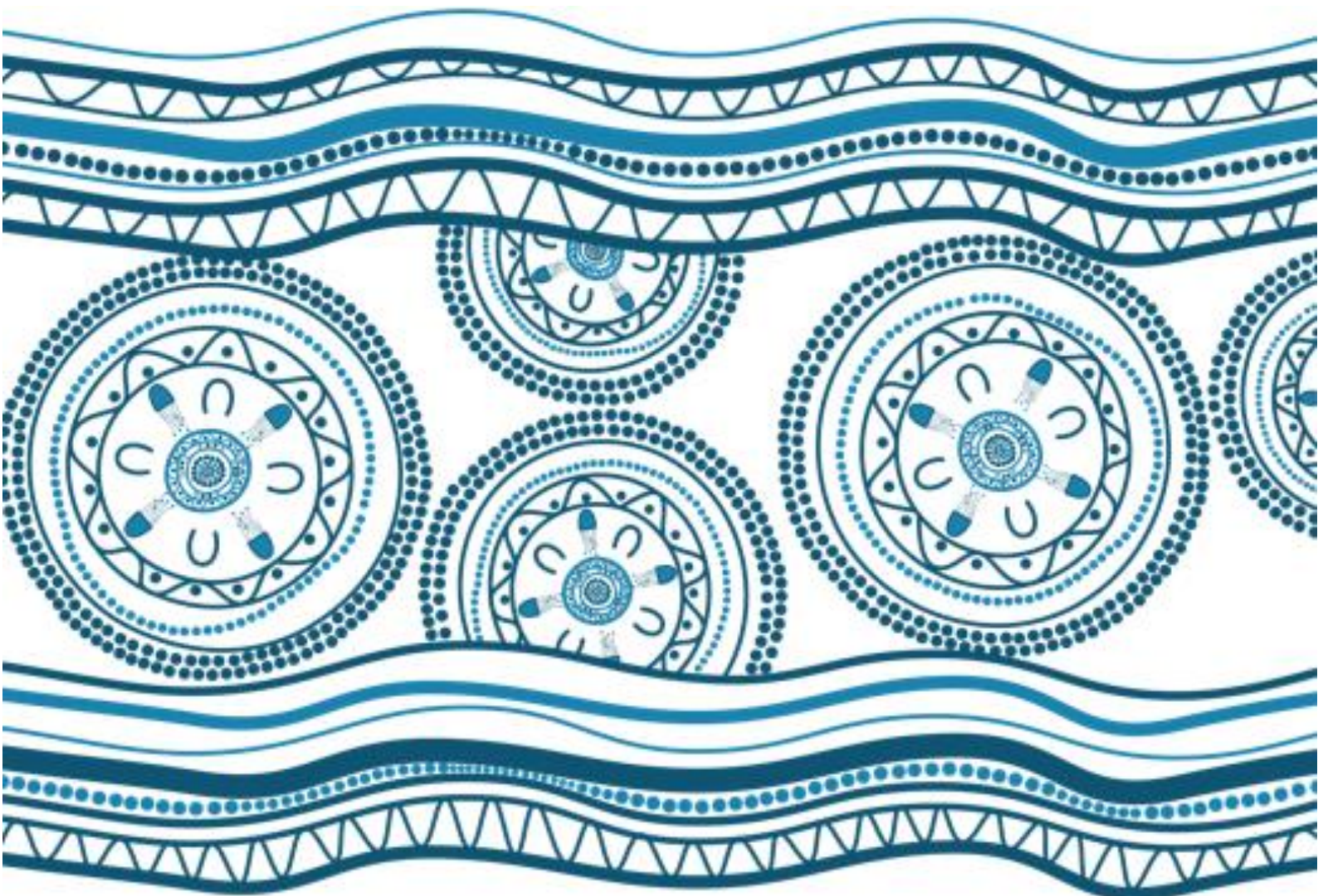


Chapter 26

Environmental risk analysis



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26 Environmental risk analysis

This chapter explains and documents the process for identifying and analysing project-related environmental issues.

26.1 Overview

Before lodging the application for project approval, Transport for NSW reviewed the outcomes of preliminary investigations and community and stakeholder consultation and identified those environmental issues of most importance for the project through a preliminary environmental risk analysis.

The findings formed the basis of Transport for NSW's scoping report and helped the Secretary formulate the 'key issues' for the project as outlined in the Secretary's environmental assessment requirements (SEARs).

As required by the SEARs, the process of environmental risk analysis continued during the course of carrying out the environmental assessment. The emphasis was on using the detailed information gathered during the assessment process to review the environmental aspects of the project. More specifically, the analysis:

- Identified environmental issues, including key issues in the SEARs, and any other issues
- Examined potential impacts and proposed mitigation measures in relation to the identified issues
- Identified the nature and extent of impacts likely to remain after mitigation measures are applied.

Based on this analysis, an environmental risk category was assigned to each potential impact. This enabled the identification of any matters that might be considered as additional key issues and provided a basis for an appropriately detailed assessment of these additional key issues in this environmental assessment.

The environmental risk categories are described in Table 26-1.

Table 26-1: Risk categories

Risk category	Description
Key issue	High or moderate impact (actual and perceived) requiring further investigation to identify specific management and mitigation measures.
Other issue	Moderate or low impact that can be managed effectively with standard and best practice management and mitigation measures

26.2 Risk analysis summary

A summary of the environmental risk analysis is provided in Table 26-2. The environmental risk analysis confirms that the SEARs included all key issues. No additional key issues were identified. Following the impact assessment, three key issues changed to other issues including soil, water and contamination, coastal processes and climate change.

Table 26-2: Environmental risk analysis

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
Aboriginal heritage – Chapter 7				
Yes	Construction: <ul style="list-style-type: none"> Potential loss of/damage to unknown heritage and archaeology within the construction boundary including the Foreshore Midden Potential Archaeological Deposit (PAD) at Kurnell and a Low Potential PAD and rock engravings at La Perouse from construction activities (excavation in particular) Loss of two Aboriginal artefacts due to excavation work for the proposed utilities trench at Kurnell Potential indirect impact (eg cosmetic damage) to Aboriginal heritage values from carrying out piling and other vibration generating construction activities nearby. 	<ul style="list-style-type: none"> Potential impact to unknown heritage and archaeology within the Foreshore Midden PAD (Kurnell), Low Potential PAD (La Perouse) Direct impacts to two Aboriginal artefacts at Kurnell Potential indirect vibration impacts to Aboriginal heritage values. 	Key issue	Section 7.4 Chapter 7 (Aboriginal heritage) Appendix E (Aboriginal Cultural Heritage Assessment Report)
	Operation: <ul style="list-style-type: none"> No impacts during operation are expected. 	<ul style="list-style-type: none"> No residual adverse impacts during operation are expected. 		
Non-Aboriginal heritage – Chapter 8				
Yes	Construction: <ul style="list-style-type: none"> Direct impacts to nationally, state and locally listed heritage items including Kurnell Peninsula Headland, Kamay Botany Bay National Park (North and South) and Towra Point Reserve and Kurnell Historic Site (in Kamay Botany Bay National Park) from installation of utilities, land disturbance Direct impacts to the Landscape element of the La Perouse Headland Conservation Management Plan (CMP) from removal of grassed areas and any direct impacts to sandstone rock outcrops and sandy soils Direct impacts to the coursed stone sea wall, Monument Track, African Olive tree, Coastal Banksia scrub, Captain Cook watering well and Landing Place Memorial at Kurnell from removal and/or relocation Vibration impacts to the Landscape element of the La Perouse Headland CMP and the La Perouse Monument from piling and other vibration generating construction activities 	<ul style="list-style-type: none"> Direct impacts to nationally, state and locally listed heritage items including Kurnell Peninsula Headland, Kamay Botany Bay National Park (North and South) and Towra Point Reserve and Kurnell Historic Site (in Kamay Botany Bay National Park) Direct impacts to the Landscape element of the La Perouse Headland Conservation Management Plan (CMP) Direct impacts to the coursed stone sea wall, Monument Track, African Olive tree and Coastal Banksia scrub Indirect visual impacts from construction equipment and activities within heritage curtilages Access restriction to heritage items within the construction boundaries 	Key issue	Section 8.3 Chapter 8 (Non-Aboriginal heritage) Appendix F (Statement of Heritage Impact)

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> Vibration impacts to the coursed stone sea wall, Captain Cook Monument and Ferry shelter shed at Kurnell from piling and other vibration generating activities Indirect visual impacts from construction equipment and activities within heritage curtilages from construction activities (eg equipment, exposed earth and construction vehicles) Access restriction to heritage items within the construction boundaries Archaeological impacts to the former wharf approach road at La Perouse and the former sandstone sea wall at Kurnell from ground disturbance works. 	<ul style="list-style-type: none"> Archaeological impacts to the former wharf approach road at La Perouse and the former sandstone sea wall at Kurnell. 		
	<p>Operation:</p> <ul style="list-style-type: none"> Indirect visual impacts on views and vistas to and from heritage items from the proposed wharf introducing additional visual clutter. 	<ul style="list-style-type: none"> No residual adverse impacts during operation are expected. 		
Underwater heritage – Chapter 9				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Construction of the temporary crane platform at La Perouse would have direct impacts on the second slipway, the old wharf approach and potential Aboriginal heritage Construction of the temporary causeway at Kurnell would impact the Trust Wharf remains and any potential Aboriginal heritage if present Piling activities would have direct impacts on underwater heritage within the wharf alignment, this may include old boat moorings, an unidentified ferrous object and any potential Aboriginal or non-Aboriginal underwater heritage Potential direct impacts from anchoring and propeller jet scour would mobilise sediment and exposure or cover heritage features. This may include the old wharf approach, boat moorings, an unidentified ferrous object, Holts jetty remains, Trust Wharf remains and any potential Aboriginal or non-Aboriginal heritage if present 	<ul style="list-style-type: none"> Direct impacts on second slipway, old wharf approach and potential Aboriginal heritage at La Perouse Direct impacts on unknown underwater heritage within the wharf alignment Direct impacts on Trust Wharf remains and potential Aboriginal heritage if present Temporary visual impacts during construction. 	Key issue	<p>Section 9.3</p> <p>Chapter 9 (Underwater heritage)</p> <p>Appendix G (Underwater Cultural Heritage Assessment Report)</p>

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> Vibration impacts would affect heritage items already directly impacted by piling or temporary construction platform and causeway construction Temporary visual impacts due to the presence of construction equipment. 			
	Operation: <ul style="list-style-type: none"> No impacts during operation are expected. 	<ul style="list-style-type: none"> No residual adverse impacts are expected. 		
Marine biodiversity – Chapter 10				
Yes	Construction: <ul style="list-style-type: none"> Direct loss of habitat including intertidal and subtidal reefs and seagrass habitat from wharf construction. Including loss of: <ul style="list-style-type: none"> 4,802.60m² of seagrass at La Perouse 1,379.87m² of subtidal habitat (macroalgae) at La Perouse 6,906.15m² of seagrass at Kurnell 1,480.50m² of subtidal habitat (macroalgae) at Kurnell Indirect impact to benthic habitat from vessel activity and mooring (causing shading) Indirect impact to marine fauna (including White's Seahorse) due to loss of available habitat for foraging and underwater noise caused by piling and vessel movement (including Black Rockcod) Artificial light impacts on marine fauna and marine birds Potential impact to marine fauna from an increased risk of chemical spills and accidents Impacts to marine fauna from vessel strikes. 	<ul style="list-style-type: none"> Loss of habitat including intertidal and subtidal reefs and seagrass habitat Indirect impact to benthic habitat from vessel activity and mooring (causing shading) Indirect impact to marine fauna due to loss of available habitat for foraging and underwater noise caused by piling and vessel movement Artificial light impacts on marine fauna and marine birds. 	Key issue	Section 10.3 Chapter 10 (Marine biodiversity) Appendix H (Marine Biodiversity Assessment Report)
	Operation: <ul style="list-style-type: none"> Shading impacts would restrict light and cause fragmentation of seagrass Loss of habitat for threatened fauna, including White's Seahorses due to decreased foraging habitat and increased exposure to predators Increased risk of injury and death of marine species from vessel strikes 	<ul style="list-style-type: none"> Permanent loss of seagrass habitat and subtidal habitat. Loss of connectivity due to fragmentation of seagrass. 		

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> Impacts on seagrass from propeller wash, including impacts on: <ul style="list-style-type: none"> 6,716.05m² of seagrass at La Perouse 823.16m² of subtidal habitat (macroalgae) at La Perouse 2,846.11m² of seagrass at Kurnell. 			
Terrestrial biodiversity – Chapter 11				
Yes	Construction: <ul style="list-style-type: none"> Impacts from removal of vegetation: <ul style="list-style-type: none"> Clearing of 0.06ha of native vegetation Clearing of 0.034ha of Kurnell Dune Forest Threatened Ecological Community (TEC) Direct impacts to 0.05ha of potential breeding habitat for Gang-gang Cockatoo Direct impacts to 0.05ha of potential foraging habitat for Large-eared Pied Bat Direct impacts to 0.028ha of potential foraging habitat for Eastern Cave Bat Loss of one African Olive tree and five juvenile trees Indirect habitat disturbance from changes in lighting and noise levels Risk of introduction of weeds and pathogens Impacts to habitat connectivity Impacts to water quality, water bodies and hydrological processes. 	<ul style="list-style-type: none"> Permanent loss of native vegetation (about 0.064ha) including potential habitat for threatened fauna including Gang-gang Cockatoo, Large-eared Pied Bat and Eastern Cave Bat. 	Key issue	Section 11.3 Chapter 11 (Terrestrial biodiversity) Appendix I (Biodiversity Development Assessment Report) Appendix J (Aboriginal Impact Assessment)
Yes	Operation: <ul style="list-style-type: none"> Indirect habitat disturbance from lighting and noise. 	<ul style="list-style-type: none"> Indirect habitat disturbance from lighting and noise. 		
Traffic and transport – Chapter 12				
Yes	Construction: <ul style="list-style-type: none"> Temporary and marginal increases in traffic volumes on the road network along the expected haulage routes from construction vehicles Temporary reduction in car parking spaces during reconfiguration of proposed car parking areas at La Perouse Temporary traffic, pedestrian and/or cycle detours around the construction boundaries 	<ul style="list-style-type: none"> Short-term and minor traffic delays during construction Temporary access restrictions to areas within the construction boundaries. 	Key issue	Section 12.3 Chapter 12 (Traffic and transport)

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> Potential for conflict between construction vessels and existing marine users (other boats and shipping operations) Relocation of three swing moorings at La Perouse. 			Appendix K (Landside Traffic and Transport Assessment Report)
	Operation: <ul style="list-style-type: none"> Increased risk of conflict between marine users including ferry vessels, recreational vessels, commercial vessels and shipping operations. 	<ul style="list-style-type: none"> Legacy parking and traffic issues would not be resolved. No residual adverse impacts as a result of the project are expected. 		Appendix L (Navigational Safety Assessment)
Landscape character and visual amenity – Chapter 13				
Yes (referred to as design, place and movement)	Construction: <ul style="list-style-type: none"> Change to landscape character from introduction of construction equipment and structural elements Temporary visual amenity impacts associated with construction activities including fencing, material stockpiles, machinery and plant equipment. 	<ul style="list-style-type: none"> Temporary visual amenity impacts associated with construction. 	Key issue	Section 13.3
	Operation <ul style="list-style-type: none"> Permanent change to landscape character from introduced wharf elements Permanent change to visual amenity from viewpoints where wharves are visible. 	<ul style="list-style-type: none"> Permanent changes to landscape character and visual amenity. 		Appendix M (Landscape Character and Visual Impact Assessment)
Socioeconomic – Chapter 14				
Yes	Construction impacts: <ul style="list-style-type: none"> Restricted access to areas within construction boundaries may deter visitors and cause indirect economic impacts for business operators resulting in reduced expenditure, time spent in the area and patronage for tourism businesses Actual and perceived changes to amenity (such as reduced air quality, visual amenity and noise impacts) may deter people from visiting and using the area and annoy and frustrate the local community Temporary visual impacts may cause a sense of loss of valued character and impact on the community's ability to enjoy the public space 	<ul style="list-style-type: none"> Actual and perceived short-term access and amenity loss during construction for sensitive receivers and recreational activities. 	Key issue	Section 14.3 Chapter 14 (Socioeconomic) Appendix N (Socioeconomic Impact Assessment Report)

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> • Temporary restricted access to areas within the construction boundaries, would impact people's way of life and patterns of the community • Temporary restricted access to areas under construction may result in the Aboriginal community not being able to carry out cultural practices within the area • Perceived impact on the decision-making processes for the project resulting in negative decisions. 			
	<p>Operation:</p> <ul style="list-style-type: none"> • Perceived increase in traffic congestion may result in frustration for motorists • Change in landscape character from particular viewpoints could impact how people value that area and their sense of place. 	<ul style="list-style-type: none"> • No residual adverse impacts during operation are expected. However, different people perceive impacts in different ways, and therefore may perceive residual impacts during operation of the project. 		
Noise and vibration – Chapter 15 and 16				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Temporary surface noise impacts to nearby sensitive receivers from setting up and removing the site compound, earthworks, reconfiguring the car parking area at La Perouse and piling • Vibration impacts on land-based buildings (including heritage items) from piling and other vibration generating construction activities if minimum safe working distances cannot be achieved, and vibration impacts to unknown underwater heritage from piling activities. • Temporary noise impacts to sensitive marine fauna and humans from piling activities and vessel movements causing behavioural responses, hearing loss (temporary and/or permanent) and/or physical injury. <p>Operation:</p> <ul style="list-style-type: none"> • Modelled surface noise management levels may be exceeded by the ferry service and commercial/recreational users of the wharf, however this is not expected to be at a level that is discernible by the average listener or significantly above current ambient noise environment. 	<ul style="list-style-type: none"> • Temporary surface noise impacts on nearby sensitive receivers • Temporary underwater noise impacts to sensitive marine fauna and humans • Vibration impacts to unknown land-based and underwater heritage. 	Key issue	<p>Section 15.4 and Section 16.4</p> <p>Chapter 9 (Underwater heritage)</p> <p>Chapter 15 (Surface noise and vibration)</p> <p>Chapter 16 (Underwater noise and vibration)</p> <p>Appendix O (Surface Noise and Vibration Impact Assessment Report)</p>
		<ul style="list-style-type: none"> • No residual adverse impacts during operation are expected. 		

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
				Appendix P (Underwater Noise Assessment)
Soils, water and contamination – Chapter 17				
Yes	Construction: <ul style="list-style-type: none"> Sediment erosion and runoff from land disturbance Impacts to groundwater flow from installation of piles and utilities Exposure of contaminants to sensitive receivers including construction workers, groundwater and ecosystems Exposure of acid sulfate soils from land and marine sediment disturbance Localised sediment dispersal from marine piling Potential spills into Botany Bay or which flow into groundwater. 	<ul style="list-style-type: none"> No potential residual impacts with the implementation of management plans. 	Other issue	Section 17.3 Chapter 17 (Soils, water and contamination) Appendix Q (Targeted Site Investigation) Appendix R (Groundwater Assessment Report) Appendix S (Surface Water Assessment Report)
	Operation: <ul style="list-style-type: none"> Spills and runoff into Botany Bay from ferry vessels. 	<ul style="list-style-type: none"> No residual adverse impacts during operation are expected. 		
Coastal processes – Chapter 18				
Yes	Construction: <ul style="list-style-type: none"> Mobilisation of sediment from construction of the temporary causeway at Kurnell, piling and vessel movements creating short term sediment plumes Temporary impacts to sediment and wave movement from temporary causeway at Kurnell. 	<ul style="list-style-type: none"> Temporary mobilisation of sediment from construction activities Temporary changes to sediment and wave movement from temporary causeway at Kurnell. 	Other issue	Section 18.3 Chapter 18 (Coastal processes) Appendix T (Coastal Processes Memorandum)
	Operation: <ul style="list-style-type: none"> Localised scour from vessel movements in swept path Localised scour around piles. 	<ul style="list-style-type: none"> Localised scour from vessel movements in swept path Localised scour around piles. 		
Climate change – Chapter 19				
Yes	Construction: <ul style="list-style-type: none"> Potential contribution to climate change through greenhouse gas emissions and waste 	<ul style="list-style-type: none"> No residual adverse impacts during construction are expected. 	Other issue	Section 19.3

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
	<ul style="list-style-type: none"> Increase in extreme weather events caused by climate change could impact construction methodologies and damage equipment. 			Chapter 19 (Climate change)
	Operation: <ul style="list-style-type: none"> Potential contribution to climate change through greenhouse gas emissions Increase extreme weather events, sea level rise and increased atmospheric carbon dioxide caused by climate change could impact the safe operation of the wharves. 	<ul style="list-style-type: none"> No residual adverse impacts during operation are expected. 		Appendix U (Climate Change Assessment)
Air quality – Chapter 20				
No	Construction: <ul style="list-style-type: none"> Generation of dust impacting on sensitive receivers nearest to the construction works from dust generating activities (excavation), storage, and transportation Vehicle emissions from construction vehicles Odour impacts on sensitive receivers nearest odour generating activities (eg disturbing marine sediments and fuel combustion from use of machinery, equipment and barges). 	<ul style="list-style-type: none"> No potential residual impacts during construction are expected. 	Other issue	Section 20.3 Chapter 20 (Air quality) Appendix V (Air Quality Assessment Report)
	Operation: <ul style="list-style-type: none"> Emissions from vessel operation. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 		
Greenhouse gas – Chapter 21				
No	Construction: <ul style="list-style-type: none"> Greenhouse gas emissions from construction vehicles and embodied carbon in construction materials. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 	Other issue	Section 21.3 Chapter 21 (Greenhouse gas)
	Operation: <ul style="list-style-type: none"> Greenhouse gas emissions from the operation of the ferry service and maintenance of the wharves. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 		Appendix W (Greenhouse Gas Calculations)
Sustainability – Chapter 22				
No	<ul style="list-style-type: none"> Potential for unsustainable practices during all stages of the project. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 	Other issue	Section 22.2

SEARs Key issue	Potential impacts	Potential residual impacts after implementation of management measures	Residual risk category	Where discussed in EIS
				Chapter 22 (Sustainability)
Waste – Chapter 23				
No	Construction: <ul style="list-style-type: none"> Waste generated from resource use and construction materials Disposal of special waste such as asbestos and construction and demolition waste, hazardous waste, and general and restricted solid waste. 	<ul style="list-style-type: none"> No potential residual impacts from construction are expected. 	Other issue	Section 23.3 Chapter 23 (Waste)
	Operation: <ul style="list-style-type: none"> Waste generated by users of the wharves. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 		
Hazard and risk – Chapter 24				
No	Construction <ul style="list-style-type: none"> Construction equipment height, lighting impacts and bird strike risk on aircraft operation Risk to submerged electrical cable within the Kurnell marine construction boundary Extreme weather risks to construction vessels and workers Risk to utilities service disruption if existing utilities are encountered Spills from construction vehicles and vessels. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 	Other issue	Section 24.2, 24.3, 24.4, 24.5 Chapter 24 (Hazard and risk)
	Operation: <ul style="list-style-type: none"> Spills from ferry vessels. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 		
Cumulative impacts – Chapter 25				
No	Construction and operation: <ul style="list-style-type: none"> No anticipated cumulative impacts are expected as there are no other major projects scheduled at the same time as the project. 	<ul style="list-style-type: none"> No potential residual impacts are expected. 	Other issue	Section 25.3 Chapter 25 (Cumulative)