Chapter 15

Aboriginal cultural heritage

January 2020

15 Aboriginal cultural heritage

This chapter outlines the potential Aboriginal cultural heritage impacts associated with the project. A detailed Aboriginal cultural heritage assessment has been carried out for the project and is included in Appendix L (Technical working paper: Cultural heritage assessment report).

The Secretary's environmental assessment requirements as they relate to Aboriginal cultural heritage, and where in the environmental impact statement these have been addressed, are detailed in Table 15-1.

The proposed environmental management measures relevant to Aboriginal cultural heritage impacts are included in Section 15.5.

Table 15-1 Secretary's environmental assessment requirements – Aboriginal heritage

Secretary's requirement	Where addressed in EIS
Heritage	
1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative, vibration and visual impacts) to the heritage significance of listed (and nominated) heritage items inclusive of: a. Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines;	**Section 15.4** identifies and assesses all Aboriginal places and objects. The legislative and policy framework used for this assessment is outlined in **Section 15.1**, which includes reference to the guidelines used to consider potential impacts.
b. Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	**Section 15.3** identifies Aboriginal places of heritage significance as defined in the Standard Instrument – Principal Local Environmental Plan.
2. Where impacts to State or locally significant heritage items or archaeology are identified, the assessment must: a. include a significance assessment and statement of heritage impact for all heritage items (including any unlisted places that are assessed of heritage value);	Significance assessments are presented in **Section 15.4**.
b. provide a discussion of alternative locations and design options that have been considered to reduce heritage impacts;	A discussion of alternative locations and design options is provided in **Appendix L** (Technical working paper: Cultural Heritage assessment report) and in **Section 4.4** and **Section 4.5** of **Chapter 4** (Project development and alternatives).
c. in areas identified as having potential archaeological significance, undertake	Details of test excavations carried out are presented in **Section 15.3** and **Appendix E** of

Secretary's requirement	Where addressed in EIS
a comprehensive archaeological assessment and management plan in line with Heritage Council guidelines which includes a methodology and research design to assess the impact of the works on the potential archaeological resource and to guide physical archaeological test excavations and include the results of these excavations. This is to be carried out by a suitably qualified archaeologist and is to discuss the likelihood of significant historical, maritime and Aboriginal archaeology on the site, how this may be impacted by the project, and includes measures to mitigate any impacts;	**Appendix L** (Technical working paper: Cultural heritage assessment report).
e. consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant);	Discussion of impacts to items of significance as a result of vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant) are provided in **Section 15.4**.
f. provide a comparative analysis to inform the rarity and representative value of any heritage places proposed for demolition	No sites are proposed for demolition.
g. outline mitigation measures to avoid and minimise identified impacts in accordance with the current guidelines; and	Mitigation and management measures are presented in **Section 15.5.**
h. be undertaken by a suitably qualified heritage consultant (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	**Appendix L** (Technical working paper: Cultural heritage assessment report) provides details of qualifications held by archaeologists.
3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, meeting the minimum qualification requirements specified in section 1.6 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010d).	**Appendix L** (Technical working paper: Cultural Heritage assessment report) provides details of qualifications held by archaeologists. **Section 15.2** provides details of attendance for site surveys.

15.1 Legislative and policy framework

The primary legislation relevant to Aboriginal cultural heritage in NSW is the *National Parks and Wildlife Act 1974* (NPW Act) and its supporting regulation, which provides for the management of Aboriginal land, objects and places. Although an Aboriginal heritage impact permit would not be required for the project under section 90 of the NPW Act (refer to Chapter 2 (Assessment process)), an equivalent level of assessment and consultation has been carried out.

The requirement to consider potential impacts on Aboriginal cultural heritage, including objects and places, is given effect through the following guidelines:

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010d)
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (Office of Environment and Heritage, 2011a)
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010b)
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010c).

The *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime, 2011) specifically tailors and applies the requirements of these guidelines to its road projects.

The *Native Title Act 1993* (Cth) and *Aboriginal Land Rights Act 1983* (NSW) provide a framework for the protection of native title rights on certain Crown lands. There are no Crown lands subject to a native title claim within the footprint of the project.

15.2 Assessment methodology

The Aboriginal cultural heritage assessment was carried out in accordance with the PACHCI (Roads and Maritime, 2011). The PACHCI applies the requirements of other relevant guidelines (refer to Section 15.1) to road projects.

The PACHCI includes up to four stages of assessment, all of which are relevant and have been applied to the project:

- Stage 1 – a desktop risk assessment was carried out to determine whether the project may potentially impact on Aboriginal cultural heritage and require further assessment or investigation. The desktop risk assessment took into account relevant registers and databases, including but not limited to the Aboriginal Heritage Information Management System (AHIMS)
- Stage 2 – because Stage 1 identified a risk of impact on Aboriginal cultural heritage, site surveys of relevant areas were carried out in consultation with the Metropolitan Local Aboriginal Land Council
- Stage 3 – because Stage 2 identified that there may be an impact on Aboriginal cultural heritage, an Aboriginal Cultural Heritage Assessment Report (ACHAR) was prepared and formal consultation with Aboriginal stakeholders was carried out
- Stage 4 – the outcomes and recommendations from the ACHAR, including mitigation and management measures, would be implemented during construction and operation of the project.

For the purpose of the Aboriginal cultural heritage assessment, all areas within 50 metres of the project's construction footprint have been considered. Searches of AHIMS, relevant local environmental plans and State and Commonwealth heritage registers were carried out in March 2018. Feedback from Registered Aboriginal Parties has been incorporated into the ACHAR.

Site surveys were carried out in May, June and August 2017 by a qualified archaeologist accompanied by a representative of the Metropolitan Local Aboriginal Land Council.

Registered Aboriginal Parties were identified in accordance with the DECCW guidelines (2010b) and invited to focus group meetings (September 2017 and October 2019) on the project, and have been provided an opportunity to review the survey and assessment methodology. Feedback from Registered Aboriginal Parties has been incorporated into the ACHAR. Aboriginal site officers were engaged for archaeological fieldwork in January 2018.

Aboriginal stakeholder consultation was carried out in accordance with the PACHCI and is discussed in Chapter 7 (Stakeholder and community engagement).

In conjunction with the PACHCI process, an assessment of potential submerged Aboriginal sites was carried out within the marine environment of the project area. Where possible, the assessment of potential submerged Aboriginal sites was coordinated with the PACHCI process.

The potential submerged Aboriginal sites assessment included:

- Review of existing information and remote sensing data
- Field survey, carried out as part of the maritime archaeological dive inspections in December 2017
- Establishing a predictive model of maritime heritage potential, to guide the assessment of significance and sensitivity
- Assessing potential impacts and providing appropriate mitigation and management measures.

15.3 Existing environment

15.3.1 Ethnographic and archaeological context

The Sydney area has a rich indigenous heritage. Aboriginal occupation focused on accessing resources from diverse ecological areas, seasons and conditions. Occupation sites, hunting, travel and inter-clan contact would have been associated with coastal areas, smaller rivers, creeks and swamps.

Aboriginal occupation in the Sydney area is known to have extended beyond the Last Glacial Maximum (about 21,000 years ago). Evidence of Aboriginal occupation in NSW dates back to around 50,000 to 60,000 years ago at Lake Mungo, up to 30,000 years ago at Parramatta, and is increasingly identified at other locations in the Sydney Basin.

Until the most recent ice age, about 12,000 years ago, sea levels were about 100 metres below their current level and the eastern coastline of Australia was about 25 to 30 kilometres further east. As the climate grew warmer and the sea level began to rise, these freshwater creeks and rivers were gradually drowned and the lower-middle slopes of the ancient valleys were slowly inundated. The sea eventually flooded the area that became Port Jackson and food resources would have changed dramatically. The sea level stabilised about 8000 to 6000 years ago, which allowed the development of the foreshore maritime resource economy that then operated until after the arrival of the First Fleet in 1788.

Numerous open and rockshelter sites with shell middens and remains of fish and land mammals dating to the past 4500 years are known around Port Jackson, including Sydney Harbour (Attenbrow, 2010). The material culture of Aboriginal people reflected a reliance on organic materials, using an intimate understanding of timber, plant and animal products to make utensils, tools and weapons. Igneous stone suitable for hatchet heads and stone for flaking, cutting and scraping were not naturally available in the area and could be traded from long distances.

Historically, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. The project would be located on land within the boundaries of the Darug linguistic group. Two dialects of *Darug* are suggested to have been used: the coastal dialect (area between Sydney Harbour and Botany Bay, and west to Parramatta), and the hinterland dialect (area to the west of the Cumberland Plain) (Attenbrow, 2010).

Rock shelters appear to have been widely used by Darug-speaking people in coastal areas at the time of European contact. Existing data suggests that dominant site types for this region include rock shelters, artefact scatters and isolated artefacts, with middens present in the coastal areas further north. Applied art in rock shelters and engravings on sandstone platforms were common in this part of Sydney, although their fragility means that many have been lost in the past two centuries.

There is evidence of Aboriginal occupation along and around the project alignment, with areas of plentiful food resources associated with shorelines, riparian zones and adjacent areas including Berrys Bay, Yurulbin Park and the Sydney Harbour foreshore. During urban development, many of these areas were covered by fill, concealing original formations. Some evidence of Aboriginal occupation may also be present along movement pathways, meeting and camping sites, which were often associated with ridgelines.

15.3.2 Environmental and landscape context

The project is located in a region bordered by steep headlands of exposed Hawkesbury Sandstone with some low hills and rises on later sediments.

The project is underlain by Hawkesbury Sandstone across the majority of the project alignment, with isolated occurrences of Ashfield Shale in the north-eastern portion of the project alignment, around North Sydney and Neutral Bay. During the glacial maximum, the area would have resembled the flat-topped, steeply stepped river valleys still seen in the Blue Mountains, creating plateaus with sandstone exposures exploited for engraved art, but which held little water or complex vegetation. Rockshelters, seeps and little creeks formed repeatedly down the cascading cliff sides, now largely drowned, while the ancient Parramatta River itself was probably narrow and fast-flowing.

Most of the project alignment is underlain by soils of the Gymea landscape group. Hawkesbury landscape group soils surround the shorelines of Sydney Harbour and there are isolated occurrences of the Blacktown landscape group soils around North Sydney. In the drowned river valley, there is evidence of more extensive open soil development, which would have created yet another resource and subsistence zone for occupation by Aboriginal people.

After rising sea levels began to stabilise about 8000 years ago, the now-familiar Sydney Harbour foreshore environments began to develop. These provided environments for different types of fish, shellfish and other marine resources to be exploited. Below the water surface, sedimentation began to fill up and smooth the tumbled rocky cliffsides, masking their appearance and possibly burying evidence of former Aboriginal occupation.

The present landscape is highly urbanised and is characterised by planted native vegetation mixed with exotic or invasive species. Vegetation within built-up areas is generally limited to planted street trees and vegetation within public parks and reserves, such as at Yurulbin Park, Birchgrove and St Leonards Park.

Urban development has resulted in a high level of disturbance across the region. This has included extensive vegetation clearance, landscape modification and infrastructure development. This level of disturbance means that most Aboriginal deposits that were present are likely to have been destroyed.

15.3.3 Database search results

Aboriginal Heritage Information System (AHIMS) sites in the region around the project are shown in Figure 15-1. Of these, nine sites have been identified within 50 metres of the project construction footprint:

- Seven rock shelters (with middens and engravings)
- One midden site
- One art site (engravings).

Details of these AHIMS sites, including Aboriginal cultural values identified through consultation with knowledge holders, are summarised in Table 15-2. The proximity of these sites to the project construction footprint is shown in Figure 15-2. The location of Aboriginal sites presented in Figure 15-2 is based on the results of extensive AHIMS searches. Where possible, the location of these sites were confirmed during the archaeological survey. As discussed in Section 15.3.5, the location of four sites could not be verified due to private property access constraints.

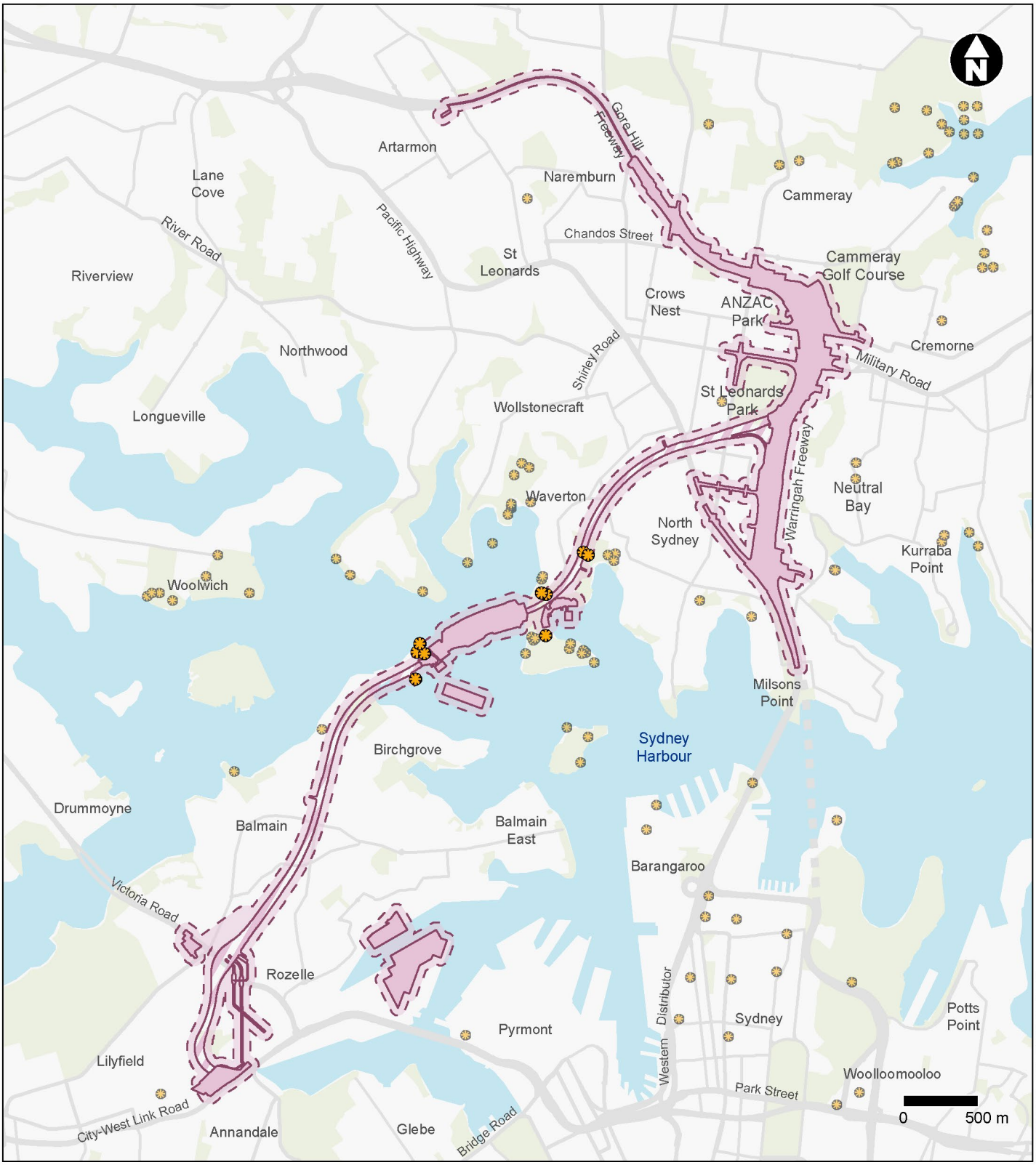
Four of the AHIMS sites within 50 metres of the project construction footprint are also listed under the *Leichhardt Local Environmental Plan 2013*:

- LEP item A4: Aboriginal midden and rock shelter, 144 Louisa Road at Birchgrove
- LEP item A8: Aboriginal middens and rock shelter, Numa Street (public reserve) at Birchgrove
- LEP item A6: Aboriginal middens and rock shelter, 7 Numa Street at Birchgrove
- LEP item A7: Aboriginal middens and rock shelter, 9 Numa Street at Birchgrove.

Table 15-2 AHIMS sites within 50 metres of the project construction footprint

AHIMS site ID/LEP item	Site name	Site type	Proximity to the project	Cultural value description
45-6-2180	Quarantine Cave: Waverton	Shelter with midden (rock shelter is less than 50 m^3 in size)	Within 50 metres of the surface works at the Berrys Bay construction support site (WHT7).	Part of cultural area and occupation site.
45-6-2762	Coal Loader 1	Shelter with midden (rock shelter is less than 50 m^3 in size; shell is non-human bone and organic material)	Within 50 metres of the driven tunnel alignment and over 50 metres from surface works at the Berrys Bay construction support site (WHT7).	Part of cultural area and occupation site.
45-6-1270	Waverton Park	Midden	Within 50 metres of the driven tunnel alignment and over 50 metres from surface works at the Berrys Bay construction support site (WHT7).	Part of cultural area and occupation site.
45-6-2181	Waverton Park Cave	Shelter with midden (rock shelter is less than 50 m^3 in size)	Directly above the driven tunnel alignment and over 50 metres from surface works at the Berrys Bay construction support site (WHT7).	Part of cultural area and occupation site.
45-6-0026	Whale Rock	Rock engravings	Within 50 metres of the driven tunnel alignment and over 50 metres of surface construction works at the Berrys Bay construction support site (WHT7).	Part of cultural area and occupation site. Vantage point looking toward harbour. Likely a place of spiritual significance. Multiple engravings including large whale with human figures. This engraving was recorded as early as the 1840s.
45-6-1901 LEP item A7	Long Nose Point 1	Shelter with midden and art (rock shelter is less than 50 m^3 in size)	Assumed to be within 50 metres of driven tunnel alignment and potentially within 50 metres of surface construction works at Yurulbin Point construction support site (WHT4). Further investigation and	Part of cultural area and occupation site.

AHIMS site ID/LEP item	Site name	Site type	Proximity to the project	Cultural value description
			consultation would be carried out to confirm site location.	
45-6-2287 LEP item A6	Yerroulbin Cave	Shelter with midden and art (rock shelter is less than 50 m^3 in size)	Assumed to be within 50 metres of the driven tunnel alignment and potentially within 50 metres of surface construction works at the Yurulbin Point construction support site (WHT4). Further investigation and consultation would be carried out to confirm site location.	Part of cultural area and occupation site. Vantage point looking toward harbour. Likely a place of spiritual significance. Hand stencils recorded as being present.
45-6-2672 LEP item A4	Shed Cave	Shelter with midden and art (rock shelter is less than 50 m^3 in size)	Assumed to be within 50 metres of the driven tunnel alignment (based on a hand drawn map provided on the AHIMS site card) and potentially within 50 metres of surface construction works at the Yurulbin Point construction support site (WHT4). Further investigation and consultation would be carried out to confirm site location.	Part of cultural area and occupation site.
45-6-2967 LEP item A8	5 Hands Shelter	Shelter with midden and art (rock shelter is less than 50 m^3 in size)	Assumed to be within 50 metres of the driven tunnel alignment and potentially within 50 metres of surface construction works at the Yurulbin Point construction support site (WHT4). Further investigation and consultation would be carried out to confirm site location.	Part of cultural area and occupation site.



Legend

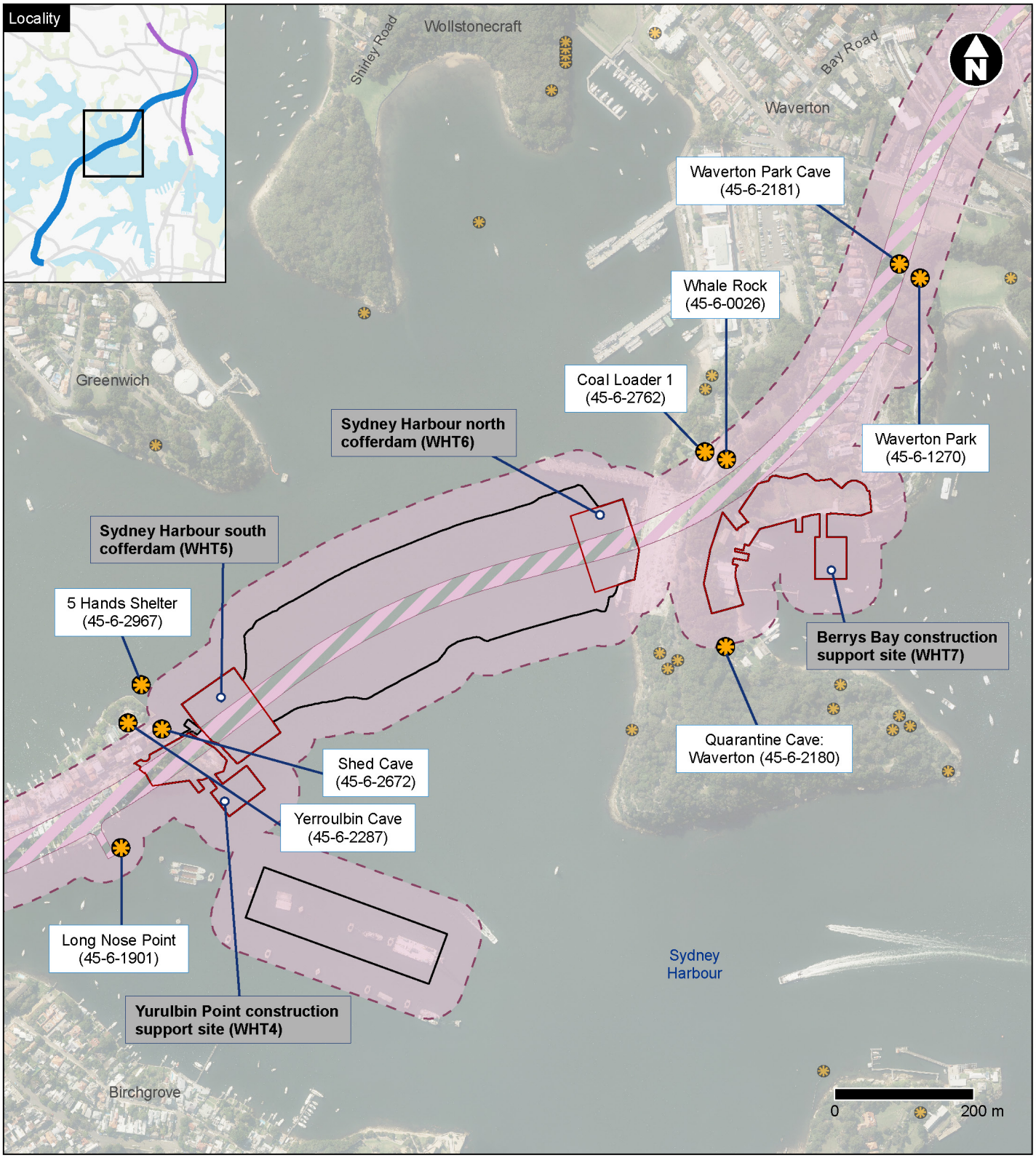
Construction features

- 50 metre area around construction footprint
- Construction footprint
- Tunnel

AHIM sites

- AHIMS site within 50 metres of the construction footprint
- AHIMS site over 50 metres from the construction footprint

Figure 15-1 AHIMS sites in the region around the project



Legend

Construction features

- 50 metre area around construction footprint
- Construction footprint
- Construction support site
- Tunnel

AHIMS sites

- AHIMS site within 50 metres of the construction footprint
- AHIMS site over 50 metres from the construction footprint

Figure 15-2 AHIMS sites within 50 metres of the project construction footprint

15.3.4 Potential submerged Aboriginal sites

Potential submerged Aboriginal sites refer to archaeological sites inundated since the rise in sea levels that occurred in Port Jackson (including Sydney Harbour) after 18,000 years ago. Aboriginal sites that could occur in inundated areas of the study area include:

- Rock shelters with occupation evidence and deposit
- Engraving and applied pigment art and axe grinding grooves on sandstone ledges and faces
- Middens and/or stone artefact scatters on sandstone platforms and within soil profiles
- Fish traps on shallow, wide and gently sloping sandstone platforms.

The probability of these surviving intact, or at all depends on how the sea rose – gradually or as an encroaching active shoreline with wave and tidal action, and the subsequent pattern of tidal flow. Between Yurulbin Point and Balls Head Aboriginal sites may have a lesser likelihood of surviving inundation due to present strong tidal flows. Elsewhere in the area, data collected from geotechnical drilling for the project indicates that for a time during the latest sea level rise, water flow was sufficiently slow to allow sedimentary build-up that was potentially capable of trapping, burying and effectively protecting archaeological sites and deposits.

Potential rock overhangs are submerged and concealed by marine sediments, so they cannot be readily accessed and assessed. The assessment of impacts to submerged Aboriginal sites is therefore based on the potential for such sites to exist, using available geophysical information and an understanding of site formation processes.

Areas where submerged Aboriginal archaeological sites could occur have been considered based on a combination of the likelihood of the site occurring and the likelihood of it surviving inundation. Table 15-3 presents how archaeological potential has been defined, based on the likelihood of a site's presence.

Table 15-3 Defining Aboriginal archaeological potential

Archaeological Potential	Likelihood of presence
Moderate to high	50–100%
Low	25–49%
Very Low	2–24%
Remote	>0–1%

Table 15-4 summarises areas of submerged Aboriginal archaeological potential relevant to the project.

Table 15-4 Summary of areas of submerged Aboriginal archaeological potential

Location	Potential Aboriginal site type	Archaeological potential	Predicted potential location within study area
Between Yurulbin Point and Waverton	Stone artefacts, midden deposits and fish traps	Moderate to high (in one localised area)	In identified peat deposits formed above residual soils (as shown from geotechnical investigations).
	Stone artefacts and	Low	In identified residual soils.

Location	Potential Aboriginal site type	Archaeological potential	Predicted potential location within study area
	midden deposits		
	Rock shelters, art, grinding grooves, middens, stone artefact scatters, quarry sites and fish traps	Very low	Buried beneath at least 10 metres of marine sediment.
Berrys Bay	Rock shelters, grinding grooves, middens and/or stone artefact scatters, fish traps.	Moderate to high	In potential residual soils and/or sandstone overhangs/ledges, creek lines that may occur buried beneath Holocene marine sediments, up to 20 metres thick below the current bed of the harbour surface.
White Bay	Rock shelters, grinding grooves, middens and/or stone artefact scatters, stone quarry sites, fish traps.	Moderate to high	In potential residual soils and/or sandstone overhangs/ledges, creek lines that may occur buried beneath Holocene marine sediments, up to 20 metres thick below the current bed of the harbour surface as well as under reclamation.

15.3.5 Archaeological survey results

Targeted archaeological surveys were carried out in January 2018 to confirm the location of registered AHIMS sites and LEP items and to assess areas identified as having potential Aboriginal archaeological sensitivity based on particular landforms. These areas of potential Aboriginal archaeological sensitivity and archaeological survey results are described in Table 15-5.

The archaeological surveys verified the presence of five of the nine identified AHIMS sites. The location of the remaining four sites could not be verified due to private property access constraints. Further investigation and consultation with Department of Premier and Cabinet (Heritage), the Metro Local Aboriginal Land Council (LALC) and the RAPs would be carried out to confirm the location of these four remaining sites.

No previously unrecorded Aboriginal cultural heritage places, objects or areas of potential archaeological deposits were identified during the surveys.

Table 15-5 Outcomes of the archaeological surveys

Survey area	Aboriginal archaeological sensitivity	Archaeological survey results
Yurulbin Park, Birchgrove	Moderate	Sites not accessed due to private property access constraints: • 5 Hands Shelter (45-6-2967) • Yerroulbin Cave (45-6-2287) • Long Nose Point 1 (45-6-1901) • Shed Cave (45-6-2672).

Survey area	Aboriginal archaeological sensitivity	Archaeological survey results
		No further Aboriginal cultural heritage was identified.
Balls Head and surrounds, Waverton Peninsula	High	Registered AHIMS sites inspected: • Waverton Park Cave (45-6-2181) • Waverton Park (45-6-1270) • Coal Loader 1 (45-6-2762) • Whale Rock (45-6-0026) • Quarantine Cave: Waverton (45-6-2180). No further Aboriginal cultural heritage was identified.
St Leonards Park, North Sydney (south east section of the park between The Greens Bowling Club and the Warringah Freeway)	Low	No Aboriginal cultural heritage was identified.
ANZAC Park, Cammeray	Low	No Aboriginal cultural heritage was identified.
Cammeray Golf Course, Cammeray (western edge of the Cammeray Golf Course site between the Warringah Freeway and Ernest Street)	Low	No Aboriginal cultural heritage was identified.

15.3.6 Significance assessment

The significance of those Aboriginal sites within 50 metres of the project construction footprint is summarised in Table 15-6 and has been assessed based on the four values of the Australia ICOMOS Burra Charter (Australia ICOMOS 2013):

- Social values
- Historical values
- Scientific values
- Aesthetic values.

Aboriginal cultural significance was assessed through consultation with the relevant Registered Aboriginal Parties during the archaeological survey and consultation process.

Any potential submerged Aboriginal archaeological sites are likely to have very high scientific significance due to the potential to yield information that would contribute to an understanding of New South Wales' natural and cultural history. Submerged Aboriginal archaeological sites and Pleistocene Aboriginal archaeological sites are both, on their own, rare site types within a New South Wales context and the identification of submerged Pleistocene landscapes and associated Aboriginal archaeological resources would be an extremely rare discovery within Australia.

Table 15-6 Significance of Aboriginal sites within 50 metres of the project construction footprint

Name and AHIMS ID	Significance value				Overall significance
	Social	Historical	Scientific	Aesthetic	
Waverton Park Cave (45-6-2181)	High	N/A	Moderate to high	Moderate	Moderate to high
Waverton Park (45-6-1270)	High	N/A	Moderate to high	Low	Moderate to high
Coal Loader 1 (45-6-2762)	High	N/A	Moderate	N/A	Moderate to high
Whale Rock (45-6-0026	High	High	High	High	High
Quarantine Cave: Waverton (45-6-2180)	High	N/A	Moderate to high	Moderate	Moderate to high
5 Hands Shelter (45-6-2967)	The sites were unable to be inspected due to private property access constraints and have been assumed to hold 'high' overall significance for the purpose of this assessment.				
Yerroulbin Cave (45-6-2287)					
Long Nose Point 1 (45-6-1901)					
Shed Cave (45-6-2672)					

15.4 Assessment of potential impacts

15.4.1 Potential impacts to terrestrial Aboriginal heritage sites

The majority of potential impacts to Aboriginal sites would likely occur during construction rather than operation of the project, and may include:

- Direct impacts such as the removal or destruction of an Aboriginal site
- Indirect impacts associated with construction vibration generated by surface works in proximity to Aboriginal sites
- Indirect impacts associated with vibration and settlement from tunnelling works beneath or near to Aboriginal sites
- Indirect impacts associated with Aboriginal site setting (visual impacts, changes to vistas/landscapes), dust, changes to ongoing use or environmental association.

The potential for these impacts to occur at known Aboriginal sites is summarised in Table 15-7. Based on the results of this assessment and in consultation with the Registered Aboriginal Parties:

- No verified Aboriginal heritage sites are located within the surface construction footprint of the project, and therefore no known sites would be directly impacted by the project
- One archaeological site (45-6-2180, Quarantine Cave: Waverton) is located within 50 metres of surface works and may be subject to indirect impacts associated with vibration and settlement
- One archaeological site (45-6-2181, Waverton Park Cave) is located directly above the tunnel alignment and may be subject to indirect impacts associated with vibration and settlement
- Three archaeological sites (45-6-1270, Waverton Park; 45-6-2762, Coal Loader 1; and 45-6-0026, Whale Rock) are located within 50 metres of the tunnel alignment and may be subject to indirect impacts associated with vibration and settlement.

The four archaeological sites at Long Nose Point, Birchgrove that could not be inspected (45-6-2967, 45-6-2287, 45-6-1901 and 45-6-2672) are likely to be within 50 metres of the tunnel alignment or surface construction works and could be indirectly impacted by vibration and settlement. No Aboriginal sites were identified within the construction footprint at the surface in this location.

Table 15-7 Assessment of potential impacts to known Aboriginal cultural heritage sites

Site	Site type	Overall site significance	Potential impact and description	Risk of potential impacts
Waverton Park Cave (45-6-2181)	Shelter with midden	High	Indirect – vibration Vibration impact would be within the minimum working distance for unsound structures and could pose a risk to the structural integrity of the site if not minimised and managed.	Moderate
			Indirect – settlement Settlement is predicted to be between 15-20 millimetres.	Negligible
Waverton Park (45-6-1270)	Midden	High	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Coal Loader 1 (45-6-2762)	Shelter with midden	Moderate	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Quarantine Cave: Waverton (45-6-2180)	Shelter with midden	High	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Whale Rock (45-6-0026)	Rock engraving	High	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
			Indirect – settlement Settlement is predicted to be less than 10 millimetres.	Negligible

Site	Site type	Overall site significance	Potential impact and description	Risk of potential impacts
5 Hands Shelter (45-6-2967)	Shelter with midden and art	Moderate-high	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Yerroulbin Cave (45-6-2287)	Shelter with midden and art	Moderate-high	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Long Nose Point 1, 9 Numa Street, Birchgrove (45-6-1901)	Shelter with midden and art	Moderate-high	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
Shed Cave (45-6-2672)	Shelter with midden and art	Moderate-high	Indirect – vibration Vibration impact would be outside the minimum working distance for unsound structures.	Negligible
			Indirect – settlement Settlement is predicted to be less than 10 millimetres.	Negligible

Note: Each AHIMS site has been assessed for indirect impacts associated with settlement. With the exception of Waverton Park Cave (45-6-2181), Shed Cave (45-6-2672) and Whale Rock (45-6-0026) all sites within the study area are outside of the zone of potential settlement impacts.

15.4.2 Impacts to potential submerged Aboriginal sites

Potential rock overhangs are submerged and concealed by marine sediments, so they cannot be readily accessed and assessed. The assessment of impacts to submerged Aboriginal sites is therefore based on the potential for such sites to exist, using available geophysical information and an understanding of site formation processes.

The predictive model provides a basis for assessing potential impacts and identified that there is documented evidence of Aboriginal occupation and land use patterns along the Port Jackson shoreline and the broader Sydney Basin.

The extent to which sites may have survived inundation is dependent on the length and intensity of exposure to water movement and wave action. It is predicted that most submerged sites are likely to be identified in peat deposits which have formed above residual subsoils, some of which may be beneath at least 10 metres of marine sediment.

Construction activities associated with excavation within the cofferdams, dredging and piling may have direct and indirect impacts on potential submerged Aboriginal sites. The construction of the immersed tube tunnels would require dredging of the bed of the harbour to create a trench for the installation of the immersed tube tunnel. The slopes of the trench would generally be about 1:4 to maximise the stability of the trench and minimise the risk of slumping. The tunnel trench would be designed to provide a solid and safe place for the immersed tube tunnel to be placed. A rock protection layer would be installed with rock materials to protect the immersed tube tunnels from activities during operation, including falling or dragging anchors.

The majority of potential impacts to submerged Aboriginal sites would likely occur during construction rather than operation, and may include:

- Direct impacts from construction activities such as dredging, piling and excavation within the cofferdams
- Indirect impacts associated with construction vibration generated by construction activities in proximity to Aboriginal sites.

Indirect impacts such as vibration would have a negligible impact, because any submerged Aboriginal remains would be buried and movement of individual artefacts would be minimal.

Further investigation would be required to confirm the presence of sites and their condition. If confirmed, the identification and documentation of such remains would demonstrate that such remains could be present across Sydney Harbour, and the information obtained in this project would be valuable in managing this resource.

A summary of potential impacts to submerged Aboriginal heritage is provided in Table 15-8.

Table 15-8 Assessment of potential impacts to submerged Aboriginal sites

Location	Potential Aboriginal site type	Archaeological potential	Significance of direct impacts	Risk of indirect impacts
Between Yurulbin Point and Waverton	Stone artefacts, midden deposits and fish traps	Moderate to high (in one localised area)	Moderate (without mitigation)	Negligible
	Stone artefacts and midden deposits	Low	Negligible to moderate	Negligible

Location	Potential Aboriginal site type	Archaeological potential	Significance of direct impacts	Risk of indirect impacts
			(without mitigation)	
	Rock shelters, art, grinding grooves, middens, stone artefact scatters, quarry sites and fish traps	Very low	Negligible to moderate (without mitigation)	Negligible
Berrys Bay	Rock shelters, grinding groves, middens and/or stone artefact scatters, stone quarry sites, fish traps	Moderate to high	Negligible to minor	Negligible
White Bay	Rock shelters, grinding groves, middens and/or stone artefact scatters, stone quarry sites, fish traps	Moderate to high	Negligible to minor	Negligible

15.5 Environmental management measures

Measures to avoid, minimise or manage Aboriginal heritage impacts as a result of the project are detailed in Table 15-9.

Table 15-9 Environmental management measures – Aboriginal cultural heritage

Ref	Phase	Impact	Environmental management measure	Location
Terrestrial Aboriginal heritage				
AH1	Pre-construction and construction	Aboriginal heritage – vibration, and settlement impacts	Prior to construction, further consultation with Department of Premier and Cabinet (Heritage), the Metro LALC and the RAPs will be carried out to decide an appropriate course of action for previously recorded Aboriginal sites not assessed during archaeological surveys due to site accessibility constraints. If new information regarding site condition and location is identified during consultation suggesting the sites may be subject to impacts due to vibration and settlement, then mitigation measures AH2, AH3 and AH4 will apply.	Yerroulbin Cave (45-6-2287) Long Nose Point 1 (45-6-1901) 5 Hands Shelter (45-6-2967) Shed Cave (45-6-2672)

Ref	Phase	Impact	Environmental management measure	Location
			If during construction works a site is located, Department of Premier and Cabinet (Heritage), an appropriately qualified archaeologist and the Metro LALC will be contacted and the site will be re-recorded in situ. If the site is determined to be within the construction footprint, consultation between Department of Premier and Cabinet (Heritage), Transport for NSW, Metro LALC and RAP groups will occur with the aim of avoiding, minimising and managing adverse impacts on the site before construction works at the location recommence.	
AH2	Pre-construction and construction	Aboriginal heritage – vibration impacts	The following process will be carried out to confirm where vibration monitoring at terrestrial AHIMS sites will be required: a) Terrestrial Aboriginal site condition surveys will be completed using photogrammetry and 3D-capture techniques to determine which AHIMS sites are considered to be structurally unsound b) Where this determination cannot be made, the AHIMS site will be considered to be structurally unsound c) A screening of vibration intensive activities within 50 metres of structurally unsound sites will be carried out to identify activities that have the potential to exceed vibration levels of 2.5 millimetres per second d) Sites identified as being both structurally unsound and having potential for exceedance in vibration levels of 2.5 millimetres per second will be identified as requiring vibration monitoring.	All registered AHIMS sites located within 50 metres of the project construction footprint
AH3	Construction	Aboriginal heritage – vibration impacts	Vibration monitoring will be carried out at AHIMS sites that have been identified as requiring monitoring in accordance with the process outlined in mitigation measure AH2. Where possible, works will be	All registered AHIMS sites subject to vibration intensive activities determined to be structurally

Ref	Phase	Impact	Environmental management measure	Location
			conducted in a manner to minimise vibration levels, to less than 2.5 millimetres per second at all structurally unsound AHIMS sites.	unsound (see AH2)
AH4	Construction	Aboriginal heritage – vibration impacts	If vibration monitoring identifies that vibration levels exceed 2.5 millimetres per second at AHIMS sites that have been identified as requiring monitoring, a site visit will be organised with a representative from Metro LALC to record any changes to the integrity of the site that may have resulted from construction vibration, and updated site cards must be prepared accordingly. Condition surveys may include further photogrammetry and 3D-capture techniques.	All registered AHIMS sites subject to vibration intensive activities determined to be structurally unsound (see AH2)
AH5	Construction	Unexpected discovery of historical heritage materials, features or deposits	If at any time during construction of the project, any items of potential Aboriginal archaeological or cultural heritage conservation significance or human remains are discovered they will be managed in accordance with the *Standard Management Procedure: Unexpected Heritage Items* (Roads and Maritime Services, 2015e).	WHT/WFU
AH6	Construction	Aboriginal heritage – impacts	Cultural and historic heritage awareness training will be carried out for personnel engaged in work that may impact heritage items before commencing works for the project.	WHT/WFU
Maritime Aboriginal heritage				
AH7	Pre-construction	Maritime Aboriginal heritage impacts	The need for further high-resolution geophysical survey/s to identify the presence of submerged rock overhangs concealed by marine sediments will be investigated in consultation with a maritime archaeology advisor. If it is determined that a high resolution geophysical survey could produce the desired results, the geophysical	Sydney Harbour south and north cofferdams (WHT5 and WHT6)

Ref	Phase	Impact	Environmental management measure	Location
			survey will be carried out.	
AH8	Construction	Maritime Aboriginal heritage impacts	The following mitigation measures will be carried out if the geophysical survey described in AH7 is inconclusive or if the geophysical survey identifies rock overhangs at least 1.2 metres in height: a) Excavations will be visually monitored after WHT5 and WHT6 cofferdams have been de-watered in order to identify voids within the bedrock and identify potential rock shelters b) In consultation with a suitably experienced geomorphologist, criteria will be established for the identification of pre-inundation soil deposits (peat, charcoal, roots, etc) and where necessary, samples of marine sediments will be collected to identify if pre-inundation soil deposits are evident c) If pre-inundation soil deposits are evident then a controlled archaeological investigation will be carried out to recover any artefacts, subject to bed rock conditions and safety constraints within the cofferdams.	Sydney Harbour south and north cofferdams (WHT5 and WHT6)
AH9	Pre-construction and construction	Maritime Aboriginal heritage impacts	Prior to construction, determination of whether dredged soil units have potential to contain cultural material will be carried out by a palaeo-geomorphologist through review of existing borehole information. If the potential to encounter cultural material is identified, then an appropriate sampling protocol will be designed so that samples can be collected during construction if feasible.	Dredging works in the immediate vicinity of borehole B215W in Area A, located between Yurulbin Point and Balls Head (Appendix L (Technical working paper: Cultural heritage assessment report))

Western Harbour Tunnel = WHT, Warringah Freeway Upgrade = WFU

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