

CONSOLIDATED ENVIRONMENTAL MITIGATION MEASURES

CHAPTER TWENTY-SEVEN

27 Consolidated environmental mitigation measures

This chapter collates the environmental mitigation measures for the project that were identified through the impact assessment process in Chapters 8 to 26. It also identifies the environmental performance outcomes for the project.

27.1 Approach to environmental mitigation and management

The project approach to environmental mitigation and management is shown on Figure 27-1. This includes:

- Project design – measures which are inherent in the design of the project to avoid and minimise impacts. Further detail on these aspects of the project are provided in Chapter 6 (Project description – operation) and Chapter 7 (Project description – construction)
- Mitigation measures – additional to the project design which are identified through the environment impact assessment in Chapters 8 to 26. These measures are consolidated in Table 27-1
- Construction environmental management framework – details the management processes and documentation for the project. Further details are provided in section 27.1.1
- Construction noise and vibration strategy – identifies how Sydney Metro proposes to manage construction noise and vibration. Further details are provided in section 27.1.2
- Design guidelines – provides an assurance of end-state design quality. Further details are provided in section 27.1.3
- Environmental performance outcomes – which establish the intended outcomes which would be achieved by the project. The performance outcomes are identified in section 27.3.

The construction environmental management framework, construction noise and vibration strategy and design guidelines would be reviewed and updated periodically throughout delivery of the project.

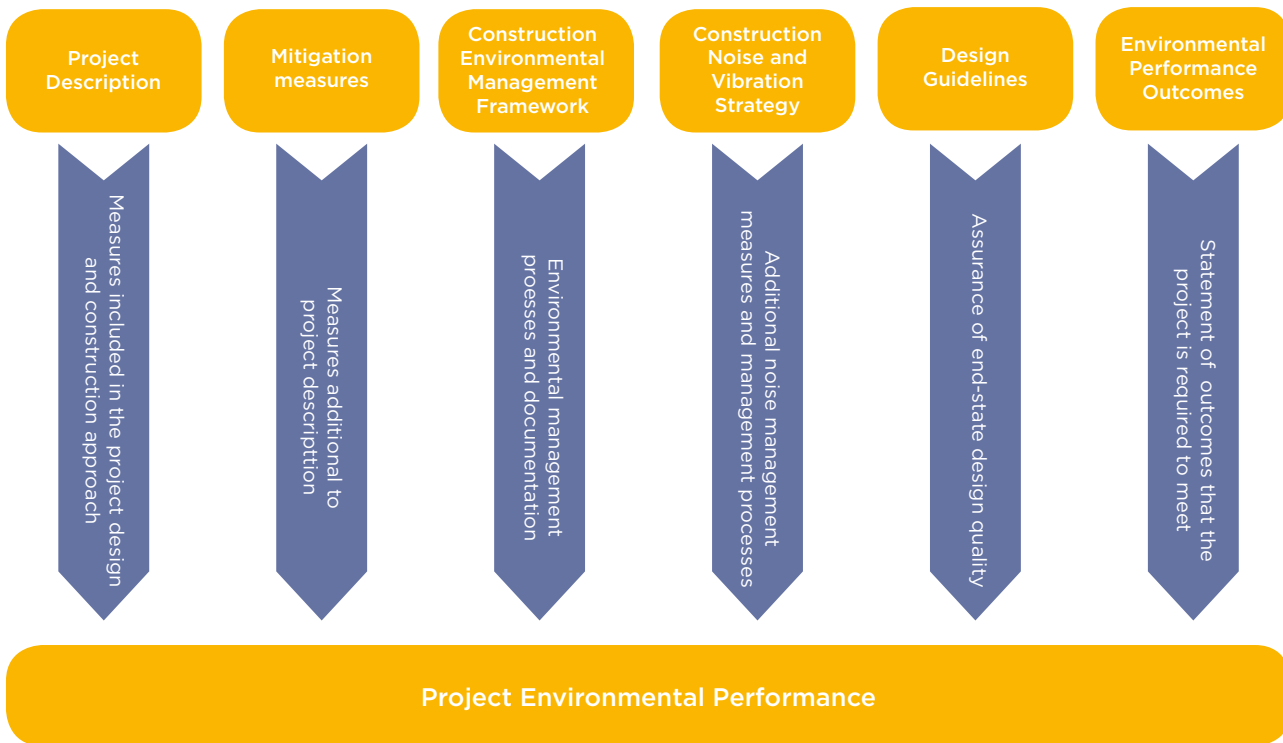


Figure 27-1 Project approach to environmental mitigation and management

27.1.1 Construction environmental management framework

A construction environmental management framework (CEMF) was developed and successfully implemented as part of the Sydney Metro Northwest project. This document has been reviewed and amended for application on this project and is provided in Appendix D.

The practical application of the CEMF is as a linking document between planning approval documentation and construction environmental management documentation, which would be developed by the construction contractors.

The CEMF details the environmental, stakeholder and community management systems and processes for the construction of the project. Specifically, it details the requirements in relation to the Construction Environmental Management Plan, sub-plans and other supporting documentation for each specific environmental aspect.

27.1.2 Construction noise and vibration strategy

The *Construction Noise and Vibration Strategy* (CNVS) (Appendix E) has been developed to identify how Sydney Metro proposes to manage construction noise and vibration for the City & Southwest project. It is anticipated that construction of City & Southwest would be developed under a number of separate construction contracts. The CNVS defines the strategies by which construction noise and vibration impacts are to be minimised on Sydney Metro projects and aims to provide a consistent approach to management and mitigation across the Sydney Metro projects.

Specifically the CNVS identifies:

- The requirements and methodology to develop Construction Noise Impact Statements. These are prepared prior to specific construction activities and are based on a more detailed understanding of the construction methods, including the size and type of construction equipment. Construction Noise Impact Statement would include:
 - ◆ A more detailed understanding of surrounding receivers including particularly sensitive receivers such as education and child care, and vibration sensitive medical, imaging and scientific equipment
 - ◆ Application of appropriate noise and vibration criteria for each receiver type
 - ◆ An assessment of the potential noise and vibration impacts as a result of the construction activities
- Two different types of Construction Noise Impact Statements may be developed:
- ◆ General – for construction activities that are consistently the same and progressively move along the alignment, eg tunnelling
 - ◆ Location specific – for activities that are specific to a location. This also includes out of hours works and to support applications for variations to the project Environment Protection Licence
- The minimum requirements in relation to standard noise and vibration mitigation measures
 - Noise and vibration auditing and monitoring requirements
 - Additional mitigation measures to be implemented when exceedances to the noise management levels (NMLs) are likely to occur. These measures are primarily aimed at pro-active engagement with potentially affected receivers, and the provision of respite periods and alternative accommodation for defined exceedance levels.

27.1.3 Design guidelines

Sydney Metro has developed design guidelines in order to guide the design development process, and establish the aesthetic standards for the project. These guide the design of:

The interface between stations and their surrounding locality including:

- Station entries
 - ◆ Development over stations
 - ◆ Transport interchange facilities (bicycle facilities, bus stops, kiss-and-ride, taxi ranks and connections to existing rail, ferry and light rail transport)
 - ◆ Landscaping and other public domain elements
- Rail corridor works including the tunnel dive structures, rail cuttings and embankments
- Station and service buildings, including underground stations.

Five Design Objectives have been developed for the project to guide decision making and the design process for the project. These are:

1. Ensuring an easy customer experience
2. Being part of a fully integrated transport system
3. Being a catalyst for positive change
4. Being responsive to distinct contexts and communities
5. Delivering an enduring and sustainable legacy for Sydney.

The Chatswood to Sydenham Design Guidelines are provided in Appendix B.

27.2 Consolidated environmental mitigation measures

The site specific mitigation measures identified through the impact assessment process are consolidated in Table 27-1. The location(s) applicable to each mitigation measure are identified by using a unique identifier as follows:

- STW – Surface track works
- CDS – Chatswood dive site
- AS – Artarmon substation
- CN – Crows Nest Station
- VC – Victoria Cross Station
- BP – Blues Point temporary site
- GI – Ground improvement works
- BN – Barangaroo Station
- MP – Martin Place Station
- PS – Pitt Street Station
- CS – Central Station
- WS – Waterloo Station
- MDS – Marrickville dive site
- Metro rail tunnels – Metro rail tunnels not related to other sites (eg TBM works)
- PSR – Power supply routes.

Table 27-1 Consolidated environmental mitigation measures

ID	Mitigation measure	Applicable location (s) ¹
Construction traffic and transport		
T1	Ongoing consultation would be carried out with (as relevant to the location) the CBD Coordination Office, Roads and Maritime Services, Sydney Trains, NSW Trains, local councils, emergency services and bus operators in order to minimise traffic and transport impacts during construction.	All except metro rail tunnels
T2	Road Safety Audits would be carried out at each construction site. Audits would address vehicular access and egress, and pedestrian, cyclist and public transport safety.	All except metro rail tunnels
T3	Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes.	All except metro rail tunnels
T4	In the event of a traffic related incident, co-ordination would be carried out with the CBD Coordination Office and / or the Transport Management Centre's Operations Manager.	All except metro rail tunnels
T5	The community would be notified in advance of proposed road and pedestrian network changes through media channels and other appropriate forms of community liaison.	All except metro rail tunnels
T6	Vehicle access to and from construction sites would be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence.	All except metro rail tunnels
T7	<p>Additional enhancements for pedestrian, cyclist and motorist safety in the vicinity of the construction sites would be implemented during construction. This would include measures such as:</p> <ul style="list-style-type: none"> ○ Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers ○ Shared experience educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle ○ Specific construction driver training to understand route constraints, expectations, safety issues and to limit the use of compression braking ○ Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn. 	All except metro rail tunnels
T8	Access to existing properties and buildings would be maintained in consultation with property owners.	All except metro rail tunnels
T9	All trucks would enter and exit construction sites in a forward gear, where feasible and reasonable.	All except metro rail tunnels
T10	Any relocation of bus stops would be carried out by Transport for NSW in consultation with Roads and Maritime Services, the CBD Coordination Office (for relevant locations), the relevant local council and bus operators. Wayfinding and customer information would be provided to notify customers of relocated bus stops.	All except metro rail tunnels

ID	Mitigation measure	Applicable location (s) ¹
T11	For special events that require specific traffic measures, those measures would be developed in consultation the CBD Coordination Office (for relevant locations), Roads and Maritime Services, and the organisers of the event.	BN, MP, PS, CS
T12	Construction sites would be managed to minimise construction staff parking on surrounding streets. The following measures would be implemented: <ul style="list-style-type: none"> ○ Encouraging staff to use public or active transport ○ Encouraging ride sharing ○ Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable. 	All except metro rail tunnels
T13	Construction site traffic would be managed to minimise movements in the AM and PM peak periods.	All except metro rail tunnels
T14	Construction site traffic immediately around construction sites would be managed to minimise movements through school zones during pick up and drop off times.	All except metro rail tunnels
T15	Pedestrian and cyclist access would be maintained at Crows Nest during the temporary closure of Hume Street, and at Martin Place during the temporary partial closure of Martin Place. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes.	CN, MP
T16	Timing for the temporary closure of the Devonshire Street tunnel would avoid periods of peak pedestrian demand. Wayfinding and customer information would be provided to guide pedestrians to alternative routes.	CS
T17	Consultation would occur with the Harbour Master, Roads and Maritime Services and Sydney Ferries' to ensure shipping channels are maintained during the Sydney Harbour ground improvement works.	GI
T18	During the closure of existing entrances to Martin Place Station, marshalls would be provided during the AM and PM peak periods to direct customers to available access and egress points.	MP
T19	Where existing parking is removed to facilitate construction activities, alternative parking facilities would be provided where feasible and reasonable.	All except metro rail tunnels
T20	Alternative pedestrian routes and property access would be provided where these are affected during the construction of the power supply routes.	PSR
Operational traffic and transport		
OpT1	Enhancement of pedestrian infrastructure in the vicinity of Victoria Cross and Martin Place stations would be investigated further in consultation with (as relevant to the location) the CBD Coordination Office, Roads and Maritime Services and the relevant local council.	VC, MP
OpT2	Access would be maintained to neighbouring properties.	All except metro rail tunnels

ID	Mitigation measure	Applicable location (s) ¹
Construction noise and vibration		
NV1	<p>The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable.</p> <p>This would include the following example standard mitigation measures where feasible and reasonable:</p> <ul style="list-style-type: none"> ○ Provision of noise barriers around each construction site ○ Provision of acoustic sheds at Chatswood dive site, Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and Marrickville dive site ○ The coincidence of noisy plant working simultaneously close together would be avoided ○ Offset distances between noisy plant and sensitive receivers would be increased ○ Residential grade mufflers would be fitted to all mobile plant ○ Dampened rock hammers would be used ○ Non-tonal reversing alarms would be fitted to all permanent mobile plant ○ High noise generating activities would be scheduled for less sensitive period considering the nearby receivers ○ The layout of construction sites would consider opportunities to shield receivers from noise. 	All
NV2	<p>Unless compliance with the relevant traffic noise criteria can be achieved, night time heavy vehicle movements at the Chatswood dive site, Crows Nest Station and Victoria Cross Station sites would be restricted to:</p> <ul style="list-style-type: none"> ○ The Pacific Highway and Mowbray Road at the Chatswood dive site ○ The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site ○ McLaren Street, Miller Street and Berry Street at the Victoria Cross station construction site. 	CDS, CN, VC
NV3	<p>Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.</p> <p>For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.</p>	All except metro rail tunnels
NV4	<p>Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedences are predicted.</p>	All
NV5	<p>Feasible and reasonable mitigation measures would be implemented where power supply works would result in elevated noise levels at receivers. This would include:</p> <ul style="list-style-type: none"> ○ Carrying out works during the daytime period when in the vicinity of residential receivers ○ Where out of hours works are required, scheduling the noisiest activities to occur in the evening period (up to 10 pm) ○ Use of portable noise barriers around particularly noisy equipment such as concrete saws. 	PSR

ID	Mitigation measure	Applicable location (s) ¹
Operational noise and vibration		
OpNV1	The height and extent of noise barriers adjacent to the northern surface track works would be confirmed during detailed design with the aim of not exceeding trigger levels from the <i>Rail Infrastructure Noise Guidelines</i> (Environment Protection Authority, 2013). At property treatments would be offered where there are residual exceedances of the trigger levels.	STW
OpNV2	Track form would be confirmed during the detailed design process in order to meet the relevant ground-borne noise and vibration criteria from the <i>Rail Infrastructure Noise Guidelines</i> (EPA, 2013) and the <i>Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects</i> (DECC, 2007a).	Metro rail tunnels
OpNV3	Stations and ancillary facilities including train breakout noise from draught relief shafts would be designed to meet the applicable noise criteria derived from the <i>Industrial Noise Policy</i> (EPA, 2000).	All except metro rail tunnels
Business impacts		
BI1	Specific consultation would be carried out with businesses potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual businesses.	All
BI2	A business impact risk register would be developed to identify, rate and manage the specific construction impacts for individual businesses.	All
BI3	Appropriate signage would be provided around construction sites to provide visibility to retained businesses.	All except metro rail tunnels
Non-Aboriginal heritage		
NAH1	Archival recording and reporting of the following heritage items would be carried out in accordance with the NSW Heritage Office's <i>How to Prepare Archival Records of Heritage Items</i> (1998a), and <i>Photographic Recording of Heritage Items Using Film or Digital Capture</i> (2006): <ul style="list-style-type: none"> ○ The internal heritage fabric and any non-original elements removed from within the curtilage of Mowbray House, Chatswood ○ The interior, exterior and setting of the shop at 187 Miller Street, North Sydney ○ The fabric and setting of the North Sydney bus shelters requiring removal and temporary relocation at Victoria Cross Station and Blues Point temporary site ○ Any component of the Blues Point Waterfront Group and the McMahons Point South heritage conservation area to be directly affected or altered, including vegetation and significant landscape features ○ Hickson Road wall in the vicinity of proposed ventilation risers and skylights for Barangaroo Station ○ The interior, exterior and setting of the 'Flat Building' at 7 Elizabeth Street, Sydney ○ Martin Place, between Elizabeth and Castlereagh streets, Sydney ○ The heritage fabric of areas of the existing Martin Place Station affected by the project ○ The Rolling Stock Officers Garden, Rolling Stock Officers Building and Cleaners Amenities Building in Sydney Yard and any other component of the Sydney Terminal and Central Railway Stations group to be removed or altered. 	CDS, VC, BP, MP, CS

ID	Mitigation measure	Applicable location (s) ¹
NAH2	An archaeological research designs would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be carried out in accordance with Heritage Council guidelines, and where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director with experience in managing State significant archaeology.	CDS, CN, VC, BP, BN, MP, PS, CS, WS, PSR
NAH3	An <i>Exhumation Policy and Guideline</i> would be prepared and implemented. It would be developed in accordance with the <i>Guidelines for Management of Human Skeletal Remains</i> (NSW Heritage Office, 1998b).	All except metro rail tunnels
NAH4	The method for the demolition of existing buildings and / or structures at Chatswood dive site, Victoria Cross Station, Martin Place Station, Pitt Street Station, Central Station and Waterloo Station would be developed to minimise direct and indirect impacts to adjacent and / or adjoining heritage items.	CDS, VC, MP, PS, CS, WS
NAH5	Prior to total or partial demolition of heritage items at Victoria Cross and Martin Place stations, heritage fabric for salvage would be identified and reuse opportunities for salvaged fabric considered. This would include salvage and reuse of heritage tiles to be impacted at Martin Place Station.	VC, MP
NAH6	An appropriately qualified and experienced heritage architect would form part of the Sydney Metro Design Review Panel and would provide independent review periodically throughout detailed design.	All
NAH7	The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Martin Place Station and Central Station would be developed with input from a heritage architect.	STW, CDS, CN, VC, BN, MP, PS, CS, WS, MDS
NAH8	Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the <i>NSW Heritage Manual</i> , the NSW Heritage Office's <i>Interpreting Heritage Places and Items: Guidelines</i> (August 2005), and the NSW Heritage Council's <i>Heritage Interpretation Policy</i> .	CDS, CN, VC, BP, BN, MP, PS, WS
NAH9	A Central Station heritage interpretation plan would be developed and implemented. It would be consistent with the <i>Central Station Conservation Management Plan</i> (Rappoport and Government Architects Office, 2013) and in accordance with the guidelines identified in NAH8.	CS
NAH10	The design of the Sydney Yard Access Bridge would be sympathetic to surrounding heritage items and minimise impacts to sight lines, views and setting of surrounding heritage items, including to Mortuary Station and the Sydney Terminal and Central Railway Stations group. As a minimum the design would: <ul style="list-style-type: none"> ○ Incorporate materials and finishes sympathetic to the heritage context of the railway station ○ Minimise height and bulk of the structure. 	CS

ID	Mitigation measure	Applicable location (s) ¹
NAH11	<p>Except for heritage significant elements affected by the project, direct impact on other heritage significant elements forming part of the following items would be avoided:</p> <ul style="list-style-type: none"> ○ The Blues Point Waterfront Group (including the former tram turning circle, stone retaining wall, bollards and steps) ○ The Millers Point and Dawes Point Village Precinct ○ The existing Martin Place Station ○ Sydney Terminal and Central Railway Stations group ○ Sydney Yard (including the Shunters Hut and Prince Alfred Sewer). 	BP, BN, MP, CS
NAH12	Power supply works would be designed and constructed to avoid impacts to the Tank Stream and Bennelong Stormwater Channel.	PSR
NAH13	<p>The design and detailed construction planning of work at Central Station would consider the requirements of the <i>Central Station Conservation Management Plan</i> (Rappoport and Government Architects Office, 2013) and include consideration of opportunities for the retention, conservation and / or reuse of original and significant heritage fabric.</p> <p>Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development.</p>	CS
Aboriginal heritage		
AH1	Aboriginal stakeholder consultation would be carried out in accordance with the NSW Office of Environment and Heritage's <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> .	All
AH2	<p>An Aboriginal cultural heritage assessment report would be prepared in accordance with the OEH <i>Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</i>. The Aboriginal cultural heritage assessment report would include:</p> <ul style="list-style-type: none"> ○ Details of Aboriginal stakeholder consultation conducted in accordance with AH1 ○ An assessment of cultural significance for the project area and identification of any specific areas of cultural significance based on consultation with Aboriginal stakeholders ○ A methodology for archaeological management including test excavation and salvage (refer to AH3). 	All
AH3	Archaeological test excavation (and salvage when required) would be carried out where intact natural soil profiles with the potential to contain significant archaeological deposits are encountered at the Blues Point temporary site, Barangaroo Station, Martin Place Station, Pitt Street Station, Central Station, Waterloo Station and Marrickville dive site. Excavations would be conducted in accordance with the methodology outlined in the Aboriginal cultural heritage assessment report	BP, BN, MP, PS, CS, WS, MDS
AH4	Appropriate Aboriginal heritage interpretation would be incorporated into the design for the project in consultation with Aboriginal stakeholders.	All
AH5	Feasible and reasonable mitigation at the ground improvement locations would be identified in consultation with the Office of Environment and Heritage.	GI
AH6	The Aboriginal cultural heritage assessment report would address areas of archaeological potential associated with the power supply routes.	PSR

ID	Mitigation measure	Applicable location (s) ¹
Landscape character and visual amenity		
Construction		
LV1	Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts, for example materials and machinery would be stored behind fencing.	All except metro rail tunnels
LV2	Existing trees to be retained would be protected prior to the commencement of construction in accordance with Australian Standard <i>AS4970 the Australian Standard for Protection of Trees on Development Sites and Adjoining Properties</i> .	All except metro rail tunnels
LV3	Lighting of construction sites would be oriented to minimise glare and light spill impact on adjacent receivers.	All except metro rail tunnels
LV4	Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period.	All except metro rail tunnels
LV5	Opportunities for the retention and protection of existing street trees would be identified during detailed construction planning.	All except metro rail tunnels
LV6	The design and maintenance of construction site hoardings would aim to minimise visual amenity and landscape character impacts, including the prompt removal of graffiti. Public art opportunities would be considered.	All except metro rail tunnels
LV7	The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.	CDS, CN, VC, BN, MP, PS, WS, MDS
LV8	Tunnel boring machine retrieval works at the Blues Point temporary site would be timed to avoid key harbour viewing events.	BP
LV9	Benching would be used where feasible and reasonable at Blues Point temporary site to minimise visual amenity impacts.	BP
Operation		
LV10	Cut off and direct light fittings (or similar technologies) would be used to minimise glare and light spill onto private property.	CDS, AS, MDS
LV11	Where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area.	CDS, AS, MDS
LV12	Identify and implement appropriate landscape treatments for Frank Channon Walk.	STW, CDS
LV13	The architectural treatment of Artarmon substation would minimise visual amenity and landscape character impacts.	AS
LV14	The Harbour cycles sculpture at North Sydney would be reinstated at a location determined in consultation with North Sydney Council.	VC
LV15	The P&O Fountain at 55 Hunter Street would be reinstated at a location determined in consultation with City of Sydney Council.	MP
LV16	Opportunities would be investigated to provide a permanent wall for street art at Marrickville dive site in consultation with Marrickville Council.	MDS
LV17	Noise barriers would be transparent where they are augmenting existing transparent noise barriers.	STW

ID	Mitigation measure	Applicable location (s) ¹
Groundwater and geology		
GWG1	<p>A detailed geotechnical model for the project would be developed and progressively updated during design and construction. The detailed geotechnical model would include:</p> <ul style="list-style-type: none"> ○ Assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain ○ Predicted changes to groundwater levels, including at nearby water supply works. <p>Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria), a structural assessment of the affected buildings / structures would be carried out and specific measures implemented to address the risk of damage.</p> <p>With each progressive update of the geotechnical model the potential for exceedance of the following target changes to groundwater levels would be reviewed:</p> <ul style="list-style-type: none"> ○ Less than 2.0 metres – general target ○ Less than 4.0 metres – where deep building foundations present ○ Less than 1.0 metre – residual soils ○ Less than 0.5 metre – residual soils (Blues Point) (fill / Aeolian sand). <p>Where a significant exceedance of target changes to groundwater levels are predicted at surrounding land uses and nearby water supply works, an appropriate groundwater monitoring program would be developed and implemented. The program would aim to confirm no adverse impacts on groundwater levels or to appropriately manage any impacts. Monitoring at any specific location would be subject to the status of the water supply work and agreement with the landowner.</p>	All
GWG2	Condition surveys of buildings and structures in the vicinity of the tunnel and excavations would be carried out prior to the commencement of excavation at each site.	All
Soil, contamination, water quality		
Construction		
SCW1	<p>Updated desktop contamination assessments would be carried out for Chatswood dive site, Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station. If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out.</p> <p>Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdenville Oval.</p> <p>In the event a Remediation Action Plan is required, these would be developed in accordance with <i>Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land</i> (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.</p>	CDS, BP, BN, CS, WS, PSR
SCW2	<p>Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, testing would be carried out to determine the presence of acid sulfate soils.</p> <p>If acid sulfate soils are encountered, they would be managed in accordance with the <i>Acid Sulfate Soil Manual</i> (Acid Sulfate Soil Management Advisory Committee, 1998).</p>	BN, WS, MDS

ID	Mitigation measure	Applicable location (s) ¹
SCW3	Erosion and sediment control measures would be implemented in accordance with <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004) and <i>Managing Urban Stormwater: Soils and Construction Volume 2</i> (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	All except metro rail tunnels
SCW4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	All except metro rail tunnels
SCW5	A silt curtain would be used around the Sydney Harbour ground improvement work barges.	GI
SCW6	A water quality monitoring program would be implemented to monitor water quality within Sydney Harbour during ground improvement work. The water quality monitoring program would be carried out to detect any potential impacts on the water quality of Sydney Harbour from the ground improvement work and inform management responses in the event any impacts are identified. Specific monitoring locations and frequencies would be determined during the development of the program in consultation with the Environment Protection Authority.	GI
Operation		
SCW7	Discharges from the tunnel water treatment plant would be monitored to ensure compliance with the discharge criteria determined in consultation with the NSW Environment Protection Authority.	MDS
Social impacts and community infrastructure		
SO1	Direct impacts to public open space at the Blues Point temporary site would be minimised.	BP
SO2	Specific consultation would be carried out with sensitive community facilities (including aged care, child care centres, educational institutions and places of worship) potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual sensitive community facilities.	All except metro rail tunnels
Biodiversity		
B1	An ecologist would be present during the removal of any hollow-bearing trees.	CDS
B2	Potential bat roosting locations at Central Station, Waterloo Station and Marrickville dive sites would be checked by a qualified ecologist or wildlife handler prior to demolition. Any bats found would be relocated.	CS, WS, MDS
B3	The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.	All except metro rail tunnels
B4	Procedures would be developed and implemented, in accordance with the National System for the Prevention and Management of Marine Pest Incursions, during Sydney Harbour ground improvement works to avoid transportation of marine pests from other locations, particularly the marine alga <i>Caulerpa taxifoli</i> .	GI

ID	Mitigation measure	Applicable location (s) ¹
Flooding and hydrology		
Construction		
FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, construction phase flooding impacts on the community and on other property and infrastructure.	BN, MP, WS
FH2	The site layout and staging of construction activities at Marrickville dive site would avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required.	MDS
FH3	<p>Overland flow diversions during construction at the Marrickville dive site would meet the following criteria:</p> <ul style="list-style-type: none"> ○ Increases in flood levels during events up to and including the 100-year average recurrence interval would be minimised particularly within private properties ○ Any increase in flow velocity for events up to and including a 100-year average recurrence interval event would not increase the potential for soil erosion and scouring ○ Dedicated evacuation routes would not be adversely impacted in flood events up to and including the probable maximum flood. <p>Construction planning for the Marrickville dive site would be carried out in consultation with the State Emergency Services and Marrickville Council.</p>	MDS
Operation		
FH4	Where feasible and reasonable, detailed design would result in no net increase in stormwater runoff rates in all storm events unless it can be demonstrated that increased runoff rates as a result of the project would not increase downstream flood risk.	STW, AS, MDS
FH5	Where space permits, on-site detention of stormwater would be introduced where stormwater runoff rates are increased. Where there is insufficient space for the provision of on-site detention, the upgrade of downstream infrastructure would be implemented where feasible and reasonable.	STW, AS, MDS
FH6	Detailed design would occur in consultation with Marrickville Council to ensure future drainage improvement works around the Marrickville dive site would not be precluded.	MDS
FH7	Consultation would be carried out with Marrickville Council to ensure flood-related outcomes of the project are consistent with any future floodplain risk management study and / or plan developed for the Marrickville Valley Catchment.	MDS
FH8	The frequency of Sydney Trains rail service disruptions due to flooding would not be increased in the vicinity of the Marrickville dive structure.	MDS

ID	Mitigation measure	Applicable location (s) ¹
HF9	<p>Design of the Marrickville dive structure would be reviewed to, where feasible and reasonable, further reduce flood levels for events up to and including the 100-year annual recurrence interval, including at private properties, within the road reserve at Bolton Street and around Sydenham Station.</p> <p>Flood modelling to support detailed design would be carried out in accordance with the following guidelines:</p> <ul style="list-style-type: none"> ○ <i>Floodplain Development Manual</i> (NSW Government, 2005b) ○ <i>Floodplain Risk Management Guideline: Practical Consideration of Climate Change</i> (DECC, 2007b) ○ <i>Floodplain Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments</i> (DECCW, 2010c) ○ <i>New guideline and changes to section 117 direction and EP&A Regulation on flood prone land, Planning Circular PS 07-003</i> (NSW Department of Planning, 2007). 	MDS
Air Quality		
AQ1	The engines of all on-site vehicles and plant would be switched off when not in use for an extended period.	All
AQ2	Plant would be well maintained and serviced to minimise emissions. Emissions from plant would be considered as part of pre-acceptance checks.	All
AQ3	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.	All except metro rail tunnels
AQ4	Hard surfaces would be installed on long term haul routes and regularly cleaned.	All except metro rail tunnels
AQ5	Unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions.	All except metro rail tunnels
AQ6	All vehicles carrying loose or potentially dusty material to or from the site would be fully covered.	All except metro rail tunnels
AQ7	Stockpiles would be managed to minimise dust generation.	All except metro rail tunnels
AQ8	Demolition would be managed to minimise dust generation.	All except metro rail tunnels
AQ9	Ventilation from acoustic sheds would be filtered.	CDS, CN, VC, BN, MP, PS, WS, MDS

ID	Mitigation measure	Applicable location (s) ¹
Hazard and risk		
Construction		
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005) and <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011).	All
HR2	Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities.	All
HR3	A hazardous material survey would be completed for those buildings and structures suspected of containing hazardous materials (particularly asbestos) prior to their demolition. If asbestos is encountered, it would be handled and managed in accordance with relevant legislation, codes of practice and Australian standards.	CDS, CN, VC, MP, PS, CS, WS, MDS
HR4	The method for delivery of explosives would developed prior to the commencement of blasting in consultation with the Department of Planning and Environment and be timed to avoid the need for on-site storage.	CN, VC, BN, MP, PS, WS
Operation		
HR5	All hazardous substances that may be required for operation would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005) and <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011).	All
Waste management		
Construction		
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the <i>NSW Waste Classification Guidelines</i> .	All
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	All
WM3	A recycling target of at least 90 per cent would be adopted for the project.	All
WM4	Construction waste would be minimised by accurately calculating materials brought to the site and limiting materials packaging.	All
Operation		
WM5	Generation of operation phase waste would be minimised.	All

ID	Mitigation measure	Applicable location (s) ¹
Sustainability		
Construction		
SUS1	Sustainability initiatives would be incorporated into the detailed design and construction of the project to support the achievement of the project sustainability objectives.	All
SUS2	A best practice level of performance would be achieved using market leading sustainability rating tools during design and construction.	All
SUS3	A workforce development and industry participation strategy would be developed and implemented during construction.	All
SUS4	Climate change risk treatments would be incorporated into the detailed design of the project including: <ul style="list-style-type: none"> ○ Ensuring that adequate flood modelling is carried out and integrated with design ○ Testing the sensitivity of air-conditioning systems to increased temperatures, and identify potential additional capacity of air-conditioning systems that may be required within the life of the project, with a view to safeguarding space if required ○ Testing the sensitivity of ventilation systems to increased temperatures and provide adequate capacity. 	All
SUS5	An iterative process of greenhouse gas assessments and design refinements would be carried out during detailed design and construction to identify opportunities to minimise greenhouse gas emissions. Performance would be measured in terms of a percentage reduction in greenhouse gas emissions from a defined reference footprint.	All
SUS6	25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction would be offset.	All
Operation		
SUS7	Sustainability initiatives would be incorporated into the operation of the project to support the achievement of the project sustainability objectives.	All
SUS8	Periodic review of climate change risks would be carried out to ensure ongoing resilience to the impacts of climate change.	All
SUS9	A workforce development and industry participation strategy would be developed and implemented during operation.	All
SUS10	100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation would be offset.	All

ID	Mitigation measure	Applicable location (s) ¹
Cumulative impacts		
CU1	<p>Transport for NSW would manage and co-ordinate the interface with projects under construction at the same time. Co-ordination and consultation with the following stakeholders would occur, where required:</p> <ul style="list-style-type: none"> ○ CBD Coordination Office ○ Department of Planning and Environment ○ Roads and Maritime Services ○ Sydney Trains ○ NSW Trains ○ Sydney Buses ○ Sydney Water ○ Port Authority of NSW ○ Willoughby Council ○ North Sydney Council ○ City of Sydney Council ○ Marrickville Council ○ Sydney Motorways Corporation ○ Barangaroo Delivery Authority ○ Emergency service providers ○ Utility providers ○ Construction contractors. <p>Co-ordination and consultation with these stakeholders would include:</p> <ul style="list-style-type: none"> ○ Provision of regular updates to the detailed construction program, construction sites and haul routes ○ Identification of key potential conflict points with other construction projects ○ Developing mitigation strategies in order to manage conflicts. Depending on the nature of the conflict, this could involve: <ul style="list-style-type: none"> ◆ Adjustments to the Sydney Metro construction program, work activities or haul routes; or adjustments to the program, activities or haul routes of other construction projects ◆ Co-ordination of traffic management arrangements between projects. 	All

¹ STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site; Metro rail tunnels: Metro rail tunnels not related to other sites (eg TBM works); PSR: Power supply routes.

27.3 Environmental performance outcomes

The Secretary's environmental assessment requirements identify a number of desired performance outcomes. These desired performance outcomes outline the broader objectives to be achieved by the proponent in the design, construction and operation of the project.

Table 27-2 identifies the environmental performance outcomes based on the outcomes of the assessment and the implementation of the mitigation measures identified in Table 27-1. Future design development and any design changes would be considered against these environmental performance outcomes.

Table 27-2 Environmental performance outcomes

Relevant Secretary's environmental assessment requirements desired performance outcomes	Environmental performance outcome
Construction traffic and transport	
<p>Transport and traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.</p>	<ul style="list-style-type: none"> ○ The project would minimise impacts to the road network ○ Pedestrian and cyclist safety would be maintained ○ Effective coordination would be carried out to minimise cumulative network impacts ○ Access to properties would be maintained.
Operational traffic and transport	
<p>Transport and traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.</p>	<ul style="list-style-type: none"> ○ The project would appropriately integrate with existing and planned future transport infrastructure including active transport ○ Access to properties would be maintained ○ Metro customers would be provided with a safe and secure service ○ The project would reduce station crowding, increase rail network reach and use, improve network resilience, and improve travel times within the global economic corridor.
Construction noise and vibration	
<p>Noise and vibration – amenity Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimize adverse impacts on acoustic amenity.</p> <p>Noise and vibration – structural Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimize adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage.</p>	<ul style="list-style-type: none"> ○ Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable ○ The project would avoid any damage to buildings from vibration.

Relevant Secretary's environmental assessment requirements desired performance outcomes	Environmental performance outcome
Operational noise and vibration	
<p>Noise and vibration – amenity Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community.</p> <p>Noise and vibration – structural Increases in noise emissions and vibration affecting environmental heritage as defined in the <i>Heritage Act 1977</i> during operation of the project are effectively managed.</p>	<ul style="list-style-type: none"> ● Noise levels would comply with the <i>Rail Infrastructure Noise Guidelines</i> (Environment Protection Authority, 2013). ● The project would avoid any damage to buildings from vibration.
Landuse and property	
<p>Socio-economic, land use and property The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.</p>	<ul style="list-style-type: none"> ● The project would be appropriately integrated into local landuse planning strategies ● The surface footprint of the project would be minimised ● The project would provide substantial future development opportunities.
Business impacts	
<p>Socio-economic, land use and property The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities.</p> <p>The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.</p>	<ul style="list-style-type: none"> ● The project would minimise impacts on businesses during construction ● During operation, the project would improve access to businesses for employees and customers, and connectivity between businesses within the global economic corridor.
Non-Aboriginal heritage	
<p>Heritage The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places.</p> <p>The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.</p>	<ul style="list-style-type: none"> ● The project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to non-Aboriginal heritage items and archaeology ● The design of the project would reflect the input of an independent heritage architect, relevant stakeholders and the design review panel.

Relevant Secretary’s environmental assessment requirements desired performance outcomes	Environmental performance outcome
Aboriginal heritage	
<p>Heritage</p> <p>The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places.</p> <p>The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.</p>	<ul style="list-style-type: none"> ○ The project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to Aboriginal heritage items and archaeology ○ The design of the project would reflect the input of an independent heritage architect, relevant stakeholders and the design review panel.
Landscape character and visual amenity	
<p>Urban design</p> <p>The project design complements the visual amenity, character and quality of the surrounding environment.</p> <p>The project contributes to the accessibility and connectivity of communities.</p> <p>Visual amenity</p> <p>The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.</p>	<ul style="list-style-type: none"> ○ During operation, the project would make a positive contribution to the quality of the urban environment at each station site ○ During operation, the project would minimise change to landscape character in the vicinity of the dive structures and Artarmon substation ○ The project would be visually integrated with its surroundings.
Groundwater and geology	
<p>Water – hydrology</p> <p>Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved).</p> <p>Sustainable use of water resources.</p>	<ul style="list-style-type: none"> ○ The project would make good any impacts on groundwater users ○ The project would avoid any damage to buildings from settlement.

Relevant Secretary's environmental assessment requirements desired performance outcomes	Environmental performance outcome
Soils, contamination and water quality	
<p>Soils The environmental values of land, including soils, subsoils and landforms, are protected.</p> <p>Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.</p> <p>Water - quality The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).</p>	<ul style="list-style-type: none"> ○ Erosion and sediment controls during construction would be implemented in accordance with <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004) and <i>Managing Urban Stormwater: Soils and Construction Volume 2</i> (Department of Environment and Climate Change, 2008a) ○ There would be no impacts on aquatic environments associated with the disturbance of acid sulfate soils during construction ○ Any contamination on project sites would be remediated to suit future land use ○ The project would protect or contribute to achieving the Water Quality Objectives, during construction and operation ○ Construction water quality discharge would comply with the requirements of an environment protection licence issued to the project ○ Operation water quality discharge would comply with a discharge criteria determined in consultation with the NSW Environment Protection Authority.
Social impacts and community facilities	
<p>Socio-economic, land use and property The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities.</p> <p>The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.</p>	<ul style="list-style-type: none"> ○ The project would avoid long term impacts (during operation) on the availability and quality of public open space and community facilities ○ The project, during operation, would help to improve access to local facilities, services and destinations, supporting opportunities for community interaction.
Biodiversity	
<p>Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity.</p> <p>Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation.</p>	<ul style="list-style-type: none"> ○ The biodiversity outcome would be consistent with the Framework for Biodiversity Assessment ○ The project would minimise impacts to biodiversity.

Relevant Secretary's environmental assessment requirements desired performance outcomes	Environmental performance outcome
Flooding and hydrology	
<p>Flooding The project minimises adverse impacts on existing flooding characteristics. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.</p> <p>Water – hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.</p>	<ul style="list-style-type: none"> ○ Changes to overland flow diversions during construction would meet the following criteria: <ul style="list-style-type: none"> ◆ Increases in flood levels during events up to and including the 100-year average recurrence interval would be minimised particularly within private properties ◆ Any increase in flow velocity for events up to and including a 100-year average recurrence interval event would not increase the potential for soil erosion and scouring ◆ Dedicated evacuation routes would not be adversely impacted in flood events up to and including the probable maximum flood ○ There would be no additional private properties affected by flooding up to and including the 100-year average recurrence interval event during operation ○ Flood levels would be increased by a maximum of 470 mm during the 100-year average recurrence interval event in the vicinity of the Marrickville dive structure during operation ○ The performance of the downstream drainage network would be maintained during operation.
Air quality	
There are no Secretary's environmental assessment requirements relevant to air quality.	<ul style="list-style-type: none"> ○ Dust and exhaust emissions during construction would be minimised.
Hazard and risk	
There are no Secretary's environmental assessment requirements relevant to hazard and risk.	<ul style="list-style-type: none"> ○ The storage, use and transport of dangerous goods and hazardous substances would comply with <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011) ○ There would be no unplanned or unexpected disturbance of utilities.
Waste Management	
<p>Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.</p>	<ul style="list-style-type: none"> ○ All waste would be assessed, classified, managed and disposed of in accordance with the NSW Waste Classification Guidelines ○ 100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy ○ A recycling target of at least 90 per cent would be adopted for the construction of the project.

Relevant Secretary's environmental assessment requirements desired performance outcomes	Environmental performance outcome
Sustainability	
<p>Sustainability</p> <p>The project reduces the NSW Government's operating costs and ensures the effective and efficient use of resources.</p> <p>Conservation of natural resources is maximised.</p>	<ul style="list-style-type: none"> ○ The project would be carried out in accordance with the Sydney Metro City & Southwest Environment and Sustainability Policy ○ 25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction would be offset ○ 100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation would be offset.

28 Environmental risk analysis

This chapter provides an environmental risk analysis for the project.

28.1 Secretary’s environmental assessment requirements

The Secretary’s environmental assessment requirements relating to environmental risk analysis, and where these requirements are addressed in this Environmental Impact Statement, are outlined in Table 28-1.

Table 28-1 Secretary’s environmental assessment requirements – environmental risk analysis

Ref.	Secretary’s environmental assessment requirements	Where addressed
3. Assessment of Key Issues		
3.2(c)	Identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts.	A risk assessment is provided in Section 28.5.

28.2 Purpose of environmental risk analysis

The purpose of this environmental risk analysis is to:

- Identify the potential environmental and community risks and issues to be considered as part of this Environmental Impact Statement
- Identify any issues not included in the Secretary’s environmental assessment requirements to enable appropriate assessment
- Consider environmental impacts based on additional detailed investigations and greater project definition
- Identify the residual environmental impacts after the implementation of the mitigation measures described in this Environmental Impact Statement. This provides early identification of high residual impacts to allow a focus on these areas during the refinement of the design and the development of construction methodologies.

This environmental risk analysis is intended to identify broad environmental risks associated with the project. Activity and site-specific risks are detailed within each individual chapter.