detailed assessment.

5.1.2 Step 2a: magnitude assessment

As shown in Table 5.5 of the EIS [construction works], the construction phase has been split into three stages:

- Stage 1: Early works and site establishment
- Stage 2: Main construction
- Stage 3: Site demobilisation.

Each of these stages would generate dust in some way, however demolition, piling and earthworks required in Stages 1 and 2 would be the largest sources of fugitive dust emissions.

As per the IAQM guidance, dust-generating sources have been split into demolition, earthworks and construction sources and trackout. Dust-generating activities include demolition, material handling and transfer, piling and wind erosion from stockpiling or exposed surfaces. The amount of dust generated in any given location at any given time would depend on the activities taking place at the time.

Following the method outlined in Section 3.3.1 and criteria presented in Table 3-1, each dust-generating source has been assigned an ‘emission magnitude’ as shown in Table 5-1. The assessment has been split between La Perouse and Kurnell so that a site-specific assessment can be undertaken to recommend appropriate safeguard measures at each location.

Table 5-1: Dust emission magnitude for construction activities

Dust-generating source	Dust emission magnitude	Reasoning
La Perouse		
Demolition	Small	• Break-up of hard standing would be required for the slight change to car parking spaces and for a utilities trench.
Earthworks	Small	• Earthworks would only be required for a small area at La Perouse point • Approximately 4,390m^3 of material would need to be moved across the construction boundary.
Construction	Medium	• Piling would be required • Construction of the wharf tie-in would use dust generating materials • Construction of the wharf itself would use materials less likely to generate dust.
Trackout	Small	• On average, around 12 vehicles would arrive and leave site every day • The site would generally be accessed by paved road. However, a temporary access road would be constructed to provide access from Anzac Parade to the wharf tie-in area. This would be constructed of crushed concrete on top of geotextile material.
Kurnell		
Demolition	Small	• The project requires demolition of the existing Kurnell viewing platform • Total structure volume to be demolished would be less than 20,000m^3 • Break-up of hard standing would be required for the installation of a utilities trench.
Earthworks	Small	• Earthworks would only be required for the wharf tie-in and utilities • Approximately 2,723m^3 of material would need to be moved across the construction boundary.
Construction	Medium	• Piling would be required • A temporary causeway would be constructed to enable piling, this would be removed at the end of the construction phase • Construction of the wharf tie-in would use dust generating materials • Construction of the wharf itself would use materials less likely to generate dust.
Trackout	Medium	• On average, around 20 vehicles would arrive and leave site every day • The site would generally be accessed by paved road. However, a temporary access road would be constructed from Cape Solander Drive, and along

Dust-generating source	Dust emission magnitude	Reasoning
		Monument Track. This would be constructed of crushed concrete on top of geotextile material.

5.1.3 Step 2b: site sensitivity

As per the classification given in Table 3-2, commercial premises and recreational areas are determined to be of *medium* sensitivity while residential receivers are of *high* sensitivity.

At La Perouse, with the exception of minor disturbance works associated with utilities, the closest commercial properties (eg the Boatshed) are about 60m from the main dust-generating activities. Residential dwellings are about 160m from the proposed wharf where the main works likely to generate dust would occur. There are approximately 10 residences within 50m of the haulage routes used to access the La Perouse site. Therefore, the overall sensitivity of the area to dust deposition effects has been assigned as *low*, as per Table 3-3.

The annual average PM_{10} concentration recorded at the Randwick monitoring station in 2019 is 24.1µg/m^3 (96% of the annual average PM_{10} standard). Despite elevated PM_{10} concentrations, the overall sensitivity of the area to human health impacts has been assigned as *medium* due to the proximity and number of commercial and residential receivers to dust-generating activities.

At Kurnell, the overall sensitivity of the area to dust deposition effects has been assigned as *high*, as there are a number of commercial and residential properties within 20m of early construction works for the installation of utilities and the haulage routes used to access the Kurnell site.

The overall sensitivity of the area to human health impacts at Kurnell has also been assigned as *high*, due to the presence of a number of residential and commercial properties within 20m of construction works as well as haulage routes.

The sensitivity of the area at each site is summarised in Table 5-2.

Table 5-2: Summary of sensitivity of the area

Location	Sensitivity of the area to dust deposition effects	Sensitivity of the area to human health impacts
La Perouse	Low	Medium
Kurnell	High	High

5.1.4 Step 2c: impact risk

Accounting for the predicted scale of dust emissions and the area's sensitivity, the La Perouse site has been classified as *low* risk for demolition and earthworks, a *medium* risk due to construction sources, and a *negligible* risk for trackout. The Kurnell site has been classified as *medium* for demolition, construction and trackout sources, and a *low* risk for earthworks. Section 7 describes management measures recommended to minimise impacts.

Table 5-3: Summary dust risk table before mitigation

Dust-generating source	Dust emission magnitude	Sensitivity of the area		Dust risk before mitigation for dust deposition and human health impacts
		Dust Deposition	Human health impacts	
La Perouse				
Demolition	Small	Low	Medium	Low
Earthworks	Small			Low
Construction	Medium			Medium
Trackout	Small			Negligible
Kurnell				
Demolition	Small	High	High	Medium
Earthworks	Small			Low
Construction	Medium			Medium
Trackout	Medium			Medium

5.2 Odour

During construction there will be some disturbance of the ocean floor and marine sediments displaced during piling which may become odorous on contact with the air. In addition, odour would be generated by fuel combustion in construction equipment, machinery and barges. This has the potential to generate odour impacts near the activity. The amount of odour generated would depend on several factors including the content and composition of the dredged materials, the dredging rate and loading times, and the prevailing wind direction and strength.

The source-pathway-receptor assessment is detailed in Table 5-4. The risk of odour exposure during construction is predicted to be *negligible*.

Table 5-4: Source-Receptor-Pathway Assessment Outcome

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
La Perouse				
Disturbance of marine sediments and fuel combustion	Organic matter and hydrocarbons within marine sediments can become odorous on contact with the air. Odour would be generated from material being disturbed by piling and by fuel combustion to power construction equipment, machinery and barges. While odour from disturbance of marine sediments could be classed as offensive, the volume of material generated by piling would be *small*. Odour associated with construction equipment, machinery and barges would be no different to other fuel combustion sources.	Receivers are located to the east of any odour-generating activities. The prevailing wind direction in the area is north-westerly/westerly (see Section 4.2). This means that receivers will generally be downwind of the works.	The commercial receivers of The Boatshed and La Perouse Museum are about 60m from activities that are likely to be odorous. The closest residential properties are about 160m from odour generating activities. The land use of the area immediately surrounding the works would be classed as *medium* due to commercial receivers and *high* due to the residential receivers as well as the recreational areas being used for tourist/cultural purposes.	Given the small source odour potential and distance and sensitivity of receivers from the works/equipment, the risk of odour exposure is predicted to be *negligible*.
Kurnell				
Disturbance of marine sediments and fuel combustion	Organic matter and hydrocarbons within marine sediments can become odorous on contact with the air. Odour would be generated from material being disturbed by piling and by fuel combustion to power construction equipment, machinery and barges. While odour from disturbance of marine sediments could be classed as offensive, the	Receivers are located to the south of any odour-generating activities. The prevailing wind direction in the area is north-westerly/westerly (see Section 4.2). This means that receivers would not be downwind of the works under typical meteorological conditions.	The closest commercial receivers are about 200m from odour generating activities, and about 300m form residential receivers. The land use of the area immediately surrounding the works would be classed as *medium* due to this being a tourist site, including Captain Cook's landing place and the Kurnell Visitor	Given the small source odour potential and distance and sensitivity of receivers from the works/equipment, the risk of odour exposure is predicted to be *negligible*.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
	volume of material generated by piling would be *small*. Odour associated with construction equipment, machinery and barges would be no different to other fuel combustion sources.		Centre, and *high* due to the nearby residential receivers.	

5.3 Equipment, machinery and traffic

Table 5-8 of the EIS [plant and equipment] lists the expected machinery and equipment required to build the project. The machinery and equipment listed are typical for construction of new infrastructure in close proximity to the marine environment. It is common to use maritime transport to minimise landside disruption and impacts.

Exhaust emissions from onsite machinery and equipment as well as construction vehicles can be effectively avoided and minimised by implementing the standard mitigation and management measures described in Section 7. Providing these are implemented and monitored, associated impacts are expected to be temporary and low risk. As existing conditions meet the relevant standards, for most pollutants, there is not predicted to be any significant ambient air quality impact associated with equipment, machinery and traffic during construction.

6 Assessment of potential operational impacts

Potential impacts are emissions to air from ferries and changes to local traffic movements.

6.1 Ferries

While the ferry model has not been confirmed at this stage, the selected model would be powered by conventional diesel-powered engines as per the rest of the Sydney Ferries fleet. To accommodate patronage forecast, on average, there are expected to be 36 ferry vessel movements per day during daylight hours. A turnaround time of 15 minutes is expected at berth from arriving to departing. This means that idling at each wharf would be restricted to 15 minutes at any one time. Ferries would only use the wharves during the day.

In addition to ferries, the proposed wharves cater for commercial and recreational vessels. They would not be used for shipping purposes. It is anticipated that on average two recreational vessels or four charter vessels would use the wharves per day.

Based on the above, emissions to air from the vessels have not been quantified as these are anticipated to be small compared to the other transport modes that currently travel within Botany Bay, including aircraft and large ships, and would not have a direct or measurable impact on local air quality.

Idling at the berth is when the ferries would generate the most emissions, as noted above this is expected to be restricted to fifteen minutes. In addition, due to the draft of the vessels, the berthing locations for all vessels are at the end of the wharves at both La Perouse and Kurnell. This means that vessel engines would be located over 300m from the nearest receivers. Pollution drops off rapidly from source and therefore emissions generated at berth are unlikely to impact the local air quality onshore at sensitive receivers.

6.2 Traffic

Changes to road traffic as a result of the project are discussed in Appendix K of the EIS (Landside Traffic and Transport Assessment Report). About 149,600 passengers are expected to use the ferry annually from 2036. These passengers are expected to arrive by a mix of private vehicle and public/active transport modes. Passengers travelling by private vehicle would create a slight increase in road traffic. However additional vehicle movements are predicted to be small and there would be no changes to the existing road layout. In comparison to existing vehicle emissions, this small increase in vehicles numbers due to the project would not be noticeable. In addition, some visitors who previously drove between La Perouse and Kurnell may choose to take the ferry service, therefore reducing vehicle emissions from private vehicle transport between the two sites. Air emissions from additional vehicles would not have a material impact on local air quality, and any impact is predicted to be negligible.

7 Environmental management measures

This section describes the measures to mitigate against, monitor and manage any adverse air quality impacts described in Section 5 and 6**.**

The dust emitting activities assessed above can be greatly reduced or eliminated by applying mitigation and management measures. The IAQM guidance notes that it is anticipated that with the implementation of effective management measures, the environmental effect would not be significant in most cases. Table 7-1 outlines the air quality mitigation and management measures recommended for the project. These measures should be included in the CEMP.

Operation of the project is not anticipated to significantly impact local air quality therefore no specific mitigation or management measures are proposed for the operational phase.

Table 7-1: Environmental management measures for air quality and odour impacts

Impacts	Mitigation	Responsibility	Timing
Risks to air quality during construction (general)	Air quality management measures will be incorporated into the CEMP and sub plans. As a minimum these measures will identify: • Dust mitigation and suppression measures such as spraying or covering exposed surfaces, providing vehicle clean down areas, covering of loads, street cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions • Methods to manage works during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces.	Contractor	Pre-construction Construction
Community notification	Through the implementation of the Community Liaison Implementation Plan, all sensitive receivers (eg schools, local councils) likely to be affected will be notified prior to commencement of any works associated with the activity that may have an adverse impact on local air quality. The notification will include details of the project; construction period and construction hours; any	Transport for NSW	Pre-construction / Construction

Impacts	Mitigation	Responsibility	Timing
	recommended measures that can be implemented (eg window closure, staying indoors, etc), contact information for project management staff; complaint and incident reporting; and how to obtain further information.		
Idling ferries	The operator will be responsible for ensuring the ferry vessels are maintained to operate efficiently and avoid excessive emissions.	Operator	Operation

Summary of residual impacts

This section provides a summary of the construction and operational risks both pre-mitigation and any residual impacts remaining after the implementation of the management measures describe in Section 7. Pre-mitigation and residual impacts are summarised in Table 8-1.

Table 8-1: Summary of pre-mitigation and residual impacts

Potential pre-mitigation adverse impact	Relevant management measures	Potential residual impact after implementation of management measures	Comment on how any residual impacts would be managed
Construction			
Medium risk of dust-generation during construction effecting local air quality	Best practice air quality management measures included as part of the CEMP.	Negligible	N/A
Negligible risk of odour exposure during construction	N/A	Negligible	N/A
Low risk of emissions from equipment, traffic and machinery effecting local air quality	Best practice emission control management measures included as part of the CEMP.	Negligible	N/A
Operation			
Negligible risk of ferry emissions effecting local air quality	N/A	Negligible	N/A
Negligible risk of traffic emissions effecting local air quality	N/A	Negligible	N/A

8 References

Australian Government Bureau of Meteorology, 2020. Summary statistics Sydney Airport AMP, http://www.bom.gov.au/climate/averages/tables/cw_066037.shtml, [accessed August 2020].

Australian Government NationalMap, 2020. National Pollutant Inventory.

Department of Planning, Industry and Environment, 2020. Randwick air quality monitoring station, https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/sydney/~/link.aspx?_id=231C979C3F434C589A343CD4349ADBBE&_z=z, [accessed August 2020].

International Maritime Organisation, 2020a. Annex VI of the International Convention for the Prevention of Pollution from Ships (known as the MARPOL Convention).

International Maritime Organisation, 2020b. Sulphur 2020 – cutting sulphur oxide emissions, https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx

Institute of Air Quality Management, 2014. Guidance on the assessment of the dust from demolition and construction, v1.1.

Institute of Air Quality Management, 2018. Guidance on the assessment of odour for planning.

National Environment Protection Council, 2016. National Environment Protection (Ambient Air Quality) Measure 2016.

NSW Environment Protection Authority, 2016. Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW.

NSW Government, 2020. Sydney air quality monitoring stations, https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/sydney/monitoring-stations [Accessed August 2020].